Representation of Jennifer Dawes

Re-determination of the Application by RiverOak Strategic Partners Limited ("the Applicant") for an Order granting Development Consent for the reopening and development of Manston Airport in Kent.

Index to Representation of Jennifer Dawes

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Re-determination of the Application by RiverOak Strategic Partners Limited ("the Applicant") for an Order granting Development Consent for the reopening and development of Manston Airport in Kent ("the Development").

This representation is made in response to the Department for Transport's Statement of Matters of 11 June 2021.

I make this representation in my personal capacity.

1. National or local policy changes that inform the level of need for the services that the Development would provide and the benefits that would be achieved from the Development

On 9 July 2020 the Secretary of State made a DCO for the reopening and development of Manston Airport, overturning the recommendation of the Examining Authority ("ExA") in its Report of Findings and Conclusions and Recommendations (the "ExAR"), issued on 18 October 2019.

At the time of the ExA inquiry and the publication of the ExAR, the Airports National Policy Statement ("ANPS") was in effect.

When the Secretary of State made the DCO, the Government had been compelled to review the ANPS by the Court of Appeal.[1]

On 16 December 2020, the Supreme Court reinstated the ANPS.[2] Consequently, the Secretary of State is required to take the ANPS into account when re-considering the DCO application.

Paragraph 1.12 of the ANPS states that:

> "The Airports NPS provides the primary basis for decision making on development consent applications for a Northwest Runway at Heathrow Airport, and will be an important and relevant consideration in respect of applications for new runway capacity and other airport infrastructure in London and the South East of England."

At paragraph 1.41, the ANPS goes on to state:

> "1.41 …., the Secretary of State considers that the contents of the Airports NPS will be both important and relevant considerations in the determination of such an application, particularly where it relates to London or the South East of England. Among the considerations that will be important and relevant are the findings in the Airports NPS as to the need for new airport capacity and that the preferred scheme is the most appropriate means of meeting that need."

[1] Following *R (on the application of Plan B Earth) v Secretary of State for Transport* [2020] EWCA Civ 214
[2] *R (on the application of Plan B Earth) v Secretary of State for Transport* [2020] UKSC 52.

Consequently, the ANPS is an important and relevant consideration under section 105(2) of the Planning Act 2008 in any application for an airport-related NSIP in the South East of England.

The ANPS itself does not mention Manston airport. That is because the Airport's Commission ("AC") reviewed the case for Manston as a dedicated freight airport[3] and dismissed it as an option for further consideration because the proposal:

> "did not fit with the Commission's remit or offer a solution to the key question of providing additional long-term capacity and connectivity for the UK."[4]

Thus, the ANPS confirms, at paragraph 2.23, that:

> "The Government believes that the Airports Commission has analysed all the options put forward to the appropriate degree of detail, and discounted shortlisted schemes fairly and objectively."

It is therefore clear, based on the ANPS and the research that underpinned it, that government policy is that there is no need for Manston as a dedicated freight airport. The 'Making best use of existing runways' ("MBU") policy of June 2018 does not alter this. The MBU policy reiterates that proposals for other airports with existing runways must take into consideration both economic (including need) and environmental considerations.

At the local level, Thanet District Council's Local Plan was adopted in July 2020. The Local Plan recognised the DCO application and the need for review of the Local Plan "whether or not the DCO is confirmed" (SP07).

It is also clear that there is, as a matter of fact, no need for Manston as a dedicated freight airport. This was the conclusion of numerous extensive reports submitted to the ExA.[5] Dismissing the approach and reliability of the findings of RSP's experts (ExAR, 5.6.59 and 5.6.69), it was also the emphatic conclusion of the ExA itself: [6]

> "**the ExA concludes that the levels of freight that the Proposed Development could expect to handle are modest and could be catered for at existing airports (Heathrow, Stansted, EMA, and others if the demand existed). The ExA considers that Manston appears to offer no obvious advantages to outweigh the strong competition that such airports offer. The ExA therefore concludes that the Applicant has failed to demonstrate**

[3] Manston was considered as a dedicated freight airport in the PWC report "The Air Freight Industry in the UK", which was one of the reports included in the AC's Economics Analysis: Consultants Reports – see: charts on p.33 & 34 and map on p.43
[4] Appendix 2 to the AC's Interim Report (2013), p16. See also Samara Jones-Hall, Deadline 5, Comment on Civil Aviation – Response to Examining Authority's WQ [REP3-231].
[5] AviaSolutions, Commercial Viability of Manston Airport, September 2016 [REP3-276]; AviaSolutions, Review of Azimuth & Northpoint Forecast for Manston Airport, August 2017 (referred to in REP2-012, p.31 and available here]; York Aviation, Summary report analysing use of York Aviation material by Riveroak Strategic Partners Limited and assessment of capability of Manston Airport, November 2017 [REP3-025, p.188]; York Aviation, Assessment of the need and justification for the development of Manston Airport as an air freight hub, February 2019 [REP3-025, Appendix 4]; Altitude Aviation, Analysis of the freight market potential of a reopened Manston Airport, January 2018 [REP3-025, p.393]; and Altitude Aviation, Analysis of the freight market potential of a reopened Manston Airport – Addendum, February 2019 [REP3-025, Appendix 5]
[6] ExAR, Chapter 5 [TR020002-005347].

sufficient need for the Proposed Development, additional to (or different from) the need which is met by the provision of existing airports." [Emphasis Original] (5.7.28)

The need case for Manston has not improved due to any national or local policy developments. There was and still is no need for Manston as a dedicated freight airport. The lack of need is supported by the findings of York Aviation in their report attached at Annex I.

The potential benefits of the proposed development depend to a large degree on their being a need. The need and benefits of the development are different concepts and must be treated as such.

Given the lack of need for a dedicated freight airport at Manston, the airport is likely to struggle to obtain the necessary investment required,[7] and is highly unlikely to be commercially viable in the long-term. If the airport fails, there will be no socio-economic benefits beyond the construction phase. Further, using the land for an airport that has limited prospect of opening, let alone operating, is likely to create disbenefits. A more sustainable use of the site with longer-term viability would be highly preferable.

In relation to direct jobs the ExA found:

> **that the numbers forecast by the Applicant are too high, when considering the likely actual number of direct aviation jobs at EMA and Prestwick. Actual direct jobs for the Proposed Development would be likely to be significantly lower than those forecast (to the order of around 20%).** (emphasis as original) (ExAR, 6.10.74)

Further, as regards indirect jobs, the ExA preferred the approach of York Aviation and found that many of these jobs would not benefit the local area (ExAR 6.10.80-6.10.81). In addition, the ExA found there was likely to be an adverse impact on tourism (ExAR 6.10.142).

Overall, the ExA concluded:

> The ExA considers that the socio-economic benefits of the Proposed Development have been overstated, and that the Proposed Development would have an adverse effect on tourism in Ramsgate. The education, training and skills commitments would benefit Thanet and East Kent. When taken together the ExA considers that the Proposed Development would still generate a socio-economic benefit to Thanet and East Kent, but such benefits are substantially lower than that forecast by the Applicant. Such benefits are also dependent on the need for the Proposed Development; without the need and the forecasts based on this need, socio-economic benefits (aside from the education, training and skills commitments) would reduce further. (ExAR, 6.10.164)

[7] https://www.ft.com/content/40cf97e5-4222-4220-ad10-0704cb37b680?accessToken=zwAAAXo946kAkc9Az5flQiJCINOtEAcEyze2gA.MEUCIGqU8N9OdThSbf2SA0cVWNCDiwxrnJsL92lB8LPctUu3AiEAs7TkrF8CuI0rqbDi1k_tzZm5j2bNs5MjjcbnuwbXeag&sharetype=gift?token=5d938752-d6bd-4be9-a0c0-3b4fe93544b5

The finding that any benefits from the Development will be limited and are dependent on the need case, remain valid. This is borne out by the findings of York Aviation in their report attached at Annex I.

Indeed, other developments since the Secretary of State's decision of 9 July 2020 offer greater potential to provide employment, education, leisure and tourism, regeneration and regional connectivity benefits, including:

i. Thanet Parkway Station – planning permission was approved in October 2020, construction is underway and the station is due to complete in 2023 providing improved connectivity between East Kent, London and the wider Kent area,
ii. The London Resort, Swanscombe, Kent – the DCO application was submitted in December 2020 and accepted in January 2021. The build is projected to take six years with 2,500-3,700 jobs during construction and 4,835 full time jobs in 2025 and 10,170 full time jobs in 2037,
iii. Levelling-up funds - Thanet District Council submitted two bids worth £26.1m for levelling-up investment in Ramsgate and Margate in June 2021,
iv. Ebbsfleet Garden City – the development of a new Garden City at Ebbsfleet Valley is expected to deliver up to 30,000 jobs by the completion of its final development phase in 2035.
v. The Lower Thames Crossing – due to re-submit its DCO application following consultation in July 2021. Construction is projected to take six years and to provide up to 22,000 jobs and supply chain training for local businesses.

2. Impacts on the quantitative need for the Development by changes since 9 July 2019 (such as, but not limited to, changes in demand for air freight, changes of capacity at other airports, locational requirements for air freight and the effects of Brexit and/or Covid);

The ExAR's findings on the lack of quantitative need for Manston Airport remain valid.

This is supported by the analysis and conclusions of York Aviation in their report attached at Annex I, which examines the changes since July 2019.

As regards the impact of the Covid-19 pandemic, York Aviation states:

> "Prima facie, there is no change in the need for additional airport capacity going forward for dedicated freighter operations as a consequence of the Covid-19 pandemic than there was in our original assessments in 2017 and 2019." (para.4.24)

In relation to any changes brought about as a result of Brexit, York Aviation confirms:

> "Ultimately, there is no compelling evidence to suggest that the UK's withdrawal from the European Union contributes to an alleged need for the development and re-opening of Manston Airport." (para. 4.28)

Further, in terms of increases in e-commerce as a result of the pandemic, York Aviation states:

> "This confirms our view that, notwithstanding growth in e-commerce, accelerated by the pandemic, the dynamics of the industry and how it operates remain based on the patterns previously seen in the express/integrator operations, with a premium placed

on central locations with easy access to other distribution networks. Manston is simply inappropriately located and, with binding constraints on night operations, could not play any substantive role in such operations." (para.4.42)

As regards changes to airline fleets, York Aviation notes:

> "...the market outlook is for the number of freighter aircraft in airline fleets over the long term to be the same as forecast in 2018, i.e. there is no structural change expected in the market over the longer term since July 2019." (para.4.32)

Consequently, York Aviation concludes:

> "We do not consider that anything has fundamentally changed since the close of the Examination in July 2019 sufficient to alter this [the ExAR] conclusion. (para.2.19 and 5.11)"

3. <u>The extent to which the Secretary of State should, in his re-determination of the application, have regard to the sixth carbon budget (covering the years between 2033 – 2037) which will include emissions from international aviation</u>

RSP's Environmental Statement ("ES") recognises that the Development cannot be implemented without having a material impact on the Government's ability to meet its carbon targets (ES, 16.4.25 and table 16.16).[8]

The ExA stated that:

> "...given the direction of emerging policy that the Proposed Development's contribution of 730.1 KtCO2 per annum ie 1.9% of the total UK aviation carbon target of 37.5 Mt CO2 for 2050, from aviation emissions will have a material impact on the ability of Government to meet its carbon reduction targets, including carbon budgets." (ExAR, 6.5.75)

As detailed below, the target of 37.5Mt CO2 for 2050 is outdated and has now been reduced to 23 MtCO2.

Even on the outdated target, the ExA concluded that the impacts on climate change weighed moderately against the case for development consent (ExA, 8.2.75).

Since the ExA report, on 9 December 2020, the Climate Change Committee ("CCC") published its advice on the level at which to set Carbon Budget 6 ("CB6"), for the period 2033 to 2037. CB6 includes international aviation emissions. The CB6 Aviation Sector Summary is attached at Annex II.

In April 2021 the government announced that it would accept the recommendation of the CCC and incorporate the UK's share of international aviation into CB6.[9] The Carbon Budget Order 2021 came into force on 24 June 2021 and sets the carbon budget for the period

[8] RiverOak Strategic Partners Ltd, 5.2-2 Environmental Statement - Volume 2 - Chapters 11-16 [APP-034]
[9] BEIS press release, UK enshrines new target in law to slash emissions by 78% by 2035, 20 April 2021 https://www.gov.uk/government/news/uk-enshrines-new-target-in-law-to-slash-emissions-by-78-by-2035

2033 to 2037 at 965MtCO2e. The government has stated that legislation to formally include international aviation will be introduced in 2021.[10]

Having accepted the CCC's approach and formally adopted CB6 on the basis of the inclusion of international aviation, CB6 is clearly relevant to the decision.

If CB6 is properly taken into account, it further undermines the case for development at Manston. This is because:

i. The planning assumption for aviation used by the ExA is no longer appropriate,
ii. In order to meet CB6 there can be no net increase in airport capacity, and
iii. This is particularly so, given that there remain significant gaps in the policy framework for aviation (and other sectors) to meet reduction targets.

These factors are addressed in turn below.

i. Aviation planning assumption is outdated

The planning assumption of 37.5 MtCO2e by 2050 for aviation that was used by the ExA as the basis for its analysis is no longer appropriate.

That figure was set in order to achieve the 80% reduction target prior to the amendment of the CCA 2008 to introduce the Net Zero target and prior to the adoption of CB6.

Indeed, the CCC have recommended that the gross figure for aviation for 2050 should be 23 MtCO2e with a downward trajectory in the interim.[11]

Further, as referenced by York in its report at Annex I, freighter aircraft are often older and more polluting aircraft thereby benefiting later from newer and cleaner technologies (para.3.14). In addition, electric and hydrogen powered aircraft are unlikely to be suitable for cargo carrying out to 2050 (para.4.33). Consequently, as a freight only airport Manston is likely to be comparatively more polluting, meaning that it will represent a higher percentage of the target than that assumed by the ExA in its analysis (1.9% of the total UK aviation carbon target, ExAR, para.6.5.71).

ii. No net increase in airport capacity

The CCC recommends on the basis of CB6 and as a matter of priority that:

> "There should be no net expansion of UK airport capacity unless the sector is on track to sufficiently outperform its net emissions trajectory and can accommodate the additional demand".[12]

[10] Hansard HC, Draft Carbon Tax Budget, Monday 21 June 2021: https://hansard.parliament.uk/commons/2021-06-21/debates/bd4ca84b-09ea-4400-8b72-847af1b9a3e6/DraftCarbonTaxBudget
[11] CCC, Policies for the Sixth Carbon Budget and Net Zero, December 2020, p.166 https://www.theccc.org.uk/wp-content/uploads/2020/12/Policies-for-the-Sixth-Carbon-Budget-and-Net-Zero.pdf and CCC, Summary Sector Aviation: https://www.theccc.org.uk/wp-content/uploads/2020/12/Sector-summary-Aviation.pdf p.33. Interim targets are also required as follows: 2025 – 37 Mt CO2e; 2030 – 33 Mt CO2e; 2035 – 31 Mt CO2e; 2040 – 30 Mt CO2e; 2045 – 25 Mt CO2e.
[12] CCC, Policies for the Sixth Carbon Budget and Net Zero, December 2020, p.162, Table 8.1; and CCC, Progress in reducing emissions, June 2021: https://www.theccc.org.uk/wp-

Further, the CCC has highlighted that "[t]he UK already has more than enough capacity to accommodate the demand increases in our Balanced Net Zero Pathway".[13]

Expansion at Manston would therefore require capacity constraints elsewhere.[14] This cannot be justified given the lack of need for Manston.

iii. Significant gaps between ambition and policy

The UK is not on track, both in the aviation sector and other sectors, to meet its carbon reduction targets let alone outperform these targets.

In June 2021 the CCC submitted its report on progress in reducing emissions to Parliament (attached at Annex III) and found that "if progress does not extend outside the power sector, the Sixth Carbon Budget will be missed by a huge margin".[15] Policy significantly lags behind ambition with "only one-fifth of the emissions savings for the Sixth Carbon Budget having policies that are 'potentially on track' for full delivery".[16] The UK is also not on track to meet its fourth or fifth carbon budget.[17]

In relation to aviation, the CCC has identified "significant gaps within the policy framework for aviation".[18] The failure of government to manage aviation demand is one such gap that risks undermining CB6.[19] The CCC has stated that government policy is "falling behind" and poses "major risks", because of:

> "No such recognition that demand needs to be managed and several policies (e.g. proposed Air Passenger Duty reductions and airport expansion) are encouraging growth in the sector."[20]

Furthermore, key decarbonisation strategies and plans are not yet published or have been delayed, including the Transport Decarbonisation Plan and the Net Zero Aviation Strategy.[21] On the latter the CCC states:

> The overdue Net Zero Aviation Strategy must set out credible pathways and policies to encourage technological development in the sector but also recognise the potential need to manage aviation demand in future, should improvements in sustainable aviation fuels and low-carbon aircraft fall short of Government and industry ambitions. An assessment of the UK's airport capacity strategy and a mechanism for aviation demand management should be part of the aviation strategy.[22]

content/uploads/2021/06/Progress-in-reducing-emissions-2021-Report-to-Parliament.pdf p.211, Table A6

[13] CCC, Progress in reducing emissions, June 2021, p.185

[14] CCC, The Sixth Carbon Budget - The UK's path to Net Zero, December 2020, p.176

[15] CCC, Progress in reducing emissions, June 2021, p.61

[16] CCC, Progress in reducing emissions, June 2021, p.26

[17] Carbon Brief, CCC: UK will miss climate goals by 'huge margin' without new policies, 24 June 2021 https://www.carbonbrief.org/ccc-uk-will-miss-climate-goals-by-huge-margin-without-new-policies

[18] CCC, Policies for the Sixth Carbon Budget and Net Zero, December 2020, p.166

[19] CCC, Progress in reducing emissions, June 2021, p.16, 25, 29, 32, 141

[20] CCC, Progress in reducing emissions, June 2021, p.156

[21] CCC, Progress in reducing emissions, June 2021, p.140

[22] CCC, Progress in reducing emissions, June 2021, p.224

In light of the above, the finding by the ExA that climate change weighs moderately against the proposal must be revised. It is clear that due to developments since the ExA published its recommendations the climate change impacts now weigh significantly against the Development.

4. Any other matters arising since 9 July 2019 which Interested Parties consider are material for the Secretary of State to take into account in his re-determination of the application.

The ExAR refers to the planning statement citing Ramsgate as approximately 4km to the east (para.2.3.1). It also states in a footnote that the Nethercourt Estate, a suburb of Ramsgate, is 1.5km from the airport perimeter. These figures are misleading and don't fully capture the harmful impact that the airport will have on local residents, schools and businesses.

From the end of the runway, the closest residence is 1.37km, the Royal Harbour of Ramsgate is 3.82km and the beach is 4.14km.

The proximity of the runway and of planes landing and departing to homes, schools and businesses will have an enormously detrimental effect due to the noise impacts.

5. Currency of Environmental Information produced for the application.

The Environmental Statements submitted by RSP were completed three years ago and based upon information gathered even earlier.

Relevant changes since the EIA were conducted include:

i. UK climate projections published in November 2018,
ii. Amendment to s.1 of the CCA 2008 from 80% to 100% in June 2019,
iii. CB6 adopted and entered into force, which includes international aviation and shipping,
iv. Brexit, and
v. COVID-19 pandemic - since the COVID-19 pandemic the importance of access to green space has been highlighted, as has the link between poor air quality and more severe health impacts from respiratory diseases.

The consultations and information on which the environmental statements were based are therefore outdated and should be updated.

9 July 2021

Annex I – York Aviation Expert Evidence in Relation to the Re-Determination of a Development Consent Order for the Reopening and Development of Manston Airport

Expert Evidence in Relation to the Re-Determination of a Development Consent Order for the Reopening and Development of Manston Airport

8th July 2021

Contents

1. Introduction

Background

1.1 York Aviation (YAL) was instructed by Harrison Grant Solicitors on behalf of Jenny Dawes in June 2021 to provide expert evidence in response to the Department for Transport ('DfT')'s Statement of Matters in relation to the Re-determination of the Application by RiverOak Strategic Partners Limited ('RSP') for a Development Consent Order ('DCO') for the reopening and development of Manston Airport in Kent.

1.2 The Statement of Matters raises a number of points upon which the Secretary of State seeks further representations, namely:

- the extent to which current national or local policies (including any changes since 9 July 2020 such as, but not limited to, the re-instatement of the ANPS) inform the level of need for the services that the Development would provide and the benefits that would be achieved from the Development;
- whether the quantitative need for the Development has been affected by any changes since 9 July 2019, and if so, a description of any such changes and the impacts on the level of need from those changes (such as, but not limited to, changes in demand for air freight, changes of capacity at other airports, locational requirements for air freight and the effects of Brexit and/or Covid);
- the extent to which the Secretary of State should, in his re-determination of the application, have regard to the sixth carbon budget (covering the years between 2033 – 2037) which will include emissions from international aviation; and
- any other matters arising since 9 July 2019 which Interested Parties consider are material for the Secretary of State to take into account in his re-determination of the application.

1.3 This Report principally addresses the first two of the matters upon which the Secretary of State seeks further evidence and is based on previous work by YAL submitted to the Examination by Stone Hill Park Ltd (SHP), but updated in the light of the relevant changes in circumstances. YAL was initially appointed by Stone Hill Park Limited (SHP) in September 2017 to review the evidence presented by RSP in connection with RSP's then prospective application for a Development Consent Order (DCO) for the redevelopment and re-opening of Manston Airport as a hub for international freight services, in addition to passenger, executive travel and aircraft engineering support services. In 2019, YAL produced an additional Report that further highlighted the deficiencies in the evidence submitted by RSP in support of its case, in particular the absence of detailed analysis and justification from RSP related to the need for the development. These two Reports were submitted to the Examination appended to representation TR020002-003137.

1.4 We have been asked to:

- Summarise the conclusions of our 2017 and 2019 Reports; and
- Address whether the quantitative need for the Development has been affected by any changes since 9 July 2019, including but not limited to:
  - the reinstatement of the Airports National Policy Statement (ANPS) and, therefore, support for a third runway at Heathrow;
  - changes in demand for air freight (bellyhold and dedicated freighter);
  - changes of capacity at other airports;

  - locational requirements for air freight, and
  - the effects of Brexit and Covid,
- If so, provide a description of any such changes and the impacts on the level of need from those changes; and
- Identify any other matters arising since 9 July 2019 likely to impact on the need for the Development.

1.5 We set out the key conclusions of our 2017 and 2019 Reports in Section 2 of this Report. In so doing, we also comment on RSP's Summary of Need Case submitted to the Examination at Deadline 11 TR020002-004669.

1.6 In Section 3, we address changes in policy and their implications and in Section 4, we address changes in the quantitative need case. In Section 5, we summarise our conclusions from this update review. It is important to stress that we have not, in this Report, attempted to cover all of the points in the previous evidence submitted to the Examination, which we understand will be considered in any event by the DfT. Where we do not comment expressly on a matter, this is because we consider our previous analysis to be robust and we do not repeat it here.

2. Summary of Previous York Aviation Reports

2.1 As noted in the previous section, YAL was initially appointed by SHP in September 2017 to review the evidence presented by RSP in connection with RSP's prospective application for a DCO for the redevelopment and re-opening of Manston Airport as a hub for international air freight services, which also offers passenger, executive travel and aircraft engineering services. We updated our analysis in February 2019 and this updated Report was submitted to the Examination at Deadline 3 with our 2017 Report appended as the conclusions were considered still valid. Although we update our findings, as relevant, in this Report, we consider that our overall conclusions from 2017 and 2019 remain valid and the consolidated 2019 and 2017 Reports are re-submitted and appended to this Report.

York Aviation Reports

The 2017 Report

2.2 Our November 2017 Report focussed initially on the misinterpretation and misrepresentation by RSP of earlier work undertaken by YAL for the Freight Transport Association (FTA) and Transport for London (TfL) in its public statements and in the Need Case[1] prepared by Azimuth Associates for RSP to support its case. Our 2017 Report made clear that:

- RSP's analysis of our earlier work for the FTA and TfL was flawed and that this work did not support RSP's conclusion that there would be a substantive or sustainable role for Manston in the UK air freight industry.
- The remaining evidence relied on by RSP to justify its Need Case was almost entirely circumstantial, based on reports outlining the consequences of a shortage of airport capacity in the London area principally for passenger flights, which also carry bellyhold cargo, in the circumstances where no additional capacity is provided at any of the London Airports.
- The analysis presented by Azimuth to support RSP's case showed a lack of understanding of the economics of the air freight market, especially in failing to recognise the economic drivers that prioritise the use of bellyhold capacity over dedicated freighters for most general air cargo.
- Manston's past operation was economically inefficient due to the inherent lack of viability. Reopening the Airport has no realistic prospect of success as there are more economically efficient alternatives available for any freight displaced from Heathrow in the short term, pending the development of a third runway.
- Azimuth's 'forecasts' relied strongly on the attraction of an integrator/express freight operation but Manston is too peripheral for integrator operations serving the UK and, in any event, such operations would be unlikely given the proposed restrictions on night flying, which were confirmed through the Examination.
- Azimuth's interview survey, used as further justification for RSP's freight movement forecasts, relied on a small list of mainly local companies with something of a vested interest in seeing Manston re-

[1] TR020002-002459-7.4.

opened and did not provide a credible basis for the specific aircraft movement forecasts upon which the case relied.

- The lack of credibility of the forecasts was illustrated by the projection that, in the first operational year, a cargo throughput of nearly 100,000 tonnes was expected by Azimuth for Manston, making it the 5th largest freight airport in the UK and 3rd in terms of tonnage carried on dedicated freighter aircraft in its first year after re-opening. This was simply not a credible proposition given the available capacity at other airports, with established air freight operations, to accommodate any growth in the market.

- Proper analysis of the UK air freight market showed that there was plenty of freighter aircraft capacity at Stansted and East Midlands Airport to accommodate any growth required in dedicated freighter operations such that there would be no shortage of capacity across the UK and no role for Manston in accommodating traffic spilled from other airports. These airports are better located relative to the market and the key locations for distribution within the UK.

- Our estimate was that Manston would, at best, be able to attain 2,000 annual air cargo aircraft movements by 2040 and it was equally plausible that it might not achieve more than 750 such movements annually as operated when it was previously open.

- Our initial assessment of the passenger market was that the throughput might, at best, be around half of that projected by RSP and, hence, given the dependence on passenger related income for the financial viability of airport operations, this would impact substantially on the viability of the proposal.

- Our assessment was that the existing infrastructure at Manston Airport, if made good, would be capable of handling 21,000 annual air cargo aircraft movements. The actual usage of that capability would depend on the pattern of operation and how the infrastructure was used on a day by day basis.

- We also gave provisional consideration to the land required to accommodate future forecast demand. We considered that the land required would be substantially less than shown on the RSP Master Plan and that the proposed land take was excessive and without justification in terms of the compulsory acquisition of the land, particularly given the inherent implausibility of the demand forecasts upon which the assessment was made.

- We could see no justification for the inclusion of the 'Northern Grass' area within the DCO on the basis of it being for associated development. It was expected that there would be little requirement for or likelihood of the relocation of freight forwarding activity from adjacent to the UK's main cargo hub at Heathrow or elsewhere to Manston.

- We highlighted that Azimuth had made errors in the assessment of the socio-economic implications of the proposed development, particularly in terms of the use of inappropriate multipliers, the assessment of impacts at a national scale, rather than the local scale in East Kent as implied by Azimuth, and that they should have taken displacement of activity from other UK airports fully into account, reducing the impacts well below those stated.

The 2019 Report

2.3 Our 2019 Report updated and added to the analysis of the flaws in RSP's Need Case, as set out principally in the Azimuth Reports, which remained largely unchanged from those reviewed in 2017. Our assessment of the validity of that work remained essentially unchanged.

2.4 We also updated consideration of Aviation Policy in the light of developments, including the formal designation of the ANPS in the intervening period following our 2017 Report and the clear statement of support regarding a third runway at Heathrow and its role in ensuring adequate air freight capacity for the foreseeable future.

2.5 The principal conclusions of our 2019 Report were:

- Aviation Policy

  - The Azimuth Report, setting out the RSP Need Case for the development of an air freight hub at Manston, presented a flawed interpretation of Aviation Policy that sought to infer support for the development of a mainly freight airport at Manston based on the evidence before the Airports Commission of the potential damage to the UK economy if no additional hub airport capacity was provided at Heathrow (or a reasonable alternative to Heathrow). This was never a relevant basis for considering whether there was a case for re-opening Manston as a primarily air freight airport, given that the vast majority of the economic benefit cited by Azimuth related specifically to the benefits to passengers using global passenger services from an expanded hub Heathrow and did not relate to freight related benefits at all.

  - The ANPS support for an additional runway at Heathrow would transform capacity available to the air freight sector such that the use by RSP of pre-ANPS evidence on the need to address the shortage of airport capacity overall to serve London was misleading and incorrect. Government Aviation Policy makes clear that expansion of capacity at Heathrow, allowing more global air connections providing additional bellyhold capacity and scope, if required, for more dedicated freighter movements at Heathrow, was the identified means of meeting future air freight demand, along with the continued role for East Midlands and Stansted as air freight gateways with ample spare capacity.

- Errors and Inconsistencies of Analysis

  - We identified further inconsistencies and mathematical errors in the 'forecasts' presented by Azimuth and others in the RSP team used to justify the proposed development at Manston. A number of these were highly significant and served to undermine the credibility of the whole approach outlined in the Azimuth Reports and throughout RSP's Application Documents, particularly in terms of the level of demand that Manston might attract if it re-opened as an airport and the viability of the proposed operation, but also potentially impacting on the robustness of the environmental assessments.

  - The most significant of these errors related to:

    - the lack of any soundly based forecasts drawing on an assessment of the market and cost efficiency, relying instead on a flawed list of airlines, many of which did and do not operate air freight services at all and others that would be unlikely to operate to Manston;

    - the lack of realism in the fleet mix and the assumed pattern of day/night time operations, particularly in relation to the implications for the prospect of integrator and mail operations being attracted to use Manston at all. This was compounded by the subsequent offer of a condition that there be no night flights scheduled such that the majority of the operations claimed by Azimuth would be unviable for the airlines;
    - the overstatement of longer term demand projections through the use of unjustified growth rates due to mathematical errors made by Azimuth.

  - These errors and inconsistencies rendered the so-called 'forecasts' completely unreliable as a basis for assessing the extent and nature of any usage of Manston in the event that the Airport re-opens.

- Understanding the Air Freight Market

  - Examination of market trends and the structure of the air freight market made clear that there was and is no role for Manston, other than possibly as a niche cargo operation for ad hoc specialist consignments, consistent with the nature of previous operations there. The trend in favour of bellyhold for the carriage of general air freight was clear. This freight forwarding sector was and is heavily concentrated around Heathrow for this very reason, and the associated consolidation activity essentially drives the choice of airport based on the most economical freight rates available for any consignment. It was considered highly unlikely to be a dedicated freighter option from an airport remotely located in East Kent.

  - R3 at Heathrow will provide for a doubling of air freight capacity at the Airport, mainly in bellyholds of passenger aircraft, but also with scope for dedicated freighters to the extent that these are required to feed the hub at Heathrow. Indeed, the ability to provide a step change in capacity for air freight was one of the principal reasons why the Government chose the specific proposal for the development of a new runway at Heathrow over the alternatives. Freight facilities at Heathrow are actively being modernised and extended in anticipation of the growth of cargo activity there even ahead of commencement of work on R3 so overcoming any level of service concerns, as expressed by RSP.

  - The integrators are already well established at East Midlands Airport in particular, as well as using Heathrow and Stansted to serve the main markets in England. Manston is too far from the distribution centres along the M1/M6 axis to function as an integrator base, leaving aside that the proposed night movement restrictions would render any such operation unviable for the airline/integrator.

  - This left niche/specialist cargo operations as the only possible market for Manston. This would be consistent with the types of cargo that Manston used to handle. Ultimately, this is a very small market and unlikely to result in Manston handling more freighter movements than it did historically. This was considered to have profound implications for the Need Case as a whole, not least as it seems likely that any freighter activity would in fact have to be displaced from elsewhere through price incentives as there are few, if any, natural market drivers which would make Manston the first choice location, particularly given growth in bellyhold capacity at airports such as Manchester, Edinburgh, Birmingham and Stansted, plus available capacity for freighters particularly at East Midlands and Stansted Airports.

- Air Passenger Forecasts

  - We set out air passenger forecasts that indicated a potential market for around half of the number of passengers claimed, without analysis, by Azimuth Associates over the 20 year period of the projections. We considered that this had inevitable implications for both the scale of facilities required and the viability of the airport operation as a whole. Past experience would suggest that there would remain a high risk of the airlines failing to sustain the routes on a viable basis.

- Infrastructure Requirements

  - We considered that the development proposals were excessive even in relation to RSP's forecasts of potential demand. Nor did we consider there was any basis for the requirement for associated development on the Northern Grass for airport-related uses developed and used to support the operation.

- Viability

  - We set out an assessment of the potential viability of the development and concluded that, even on RSP's forecasts, the development would not be commercially viable.

- Overall Conclusion

  - We concluded that the whole Need Case for the development of Manston as an air freight hub was infected with flaws and errors of understanding such that the so-called 'forecasts' of air freight and passenger demand had no credibility at all. Even if they were credible, the scale of development proposed was unjustified and excessive. The development and operation of the Airport would simply be unviable and incapable of attracting competent investors.

2.6 **In overall terms, we consider that our 2017/2019 findings in relation to the need for the development of Manston as an airfreight hub remain robust but we go on, in this Report, to update the policy and market assessment to address the matters upon which the Secretary of State seeks further information**.

RSP's Summary of Need Case

2.7 At Deadline 11, RSP submitted a Summary of its Need Case[2]. This was, to a large extent, a restatement of its previous position in relation to Need, taking little account of the detailed rebuttal of this evidence in our 2017 and 2019 Reports, the Oral Hearing on Need, our Supplementary Submission made following the Oral Hearing on Need and comments submitted on RSP's responses to questions from the Examining Authority. Although we have not previously provided any comments on this document, many of the points were already addressed in our Supplementary Submission following Hearings into Compulsory Acquisition and Need held on 20th and 21st March 2019. This was submitted and appended to SHP's submissions following those hearings[3] and is also appended to this Report.

2.8 We summarise our position in relation to a number of key themes in this final RSP submission below.

[2] TR020002-004669.
[3] TR020002-003977.

Reliance on York Aviation's previous work for TfL and the FTA

2.9 As we had consistently pointed out since 2017, RSP continued to misinterpret our work for TfL and the FTA and continued to seek to use this work as one of the main points of its need case. This was addressed at paras. 2.12-2.28 of our 2017 Report and again at paras. 13 and 14 of our Supplementary Note. The earlier reports, when read in their entirety, do not provide any support for the need case for Manston in terms of a requirement for more dedicated freighter capacity but do point out that there would be incremental trucking costs involved if freight that could not be accommodated in bellyhold capacity at the UK's main hub airport had to be trucked further afield to use alternative bellyhold capacity. The cost advantages to shippers of using bellyhold capacity would still be lower than the costs involved in dedicated freighter operations.

2.10 We used the same methodology as adopted in our 2015 Report for TfL and the FTA to produce updated forecasts and to examine the need for more freight capacity over the next 20 years within our 2019 Report. We have updated this analysis for this current Report, taking into account the clear trends observed in the market over the intervening period. This continues to show that there is no shortage of available airport capacity that would justify a need for re-opening Manston over the period.

The Economics of Bellyhold

2.11 RSP claims that no evidence was provided to justify why use of bellyhold capacity is more economic than the operation of dedicated freighter aircraft. This is not so as evidence on the relative cost to the airlines was set out at paras. 4.7 to 4.15 of our 2019 Report, which also addressed the important role of trucking.

2.12 Fundamentally, the existence of a wide network of global passenger services from Heathrow (other than in the short term due to Covid-19 effects) offers shippers the fastest transit time at the lowest cost as it provides the widest range of point to point service opportunities, balancing speed and cost. Other than for specialist niche cargoes, a dedicated freighter will require consolidation of a much greater volume of freight onto a single aircraft meaning that a point to point service for most cargo is much less likely and underlying costs are greater. This is clear, for example, in the higher costs charged by integrators/express freight operators compared to general air cargo to ensure speedy delivery with a higher dependence on dedicated freighter aircraft.

2.13 RSP, at para. 5.3 of its Summary, repeats the assertions that the UK is short of capacity for dedicated freighters by comparing Heathrow and Frankfurt. As made clear in YAL's comments on RSP's Deadline 3 Responses to Written Questions[4] (Question ND1.6) (also appended to this Report), the greater reliance on dedicated freighter operations elsewhere in Europe is because there was simply less bellyhold capacity available and, in the case of Germany, a stronger manufacturing economy generating greater volumes of physical trade.

Capacity at Other Airports

2.14 RSP continued to claim that other airports do not have sufficient capacity to meet demand for additional dedicated freighter flights but this is based, to a large extent, on its exaggerated forecasts of the number of such flights likely to be operated in future. We address the actual requirements, updated, in Section 4 of this Report.

[4] TR020002-003643

Northpoint Forecasts

2.15 RSP's Summary of Need Case shifted the focus from the bottom up forecasts, produced by Azimuth, to the top down modelling presented on its behalf by Northpoint Aviation during the Examination process. These forecasts are simply not robust as they rely on overstated growth rates based on analysis back to 1990 and an unevidenced assumption that Manston could clawback 25% or more of the airfreight being trucked across the Channel to avail of air freight capacity offered at European hubs. This work also relied on misrepresentation of earlier work by Ramboll and Oxford Economics. A full commentary on this work is provided in our Supplementary Note following the Oral Hearing (appended) at paras. 28 to 38.

Express/Integrator Operations

2.16 RSP's Summary of Need continued to assert that there was a new type of integrator operation that would not be reliant on night flights (para. 6.5). This was noted as being related to the rise of Amazon Air, which Manston was stated as targetting. However, the operating patterns of Amazon Air replicate those of other express operators, with a focus on hub and spoke systems and overnight operations. To the extent that they are operating in Europe, they replicate the operating patterns of such as DHL and UPS and it is simply that Amazon has brought the operation in house. Manston would not be attractive to such operations due to the binding constraints on night operations as well as the disadvantage of its peripheral location.

Conclusion on RSP Need Case

2.17 The RSP Summary of Need Case does not address the criticisms of its original need case made throughout the Examination process and, to the extent that it relies on new material produced on its behalf during the process, this was rebutted and informed the conclusions made by the Examining Authority.

Examining Authority Conclusions

2.18 In undertaking this update, we are mindful of the reliance placed on substantial aspects of our work by the Examining Authority in its previous recommendation that there was no need for the development, summarised at para. 5.7.28 of their Report of Findings and Conclusions[5]:

"Given all the above evidence, the ExA concludes that the levels of freight that the Proposed Development could expect to handle are modest and could be catered for at existing airports (Heathrow, Stansted, EMA, and others if the demand existed). The ExA considers that Manston appears to offer no obvious advantages to outweigh the strong competition that such airports offer. The ExA therefore concludes that the Applicant has failed to demonstrate sufficient need for the Proposed Development, additional to (or different from) the need which is met by the provision of existing airports."

2.19 **We do not consider that anything has fundamentally changed since the close of the Examination in July 2019 sufficient to alter this conclusion.**

[5] TR020002-005347.

3. Policy Changes Relevant to the Re-Determination

Introduction

3.1 In this section, we set out changes to national aviation policy and local planning policy that have occurred since 9th July 2020 and the extent to which these would change the conclusions of our previous work. We also note a number of other local planning developments.

Relevant National Policy

3.2 The principal change to National Aviation Policy since July 2020 has been the status of the ANPS. Work to prepare a new Aviation Strategy, to replace the 2013 Aviation Policy Framework is still ongoing.

Airports National Policy Statement

3.3 The ANPS was initially designated in June 2018, setting out the Government's approach to meeting the need for increased airport capacity in the South East of England by provision of a third runway at Heathrow. The ANPS sets out:

- The Government's policy on the need for new airport capacity in the South East of England;
- The Government's preferred location and scheme to deliver new capacity; and
- Particular considerations relevant to a development consent application to which the Airports NPS relates.

3.4 Specifically, the ANPS is clear that[6]:

> *"The Airports NPS does not have effect in relation to an application for development consent for an airport development not comprised in an application relating to the Heathrow Northwest Runway, and proposals for new terminal capacity located between the Northwest Runway at Heathrow Airport and the existing Northern Runway and reconfiguration of terminal facilities between the two existing runways at Heathrow Airport. Nevertheless, the Secretary of State considers that the contents of the Airports NPS will be both important and relevant considerations in the determination of such an application, particularly where it relates to London or the South East of England. Among the considerations that will be important and relevant are the findings in the Airports NPS as to the need for new airport capacity and that the preferred scheme is the most appropriate means of meeting that need."*

3.5 Hence, as noted in the Examining Authority's Report of Findings and Conclusions[7]:

> *"The ANPS does not have effect in relation to the application to reopen and develop Manston Airport."*

[6] Department for Transport, Airports National Policy Statement, new runway capacity and infrastructure at airports in the South East of England, June 2018, para. 1.41.
[7] TR020002-005347, para. 3.2.3.

3.6 Between submission of the Examining Authority's Report of Findings and Conclusions and the Secretary of State's decision to confirm the DCO on 9th July 2020, the Court of Appeal found, in February 2020, that the designation of the ANPS was unlawful on the grounds of the failure to take into account the Government's commitment to the provisions of the Paris Agreement on climate change.

3.7 Hence, at the time when the Secretary of State took the decision to confirm the DCO for Manston, the ANPS was not in force, albeit the accompanying 'Making Best Use' policy was still in place. As a consequence, at the point when the decision was made to confirm the DCO, the policy underpinning the proposal for the development of a third runway at Heathrow was no longer in place, which could have created a perception that there was potentially a need for the development of Manston to fill a gap in the availability of capacity for air freight in the South East of England. The extent to which this had implications, in practice, for the quantitative need case are explored further in the next section.

3.8 However, subsequently the Court of Appeal's ruling was overturned by the Supreme Court in December 2020, which determined that the ANPS had taken proper account of the Government's climate change commitments. Consequently, the ANPS has been reinstated into national policy, which allows Heathrow to proceed with its plans to submit a DCO for the development of a third runway and associated infrastructure. It follows, however, that there will be a delay to the completion of a third runway for 3 reasons:

- The delay caused by the changes to the status of the ANPS;
- Challenges related to the affordability and regulatory position of HAL in relation to funding the development;
- The effect of Covid-19 on demand and the timing when new capacity would be required.

As a consequence, the timescale when a third runway might become available has slipped from 2026, as originally set out in the ANPS, to the mid-2030s, with 2033 as an indicative delivery date assumed by many commentators. We take this into account in considering the implications for the market which Manston might serve in the next section.

3.9 As a consequence of the reinstatement of the ANPS, the clear policy expressed therein regarding the primary role for Heathrow in meeting air freight demand is confirmed. In particular, the ANPS makes clear that:

"The Heathrow Northwest Runway scheme delivers the greatest support for freight. The plans for the scheme include a doubling of freight capacity at the airport."[8]

3.10 Hence, the reinstatement of the ANPS is a material change in Government Policy since the decision was taken to confirm the Manston DCO in July 2020. This weakens the case, in so far as it existed, that there is any need for the development of Manston to meet any shortfall in freight capacity in the South East of England.

[8] Department for Transport, Airports National Policy Statement, new runway capacity and infrastructure at airports in the South East of England, June 2018, para. 3.73.

Making Best Use

3.11 Although the policy that airports, other than Heathrow, should make best us of their existing runways[9] was published alongside the ANPS in June 2018, this policy was not affected by the Court of Appeal's decision and has remained in force throughput. Crucially, however, the policy does not suggest that the best use should be made of any given runway, nor that runways should be protected in perpetuity as previously implied by RSP's Statement of Reasons[10] (para. 9.56). The policy, as set out in the 'Making Best Use' document, is clear that whilst there is a policy presumption in favour of making best use of existing runways, each case must be considered on its own economic and environmental merits (para 1.29):

> *"We therefore consider that any proposals should be judged by the relevant planning authority, taking careful account of all relevant considerations, particuarly economic and environmental impacts and proposed mitigations."*

3.12 Whilst this paragraph refers specifically to local decision making rather than a Nationally Siginficant Infrastructure Project (NSIP), the ANPS makes clear that there is no automatic presumption of need for any other airport NSIP within the South East of England. Therefore, there is still a requirement for a full justification to be provided for the best use of existing runway capacity at any individual airport on its own merits in terms of the demand it may reasonably be expected to handle and the benefits to consumers, or possibly in the case of Manston, shippers of airfreight, of using that airport rather than other available capacity.

3.13 It is not sufficient to seek to make the case based on an inference of some general shortfall of capacity across the South East of England. Re-opening a runway only for it to be seldom used in practice does not constitute an economically efficient use of that runway, and so would not be likely to equate to 'best use'.

Climate Change

3.14 We note that, as of April 2021, aviation is now included within the Government's Sixth Carbon Budget. We do not address this change in detail in this Report but note that the pace of technological change and innovation may be expected to be slower for dedicated freighter aircraft than for the passenger fleet. This is because many aircraft in the freighter fleets are second hand aircraft converted from passenger use, which are necessarily of an older generation of technology. As a consequence, there tends to be a lag in upgrading the freighter fleet to the newest technology. This would suggest that development of an airport specifically aimed at attracting more dedicated freighter operations is more likely to use a higher share of the UK's Carbon Budget than alternative solutions more reliant on passenger bellyhold capacity, where innovation and the adoption of new technologies is likely to be more rapid. Use of bellyhold capacity would also not necessarily increase the number of aircraft movements but a switch to the use of dedicated freighters would mean a relative increase in the total number of aircraft movements to/from the UK.

[9] Beyond the Horizon, The Future of UK Aviation, Making Best Use of Existing Runways, Department for Transport, June 2018

[10] TR020002/APP/3.1

Local Policy and Other Developments

Thanet Local Plan

3.15 Following the closing of the Examination in July 2019, Thanet District Council (TDC) adopted a new Local Plan (LP) the following year on July 9th 2020. The adopted LP maintains the previous policy to safeguard the site for airport related uses pending the decision on the DCO:

Policy SP07 – Manston Airport

"Manston Airport as identified on the Policies Map is safeguarded for airport related uses. Whether or not the DCO is confirmed, the future use and development of Manston Airport and/or policies affected by the outcome of the DCO process will be determined through the early review of the Plan."

3.16 The LP makes clear that this, and other related policies, will be subject to review when the outcome of the DCO is known. Hence, this policy is not definitive in its support for the re-opening of the Airport but rather reflects a safeguarding policy that remains unaltered from the previous plan pending clarification of the status of the Airport.

3.17 In any event, other elements of the LP[11] are aimed at creating 5,000 jobs in the local area on identified employment sites, which do not include Manston Airport.

Other Relevant Developments

3.18 Much of the case for the development of Manston was predicated on the need for regeneration in East Kent and the importance of new sources of local employment. Whilst the effect of the pandemic has seen massive job losses across the UK, this is not unique to Kent, although coastal areas such as Thanet, Blackpool and Great Yarmouth that have a higher dependency on domestic tourism have been disproportionately impacted by the pandemic by some metrics. The UK has also lost a part of its workforce during the pandemic due to some European citizens returning home during the pandemic and not having returned in the short term. Hence, the balance between vacancies and those seeking work has altered as the economy recovers from the pandemic, with several sectors including hospitality and the haulage industry reporting shortages of skilled labour. Overall, notwithstanding the economic impact of the pandemic in the short term, recovery in the economy is likely to see more rather than less opportunities for local employment.

3.19 Across the UK as a whole, the employment rate[12] has fallen during the pandemic but only by around 1.5%[13]. Unemployment rates have risen but only slightly to the level seen in 2016 and still well below the levels of unemployment seen in 2012 or historically. We note that the claimant rate in Kent is actually below the national average[14].

[11] Thanet Adopted Local Plan, Policy SP04.
[12] Proportion of those of working age that are employed.
[13] ONS Employment Data June 2021.
[14] https://www.kent.gov.uk/__data/assets/pdf_file/0019/8182/District-unemployment-bulletin.pdf.

3.20 In any event, as we set out clearly in our 2017 Report, the Azimuth estimates of jobs and GVA from the development, produced for RSP, were grossly exaggerated in large part due to the overstated demand forecasts but more fundamentally due to the adoption of national level multipliers for employment generated through the supply chain and catalytic impact of the development. Although RSP has continued to claim these as local jobs that would be created within Kent, in practice only a small number of the predicted jobs would be created locally with the vast majority being in the aviation supply chain nationally or even internationally. Even if the air freight demand forecasts used by RSP were correct, which we continue to strongly believe is not the case, the total employment in Kent would be expected to be no more than 16% of that claimed by RSP by year 20[15]. On the basis of more realistic projections of usage of the Airport, the employment increase for Kent would be only around 3% of that claimed by RSP by year 20, i.e. little more than 1,000 jobs in total[16]. To the extent that these jobs would be created through displacement of activity from other airports, this might divert economic activity from areas that have a greater need when considered overall. To the extent that there is ongoing unemployment in Kent, the Airport would, at best, make only a small contribution to overcoming the issue.

3.21 The economic need for this small number of incremental jobs has to be viewed in the context of other significant developments within the local area that reduce the need for the jobs that the re-opening of the Airport might bring.

Thames Freeport

3.22 On 3rd March 2021, the Government formally announced the designation of eight Freeports across the UK, including a Freeport north of the Thames Estuary. Freeports are defined economic zones where usual tax and customs rules are sometimes not applicable. This allows firms to import goods, use the same goods in manufacturing, and export finished products without facing the standard tariffs or customs checks. Furthermore, firms that operate within Freeports may benefit from paying reduced tax rates including VAT and exemptions on Stamp Duty Land Tax.

3.23 The boundary of the Thames Freeport spans from the London Gateway Port in the east, to the Port of Tilbury in the south, to the Ford Dagenham estate in the west, and the northern boundary of the London Borough of Havering to the north.

3.24 It is important to note that if goods leave the designated Freeport zone, to enter a manufacturing process elsewhere for example, then the goods must go through the usual import process, which would include the payment of taxes and other tariffs. Therefore, whilst the Thames Freeport may deliver economic benefits to Kent in terms of employment, enhanced by the opening of the Lower Thames Crossing, the Thames Freeport will be of no benefit to Manston Airport or positive influence on its alleged need case as it is not included within the boundary of the Thames Freeport and tariffs would still be applicable to goods using the Airport.

3.25 One of the other eight Freeport zones announced on 3rd March 2021 was the East Midlands Freeport, which focusses on three sites with East Midlands Airport and the adjacent Gateway at its heart. This will further enhance the role of East Midlands Airport as the UK's main dedicated air freight hub, with an enhanced ability to attract trade through its freeport status.

[15] York Aviation 2017 Report, Table 5.1.
[16] York Aviation 2019 Report, Table 5.3.

London Resort

3.26 A major development in the Ebbsfleet Valley is the proposed London Resort theme and leisure park on a 4,650,000 m^2 brownfield site. Plans for the Resort are currently before the Planning Inspectorate, who accepted the Resort's application for DCO examination in January 2021. The resort is expected to create 8,700 on-site jobs initially, rising to 17,000 by 2038[17], with additional jobs through the local supply chain. Realistically, this would dwarf the potential job generation impact of an air freight hub at Manston Airport and could make local recruitment more difficult. If approved, London Resort will further deliver economic benefit across Kent, which again will likely extend to Thanet given the High Speed Rail services between Ebbsfleet and stations in Thanet. This will open up employment opportunities to Thanet residents.

Ebbsfleet Garden City

3.27 Other development of the Ebbsfleet Valley will include a new Garden City that will deliver approximately 15,000 homes and up to 30,000 jobs by the completion of its final development phase in 2035. The development of Ebbsfleet Garden City will have a significant positive economic impact across Kent, which will extend to the area around Manston Airport given the direct High Speed Rail connection from Ebbsfleet International to stations in Ramsgate, Margate and Sandwich. This will further create competition for labour in the local area.

Lower Thames Crossing

3.28 The proposed Lower Thames Crossing comprises over 14 miles of new motorway linking Gravesend in Kent to East Tilbury in Essex via a tunnel under the River Thames. The Lower Thames Crossing is a significant development that would ultimately provide Kent with easier access to Southend and Stansted airports. The DCO for the Lower Thames Crossing was submitted to the Planning Inspectorate on 23rd October 2020, but it was subsequently withdrawn the following month on 20th November 2020 to collate further details in regards to construction plans and environmental impacts to present for Examination. The application is intended to be re-submitted later in 2021.

[17] https://londonresort.info/news/the-london-resort-to-generate-50bn-over-25-years/.

4. Updating the Quantified Need Case

4.1 In this section, we focus on whether there have been changes to the need for Manston as an airfreight hub sufficient to alter the conclusions that we reached in our 2017 and 2019 research. This section addresses the extent to which changes and developments that have occurred since 9th July 2019 might alter the conclusions reached by the Examining Authority on Need sufficient to justify the Secretary of State taking a different decision in respect of the development and re-opening of Manston Airport.

The Baseline in 2019

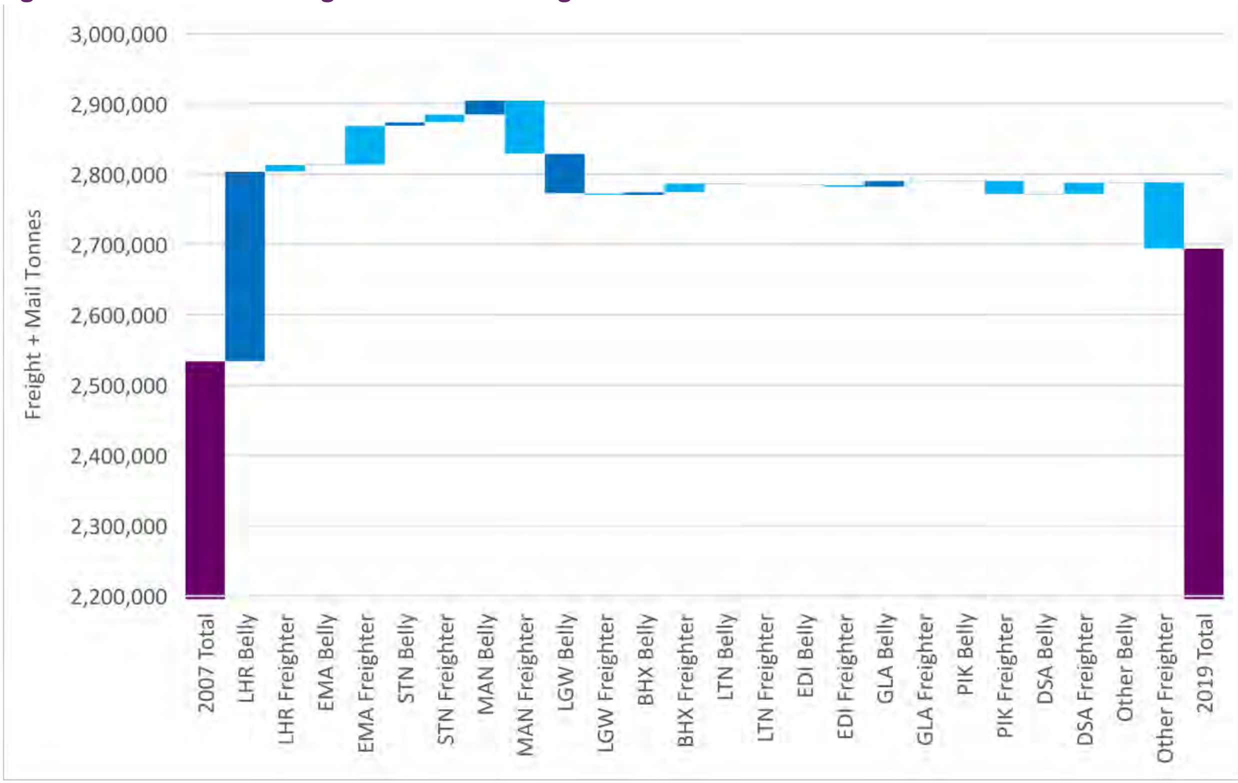
4.2 In the first instance, we consider it important to examine whether the trends in consolidation and the use of bellyhold freight that we identified in our 2017 and 2019 Reports continued to hold true through 2019 up until the start of the pandemic.

4.3 Our previous reports established that demand for air freight over the previous 15 years to 2016 had remained relatively static. Between 2016 and 2019, freight tonnage at UK airports grew by 6%, with nearly 60% of this growth being in the bellyholds of passenger aircraft principally at Heathrow, Gatwick, Manchester and Stansted[18]. Of the growth in freight tonnage carried on freighter aircraft, 56% of this growth came at East Midlands Airport, with growth also recorded at Belfast International, Doncaster Sheffield and Prestwick Airports. The growth in freighter activity was almost entirely driven by express freight/integrator operations. The market remains highly concentrated as we set out in our 2017 Report[19].

4.4 **Figure 4.1** sets out a bridge diagram between 2007 and 2019 showing the change in freight handled via bellyhold and pure freighter aircraft at major UK freight airports, which demonstrates the continued concentration of growth in the air freight market and the continued trend to consolidate firstly into bellyhold, mainly at Heathrow, with only Gatwick showing any material reduction in bellyhold freight reflecting the transfer of some long haul operations to Heathrow over the period. In relation to freight carried on dedicated freighter aircraft, it is clear that the only real growth over the period has been at East Midlands Airport, reflecting its role in the express freight market, with evident falls in freighter activity at most other airports.

[18] CAA Airport Statistics 2016 and 2019, Table 15.
[19] York Aviation 2017 Report, paras. 3.13-3.14.

Figure 4.1: Drivers of Change in the UK Air Cargo Market - 2007 to 2019



Source: York Aviation analysis of CAA Statistics

4.5 Key points to note from Figure 4.1 are:

- the market continued to consolidate into Heathrow through increased bellyhold capacity due to the increasing focus on long haul destinations. There was a marginal increase of freighter capacity at Heathrow;
- elsewhere in London, Gatwick has seen both bellyhold and freighter capacity eroded as the Airport has become more capacity constrained over time and it has focussed increasingly on short haul low fare passenger services. Stansted has seen some growth in freighter tonnage, but this does not come close to offsetting what has been lost from elsewhere with Stansted heavily focussed on the integrator and express services market;
- East Midlands, with major DHL and UPS integrator/express bases, has been the only airport that has seen significant growth in pure freighter traffic;
- these trends are reinforced by what has happened at Manchester, which has seen growth in its bellyhold market, relating to growth in its long haul network through to 2019, but with its freighter traffic falling away;
- in general, there has been a clear switch towards the use of bellyhold capacity. Since 2007, the share of the cargo market carried on dedicated freighters has fallen from 35% to 30%.

4.6 This updated analysis confirms the trends set out in our 2017 and 2019 Reports. Up until the point when the pandemic started, the focus of airfreight growth to/from the UK continued to be using available bellyhold capacity. This is not, as RSP have always sought to claim, because of a shortage of airport capacity in the UK for dedicated freighter operations, as we demonstrated in our 2019 Report[20], but due to the high levels of long haul services to the UK providing bellyhold capacity pre-pandemic. To reiterate, the reason that the proportion of airfreight carried to/from the UK in dedicated freighters is lower than the world average is because of the strong global network of passenger services in place to/from the UK prior to the pandemic, which means there has been less reliance on dedicated freighter activity to fill the gaps other than in the clearly defined express freight sector concentrated at East Midlands and, to a lesser extent, Stansted. It is rather that the rest of the world has been more reliant on freighter services because the global connectivity offered by their passenger networks is less than the UK has been able to sustain.

4.7 The key factors behind this are the underlying economics of the market whereby bellyhold capacity can be offered much more cheaply for the shipper than dedicated freighter services, as we set out clearly in Section 2 of our 2017 Report and Section 4 of our 2019 Report. The wide network of passenger services from Heathrow also offered frequent connections to many points around the world in a manner that dedicated freighter operations cannot do without requiring trans-shipment at a hub with the consequent risk of delays. This is why, other than for express parcels that can sustain a premium price and for specialist cargoes, bellyhold will almost always trump dedicated freighter operations in terms of market preference.

4.8 We now go onto consider whether there is anything in subsequent events related to Covid-19 or Brexit that would lead to a change in the expected pattern of operation and consolidation over the medium to long term.

The Effects of Covid-19

4.9 The impacts of the Covid-19 pandemic have resulted in far-reaching changes for the aviation sector. There are four principal factors at play:

- the economic implications due to lower activity levels leading to reduced demand for both passenger and freight services;
- the direct effects of travel restrictions impacting passenger travel and, hence, the availability of bellyhold capacity;
- increased demand for air freight related specifically to the pandemic (PPE, vaccines etc);
- increased reliance on e-commerce and next day delivery.

[20] York Aviation 2019 Report, paras. 4.38 – 4.39.

Effect on Passenger Travel and Flight Availability

4.10 Travel restrictions imposed by governments seeking to reduce the likelihood of importing cases of coronavirus have resulted in demand for passenger services drastically reducing. Passenger airlines respond to reductions in demand by reducing their capacity. Equally, as restrictions are eased airlines have shown flexibility to reinstate services quickly so as to meet pent up demand. Statistics from IATA[21] indicate that Revenue Passenger Kilometres[22] (RPKs) fell by 66% in 2020 compared to the previous year. Reductions in passenger flights, in turn, reduce the volume of bellyhold capacity available for the conveyance of air freight.

4.11 However, this is expected to be a transient phenomenon as travel restrictions ease within the coming months and services are reinstated. Although full reinstatement of services is not expected in 2022, most commentators expect, with effective vaccines as we are now seeing, demand and service levels could be reinstated to 2019 values by 2024, accepting that some markets may be slower to recover than others[23] dependent on the success of the vaccine roll out country by country. However, it is clear that any effect that Covid-19 may have had on the availability of bellyhold capacity is expected to have been unwound by the mid-2020s meaning that Manston could not realistically deliver a material uplift in available capacity in time to make any contribution, even if there was a capacity shortage, which there is not.

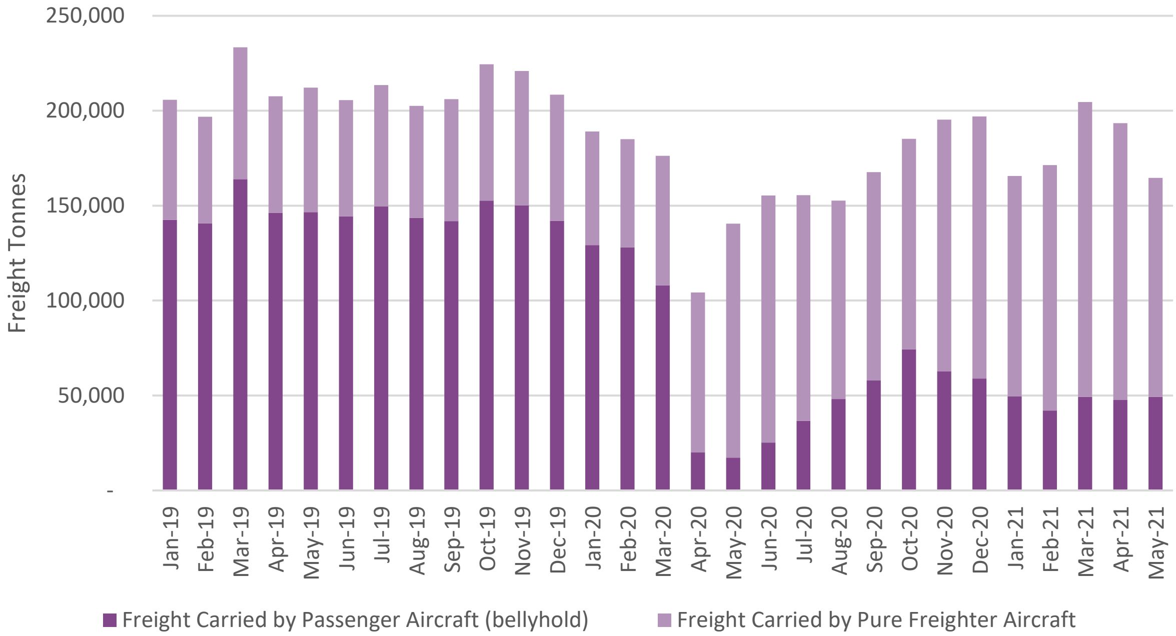
Effect on Freight Demand and Capacity

4.12 Despite reductions in demand for passenger air transport, global supply chains are still reliant upon aviation to meet customer requirements for some goods particularly in terms of speed, security, and to a lesser extent, capacity. Therefore, since the start of the pandemic, the way in which air freight is usually carried has temporarily changed to adapt to the scarcity of conventional bellyhold capacity.

4.13 **Figure 4.2** presents the overall freight tonnage flown to or from UK airports on a monthly basis from January 2019 through to May 2021. This separates freight flown in passenger aircraft (bellyhold) and pure freighter aircraft, which clearly demonstrates the shift from the majority of air freight carried by passenger aircraft to pure freighter aircraft from the onset of the pandemic in March 2020.

[21] International Air Transport Association (IATA) Air Passenger Market Analysis, December 2020.
[22] Revenue Passenger Kilometers (RPKs) = the sum of revenue passenger seats that are carried per kilometer, which is used as an indicator to assess the total size of passenger-related capacity available in the market.
[23] https://www.eurocontrol.int/publication/eurocontrol-five-year-forecast-2020-2024.

Figure 4.2: Total Freight Tonnage to/from UK Airports between January 2019 and May 2021

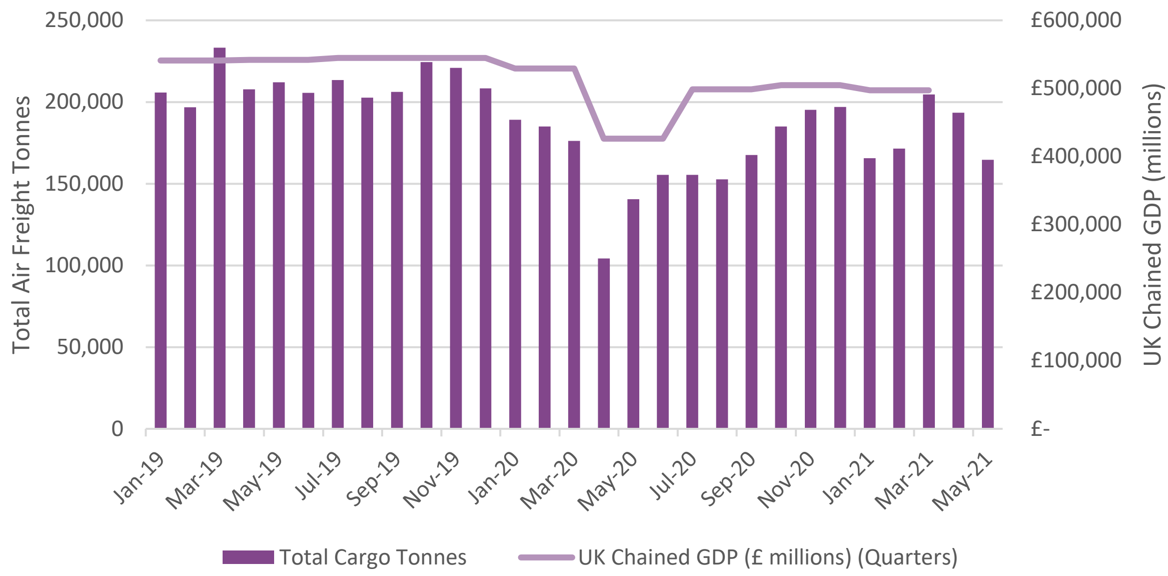


Source: CAA Statistics

4.14 **Figure 4.3** compares the total volume of air freight tonnage flown to and from UK airports against the UK's chained GDP value[24]. Again, the initial impact of the Covid-19 pandemic in March 2020 on the UK's GDP is clearly illustrated, which corresponds with the decline in air freight tonnes flown to or from UK airports. Whilst both metrics recovered somewhat in Q3 2020, GDP and air freight tonnage was still below 2019 levels by Q2 2021. It is clear that, to the extent that there is any reduction in air freight tonnage to/from the UK, this is clearly linked to overarching economic performance, notwithstanding some monthly fluctuations. It is not currently constrained by any shortage of airport capacity.

[24] i.e. stated in real terms at constant value.

Figure 4.3: UK GDP and UK Air Freight Volumes between January 2019 and May 2021



Source: ONS, CAA Statistics

4.15 In order to ensure that there has been sufficient freighter capacity to meet demand, absent bellyhold availability, we have witnessed a number of airlines, which already operated freighter aircraft before the pandemic, such as Lufthansa and Qatar Airways, seeking additional freighter aircraft to take advantage of the short-term fall in bellyhold capacity. Of course, for these carriers that already had established dedicated freighter operations, the marginal cost of adding additional aircraft when flight crews are already trained and processes to handle pure freighters are already established is not overly significant. Some airlines have also taken the opportunity to acquire new freighter aircraft due to a depressed market for new aircraft, in part due to the number of airlines that have failed during the pandemic so reducing the purchase costs of new and second-hand aircraft in the short term. However, overall projections for the operation of dedicated freighter aircraft globally have not changed, despite any short term factors arising from the pandemic. In 2018, Boeing forecast a worldwide freighter fleet of 3,260 aircraft by 2037[25] and now projects the same number by 2039[26]. In other words, the manufacturers of aircraft do not expect any structural change in the market as a consequence of the pandemic. Short term acquisitions of freighter aircraft are merely an opportunistic response to lower prices.

4.16 An innovation that was unprecedented before the pandemic has been the use of passenger cabins to convey volumes of air cargo. Some passenger airlines have temporarily removed all seats and galleys from the cabins of aircraft to carry as much cargo as possible within the passenger cabins, in addition to carrying cargo in the bellyhold. Some carriers have retained the seats and galleys in anticipation of increased demand for passenger traffic and have, therefore, simply been placing cargo onto the passenger seats, whilst other carriers have temporarily removed seats, galleys, and lavatories from their cabins to maximise the space available for cargo. Passenger aircraft temporarily configured to freighter operations have been dubbed as 'preighters' within the industry.

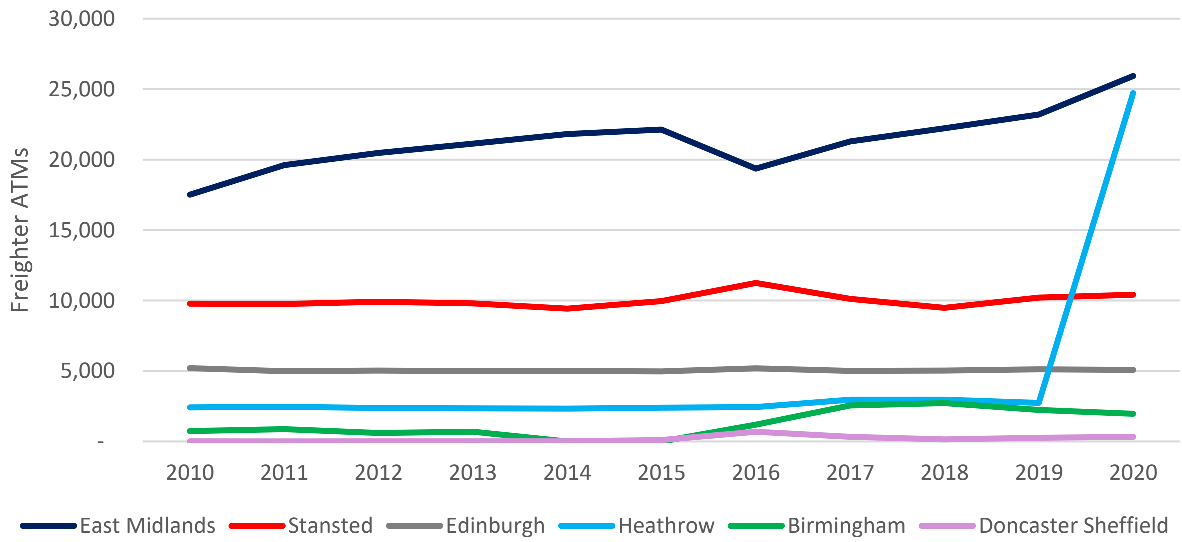
[25] Boeing, World Air Cargo Forecast 2018-2037.
[26] Boeing, Commercial Market Outlook 2020-2039.

4.17 The operation of ‘preighters’ is largely in response to the fact that passenger demand during the pandemic plummeted and airlines were seeking new ways to generate revenue. When government restrictions on travel ease and, hence, passenger demand recovers, airlines operating ‘preighters’ will return to carrying passengers in the cabins and freight in the bellyhold. Indeed, dispensations granted by the American (FAA) and European (EASA) aviation regulators that permit ‘preighter’ operations are due to expire in July 2021 and December 2021 respectively, which indicates the short-term nature of this phenomena. Of course, there is potential for these dispensations to be extended if passenger demand is still depressed due to ongoing travel restrictions but this seems less likely given changes to quarantine rules just announced.

4.18 We understand that the majority of ‘preighter’ operations from UK airports have been long haul flights that mainly carry consignments related to the pandemic itself, such as personal protective equipment (PPE) and Covid testing kits. CAA Airport Statistics, which we understand record ‘preighter’ movements as freighter aircraft movements, demonstrate how Heathrow has facilitated many ‘preighter’ flights as widebodied passenger aircraft based at Heathrow are deployed on long haul sectors but carrying cargo only. We understand, anecdotally, that conventional freighter movements at Heathrow have generally remained at the same volumes in 2020 as handled in 2019, i.e. before the pandemic. Therefore, this temporary increase in freighter ATMs recorded at Heathrow should not be used as an indication of latent pent up demand for freighter movements but as temporary direct replacement of lost bellyhold capacity.

4.19 **Figure 4.4** below presents freighter aircraft movements at the principal UK airports that handle air cargo over the last decade.

Figure 4.4: Freighter Aircraft Movements at Key UK Airports Between 2010-20

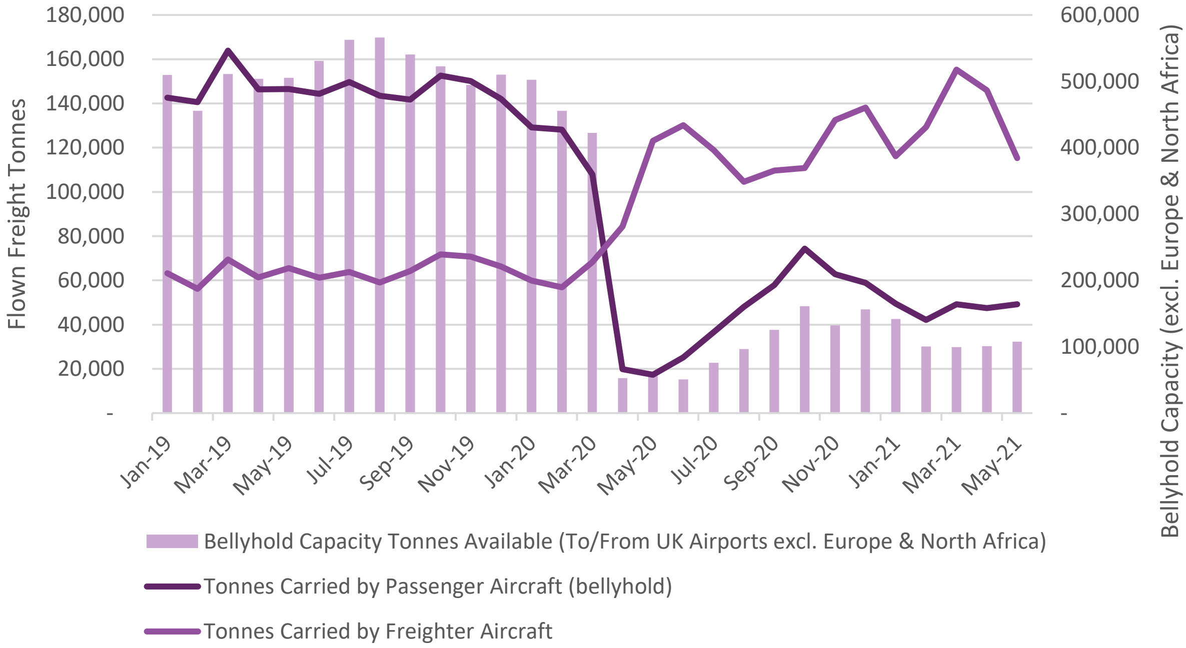


Source: CAA Statistics

4.20 There are also other examples of 'preighter' operations that are likely to be of a temporary nature, such as the operation of large wide-bodied former passenger aircraft operating long haul cargo services at Bournemouth Airport operated by European Aviation. Throughout the pandemic, European Aviation has conducted flights between Bournemouth and points across Asia, North America, and elsewhere. It is believed that some movements are related to the shipment of PPE supplies related to the pandemic and other movements are seeking to replace the shortfall in scheduled bellyhold capacity. The rationale for these services is clear *"the loss of transatlantic capacity as a result of the pandemic has seen an urgent requirement for reliable service between Europe and the US"*[27]. The aircraft used by European Aviation are conventional passenger aircraft that have not undergone formal P2F[28] conversion and, hence, it is likely that they will be reinstated to passenger use once the pandemic is under control globally.

4.21 **Figure 4.5** shows the volume of freight handled by passenger and freighter movements across all UK airports between January 2019 and May 2021 (left axis), and the volume of bellyhold capacity available between the UK and long haul markets[29] (right axis). It is evident that freighter activity increased in direct response to the fall in bellyhold capacity but that, when bellyhold capacity increased during the autumn of 2020, the tonnage carried on freighter aircraft fell back again.

Figure 4.5: Air Freight Tonnes Handled at All UK Airports by Aircraft Type and Long Haul Bellyhold Capacity



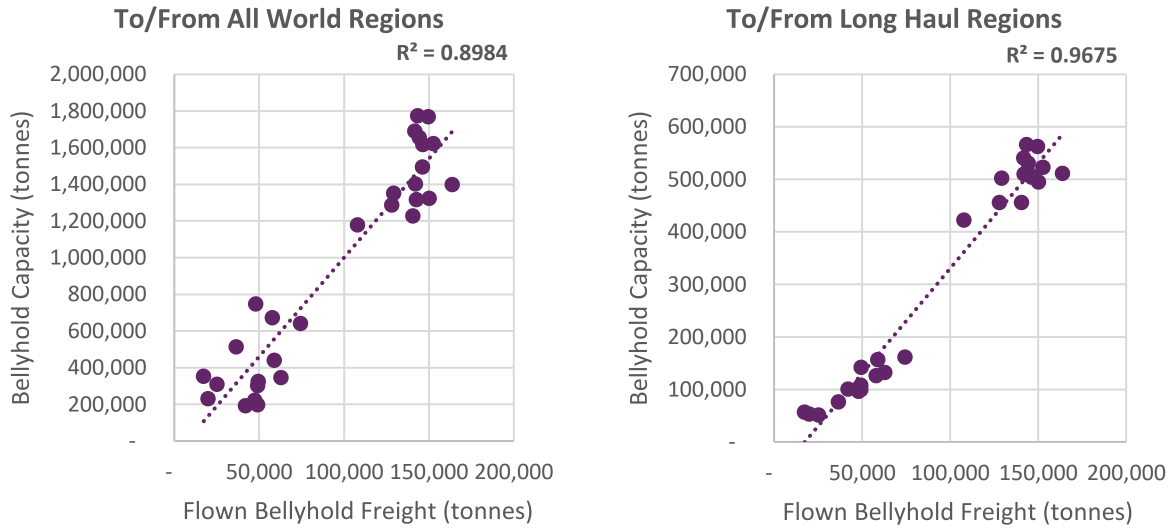
Source: CAA Statistics, OAG

4.22 This would suggest strongly that, over the longer term, as passenger services are reinstated and bellyhold capacity becomes available again, the reliance on dedicated freighter operations would reduce again pro-rata. The timescale for this will, however, depend upon government travel restrictions for air passengers, particularly to long haul markets, given that the majority of bellyhold freight travels between the UK and long haul destinations.

[27] Air Cargo News, Bournemouth-JFK Cargo Flights in High Demand, 8th June 2021
[28] Passenger to Freight
[29] All world regions excluding Europe and North Africa.

4.23 We have looked at the correlation between the quantity of bellyhold capacity available to and from all UK airports against the actual volumes of air freight flown in the bellyholds of passenger aircraft to and from all UK airports during each month between January 2019 and May 2021. In **Figure 4.6**, we show the correlation between flown bellyhold tonnes against available capacity between the UK and all world regions on the left and between the UK and all long haul regions only on the right. It is clear that there is a very strong correlation between the tonnage flown bellyhold and available capacity in both overall terms and long haul markets in particular.

Figure 4.6: Correlation between Available Bellyhold Capacity and Actual Utilisation between January 2019 and May 2021



Note: long haul regions excludes Europe and North Africa

Source: OAG, CAA Statistics

4.24 Hence, given the priority for 'Global Britain' within Build Back Better: Our Plan for Growth[30], reinstatement of global air services will clearly be a priority to support the recovery plan. As passenger services and bellyhold capacity are reinstated, the need for dedicated freighters, other than for express parcels (integrators) and specialist niche services will fall again as the evidence shows. **Prima facie, there is no change in the need for additional airport capacity going forward for dedicated freighter operations as a consequence of the Covid-19 pandemic than there was in our original assessments in 2017 and 2019.**

Changes Related to the UK's Withdrawal from the European Union

4.25 The UK formally withdrew from the European Union on 31st January 2020. Cross-channel freight did face some initial teething problems through the end of the transition period on 31st December 2020 related to paperwork and other formalities but this was due principally to lack of familiarity with new procedures. There was a period of disruption before Christmas 2020 when France introduced restrictions for trucks originating from the UK over concerns of a coronavirus variant thought to have originated in Kent. This disruption caused by the 'Kent variant' was unrelated to the UK's withdrawal from the European Union.

[30] Published by the Chancellor of the Exchequer in March 2021

4.26 There is no systematic evidence that Brexit related border issues at the ports have resulted in any increase in demand for air freight services to/from the EU but there have been some increases in 'preighter' operations to Europe linking supply chains, which were previously served through bellyhold capacity, due to the effect of the pandemic. It is likely that the changes will reverse as aircraft again become prioritised for passenger operations.

4.27 Since the UK's withdrawal from the European Union, the UK has forged several trade deal agreements with a range of foreign countries including Canada, Japan and Singapore. Whilst such trade deals may reduce the formalities and administration required to ship goods between nations and this may change the balance of where the UK trades with, ultimately, the volume of air freight to and from the UK will be driven by the performance of the economy. To the extent that there is greater dependence on importing goods from further afield, this will tend to reinforce the importance of bellyhold capacity as the principal means of carriage as it enables a wider network of points to be served directly rather than trying to consolidate cargo onto a small number of dedicated freight routes.

4.28 Therefore, it is difficult to conclude that the airport capacity that could be delivered from the re-opening of Manston Airport is necessary to meet any increase in trade of goods that are transported by air freight as a result of new foreign trade deals ratified between the UK and foreign nations. **Ultimately, there is no compelling evidence to suggest that the UK's withdrawal from the European Union contributes to an alleged need for the development and re-opening of Manston Airport.**

4.29 Brexit has brought about some changes to airline operating models. For example, DHL Air's UK subsidiary is transitioning to become a long-haul specialist carrier and, as such, the UK arm will increase the number of long-haul capable freighter aircraft to serve North America and Asia operating under the UK's bilateral air service agreements. Its medium-haul aircraft will be transferred to an Austrian entity, DHL Air Austria, which will focus on intra-European services operating under an EU operating licence and still capable of serving the UK as well as other points in Europe. In a press statement[31], a DHL spokesperson said *"As a UK carrier, DHL Air UK is limited in terms of what it can do in terms of intra-European flying. The recently concluded transport agreement with the UK did not replicate the traffic rights available when the UK was still part of the EU."* If anything, this is likely to cement the hub role of East Midlands Airport and limit the potential of other airports in the UK to being merely spokes to other European hubs.

Other Market Developments

Changes in Airline Fleets

4.30 As outlined earlier in this Report, there has been an increase in demand for freighter aircraft since July 2019 as operators scramble to fill the void of bellyhold capacity as a result of the Covid-19 pandemic. Some carriers such as Lufthansa Cargo had retained a small number of aircraft that they had planned to retire during the pandemic to handle the short-term scarcity of air freight capacity, but we understand as of June 30th 2021[32] that these aircraft have recently been sold. Some large operators of freighter aircraft have placed new factory orders for additional aircraft but at least some of these new orders will be one-for-one replacements of existing aircraft within freighter fleets, which in principle would not contribute to growth within the market.

[31] The Load Star, DHL to Launch Air Austria Subsidary as Air UK Looks Beyond Europe, 25th May 2021
[32] Aero Telegraph, Lufthansa Cargo Has Sold the Last Three MD-11s [originally published in German], 14th June 2021

4.31 Similarly, there is scope for passenger-to-freighter (P2F) conversions where aircraft have been retired from passenger service but, rate of conversion is not expected to be large and, again, may simply reflect airlines replacing older conversions with newer variants. To the extent that the air freight industry relies to some degree on conversion of older types, this means that inevitably introduction of new and more sustainable aircraft types will lag the introduction into passenger fleets. This is, in large part, dictated by the economics of the air freight sector which tends to deliver lower profits than the passenger/freight market combined.

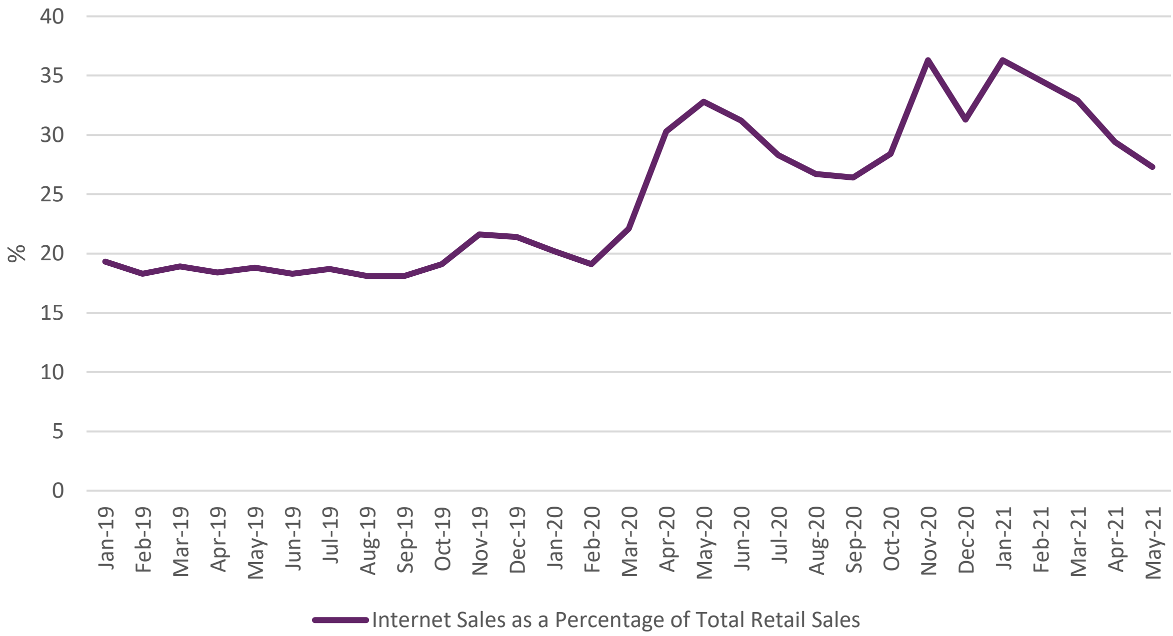
4.32 As noted earlier in this section, the market outlook is for the number of freighter aircraft in airline fleets over the long term to be the same as forecast in 2018, i.e. there is no structural change expected in the market over the longer term since July 2019.

4.33 In the longer term, there may be potential for electric or hydrogen powered aircraft. Currently, research suggests that these are more likely to be suitable for short to medium haul routes with smaller payloads[33] and so are unlikely to be the primary vehicles for cargo carriage out to 2050. To the extent that hydrogen powered airships might be viable alternatives, it is significant that these do not need complex airport infrastructure or long runways.

E-Commerce

4.34 The impacts of the Covid-19 pandemic on consumer preferences has lead to an acceleration in e-commerce trade. Indeed, **Figure 4.7** illustrates the percentage of online sales as a percentage of total UK retail sales between January 2019 and May 2021.

Figure 4.7: Internet Sales as a Percentage of Total UK Retail Sales



Source: ONS

[33] McKinsey and Co for Clean Sky 2, Hydrogen powered aircraft, May 2020.

4.35 Whilst online sales between January and May 2021 have fallen in-line with the easing of public health restrictions imposed by the UK Government, it is reasonable to assume that there will continue to be a higher rate of online sales than before the pandemic.

4.36 Increases in e-commerce activity, however, do not necessarily lead to an increase in the volumes of air freight carried to or from UK airports. Consumers have long purchased goods made in China for example, which are transported to the UK by both air and surface modes. Even if some goods that were previously bought in physical stores are now bought online, these goods generally share the same journey from China to the UK, but rather than being shipped directly to the retailer's distribution centre for onward travel to the physical store, they are being shipped to an online retailer's distribution centre for last-mile dispatch direct to consumers. Therefore, whilst increased e-commerce activity has resulted in an increase in demand for last-mile logistics between distribution centres and consumers, there has so far been a neglible net impact in the volumes of air freight carried to and from UK airports.

4.37 Of course, air freight does have an integral role in supporting supply chains related to e-commerce activity, as demonstrated by Amazon's own developments of its Amazon Air carrier. The operation of freighter aircraft serving this market, as indeed with the role of freighter aircraft in the wider express logistics sector, is based upon the overnight hub and spoke model, whereby centralised hubs relative to core population centres handle numerous flights during the night time, which allows freight to be sorted and transferred to surface modes in the early morning for next-day delivery.

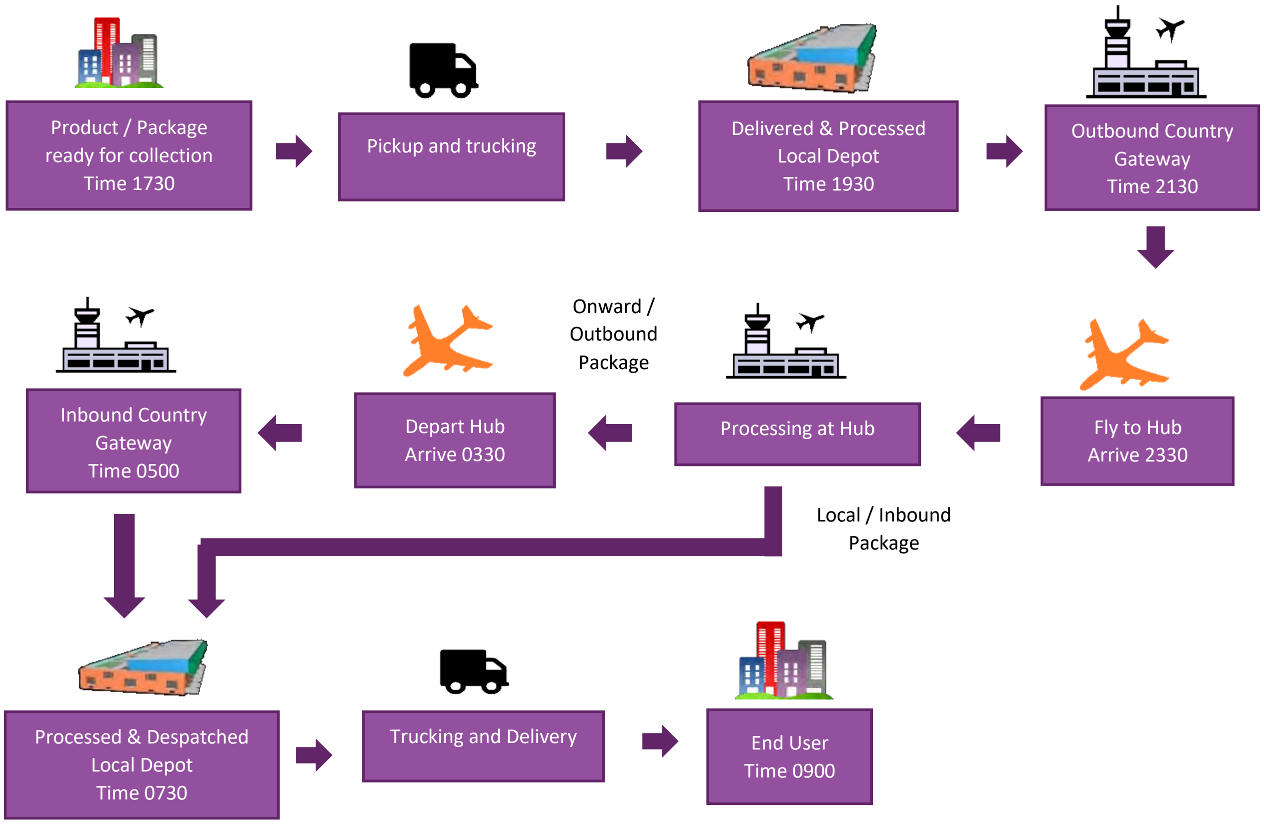
4.38 A more recent development is the advent of Amazon's own freighter operations, dubbed Amazon Air. Amazon Air's operations in the US have increased rapidly over the past couple of years, with approximately 50 freighter aircraft supporting Amazon's logistics operations. Amazon Air's operations in the US are based on a hub and spoke model, whereby a small number of hubs in cities such as San Bernadino and Cincinnati feed various points throughout the US. These operations were previously supplied by other integrators such as DHL and UPS but Amazon brought these operations in house so as to have greater control over the product and costs. Hence, the flying is not necessarily incremental, just a change in how it is operated.

4.39 Amazon's aviation operations in Europe are not as established as its operation in North America, however. In November 2020, Amazon Air opened its first European hub at Leipzig/Halle Airport in Germany, which is already a major freight hub and home to DHL's European operations due to its central location relative to key population centres in Central Europe. As of 1st July 2021, we understand that Amazon Air's operations in the UK are relatively sparse, with just a small number of airports such as East Midlands acting as spokes from the Leipzig hub. Whilst there are a number of UK freighter movements that support Amazon's supply chains on a contractor basis, Amazon Air has not yet established its own operating base at a UK airport. Of course, if Amazon Air were to establish at base at a UK airport, it would most likely be in a relatively central location and within close proximity to existing Amazon distribution centres, as demonstrated by the locations of Amazon Air's US bases. This places East Midlands Airport in prime position, given its central location at the core of the UK's motorway network, in addition to a wide range of Amazon fulfilment centres within proximity to the airport, which has recently been further enhanced by the opening of an additional centre at the East Midlands Gateway site.

4.40 We note that Alibaba Group's logistics arm, Cainiao, has also made headway in the development of its multi-modal logistics site based around Liege, which was already a busy freighter airport given its central location and 24/7 operations. Operators for Cainiao at Leige have reportedly handled over 500 million packages in 2020, compared to 9 million in 2018[34] but this may have been at the expense of other operators such as Fedex. Cainiao have forged agreements with freighter operators for a small number of regular operations between China and Europe, including to Budapest and Madrid via Liege, from which trucking operations serve the rest of Europe including[35]. Along with the Amazon Air developments, this development confirms that the current operating patterns of express freight are likely to remain.

4.41 Two crucial factors preclude Manston from faciliting any sort of operation in this market, namely its peripheral location relative to population centres and the wider logistics networks and the commitment by RSP that night flights would be heavily restricted to late running arriving aircraft only. In **Figure 4.8** below, we illustrate the typical timings for express/integrator operations. Manston could not operate as a hub for such operations due to its inability to schedule operations during the night period and would be unsuitable even as a spoke as the requirement for late collection from key business centres would risk flights to the hub impinging on the night period when there is no flexibility allowed for late departures. Similary, early morning arrivals could not be scheduled early enough to ensure 09.00 delivery to businesses as required to justify the price premium that express freight and e-commerce operations demand.

Figure 4.8: Typical Integrator/Express Operating Patterns



Source: York Aviation for the Freight Transport Association Ireland[36]

[34] https://www.theguardian.com/business/2021/feb/14/open-sesame-alibabas-push-into-europe-a-mixed-blessing-for-liege.
[35] https://supplychaindigital.com/logistics/cainiao-launches-its-first-china-hungary-cargo-flight.
[36] York Aviation, The Economic Impact of Night Flying at Dublin Airport, March 2020.

4.42 **This confirms our view that, notwithstanding growth in e-commerce, accelerated by the pandemic, the dynamics of the industry and how it operates remain based on the patterns previously seen in the express/integrator operations, with a premium placed on central locations with easy access to other distribution networks. Manston is simply inappropriately located and, with binding constraints on night operations, could not play any substantive role in such operations.**

Market Recovery and the Need for Capacity

4.43 The current downturn in the air transport sector caused by the Covid-19 pandemic is temporary. However, it is challenging to pinpoint a precise date for recovery of the market given there are many variables outside of the sector's control, including the global rollout and uptake of vaccinations and the potential threat of new variants of the virus. Ultimately, however, as these factors stabilise and passenger demand for long haul air transport rebounds, the majority of UK air freight will again be carried within bellyhold capacity.

4.44 Whilst general freighter operations have benefited from the pandemic, it is unlikely this trajectory will continue beyond the short-term, despite the increase in availability of freighter aircraft. It is likely that growth will slow as the urgent need for freight consignments directly related to the pandemic, such as vaccines, PPE and Covid-19 testing kits, becomes normalised. The use of dedicated freighter operations during the pandemic is a prime of example of how dedicated freighter operations suit distinct niches in the market, which are sometimes transient, and which supplement the primary flows using available bellyhold capacity.

4.45 Before considering what the market growth trajectory might look like post-Covid-19, we first consider the extent to which there have been changes to capacity available at other airports to accommodate that growth.

Changes in Capacity at Other Airports

South East of England

4.46 As noted earlier in Section 2, the reinstatement of ANPS creates a presumption in favour of the development of a third runway at **Heathrow** providing significant additional capacity for air freight. This reinstates the position as at July 2019 in terms of the capacity for air freight expected to be developed at Heathrow, albeit the timescale over which it might be developed has necessarily slipped somewhat.

4.47 At the beginning of 2020, Uttlesford District Council overturned its previous decision of 2018 to grant planning permission for **Stansted** to increase its passenger cap to 43 million passengers per annum (mppa), with some consequent changes to the number of aircraft movements reserved for cargo air transport movements. Following an appeal, in May 2021, the Planning Inspectorate granted approval to Stansted's plans[37], which will allow the airport to handle up to 274,000 aircraft movements over a 12-month period, of which no more than 16,000 movements are permitted to be cargo air transport movements. Hence, the current position remains as at July 2019 in that Stansted has substantial headroom to grow its freighter activity as, in 2019, it handled a total of only 10,208 cargo air transport movements. Further growth in cargo capacity is expected through the development of more long haul services offering bellyhold capacity, building on the success of the Emirates operation[38]. The latest cargo forecasts for Stansted indicate that it expects to handle up to approximately 375,000 freight tonnes per annum[39]. This is slightly lower than our previous estimate of 400,000 tonnes taken from the Airport's Sustainable Development Plan.

4.48 In August 2019, **Gatwick** announced its intention to commence the preparation of a planning application that would allow the airport to bring its existing Northern Runway into regular use[40], which would increase the hourly throughput of aircraft movements at Gatwick Airport. This followed from the options that it had consulted on in late 2018 and which were taken into account in our 2019 analysis. We understand that further consultation on the planning application is expected later in 2021. Gatwick's current master plan, published on 18th July 2019, forecasts that air cargo handled at the airport will grow from approximately 102,000 tonnes per annum in 2018 to approximately 325,000 tonnes by 2032/33 if the standby runway is put into regular operation through the development of enhanced long haul services offering bellyhold capacity[41].

4.49 **Luton** Airport has been in the process, since 2017, of preparing an application for a DCO that would include the development of a second passenger terminal and an increase from its current cap of 18 mppa to 32 mppa. This would provide opportunities for some long haul services and growth in bellyhold tonnage, albeit no changes to capacity for dedicated freighters are proposed.

4.50 A further development in regard to advances in airport capacity in the South East is related to **Southampton** Airport, which gained planning approval on 10th April 2021 for a 164m extension to its existing runway. Southampton's existing runway is too short to handle some of the larger aircraft popular with the dominant European low cost carriers and, thus, an extended runway will allow the Airport to rebuild its reduced passenger network since the closure of Flybe. This may offer some limited opportunities for short haul freight given the good surface access links, including direct motorway access to London via the M3 and to key settlements on south coast via the M27.

4.51 Taken overall, the total air freight capacity expected to be available across the airports in the South East of England remains largely as at July 2019 and as assessed in our 2019 Report.

[37] It is noted that the Council has indicated that it may seek leave to judicially review the decision but this application has not yet been made.
[38] Note that the lack of recorded freight on the Emirates Stansted passenger service in 2018/9 was due to reporting errors to the CAA not a lack of freight carried in bellyhold.
[39] London Stansted Airport, 35+ ES Addendum, Chapter 4 Aviation Forecasts, para 4.2.28
[40] London Gatwick's Northern Runway is primarily used as a taxiway, or is brought into use when the main runway is closed for maintenance or emergencies.
[41] London Gatwick Airport, Master Plan 2019 (Final version published July 2019)

East Midlands Airport

4.52 East Midlands Airport, the UK's principal airport for pure freighter activity, has seen further development of its facilities and the immediate surrounding area, which will ultimately affirm its leading position in the UK air freight market.

4.53 In February 2021, UPS opened an expanded facility over 100,000m^2 in size that replaced its smaller facility at the Airport. Adjacent to the airport site, a new logistics park has been developed that will offer a total of over 500,000m^2 of accommodation for logistics firms when its final development phase is complete. The development, named East Midlands Gateway, features direct access to north-south and east-west motorways and trunk roads, in addition to a purpose-built rail freight facility. Current tenants of East Midlands Gateway include Amazon, DHL, XPO Logistics and Kuehne+Nagel. The proximity of the Airport to the East Midlands Gateway will further cement its position as the UK's pre-eminent air freight distribution hub outside of Heathrow. The Airport's Sustainable Development Plan 2015, which remains current, projects cargo growth from 422,000 tonnes to 1.2 million tonnes with facilities planned to accommodate that growth[42].

4.54 The unparalleled location of East Midlands Airport is a key factor for logistics firms establishing operations in the area, but the attractiveness of the location has been further enhanced by the area's designation as a Freeport based around the Airport. On 3rd March 2021, the Government officially announced that East Midlands Airport and designated sites within the immediate surrounding area would benefit from Freeport status that would allow the import and export of goods without paying tariffs, in addition to a range of other benefits including forms of tax relief. The Airport has indicated that the granting of Freeport Status would be likely to bring forward its cargo expansion plans.

4.55 This confirms our view that Manston, located where it is, would be highly unlikely to offer any competition to East Midlands in terms of attracting express and integrator operations on any scale and upon which the freighter aircraft movement forecasts presented by RSP relied for 48% of the aircraft movements[43].

Rest of the UK

4.56 Elsewhere in the UK, a small number of regional airports are progressing with plans for expansion in anticipation of market recovery following the impacts of the Covid-19 pandemic.

4.57 Leeds Bradford Airport had been granted conditional approval by Leeds City Council in February 2021 for the construction of a replacement terminal building that would support the airport's future growth. However, as of 1st July 2021, the Airport's expansion plans are being reviewed by the Secretary of State for Housing, Communities and Local Government following representations from objectors.

4.58 Bristol Airport has been in the process of advancing its own plans to expand its capacity from its current limit of 10 mppa to 12 mppa, which includes an expansion of the passenger terminal and some enhancements to the local road network. North Somerset Council refused the Airport's planning application in March 2020 and the Airport appealed this decision to the Planning Inspectorate in September 2020. A public inquiry is due to take place in July/August 2021.

[42] https://mediacentre.eastmidlandsairport.com/east-midlands-airport-will-help-realise-global-britain-aspirations-if-freeport-bid-successful/.
[43] 2019 Report, para. 3.40.

4.59 Regardless of the outcome of either of these Airport's expansion plans, neither Leeds Bradford nor Bristol foresees a significant increase in freighter aircraft activity.

4.60 We are also aware of a start-up carrier, ZFG Air, who are seeking to operate freighter flights from Newcastle Airport to Dubai and Hong Kong. This may partially be driven by the temporary withdrawal of long haul bellyhold capacity that would usually be provided by Emirates' service to Dubai, but the North East has a cluster of pharmaceutical and electronics firms that typically depend upon air freight to support their supply chains and may provide a specific local market.

4.61 Regardless of the longevity of new freighter operations at Bournemouth and Newcastle, which may be a short term reaction to reductions in bellyhold capacity, these developments do demonstrate that capacity exists within the national airport network to accommodate freighter services to the extent that there is a need for such services. Both Bournemouth and Newcastle would continue to have spare runway capacity to accommodate such freighter services for the longer term if required.

Locational Requirements

4.62 The geographical characteristics related to air freight in the UK remain fundamentally unchanged in relation to the locational determinants as set out in our previous 2017 and 2019 Reports. The consolidation of general airfreight continues to be focussed at Heathrow, notwithstanding that it is using 'preighter' rather than bellyhold capacity in the short term.

4.63 Express freight operators and integrators still depend on the hub and spoke operation of freighter aircraft, with the centralised location of hubs relative to key population centres and surface access links remaining of paramount importance to support their business models. Indeed, freight flown to and from East Midlands Airport in 2020 increased by approximately 14%, which demonstrates the continued significance of East Midlands' role in facilitating the needs of express freight operators and dedicated freighter operations as well in a market that declined overall by 21% in terms of tonnage handled due to the economic effects of the pandemic. Despite this, freighter operators continued to prioritise use of East Midlands and Heathrow because they represent the best locations for distribution within the UK, with relevant infrastructure already in place. East Midlands' hub role will be further strengthened by the Freeport designation and the changes to the way in which DHL's operations are organised post-Brexit.

4.64 General air cargo movements still continue to operate from a number of UK airports but the bulk of such movements are operated from East Midlands, Edinburgh and Stansted Airports. The trucking of general air freight across the English Channel also continues to form a crucial component of logistics chains, with consignments trucked for consolidation at major freight hubs in Europe such as Liege and Cologne to avail of cost savings by consolidating air freight onto a single flight from these airports.

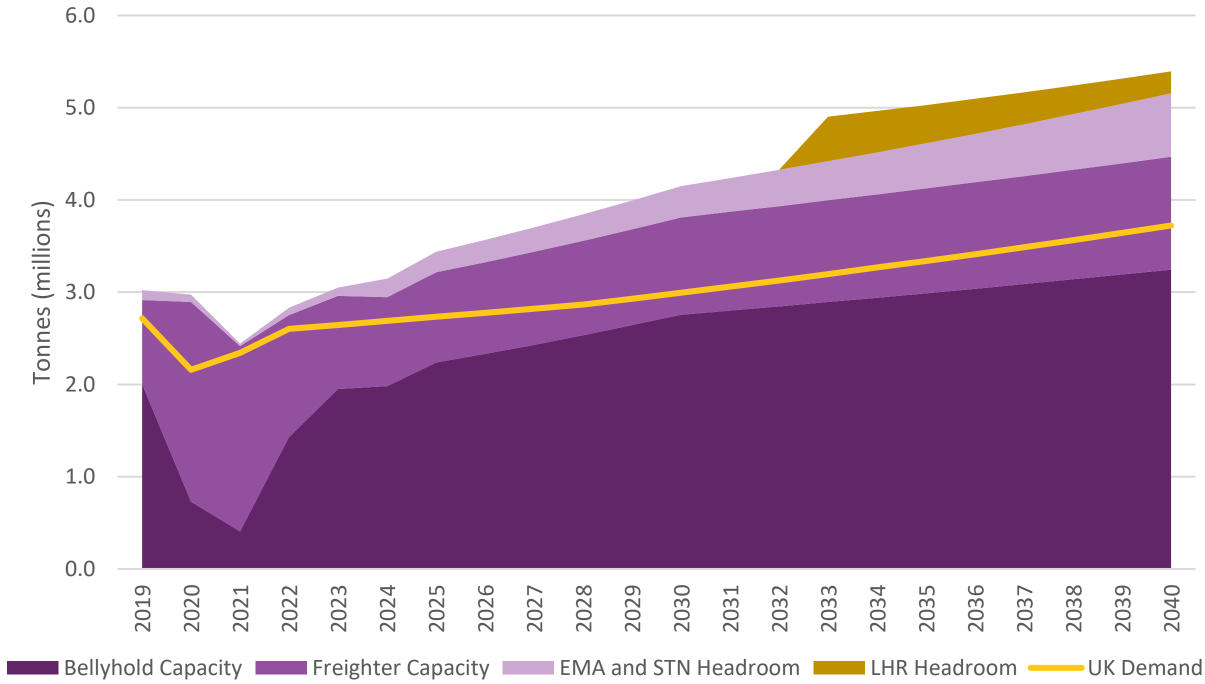
Quantifying the Need for Manston Airport

4.65 Our previous 2017 and 2019 Reports both demonstrated that there is ample capacity for the forecast volumes of air freight to be handled at airports across the South East of England and across Great Britain, and that, therefore, the additional capacity that would be provided by re-opening Manston Airport was simply not needed to meet future demand.

4.66 **Figure 4.9** updates our previous analysis[44] that compared forecast demand for air freight against bellyhold and dedicated freighter capacity for the entirety of the UK based, as in 2019, on the relationship between air freight tonnage and GDP using the latest forecasts from the OBR[45]. We have considered the changes to demand and supply from 2019 onwards as outlined above, which includes the impacts resulting from the Covid-19 pandemic[46]. In essence, our updated forecasts show a lag to the achievement of future forecast demand levels by around 5 years, consistent with the lag to economic performance. Given that air cargo has shown a close relationship to the performance of the economy through the pandemic (see Figure 4.3), notwithstanding the specific pandemic related supply issues and the growth of e-commerce, we expect ongoing demand for air freight services to remain largely driven by GDP.

4.67 Our forecast assumes that bellyhold capacity in the market will return to 2019 levels by 2024-25, by which time air freight demand is comfortably absorbed by the abundance of availability of bellyhold capacity. As with our previous assessment, the headroom for freighter growth at East Midlands, Stansted and Heathrow, with a third runway assumed to open by 2033, further increases the headroom available for surplus demand over-and-above the forecast. At the UK level, there is simply no shortage of airport capacity to meet air freight demand. Even if recovery of passenger services was slower, the experience during the pandemic has shown that the industry is able to respond and that there is no shortage of airport capacity which would prevent it from doing so if need be.

Figure 4.9: UK Air Cargo Capacity

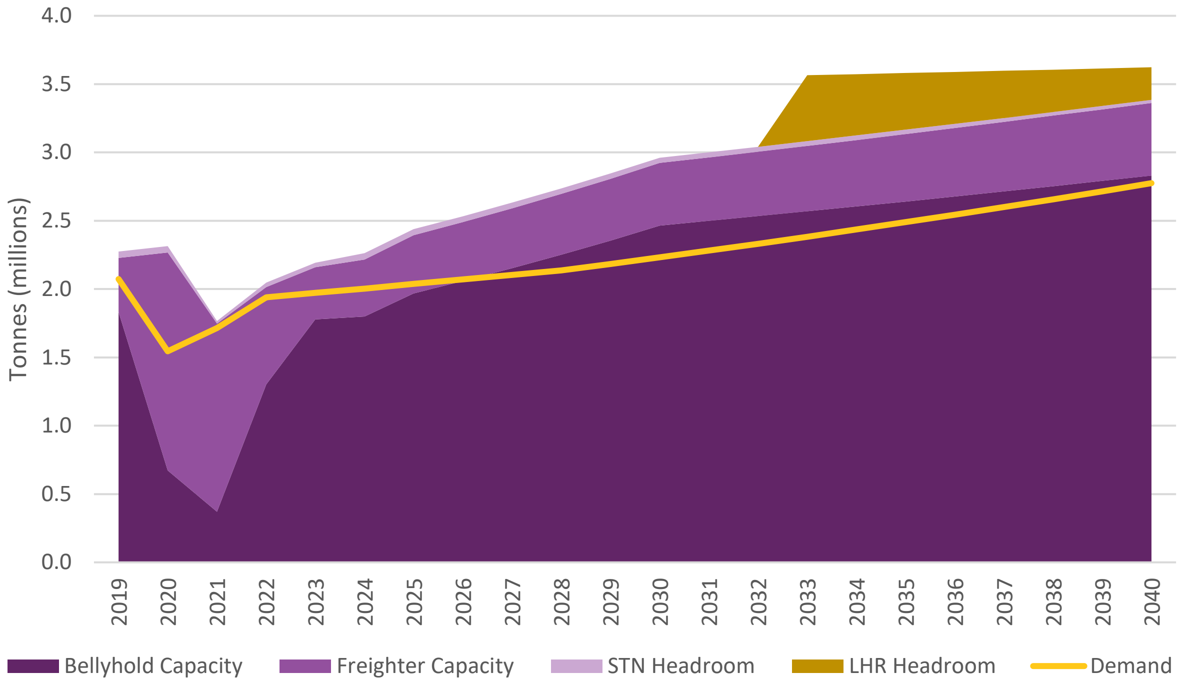


Source: York Aviation

[44] The methodology was outlined at paras. 4.29-4.36 of our 2019 Report.
[45] Office for Budget Responsibility.
[46] Data related to the volume of supply is based on the average tonnes carried separately by freighter and passenger aircraft in 2019. This does not reflect the temporary operation of passenger aircraft operating freighter-only flights in 2020 and 2021, which has resulted in a reduction of average tonnes carried per aircraft operating freighter services during this period.

4.68 **Figure 4.10** compares our forecast for air freight demand against the capacity of the London airports to handle air freight. As with the UK position, there is ample spare capacity in the London system to accommodate future air freight demand growth to 2040. **There is simply no need for Manston**.

Figure 4.10: London Airport System Air Cargo Capacity



Source: York Aviation

Summary

4.69 Our updated analysis does not suggest any change in the quantifiable need for Manston. Although there have been short term changes in the balance between bellyhold freight and dedicated freighter activity during the pandemic, these changes are not expected to be permanent, notwithstanding growth in e-commerce and changes to the UK's trading patterns post-Brexit.

4.70 There is adequate airport capacity across the UK planned to meet forecast demand based on current plans. Even if there were further delays to R3 at Heathrow or the opening up of additional bellyhold capacity at Gatwick, overall capacity would still be adequate to meet demand out to 2040 when the headroom for growth for growth in freighter activity at Stansted and East Midlands is taken into account. The same is true at the level of the South East of England. There is simply no need for Manston.

4.71 In any event, as set out clearly in our 2019 and 2017 Reports, even if there was a residual need, Manston is simply in the wrong place to meet that need with alternative locations more centrally located within the UK strongly to be preferred based on the established patterns of logistics within the UK.

5. Summary Conclusions

5.1 Theis Report has been prepared to address two specific points in the Department for Transports's Statement of Matters in relation to its reconsideration of the application for DCO consent for the re-opening of Manston Airport as an airfreight hub, namely:

- the extent to which current national or local policies (including any changes since 9 July 2020 such as, but not limited to, the re-instatement of the ANPS) inform the level of need for the services that the Development would provide and the benefits that would be achieved from the Development; and
- whether the quantitative need for the Development has been affected by any changes since 9 July 2019, and if so, a description of any such changes and the impacts on the level of need from those changes (such as, but not limited to, changes in demand for air freight, changes of capacity at other airports, locational requirements for air freight and the effects of Brexit and/or Covid);

5.2 This work is largely based on previous work by YAL submitted to the Examination by SHP appended to representation TR020002-003137. Although we update our findings, as relevant, in this report, we consider that our overall conclusions from 2017 and 2019 Reports as submitted remain valid.

York Aviation 2017 and 2019 Reports

The 2017 Report

5.3 Our November 2017 Report focussed initially on the misinterpretation and misrepresentation by RSP of earlier work undertaken by YAL for the FTA and TfL. We made clear that, properly understood, this work did not support RSP's conclusion that there would be a substantive or sustainable role for Manston in the UK air freight industry. The remaining evidence relied on by RSP was almost entirely circumstantial, based on reports outlining the consequences of a shortage of airport capacity in the London area principally for passenger flights in circumstances where no additional capacity is provided at any of the London Airports, and showed a lack of understanding of the economic drivers favouring bellyhold capacity for the majority of general air cargo.

5.4 It was highlighted that Azimuth's 'forecasts' for RSP relied strongly on the attraction of an integrator/express freight operation but Manston is too peripheral for integrator operations serving the UK and, in any event, such operations would be unlikely given the proposed restrictions on night flying.

5.5 Proper analysis of the UK air freight market showed that there was plenty of freighter aircraft capacity at Stansted and East Midlands Airport to accommodate any growth required in dedicated freighter operations such that there would be no shortage of capacity across the UK and no role for Manston in accommodating traffic spilled from other airports. These airports are better located relative to the market and the key locations for distribution within the UK.

5.6 We also highlighted that Azimuth had made errors in the assessment of the socio-economic implications of the proposed development, particularly in terms of the use of inappropriate multipliers, the assessment of impacts at a national scale, rather than the local scale in East Kent as implied by Azimuth, and that they should have taken displacement of activity from other UK airports fully into account, reducing the socio-economic impacts well below those stated.

The 2019 Report

5.7 The principal conclusions of our 2019 Report relevant to the Statement of Matters were:

- Aviation Policy – RSP wrongly based its case for the development of Manston on evidence of the economic implications for the UK if additional hub airport capacity for passenger flights was not provided. Government Aviation Policy makes clear that expansion of capacity at Heathrow, allowing more global air connections providing additional bellyhold capacity and scope, if required, for more dedicated freighter movements at Heathrow, is the identified means of meeting future air freight demand, along with the continued role for East Midlands and Stansted as air freight gateways with ample spare capacity.

- Errors and Inconsistencies of Analysis – there were inconsistencies and mathematical errors in the 'forecasts' used by RSP to justify the proposed development at Manston, including the lack of any soundly based forecasts drawing on an assessment of the market and cost efficiency, a lack of realism in the fleet mix and the assumed pattern of day/night time operations, and the overstatement of longer term demand projections through the use of unjustified growth rates due to mathematical errors made by Azimuth.

- Understanding the Air Freight Market – proper analysis showed that there was no role for Manston, other than possibly as a niche cargo operation for ad hoc specialist consignments, consistent with the nature of previous operations there. R3 at Heathrow will provide for a doubling of air freight capacity at the Airport, mainly in bellyholds of passenger aircraft and the integrators are already well established at East Midlands Airport, which has substantial scope for growth and is well located in the centre of the country to act as a distribution hub.

- Viability – we concluded that, even on RSP's forecasts, the development would not be commercially viable.

5.8 In overall terms, we consider that our 2017/2019 findings in relation to the need for the development of Manston as an airfreight hub remain robust but we go on, in this Report, to update the policy and market assessment to address the matters upon which the Secretary of State seeks further information.

5.9 In relation to RSP's Summary of Need Case submitted at the end of the Examination period, this largely repeated RSP's original need case unalterred from that originally submitted except in so far as it relied on forecasts produced by Northpoint Aviation rather than the Need Case prepared by Azimuth Associates. These forecasts had already be subject to criticism during the Oral Hearing on Need and we addressed many of the points in our Supplementary Submission following Hearings appended to this Report. In summary, the RSP Summary of Need Case does not address the criticisms of its original need case made throughout the Examination process and, to the extent that it relies on new material produced on its behalf during the process, this was rebutted and informed the conclusions made by the Examining Authority.

5.10 In undertaking this update, we are mindful of the reliance placed on substantial aspects of our work by the Examining Authority in its previous recommendation that there was no need for the development, summarised at para. 5.7.28 of their Report of Findings and Conclusions :

"Given all the above evidence, the ExA concludes that the levels of freight that the Proposed Development could expect to handle are modest and could be catered for at existing airports (Heathrow, Stansted, EMA, and others if the demand existed). The ExA considers that Manston appears to offer no obvious advantages to outweigh the strong competition that such airports offer. The ExA therefore concludes that

the Applicant has failed to demonstrate sufficient need for the Proposed Development, additional to (or different from) the need which is met by the provision of existing airports."

5.11 We do not consider that anything has fundamentally changed since the close of the Examination in July 2019 sufficient to alter this conclusion.

Policy Changes Relevant to the Re-Determination

Relevant National Policy

5.12 The principal change to National Aviation Policy since July 2020 has been the status of the ANPS, which was not in force when the the DCO was approved in July 2020 but has since been re-instated. Absent the increase in capacity expected at Heathrow, this could have created a perception that there was potentially a need for the development of Manston to fill a gap in the availability of capacity for air freight in the South East of England. However, we do not believe that such a gap would exist even absent a third runway at Heathrow over the medium term.

5.13 Nor does the 'Making Best Use' policy convey automatic support for each and every development seeking to make best use of an existing runway, rather the policy is clear that whilst there is a policy presumption in favour of making best use of existing runways, each case must be considered on its own economic and environmental merits. It is not sufficient to seek to make the case based on an inference of some general shortfall of capacity across the South East of England. Re-opening a runway only for it to be seldom used in practice does not constitute an economically efficient use of that runway, and so would not be likely to equate to 'best use'.

Local Policy and Other Developments

5.14 Although the adopted Thanet Local Plan contains a policy to safeguard the Manston site for aviation uses, it is clear that this is a holding policy pending the outcome of the DCO process.

5.15 There have been a number of other developments in the local area which will create a substantial number of jobs and are unrelated to the proposed re-opening of the Airport for airfreight. These include:

- Thames Freeport, accessible by the Lower Thames Crossing
- London Resort
- Ebbsfleet Garden City

5.16 The Thanet Local Plan also envisages the creation of other employment opportunities for 5,000 jobs within the local area. The combined job creation effect of these developments will dramatically increase employment opportunities in the local area such that any contribution that the Airport might make will be insignificant.

Updating the Quantified Need Case

5.17 In this section, we focus on whether there have been changes to the need for Manston as an airfreight hub sufficient to alter the conclusions that we reached in our 2017 and 2019 research. This section addresses the extent to which changes and developments that have occurred since 9th July 2019 might alter the conclusions reached by the Examining Authority on Need sufficient to justify the Secretary of State taking a different decision in respect of the development and re-opening of Manston Airport.

5.18 Updating our analysis of the baseline position to 2019 showed that, prior to the pandemic, there had been some small growth in freight tonnage at UK airports since 2016, with nearly 60% of this growth being in the bellyholds of passenger aircraft, principally at Heathrow, Gatwick, Manchester and Stansted. Of the remaining growth in tonnage, over half was in dedicated freighter aircraft at East Midlands Airport, with some growth also recorded at Belfast International, Doncaster Sheffield and Prestwick Airports mainly in by express freight/integrator operations.

5.19 Over the longer term, the continued concentration of growth in the air freight market was evident with the only material growth being at Heathrow (bellyhold) and East Midlands (dedicated freighters). In general, there has been a clear switch towards the use of bellyhold capacity with the share of the cargo market carried on dedicated freighters falling from 35% to 30% since 2007.

5.20 The reason for this focus on bellyhold is due to the high levels of long haul services to the UK providing bellyhold capacity pre-pandemic, which means there is less reliance than in the rest of the world, including at other European hubs such as Frankfurt, on dedicated freighter activity to fill the gaps other than in the clearly defined express freight sector. This is because it is simply much more economic to use available bellyhold capacity.

The Effects of Covid-19

5.21 The impacts of the Covid-19 pandemic have resulted in profound and far-reaching changes for the aviation sector. However, the effects of these are expected to be short term. There are four principal factors at play:

- the economic implications due to lower activity levels leading to reduced demand for both passenger and freight services;
- the direct effects of travel restrictions impacting passenger travel and, hence, the availability of bellyhold capacity;
- increased demand for air freight related specifically to the pandemic (PPE, vaccines etc);
- increased reliance on e-commerce and next day delivery.

5.22 Although travel restrictions have resulted in fewer passenger flights offering bellyhold capacity, this is expected to be a transient phenomenon with services expected to be reinstated to 2019 levels by around 2024. It is clear that volumes of air freight tonnage have also declined largely pro-rata to the underlying economic performance, notwithstanding the use of air freight for essential supplies. The lack of bellyhold capacity has meant that freighter capacity has been increased, including the temporary use of passenger aircraft as ‘preighters’ to provide capacity to meet demand. Even if recovery of passenger services was slower, the experience during the pandemic has shown that the industry is able to respond flexibly and that there is no shortage of airport capacity which would prevent it from doing so beyond 2024 if need be.

5.23 It is evident from our updated analysis, however, that in periods when passenger flights have been operated and more bellyhold capacity available, demand for dedicated freighter operations has fallen back again. There is a strong correlation between the bellyhold capacity available and the amount of freight carried in bellyhold. This would suggest strongly that, over the longer term, as passenger services are reinstated, particularly in long haul markets, and bellyhold capacity becomes available again, the reliance of dedicated freighter operations will reduce again pro-rata. This confirms our 2019 analysis regarding the primacy of bellyhold capacity other than for express/integrator operations.

Changes Related to the UK's Withdrawal from the European Union

5.24 Although there have been some initial teething problems with border controls following the UK's withdrawal from from the European Union, there is no systematic evidence that Brexit related border issues at the ports have resulted in any increase in demand for air freight services to/from the EU. To the extent that there is greater dependence on importing goods from further afield, this will tend to reinforce the importance of bellyhold capacity as the principal means of carriage as it enables a wider network of points to be served directly rather than trying to consolidate cargo onto a small number of dedicated freight routes.

Airline Fleets

5.25 Although there has been some increase in demand for freighter aircraft since July 2019 as operators scramble to fill the void of bellyhold capacity as a result of the Covid-19 pandemic, this has also been related to the availability of lower cost new and used aircraft during the pandemic. Over the longer term, Boeing has not increased its projections of the total number of dedicated freighter aircraft that would be operated globally over the next 20 years. There is no structural change expected in the market over the longer term since July 2019.

5.26 In the longer term, there may be potential for electric or hydrogen powered aircraft. Currently, research suggests that these are more likely to be suitable for short to medium haul routes with smaller payloads and so are unlikely to be the primary vehicles for cargo carriage out to 2050. To the extent that hydrogen powered airships might be viable alternatives, it is significant that these do not need complex airport infrastructure or long runways.

E-Commerce

5.27 The impacts of the Covid-19 pandemic on consumer preferences has lead to an acceleration in e-commerce trade. Increases in e-commerce activity, however, do not necessarily lead to an increase in the volumes of air freight carried to or from UK airports as e-commerce largely relates to the final distribution from the hub rather than the fundamental carriage of goods to the UK to replenish the warehouses. In essence, the same volume of goods is being purchased and, where relevant, imported into the UK but the final distribution is different. This does not fundamentally affect the demand for air freight, which is ultimately driven by broader economic indicators.

5.28 Nonetheless, air freight does have an integral role in supporting supply chains related to e-commerce activity, as demonstrated by Amazon's own developments of its Amazon Air carrier (bringing the operation in-house from the likes of DHL and UPS) but the pattern of such operations largely follows the pattern of operation of express/integrator operations with a fundamental dependence on night movements. This confirms our view that, notwithstanding growth in e-commerce, accelerated by the pandemic, the dynamics of the industry and how it operates remain based on the patterns previously seen in the express/integrator operations, with a premium placed on central locations with easy access to other distribution networks. Manston is simply inappropriately located and, with binding constraints on night operations, could not play any substantive role in such operations.

Market Recovery and the Need for Capacity

5.29 The current downturn in the air transport sector caused by the Covid-19 pandemic is temporary but there will be a lag to the recovery of the market, meaning that our updated demand projections are lower over the next 20 years than in our 2019 Report. Overall, the capacity expected to be available at other airports in the South East over the period remains largely as we previously assessed.

5.30 East Midlands continues to have substantial spare capacity for air freight and its designation at the heart of the East Midlands Airport Freeport will further cement its role. This confirms our view that Manston, located where it is, would be highly unlikely to offer any competition to East Midlands in terms of attracting express and integrator operations on any scale and upon which the freighter aircraft movement forecasts presented by RSP relied for 48% of the aircraft movements .

5.31 There is evidence that other airports such as Doncaster, Newcastle and Bournemouth may also be playing more of a role in future. Hence, this lessens any need for Manston.

5.32 Our previous 2017 and 2019 reports both demonstrated that there is ample capacity for the forecast volumes of air freight to be handled at airports across the South East of England and across Great Britain, and that, therefore, the additional capacity that would be provided by re-opening Manston Airport was simply not needed to meet future demand. We have updated this analysis and this confirms that there is simply no need for Manston.

5.33 In any event, as set out clearly in our 2019 and 2017 Reports, even if there was a residual need, Manston is simply in the wrong place to meet that need with alternative locations more centrally located within the UK strongly to be preferred based on the established patterns of logistics within the UK.

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York Aviation

STONE HILL PARK LIMITED

UPDATED CRITIQUE OF ASSESSMENT OF THE NEED AND JUSTIFICATION FOR THE DEVELOPMENT OF MANSTON AIRPORT AS AN AIR FREIGHT HUB

REPORT

FEBRUARY 2019

York Aviation	**Originated by: Louise Congdon/James Brass/Matt Jones/Richard Connelly** **Dated: 13th February 2019** **Reviewed by: Richard Kaberry** **Dated: 14th February 2019**

STONE HILL PARK LIMITED

ASSESSMENT OF THE NEED AND JUSTIFICATION FOR THE DEVELOPMENT OF MANSTON AIRPORT AS AN AIR FREIGHT HUB

Contents

EXECUTIVE SUMMARY

1. York Aviation was appointed by Stone Hill Park Limited (SHP) in September 2017 to review the evidence presented by RiverOak Strategic Partners Limited (RSP) in connection with RSP's prospective application for a Development Consent Order (DCO) for the redevelopment and re-opening of Manston Airport as a hub for international air freight services, which also offers passenger, executive travel and aircraft engineering services. Our initial summary Report was published in November 2017 and the contents remain valid and relevant. It is included at **Appendix B** to this report for completeness.

2. Our November 2017 Report made clear that:

   - RSP's analysis of our earlier work for the Freight Transport Association (FTA) and Transport for London (TfL) was flawed and this work did not support RSP's conclusion that there would be a substantive or sustainable role for Manston in the UK air freight industry.
   - The remaining evidence relied on by RSP to justify its Need Case is almost entirely based on circumstantial evidence related to the shortage of airport capacity principally for passenger flights, that can also carry bellyhold cargo, in the circumstances where no additional capacity is provided at any of the London Airport. This is simply irrelevant particularly given that it is Government policy to promote the development of a third runway at Heathrow.
   - The analysis presented by Azimuth to support RSP's case shows a lack of understanding of the economics of the air freight market, especially in failing to recognise the economic drivers that prioritise the use of bellyhold capacity over dedicated freighters.
   - Manston's past operation was economically inefficient due to the inherent lack of viability. Reopening the Airport has no realistic prospect of success as there are more economically efficient alternatives available for any freight displaced from Heathrow in the short term, pending the development of a third runway.
   - Azimuth's 'forecasts' rely strongly on the attraction of an integrator but Manston is too peripheral for integrator operations serving the UK.
   - Azimuth's interview survey, used as further justification for RSP's freight movement forecasts, relies on a small list of mainly local companies with something of a vested interest in seeing Manston re-opened and does not provide a basis for the specific aircraft movement forecasts upon which the case relies, not least as it is not possible to relate the proposed services to be operated with the responses by the interviewees. There is simply no explanation for, or justification for, the services postulated by Azimuth. There is a total lack of credibility in the approach adopted.
   - To illustrate this lack of credibility of the forecasts, in Year 2 (the first operational year), a cargo throughput of nearly 100,000 tonnes is forecast by Azimuth. This would make Manston the 5th largest freight airport in the UK in its first year after re-opening. It would make Manston the 3rd busiest airport in the UK in terms of tonnage carried on dedicated freighter aircraft. This is simply not a credible proposition.
   - Proper analysis of the UK air freight market showed that there is plenty of freighter capacity at Stansted and East Midlands Airport to accommodate any growth required in dedicated freighter operations such that there will be no shortage of capacity across the UK and no role for Manston in accommodating traffic spilled from other airports. These airports are better located relative to the market and the key locations for distribution within the UK.

- ✈ Our estimate was that Manston would, at best, be able to attain 2,000 annual air cargo aircraft movements by 2040 and it is equally plausible that it might not achieve more than 750 such movements annually as operated when it was previously open.
- ✈ Our initial assessment of the passenger market was that the throughput might, at best, be around half of that projected by RSP and, hence, given the dependence on passenger related income for the financial viability of airport operations, this would impact substantially on the viability of the proposal.
- ✈ Our assessment was that the existing infrastructure at Manston Airport, if made good, would be capable of handling 21,000 annual air cargo aircraft movements. The actual usage of that capability would depend on the pattern of operation and how the infrastructure was used on a day by day basis.
- ✈ We also gave provisional consideration to the land required to accommodate future forecast demand. Without prejudice to our view that demand to use Manston is not likely to be anything like 17,171 cargo aircraft movements a year, we considered that the land required would be substantially less than shown on the RSP Master Plan and that the proposed land take is excessive and without justification in terms of the compulsory acquisition of the land, particularly given the inherent implausibility of the demand forecasts upon which the assessment was made.
- ✈ We could see no justification for the inclusion of the 'Northern Grass' area within the DCO on the basis of it being for associated development. There will be little requirement for or likelihood of the relocation of freight forwarding activity from adjacent to the UK's main cargo hub at Heathrow or elsewhere to Manston.
- ✈ Azimuth made errors in the assessment of the socio-economic implications of the proposed development, particularly in terms of the use of inappropriate multipliers, the assessment of impacts at a national scale, rather than the local scale in East Kent as implied by Azimuth, and should have taken displacement of activity from other UK airports fully into account, reducing the impacts well below those stated.

3. This report updates and adds to the analysis of the flaws in RSP's Need Case, as set out principally in the Azimuth Reports, as presented in our November 2017 Report. In practice, the Azimuth Reports are little changed and, to the extent that new material has been added, do not address or rectify the substantial errors that we identified in the analysis contained therein. We do also update consideration of Aviation Policy in the light of developments, including the formal designation of the Airports National Policy Statement (NPS) and the clear statement of intent regarding the third runway at Heathrow and its role in ensuring adequate air freight capacity for the foreseeable future.

4. Our overall assessment in November 2017 was that RSP's case lacked any real credibility. Nothing has fundamentally changed and to the extent that there have been changes, for example in the formal designation of the Airports NPS, any need for Manston is even less than we previously assessed.

5. In updating of our previous work, we have taken particular cognisance of the requirement for RSP to present a compelling case in the public interest to justify the compulsory acquisition of land. This goes beyond the theoretical test of the capability of the infrastructure proposed but must, necessarily, consider the likelihood and extent of the level of usage of that infrastructure and the extent to which there would be wider public benefit from the land being used in that way.

Aviation Policy

6. The whole of the RSP Need Case for the development of an air freight hub at Manston is based on the Azimuth Reports. A flawed interpretation of Aviation Policy is still set out in Azimuth's Volume I, which seeks to infer support for the development of a mainly freight airport at Manston based on the evidence before the Airports Commission of the potential damage to the UK economy if no additional hub airport capacity was provided at Heathrow (or a reasonable alternative to Heathrow). This was never a relevant basis for considering whether there was a case for re-opening Manston as a primarily air freight airport, as the vast majority of the economic benefit cited relates specifically to the benefits to passengers in the main using global passenger services from an expanded hub Heathrow – a need that Manston patently cannot and does not claim that it will be able to meet.

7. The clear decision by Government in favour of the building of an additional runway at Heathrow will transform capacity available to the air freight sector. There can be no doubt that the use by RSP of pre-NPS evidence on the need to address the shortage of airport capacity overall to serve London is misleading and incorrect. Properly interpreted, Government Aviation Policy makes clear that expansion of capacity at Heathrow, allowing more global air connections providing additional bellyhold capacity and scope, if required, for more dedicated freighter movements at Heathrow, is the identified means of meeting future air freight demand, along with the continued role for East Midlands and Stansted as air freight gateways with ample spare capacity.

Errors and Inconsistencies of Analysis

8. In this report, we have identified further inconsistencies and mathematical errors in the 'forecasts' presented by Azimuth and others in the RSP team to justify the proposed development at Manston. Whilst individually some of these errors and discrepancies might seem small in scale and impact, others are highly significant and serve to undermine the credibility of the whole approach outlined in the Azimuth Reports and throughout RSP's Application Documents. The combined implications are significant in terms of whether a) the application should actually have qualified as an NSIP; b) in terms of the level of demand that Manston might attract if it re-opened as an Airport and the viability of the proposed operation; and c) whether the environmental assessments undertaken are robust.

9. The most significant of these errors relate to:

- ✈ the lack of any soundly based forecasts – instead of forecasts based on an understanding of markets, costs and real potential, RSP's case is founded on a flawed list of airlines that it claims will definitely operate at Manston and then grow their business at Manston. Several of these airlines do not operate air freight services at all and others would be unlikely to operate to Manston for the reasons we set out. Hence, the list presented is no more than a 'guesstimate', without any supporting evidence. These are not 'forecasts' in the sense that is normally recognised in the industry;
- ✈ the lack of realism in the fleet mix overall and the assumed pattern of day/night time operations, particularly in relation to the implications for the prospect of integrator and mail operations being attracted to use Manston at all. This further undermines the credibility of the short term 'forecasts' as, contrary to what RSP claim, airlines would not be able to operate to Manston on an unconstrained basis to meet their own commercial requirements but would be so constrained during the night period as to make the majority of the operations claimed by Azimuth unviable for the airlines;

- ✈ the overstatement of longer term demand projections through the use of unjustified growth rates due to mathematical errors made by Azimuth.

10. These errors and inconsistencies render the so-called 'forecasts' completely unreliable as a basis for assessing the extent and nature of any usage of Manston in the event that the Airport re-opens.

Understanding the Air Freight Market

11. Examination of market trends and the structure of the air freight market make clear that there is no role for Manston, other than possibly as a niche cargo operation for ad hoc specialist consignments, as with its historic operation. The trend in favour of bellyhold for the carriage of general air freight is clear. This freight forwarding sector is heavily concentrated around Heathrow for this very reason and the associated consolidation activity essentially drives the choice of airport based on the most economical freight rates available for any consignment. This is highly unlikely to be a dedicated freighter option from an airport remotely located in East Kent.

12. R3 will provide for a doubling of air freight capacity at Heathrow, mainly in bellyholds of passenger aircraft, but also scope for dedicated freighters to the extent that these are required to feed the hub at Heathrow. Indeed, the ability to provide a step change in capacity for air freight was one of the principal reasons why the Government chose the specific proposal for the development of a new runway. Freight facilities at Heathrow are actively being modernised and extended in anticipation of the growth of cargo activity there.

13. The integrators are already well established at East Midlands Airport in particular, as well as using Heathrow and Stansted to serve the main markets in England. Manston is too far from the distribution centres along the M1/M6 axis to function as an integrator base, leaving aside that the proposed night movement restrictions would render any such operation unviable for the airline/integrator.

14. This leaves niche/specialist cargo operations as the only possible market for Manston. This would be consistent with the types of cargo that Manston used to handle. Ultimately, this is a very small market and unlikely to result in Manston handling more freighter movements than it did historically. This has profound implications for the Need Case as a whole, not least as it seems likely that any freighter activity would in fact need to be displaced from elsewhere through price incentives as there are few, if any, natural market drivers which would make Manston the first choice location, particularly given growth in bellyhold capacity at airports such as Manchester, Edinburgh, Birmingham and Stansted, plus available capacity for freighters particularly at East Midlands and Stansted Airports.

Air Passenger Forecasts

15. As with the asserted air freight 'forecasts', RSP/Azimuth provide no quantified analysis of the market to justify the passenger forecasts. The passenger element of the forecasts will be a vital element in considering the potential viability of the Airport as, generally, passenger operations offer higher margins for an airport than cargo operations given the ability to earn ancillary commercial revenues from shops and car parking. Furthermore, much of the asserted economic benefit from the Manston operation stems from passenger flights rather than cargo operations.

16. To assist the Examining Authority, we have set out in full our market assessment for passenger services at Manston. We have undertaken this analysis on the same basis as we would for any UK regional airport and presented it in a form that would be normal practice at an airport planning inquiry. Such analysis is completely missing from the Azimuth Reports.

17. Proper analysis of the market confirms that Manston is, at best, only likely to attract around half of the number of passengers claimed, without analysis, by Azimuth Associates over the 20 year period of the projections. This has inevitable implications for both the scale of facilities required and the viability of the airport operation as a whole. It is highly likely that attracting such services will require support from the public sector as well as highly discounted airport charges. Past experience would suggest that there would remain a high risk of the airlines failing to sustain the routes on a viable basis.

Infrastructure Requirements

18. Without prejudice to our view that demand to use Manston is not likely to be anything like 17,170 cargo aircraft movements a year, our analysis shows that the land required to accommodate such a number of movements would be substantially less than shown on the RSP Master Plan. The RSP Application Documents fail to set out any justification for the extent of facilities proposed by reference to their own 'forecasts' both for the core airport infrastructure and any claimed associated development on the Northern Grass.

19. To assist the Examining Authority, we have set out the basis for estimating the required number of stands and cargo terminal infrastructure to enable RSP's forecasts to be accommodated based on the times that airlines would wish to fly. This does, of course, confirm the extent to which there would be dependence on night flying. Based on proper analysis of airline operating patterns, the maximum number of Code E equivalent stands that would be required, even allowing a buffer for resilience, would be 10. Based on global benchmarks, the scale of cargo sheds could also be substantially reduced to no more than 1/3 of the size proposed by RSP. Overall, even in the highly unlikely event that RSP/Azimuth's 'forecasts' were realised, the overall scale of development required would be no more than of the order of 40% of that proposed in RSP's Master Plan to accommodate airlines at the times they would wish to fly. This is, of course, not the same as the theoretical capability of the existing or proposed infrastructure.

20. As far as the Northern Grass is concerned, the list of airport related uses provided in the Updated NSIP Justification by RSP is no more than a list of uses that may be required at an airport without any specific reference to whether they are actually needed at Manston or, indeed, the extent to which these uses would need to be accommodated in an airside location in any event. We can see no justification for the inclusion of the 'Northern Grass' within the DCO as associated development as there will be little requirement for the relocation of freight forwarding activity from adjacent to the UK's main cargo hub at Heathrow or elsewhere to Manston and any requirement for the facilities listed could be accommodated south of the B2050.

21. The development on the Northern Grass site appears to be speculative commercial development. The total extent of landside airport related uses at East Midlands Airport, other than hotels which do not feature as part of Manston's plans, is 13,000m^2, or 13% of the scale of development proposed for the Northern Grass by RSP. Hence, based on the precedent at East Midlands Airport – the UK's principal airport for pure freighter operations – the extent of development proposed for the Northern Grass means it would be expected to be largely for non-aviation related uses.

Viability

22. In the absence of any assessment of the Business Case for the development within the RSP Application Documents, we have undertaken an assessment of the potential viability to assist the Examining Authority to assess the likelihood of the development plan being implemented if consented.

23. Our analysis shows that the RSP proposals for Manston Airport are not commercially viable even based on their unreasonably optimistic traffic 'forecasts'. The Airport would remain in a loss making position for at least 15 years and generate a negative return on investment for more than 20 years. Fundamentally, the analysis of potential viability strongly suggests that no rational private sector investor would fund the re-opening of Manston Airport on the basis proposed by RSP as the development is likely to deliver negative returns to investment for the foreseeable future.

24. The Airport was never previously a financially viable operation and we see no reason for this to be any different in future. When properly analysed, there is little prospect of the operation generating sufficient revenues to cover the costs for the investors nor deliver any returns on the investment for the foreseeable future. In the absence of evidence to the contrary, it is our judgement that investment would not be forthcoming to the extent necessary to even secure the re-opening of the Airport.

25. Clearly, to the extent that traffic growth does not materialise as RSP envisage following the initial investment, it is clear that the financial position of the Airport would be materially worse. It is our assessment that, even if initial investment was forthcoming, which we doubt, it is inevitable that the Airport would close again in the medium term due to lack of inherent viability.

Overall Conclusion

26. Fundamentally, the whole Need Case for the development of Manston as an air freight hub is infected with flaws and errors of understanding such that the so-called 'forecasts' of air freight and passenger demand have no credibility at all. Even if they were credible, the scale of development proposed is unjustified and excessive. The development and operation of the Airport would simply be unviable and incapable of attracting competent investors.

1 INTRODUCTION

This Report

1.1 York Aviation (YAL) was appointed by Stone Hill Park Limited (SHP) in September 2017 to review the evidence presented by RiverOak Strategic Partners Limited (RSP) in connection with RSP's prospective application for a Development Consent Order (DCO) for the redevelopment and re-opening of Manston Airport as a hub for international air freight services, which also offers passenger, executive travel and aircraft engineering services. Our initial Summary Report was published by SHP in November 2017 and is appended to this report at **Appendix B** to assist the Examining Authority.

1.2 We subsequently provided comments on RSP's updated consultation materials in February 2018 and these were submitted as part of SHP's response to the consultation. This note is appended to this report at **Appendix D** to assist the Examining Authority.

1.3 In our original November 2017 report, as summarised in the Executive Summary, we made clear that:

i. RSP's quantified forecast of the number of dedicated freighter aircraft that Manston might attract was based almost entirely on our earlier work for the Freight Transport Association (FTA) and Transport for London (TfL) in 2015 and a note on Freight Connectivity for TfL in 2013. However, the analysis in these reports, when properly read, does not support RSP's conclusion that there would be a substantive or sustainable role for Manston in the UK air freight industry.

ii. The remaining evidence relied on by RPS as the basis of the Justification for the Application, set out in the Azimuth Reports, is almost entirely based on circumstantial evidence related to the shortage of airport capacity principally for passenger flights, that can also carry bellyhold cargo, in the circumstances where no additional capacity is provided at any of the London Airport (the Airports Commission's baseline position). Use of the economic costs to the UK if additional passenger hub capacity is not provided in the South East of England by 2050 is not relevant to the specific question as to whether there would be sufficient demand or any economic justification for dedicated freighter movements to be operated to/from Manston in the foreseeable future, particularly in the circumstance where it is Government policy to promote the development of a third runway at Heathrow.

iii. The analysis presented by Azimuth to support RSP's case shows a lack of understanding of the economics of the air freight market. Just because there could be excess air freight demand in 2050, compared to the bellyhold capacity available in the absence of further runway capacity at the UK's main hub, it does not follow that displaced bellyhold freight will seek a more expensive dedicated freighter service from an alternative airport over the use of available bellyhold capacity, even if available at a more distant airport, as this bellyhold capacity can be provided at a lower cost to the shipper with only a marginal penalty in terms of the overall shipment time.

iv. Fundamentally, Manston's past operation was economically inefficient due to the inherent lack of viability. Reopening the Airport has no realistic prospect of success as there are more economically efficient alternatives available for any freight displaced to the extent that there are ongoing capacity constraints at Heathrow in the short and longer term.

v. The Manston freighter forecasts rely strongly on the attraction of an integrator but Manston is too peripheral for integrator operations serving the UK. Integrators have a strong preference for locations more centrally located in the UK with good road access to all of the major markets for ease of distribution. Manston is simply in the wrong place to serve the market being located at the far south east at the end of a peninsular, away from the main centres of population and remote from the majority of the UK.

vi. Azimuth's interview survey, used as further justification for RSP's freight movement forecasts, relies on a small list of mainly local companies with something of a vested interest in seeing Manston re-opened[1] and does not provide a basis for the specific aircraft movement forecasts upon which the case relies. If anything, the views of those interviewed by Azimuth suggest that there would, at best, be a limited role for Manston. The one airline interviewed made clear that *"success at Manston depended upon identifying a niche market and becoming known for excellence."* It did not identify what this niche market might be. These interviews confirm our view that any realistic expectation for Manston, at best, is for a small niche operation, as it previously sustained on a non-viable basis rather than as a general 'overspill' cargo airport for London.

vii. The outputs from these interviews are then used by Azimuth as a basis for postulating a number of cargo aircraft movements that might operate at Manston. However, it is not possible to relate the proposed services to be operated with the responses by the interviewees. There is simply no explanation for, or justification for, the services postulated by Azimuth. There is a total lack of credibility in the approach adopted.

viii. To illustrate this lack of credibility of the forecasts, in Year 2 (the first operational year), a cargo throughput of nearly 100,000 tonnes is forecast by Azimuth. This would make Manston the 5th largest freight airport in the UK in its first year after re-opening. It would make Manston the 3rd busiest airport in the UK in terms of tonnage carried on dedicated freighter aircraft. This is simply not a credible proposition.

ix. Our November 2017 Report contained an updated and further developed analysis of the UK air freight market from that previously undertaken in 2013 and 2015 for TfL and for the FTA. When properly interpreted, our forecasts of air freight demand and capacity across the UK as a whole, taking the role of bellyhold fully into account, show that, to the extent that there is <u>any</u> need for additional pure freighter movements, there is plenty of freighter capacity at Stansted and East Midlands to accommodate any growth. These airports are better located relative to the market and the key locations for distribution within the UK. Overall, we conclude from this analysis that there will be no shortage of capacity for dedicated freighter aircraft across the UK in the period up 2040 and that overspill from other airports would not provide a rationale for re-opening Manston.

[1] Not all of these companies are still in operation.

x. On any assessment of a realistic potential role for Manston, our estimate was that Manston would, at best, be able to attain 2,000 annual air cargo aircraft movements by 2040 and it is equally plausible that it might not achieve more than 750 such movements annually as operated when it was previously open. These are far below Azimuth's projection, upon which RSP rely, of 17,171 annual cargo aircraft movements.

xi. Our initial assessment of the passenger market was that the throughput might, at best, be around half of that projected by RSP and, hence, given the dependence on passenger related income for the financial viability of airport operations, this will impact substantially on the viability of the proposal. The other activities suggested by RSP, such as business aviation, maintenance, repair and overhaul, and aircraft dismantling are highly competitive markets and, to the extent that Manston might attract any such operations, these are unlikely to contribute substantially to the overall viability of the Airport.

xii. Our assessment was that the existing infrastructure at Manston Airport, if made good, would be capable of handling 21,000 annual air cargo aircraft movements. The actual usage of that capability would depend on the pattern of operation and how the infrastructure was used on a day by day basis.

xiii. We also gave provisional consideration to the land required to accommodate future forecast demand. Without prejudice to our view that demand to use Manston is not likely to be anything like 17,171 cargo aircraft movements a year, we considered that the land required would be substantially less than shown on the RSP Master Plan and that the proposed land take is excessive and without justification in terms of the compulsory acquisition of the land, particularly given the inherent implausibility of the demand forecasts upon which the assessment was made.

xiv. We could see no justification for the inclusion of the 'Northern Grass' area within the DCO on the basis of it being for associated development. There will be little requirement for or likelihood of the relocation of freight forwarding activity from adjacent to the UK's main cargo hub at Heathrow or elsewhere to Manston.

xv. Azimuth made errors in the assessment of the socio-economic implications of the proposed development, particularly in terms of the use of inappropriate multipliers, the assessment of impacts at a national scale, rather than the local scale in East Kent as implied by Azimuth, and should have taken displacement of activity from other UK airports fully into account, reducing the impacts well below those stated.

xvi. Our overall assessment was that RSP's case lacked any real credibility.

1.4 In practice, there have been no substantive changes to the case being presented by RSP since our original report was prepared. Hence, we consider that the contents of our original report and the subsequent note remain valid and should be given full consideration by the Examining Authority. We do not repeat their contents here but this updating report should be read alongside our previous reports, which are appended to this report at **Appendices B** and **D**[2]. It remains the case that RSP's assessment of the need for the development of a specialist air freight airport at Manston lacks credibility and is not founded in any proper assessment of the market as would normally be expected for a planning (or development consent) application of this magnitude.

1.5 In this report, we will highlight the key ongoing shortcomings in the Need Case being presented by RSP, drawing on our earlier reports and updating the material contained therein where necessary, in particular relating to:

- the implications of the Airports National Policy Statement (NPS) and emerging Government Policy as set out in the Aviation Strategy Green Paper[3];
- the updated performance of the UK Air Freight Sector and future trends;
- additional or revised material made available in the RSP Application Documents.

1.6 To assist the Examining Authority, this report also sets out, in more detail, our assessment of realistic passenger demand forecasts and on the implications of the assessment of the air freight market and passenger demand forecasts for the viability of the Airport, which were not previously covered in our 2017 Summary Report.

1.7 Fundamentally, this report goes beyond the work previously submitted to examine whether there is a compelling case in the public interest for the development of an air freight hub at Manston by reference to our assessment of the market and need for the development and in the light of recently emerging Government Aviation policy. The test that needs to be met is a more stringent test than simply whether the infrastructure proposed would deliver a theoretical capability greater than the threshold set out in the Planning Act 2008. It requires consideration of:

- the levels of demand that are likely to use Manston – this goes beyond consideration of the capability of the infrastructure proposed and requires consideration of whether the infrastructure is likely to be used and how this usage contributes to efficiently meeting the national demand for air transport;
- the implications of those levels of usage for the likelihood that the development and operation of the Airport would be viable and sustainable over the longer term, having regard to the requirement to fund the development of the infrastructure in the first instance;
- whether the land proposed to be acquired is required to meet realistic levels of demand.

[2] To assist the Examining Authority, we have included an updated index of the references to the final Azimuth Reports in **Appendix C**.
[3] Aviation 2050, The Future of UK Aviation, a Consultation, Department for Transport, Cmnd 9714, December 2018

1.8 In this report, we highlight further the deficiencies in the evidence presented by RSP to support its case, in particular the continued absence of detailed analysis and justification from RSP relating to the need for the development within the Application Documentation. It remains our view that the deficiencies in the evidence are not capable of remedy or, if remedied, would confirm our previous conclusion that the case for the re-opening of Manston as an operational commercial airport on a viable or sustainable basis lacks foundation.

1.9 In this Report, we consider:

- whether there is aviation policy support for the development **in Section 2**;
- errors and inconsistencies in the case presented by RSP in **Section 3**;
- understanding the air freight sector in **Section 4**;
- realistic forecasts of air passenger demand in **Section 5**;
- the justification for infrastructure required to support those forecasts in **Section 6**;
- the implications for the viability of airport operations in **Section 7**;
- our conclusions in **Section 8**.

York Aviation Credentials

1.10 York Aviation LLP is a specialist air transport consultancy that focusses on airport planning, demand forecasting, strategy, operation and management. The company was established in 2002. We offer a broad range of services to airports, airlines, governments, economic development organisations and other parties with an interest in air transport. Our team is a mixture of experienced air transport professionals and economists. Key members of the team have substantial experience of airport operations and development gained through working for Manchester Airports Group. Our core services include:

- business planning and strategy;
- capacity and facilities planning;
- master planning and planning application support;
- demand forecasting;
- economic impact assessment and economic appraisal;
- policy and regulatory advice;
- route development;
- transaction support.

1.11 Our current and recent clients include:

- Department for Transport (DfT), in particular producing supporting studies published by DfT alongside the Airports NPS and Aviation Strategy Green Paper
- Transport for the North, including recent work on the linkage between aviation connectivity and trade (with Oxford Economics);
- Transport Scotland and Scottish Enterprise;

- Civil Aviation Authority;
- London City Airport in relation to updating its Master Plan;
- London Luton Airport in relation to its prospective DCO;
- Manchester Airports Group, including economic impact assessments of East Midlands and Stansted Airports;
- Birmingham Airport;
- Glasgow Airport;
- Regional and City Airports;
- Ryanair.

In addition, we work for numerous investors in airports and other parties with an interest in the development, operation and management of airports in the UK and abroad. This includes the development of business plans, the assessment of viability and the broader business case for investment.

1.12 We previously did work for Transport for London and the Freight Transport Association related to submissions to the Airports Commission in connection with the requirement for a new hub airport serving London and the South East. This included analysis of the UK air freight market. This is work upon which RSP seeks to rely but, as made clear in our 2017 Summary Report, this reliance is misplaced and betrays a misunderstanding of air freight market and the implications of our findings in terms of any potential role for Manston in the event of capacity constraints at Heathrow and the main London airports.

1.13 Louise Congdon, Managing Partner of York Aviation has provided evidence in relation to the need for and economic impact of airport development at several airport public inquiries, including Manchester Runway 2, Liverpool Airport, Doncaster Sheffield Airport, Stansted Airport Generation 1, Farnborough Airport, London Ashford Airport (Lydd) and London City Airport. Louise has been actively involved in the development and implementation of UK Aviation Policy since the 1980s and acted as adviser to the House of Commons Transport Select Committee from 2011 to 2014. Her CV is appended at **Appendix A.** Louise has been assisted by other members of the York Aviation team in compiling this and the previous reports.

2 DOES AVIATION POLICY SUPPORT THE NEED FOR MANSTON?

In this section, we show that RSP and Azimuth's claims that development of Manston as an air freight hub are supported by Aviation Policy is flawed. The claims rely largely in the position set out by the Airports Commission in the event of no additional capacity being provided at any of the main London airports. This is no longer valid, if indeed the inferences drawn by Azimuth and RSP ever were, in the light of the clear Government Policy in support of the provision of a third runway at Heathrow as set out in the Airports National Policy Statement.

The Basis of RSP's Need Case

2.1 RSP's Statement of Reasons, Planning Statement and Environmental Statement include sections on the justification or need for the proposals but these rely entirely on the work of Azimuth Associates[4]. Azimuth Associates set out that their work seeks to address three questions[5]:

- *"Does the UK require additional airport capacity in order to meet its political, economic, and social aims?*
- *Should this additional capacity be located in the South East of England?*
- *Can Manston Airport, with investment from RiverOak, relieve pressure on the UK network and meet the requirement of a nationally significant infrastructure project?*

As we made clear in our November 2017 Report (paras 2.5 to 2.7), these are not the right questions to be addressed in terms of whether there is a specific need for the development of a dedicated air freight hub at Manston sufficient to make a compelling case in the public interest.

2.2 RSP's Need Case appears to be as follows:

- ✈ aviation is important to the national economy and will become more important post-Brexit;
- ✈ there is a shortage of airport capacity in the South East of England, ignoring the impact of the development of a third runway at Heathrow (R3) and other committed or proposed expansions of capacity at the other London airports;
- ✈ pure freighter traffic has not been growing in the UK due solely to shortage of airport capacity;
- ✈ so there must be a need for a dedicated freight airport to address this shortfall;
- ✈ Manston has spare capacity so could fulfil that role.

[4] We are unaware of any other published reports by Azimuth Associates and are unclear of the extent of their relevant experience across the aviation sector more generally.
[5] Azimuth Report Vol I, para. 1.3.1.

2.3 In practice, the RSP Application Documents, including the Statement of Reasons, continue to rely on circumstantial evidence, references and quotations relating to the need for more air passenger connectivity, the economic benefits of addressing that need, and the need for a hub airport in the South East of England as evidence to support their case. As we set out at length in our November 2017 Report, most of these references are irrelevant to the asserted need for a dedicated air freight hub as most of the economic benefits cited relate specifically to passenger connectivity through more global air service connections offering passenger and bellyhold[6] freight capacity. Many of the reports and quotations have been misconstrued or misrepresented by the RSP team. We do not seek to address each and every erroneous reference in this Report. Circumstantial evidence supporting the need for more airport capacity in the South East of England simply does not provide specific justification of the need for the development of Manston as a dedicated air freight hub sufficient to make a compelling case.

2.4 Indeed, the Planning Statement itself (para 1.47), sets out the key test, namely that:

"Significant weight should be attached to the considerations of need and the weight to be attributed to need in any given case should be proportionate to the anticipated extent of the Manston Airport Project's contribution to meeting that need"

The extent to which the Manston Airport Project would contribute to meeting that need can only be assessed by reference to the reasonably expected usage of the Airport, if it re-opened, and does not follow from a general description of the situation appertaining across the London Airport system if a third runway at Heathrow is not constructed. This assessment requires a proper examination of the air cargo market, which does not support that the contention that there is a role for Manston in meeting the need for more air freight capacity in the UK as we set out later in this report.

2.5 The work of Azimuth Associates is also stated in other Application Documents to set out not only the need for development but also the Business Plan and the viability of the development[7]. Such an assessment of the Business Plan for the operational airport would be normally expected to include financial projections, the wider business case and an assessment of viability but this is completely absent from any of the documents submitted by RSP. We return to the business case and viability in **Section 7**.

2.6 As explained in detail in our Summary Report of November 2017, we consider the report by Azimuth Associates to be infected by manifest flaws, including in its interpretation of our earlier work for Transport for London (TfL) and the Freight Transport Association (FTA). Despite providing detailed rebuttal of the interpretation of our work by Azimuth Associates in consultation responses submitted by Stonehill Park, many of the RSP Application Documents continue to misrepresent the conclusions of our work as the basis of their case. We do not repeat these criticisms here[8] but, in this section, we comment more generally on the overarching aviation policy case being made by RSP drawing on our understanding of the Government's aviation policy as set out in the Airports NPS and Aviation Green Paper. We address the implications of the errors and inconsistencies in the Azimuth Reports further in the next section.

[6] Bellyhold capacity is capacity for air freight on passenger aircraft, typically below the passenger deck.
[7] RSP Environmental Statement (ES) para. 3.3.275, RSP Planning Statement para. 9.35.
[8] These are set out in full in Section 2 of our November 2017 Report.

Aviation Policy

2.7 RSP's Planning Statement includes the extraordinary statements (paras 9.16 and 10.6) that:

"The APF[9] makes it clear that it is not appropriate to re-examine the need for increased aviation capacity or, indeed, to question the Government's clear policy position that increases in aviation capacity are necessary and that they bring significant benefits. It states that it is the purpose of national policy to settle these issues."

"Government policy on aviation makes it clear that it is not appropriate to re-examine the need for increased aviation capacity or, indeed, to question the Government's clear policy position that increases in aviation capacity are necessary and that they bring significant benefits"

This appears to be an attempt to suggest that there is no requirement to examine the specific need case for development at Manston or, indeed, any other airport. This is patently nonsense as it would suggest that airport development across the UK should proceed unfettered regardless of whether there is any underpinning justification for each specific development or a proper balancing of benefits and environmental costs in each individual case. The apparent absurdity of this suggestion is even greater when compulsory acquisition of land is in prospect requiring a compelling case in the public interest to be made.

2.8 The Airports NPS[10] sets out clearly, in Sections 2 and 3, the Government's settled approach to meeting the need for increased airport capacity in the South East of England by provision of a third runway at Heathrow (R3), such that the need for that specific development as a response to the economic need for growth in aviation capacity is established. However, this is not the case for other proposed airport capacity developments. Indeed, the NPS is specific as to its applicability in relation to all other airport developments (para 1.41):

"The Airports NPS does not have effect in relation to an application for development consent for an airport development not comprised in an application relating to the Heathrow Northwest runway, and proposals for new terminal capacity located between the Northwest Runway at Heathrow Airport and the existing Northern Runway and reconfiguration of terminal facilities between the two existing runways at Heathrow Airport. Nevertheless, the Secretary of State considers that the contents of the Airports NPS will be both important and relevant considerations in the determination of such an application, particularly where it relates to London or the South East of England. <u>Among the considerations that will be important and relevant are the findings in the Airports NPS as to the need for new airport capacity and that the preferred scheme is the most appropriate means of meeting that need.</u>" (emphasis added)

[9] Aviation Policy Framework, Department for Transport, March 2013, Cm8584.
[10] Department for Transport, June 2018.

2.9 This means that the NPS cannot be construed as creating a general presumption in favour of schemes, other than the Northwest Runway at Heathrow, which seek to address the shortfall in airport capacity within the South East of England. In fact, the wording of the NPS suggests the exact converse is true. Hence, it is not sufficient to rely, as RSP seek to do, on any general presumption in favour of increasing airport capacity for the broader economic benefit. Rather, the proponent of any other airport development proposal is required to justify that proposal by reference to the NPS and the specific benefits to users and society more generally that would arise from the specific proposed expansion.

2.10 RSP's Need Case is, in essence, based on the position before the NPS was designated[11]. Indeed, para 9.18 of the Planning Statement refers specifically to and relies on para 2.12 of the NPS that outlines the capacity shortfall that would exist in the absence of any additional capacity in the South East as a context for the Government's decision to support the development of another runway at Heathrow. This is a recurrent theme throughout the RSP documents, which seek to rely on the implications of <u>no</u> additional capacity being provided at Heathrow or, indeed, any of the other main London airports. Hence, in the light of proposals to increase capacity across the London airports, including the provision of R3 at Heathrow and recently approved capacity increases at Stansted, the alleged capacity shortfall on which RSP's case is based no longer exists. We discuss the extent to which there remains a capacity shortfall for air freight further in **Section 4**.

2.11 There is recurrent use by RSP of data relating to the economic cost of not addressing the need for additional hub airport capacity for passenger services and the benefits of overcoming that constraint[12], implying that the economic and connectivity benefits that are cited in respect of a passenger hub could, in some way, be realised by the development of Manston as a dedicated air freight hub. This creates a misleading impression of the specific benefits that the scheme might bring even if it did develop an air freight role, which we address further in later sections.

2.12 Despite the settled policy in terms of the Government's preferred option for meeting the principal need for more airport capacity in the South East of England, RSP's case remains that there is a shortage of airport capacity in the South East of England and that there must, therefore, be a need for a freight focussed airport in the South East to meet the need for more air freight capacity. This no longer follows if, indeed, it was ever a logical conclusion that could have been drawn from the evidence. The NPS settles how Government intends the shortage of airport capacity in the South East of England to be addressed, particularly in terms of meeting the requirement for additional capacity for air freight:

"The Heathrow Northwest Runway scheme delivers the greatest support for freight. The plans for the scheme include a doubling of freight capacity at the airport."[13]

2.13 Indeed, it is relevant that the Airports Commission[14] made clear one of their reasons for recommending the choice of a third runway at Heathrow over the option of a second runway at Gatwick was because:

[11] For example, Azimuth Reports Vol I, paras. 2.1.4, 2.1.5, 4.4.1, 4.4.5, 4.4.7, 9.0.4, 9.0.5.
[12] For example, the RSP Planning Statement, para 1.9 refers to work by Oxford Economics and Ramboll for Transport for London 2013 (see Azimuth Report Vol I, para. 4.4.1) which clearly relates to DfT's capacity constrained scenario.
[13] Airports NPS, Department for Transport, June 2017, para. 3.73.
[14] Airports Commission: Final Report, July 2015, Executive Summary, page 24.

"Gatwick's position to the south of London limits its effectiveness as a national freight hub."

Clearly, such considerations would apply even more so to Manston, which is even further away from the main centres of population, the sources of freight requiring shipment and the location of the main air freight consolidation and distribution centres adjacent to Heathrow and in the 'golden triangle' for distribution in the East Midlands.

2.14 Hence, references at para. 6.28 of RSP's Planning Statement to paras. 2.7 and 3.23 of the NPS as providing underpinning justification for the provision of a dedicated freight airport are misplaced as these clearly provide a context for the importance attached to meeting growing demand for air freight in the Government's decision to support the Heathrow Northwest Runway option as providing the scope for the greatest growth in air freight capacity including both bellyhold services and the opportunity for additional dedicated freighters.

2.15 A doubling of air freight capacity at Heathrow would allow for at least 31 years of extrapolated growth based using the updated analysis of future air cargo[15] tonnage growth potential set out in **Section 4**, assuming Heathrow sustains its current share of the market. We discuss the future of the market and trends further in that section. On the basis of realistic projections of cargo tonnage growth and the availability of capacity at Heathrow, it is hard to see how there is likely to be any shortfall of in air freight capacity in the South East of England for the foreseeable future, leaving aside the shorter term implications of capacity constraint at Heathrow until R3 is operational, which we also discuss further in **Section 4**.

2.16 RSP also seek to rely (Planning Statement, para 6.65) on the policy promoting best use of runway capacity at all UK airports, published alongside the Airports NPS[16]. This does not, however, settle that it will always be the case that best use should be made of any given runway, nor that runways should be protected in perpetuity as implied by the RSP's Statement of Reasons (para. 9.56). The policy, as set out in the 'Making Best Use' document, is clear that whilst there is a policy presumption in favour of making best use of existing runways, each case falls to be considered on its merits (para 1.29):

"We therefore consider that any proposals should be judged by the relevant planning authority, taking careful account of all relevant considerations, particularly economic and environmental impacts and proposed mitigations."

[15] Cargo includes freight and mail.
[16] Beyond the Horizon, The Future of UK Aviation, Making Best Use of Existing Runways, Department for Transport, June 2017.

2.17 Whilst this paragraph refers specifically to local decision making rather than an NSIP, the NPS makes clear that there is no automatic presumption of need for any other airport NSIP within the South East of England. There is, hence, still a requirement for a full justification to be provided for the best use of existing runway capacity at any individual airport on its own merits in terms of the demand it may reasonably be expected to handle and the benefits to consumers (or shippers) of using that airport rather than other available capacity. It is not sufficient to seek to make the case based on an inference of some general shortfall of capacity across the South East. Re-opening a runway only for it to be little used in practice does not constitute an economically efficient usage of that runway and so would not be likely to equate to 'best use'. There is a requirement for specific justification of how the capacity would be used and the benefits flowing from that usage at the airport in question rather than generic estimates of the economic value of overcoming the capacity constraints at the UK's main passenger hub airport that are peppered throughout the RSP documents and upon which RSP seek to rely for the substance of their need case.

2.18 More recently, the Government published a Green Paper on Aviation Strategy[17] as a pre-cursor to an updated strategy later in 2019. The section on air freight (paras. 4.45-4.50) makes clear that the three principal air freight airports are Heathrow, East Midlands and Stansted, highlights the doubling of air freight capacity that R3 at Heathrow will provide and stresses the key role that night flying plays in the air freight industry. The section also makes clear the role these airports play in meeting the need for air freight from across the whole country, i.e. it does not follow that because air freight is carried from a London airport that the freight has an origin or destination in the South East. This is relevant to consideration of alternatives, as we go on to discuss in **Section 4**.

2.19 It should be noted that the need for a dedicated freight focussed airport was previously considered in the Future of Air Transport White Paper in 2003, which stated, in relation to a proposal for a dedicated freight airport at Alconbury (arguably better located in relation to the total UK market than Manston being close to the A1M in north Cambridgeshire):

"The concept of Alconbury as a specialist freight facility attracted little support, especially from within the industry."[18]

Alconbury at the time was owned by Prologis (distribution experts) and BAA Lynton (airport developers) but they chose not to promote Alconbury as a freight airport. There are reasons why this is so, related to the complex inter-relationship between the freight forwarding sector, consolidation of freight loads, use of bellyhold capacity and the residual role of pure freighter operations that we explain further in **Section 4**. We have seen no analysis by RSP or Azimuth as to whether this position has changed, nor can we find specific policy support for a dedicated freight airport in more recent Government policy documents or consultations.

2.20 Indeed, in the same 2003 policy document, the Government set out its consideration of the potential role for Manston:

[17] Aviation 2050, The Future of UK Aviation, A Consultation, Department for Transport, December 2018, Cm 9714.

[18] Department for Transport, Future of Air Transport White Paper, December 2003, para 11.105

"11.98 The operators of Southend, Lydd and Manston argue that their airports could grow substantially and each has plans for development. The potential of other airports, including, Shoreham, and Biggin Hill, should also not be overlooked.

11.99 We consider that all these airports could play a valuable role in meeting local demand and could contribute to regional economic development. In principle, we would support their development, subject to relevant environmental considerations.

Had the Government considered there was a need for Manston as a specialist air freight airport at the time, it would have said so, not least as, in 2003, Manston was the UK's 7th busiest airport in the UK for air freight after Heathrow, Gatwick, Stansted, East Midlands, Manchester and Prestwick.

2.21 Nor can RSP take comfort from the work of the Airports Commission in considering whether there is a role for reliever airports[19] to add weight to there being a potential role for a dedicated air freight hub. The discussion in the Airports Commission Interim Report[20] dealt with the potential role of smaller airports in acting as relievers to capacity pressure at the main London airports principally for general and business aviation, which makes up a minor part of the RSP case. Indeed, the specific reference to Manston in Appendix 2 (page 16) to the Interim Report makes clear any consideration given to a potential role for the Airport was within the context of the Commission's broader consideration of reliever airports as referred to above rather than any specific role as a dedicated freight airport. Manston was promoted by its then owner, Infratil, to the Airports Commission as having potential as a major cargo hub airport but this was not taken up by the Commission.

Treatment of Alternatives

2.22 As noted in para. 2.9 above, it is notable, therefore, that the Application Documents, including the ES, contain no proper assessment of the ability of capacity that is, or will be, available at the London airports and across the UK to accommodate the asserted air freight demand that could be attracted to Manston by way of a full assessment of the alternative ways of meeting that demand. RSP's case is wrongly based on the position without the provision of additional capacity at any of the other London airports and is, incorrectly, based on a presumption that air freight currently being flown from the London airports reflects demand for air freight based within the South East; neither of which is valid. Hence, there should have been an assessment of the alternatives available for handling any excess demand for air freight rather than the simply considering whether there are alternative locations for the asserted requirement for a specialist freight airport (ES para. 2.3.3) within the South East of England. It is asserted, but not evidenced, that there are no alternatives to handle air freight growth. This is patently wrong as examination of the UK air freight sector demonstrates as set out in **Section 4**.

[19] RSP Planning Statement, paras. 6.67 to 6.71.

[20] Airports Commission, Interim Report, November 2014, paras. 5.96 to 5.100

Conclusions

2.23 The whole of the RSP need case for the development of an air freight hub at Manston is based on the Azimuth Reports. A flawed interpretation of Aviation Policy is set out in Azimuth's Volume I, which seeks to infer support for the development of a mainly freight airport at Manston based on the evidence before the Airports Commission of the potential damage to the UK economy if no additional hub airport capacity was provided at Heathrow (or a reasonable alternative to Heathrow). This was never a relevant basis for considering whether there was a case for re-opening Manston as a primarily air freight airport, as the vast majority of the economic benefit cited relates specifically to the benefits to passengers in the main using global passenger services from an expanded hub Heathrow – a need that Manston patently cannot and does not claim that it will be able to meet.

2.24 The clear decision by Government in favour of the building of an additional runway at Heathrow will transform capacity available to the air freight sector. There can be no doubt that the use by RSP of pre-NPS evidence on the need to address the shortage of airport capacity overall to serve London is misleading and incorrect. Properly interpreted, Government Aviation Policy makes clear that expansion of capacity at Heathrow, allowing more global air connections providing additional bellyhold capacity and scope, if required, for more dedicated freighter movements at Heathrow, is the identified means of meeting future air freight demand, along with the continued role for East Midlands and Stansted as air freight gateways.

3 ERRORS AND INCONSISTENCIES IN THE EVIDENCE PRESENTED BY RSP

In this section, we catalogue ongoing errors of analysis and the lack of supporting information which render the 'forecasts' presented to underpin RSP's application wholly unreliable. Indeed, they are not 'forecasts' in any meaningful sense given the absence of proper analysis of the market and any evidenced assessment of the extent to which Manston might capture any share of that market at any future date.

At best, the projections set out in Azimuth Vol III represent no more than an aspirational 'wish list' of what RSP would like to be able to attract to use Manston but, even then, this 'wish list' is infected with errors in terms of airlines that do not operate freighter aircraft, and patterns of operation, particularly in terms of the balance of movements between day and night time, that are wholly inconsistent with the patterns of operation that the airlines would require if they were even to consider operating some flights to Manston.

The Azimuth Reports

3.1 The Azimuth Reports are, in practice, little changed from those published for the supplementary consultation in January 2018, which we had previously commented on in our November 2017 Report and Supplementary Note of February 2018. In our original Report, we commented on the lack of realism in the so-called 'forecasts' for Manston and highlighted the lack of methodological rigour, particularly in relation to the adoption of the 'Delphic Approach'[21]. Azimuth have subsequently claimed that their forecasts have been subject to a peer review by Loughborough University[22] but this review has not been made available as would be normal good practice. It remains the case that the freight aircraft movement and tonnage forecasts, along with the passenger forecasts, set out by Azimuth have not been correctly derived from market data or using standard industry analytical techniques as would be normal practice in presenting the case for a planning or development consent application. As such, they cannot be relied on.

3.2 Furthermore, we have noted further errors in the use of data and information by Azimuth as well as further inconsistencies between the information presented in the four Azimuth volumes and material relied on in the Environmental Statement. These errors and inconsistencies go to the heart of the reliance that can be placed on RSP's need case for Manston. Indeed, the nature of the errors is such that the 'forecasts' are simply not realistic or achievable.

3.3 In this section, we highlight a number of areas where the information relied on by RSP is:

- unsupported by the evidence of how the airfreight sector actually operates;
- infected by mathematical errors;
- inconsistent;
- wrongly applied to the local market.

[21] York Aviation Report, November 2017, paras. 2.77-2.79.
[22] Azimuth Vol III, para. 2.1.6.

Air Freight Forecasting

3.4 There are two principal problems with the air freight demand forecasts presented by Azimuth:

- the absence of any justification for the short term forecasts for the first 10 years of the proposed airport operation;
- erroneous use of growth rates from other industry or Government publications to project forward from Year 10 to Year 20.

We set these issues out in some detail in our November 2017 Report (Section 2) and do not repeat them all here. In combination, these issues render the so-called 'forecasts' meaningless and misleading.

3.5 At the outset, any forecasts for air freight growth need to be seen within the context of deceleration of growth trends in the face of economic uncertainty. This has recently been reported as a concern by the airport's trade body, ACI EUROPE.[23]

Short Term

3.6 It is notable that the Azimuth Reports provide no detail or justification for the forecasts of air cargo aircraft movements by type, airline or world region for the first 10 years of the forecast period. The 'forecasts' are based on unevidenced interviews and indications of the types of markets which Manston might hope to serve[24]. This is simply not a sound basis for establishing the need for Manston. Similar issues infect the passenger forecasts, which we discuss further in **Section 5**.

3.7 The basis for the markets which it is claimed that Manston might serve appears to be comments such as:

"The Indian subcontinent is also a potential exporter and importer of goods to the UK. One interviewee mentioned the potential for airlines from Pakistan to use Manston Airport (Securitas). Pakistan mainly exports clothing and imports consumer goods."[25]

[23] ACI EUROPE, https://www.aci-europe.org/media-room/mediaroom.html, Press Release 6.2.19.
[24] Azimuth Reports Vol III, para. 3.2.1. We note that most of the interviewees were local haulage firms or similar, some of which are no longer in business. The interviews do not directly relate to the list of airlines that it is claimed might operate.
[25] Azimuth Reports Vol II, para. 4.2.37

3.8 There is a further list of possible geographic markets set out at para. 5.2.5 of Azimuth Vol II and then a discussion of sectoral markets which might offer opportunities for growth in air freight. However, none of this represents an assessment of the likelihood of dedicated freighter services operating at Manston but represents a generic discussion of areas where there may be growth in air freight tonnage across the UK as a whole and where increased bellyhold capacity on passenger aircraft to/from these destinations will assist the development of these import/export markets. For example, Jet Airways has recently commenced a 5 days a week service from Manchester to Mumbai with an A330-200 offering bellyhold cargo capability as part of the offer within the context of a liberal air service agreement that allows for capacity increases across the market[26] between the UK and India.

3.9 So, whilst Section 3.2 of Vol III of the Azimuth Reports sets out how the cargo tonnage forecasts have been derived from the cargo aircraft movement forecasts, the basis for the movement forecasts is not set out at all. Hence, without a reasoned justification by reference to the scale of the market for each service proposed, little reliance can be placed on the asserted aircraft movement forecasts. These appear to represent nothing more than an aspirational list rather than a robust assessment of the extent to which such services might be operated. For none of the assumed services is there any analysis presented of markets, costs or alternatives available now or in the future for such freight and for none of the assumed services is any commitment documented.

3.10 The 'guesstimates' of the aircraft movements projected each year by airline(s), aircraft type and world region are set out, without further explanation, in Appendix 3.3 to the ES[27]. We set out below our comments on a number of the suggested airlines shown as assumed to be operating at Manston should the Airport re-open as an air freight hub.

- ✈ Amazon - it is not clear why Amazon would operate up to 4 return flights a day (1 in the first year of operation) from the US to Manston as the goods which Amazon sells in the UK are not, in the main, US manufactured. This seems to confuse the asserted role as an Amazon distribution hub with a requirement for long haul freight operations. Amazon's own flights in the US are between its main hub and secondary regional hubs, they operate no international services. Manston is not well located to operate as a distribution hub either for the London area or for the country as a whole so transatlantic flights by Amazon are not a realistic prospect.
- ✈ Cargolux - this assumes reinstatement of the previous Cargolux flower operation which has relocated to Stansted. This is only likely to take place should the charges to the airline be set at a very low level at Manston, as was the case previously, given the better location of Stansted relative to the totality of the UK market for the distribution of fresh flowers. Whether this would be commercially viable given RSP's asserted £300m investment in Manston is not assessed.

[26] https://www.gov.uk/government/news/deal-agreed-to-ease-restrictions-on-flights-between-the-two-nations
[27] TR020002-002418-5.2-6 - Environmental Statement - Volume 6 - Appendices 1.4-7.2.

- ✈ Fedex/DHL- the aircraft types proposed seem to pre-suppose a DHL operation. The integrator operation is expected to account for 22.8 movements per day on average or 48% of the total at Year 20 (a higher proportion in some of the earlier years). Manston is simply in the wrong location to perform as a hub for an integrator as we explain further in **Section 4**. Based on our knowledge of the integrator operations, this is completely unrealistic for Manston.

  Overall, the number of movements would imply around 8,322 annual movements by an integrator. This is around 43% of the total number of freighter movements at East Midlands Airport (EMA) in 2016 or around 2/3 of the current DHL operation there. This is hardly realistic as it would imply Manston would be a major integrator hub, duplicating the EMA operation, which acts as the main DHL hub for the UK working in tandem its main European hub at Leipzig. Freight tonnage continues to grow at EMA but the number of freighter movements have not systematically grown over the last decade. Further detail will be set out in the next section.

- ✈ Pakistan Airlines - The airline no longer operates pure freighter aircraft. The airline operates 22 passenger flights a week to and from the UK (Heathrow, Manchester and Birmingham) offering 208.5 tonnes of freight capacity each week[28].

- ✈ Postal - The B737 operation presupposes the development of a mail hub. Royal Mail have pared back on flying even at their main hub at EMA so it is unclear why a dedicated B737 operation is expected at Manston.

- ✈ Russian - Whereas the PEIR showed Russian airlines operating with aircraft types that have noise quota counts of 8 and 16, which meant that they could not operate according to the noise mitigation plan. The proposed aircraft type has been changed to a B747-400 in the ES but with no explanation as to whether the proposed Russian airline plans to operate such an aircraft or not.

- ✈ TAAG Angola – Do not operate any dedicated freight aircraft, let alone the B747 freighters, which is the type shown as expected to operate to Manston.

- ✈ Iran Air - Had a limited freighter fleet which is now stored and no longer in service. The airline placed no new freight aircraft orders when ordering a vast number of new passenger aircraft after the lifting of sanctions so it would not have aircraft to operate to Manston.

- ✈ Qatar Airways - Operates a significant schedule of dedicated freight services at London Stansted as part of its agreement to take over British Airways' freight commitments at the Airport. This British Airways/Qatar joint operation was in place when Manston was previously operational, and there were no services at Manston at that time, so it is not clear why they would not move from their established base if Manston was re-opened.

[28] Official Airline Guide (OAG) database.

3.11 At the very least, even without the other issues that we discuss in this section, consideration of the list of airlines and the type of operation shown in the ES gives rise to serious doubts about the credibility of the air freight movement forecast overall. These airlines account for 90% of the aircraft movements projected by RSP for Manston in the first year of operation and over 80% in Year 20. Regardless of whether a list of supposed operating airlines is produced, the absence of any analysis of the market for the proposed flights and a reasoned explanation for why each of the named airlines would operate to Manston means that the forecasts lack any credibility at all. In practice, most of the airlines relied on within RSP's 'forecasts' would or could not operate, invalidating the forecast and the assessments that depend on it.

3.12 It would be normal practice to set out clearly the markets that the Airport believes could be served, taking into account demand within its catchment area, and then to indicate the airlines and the aircraft types most likely to serve those markets. No assessment is presented by RSP of the extent to which the markets that it has identified are already being served by existing bellyhold or dedicated freighter operations nor any assessment of the extent to which future demand will be met through increased freight capacity at Heathrow and elsewhere. It is not sufficient to simply hypothesize a list of airlines as a basis for a forecasts of cargo movements and tonnage without supporting evidence and analysis of the market.

3.13 We recognise that Azimuth have sought to justify the absence of any mathematical demand model[29] to assess air freight demand for Manston on the basis of the difficulty of establishing relevant market data in the circumstances when Manston is not currently operational and in the light of the RSP claim that the re-opening of the Airport could bring about a step change in performance. However, the sources that they rely on to vindicate a purely qualitative approach to preparing the forecasts do not support the position adopted. For example, the US Transportation Research Board approach cited as justification for the approach adopted[30] makes clear that any qualitative approach should be based on the clear identification of the scale of the market, the drivers for change and an assessment of the potential market share that could be achieved as well as consideration of alternative future scenarios. It is evident that Azimuth has not completed these steps in a systematic and transparent fashion based on analysis of the actual demand for dedicated freighter aircraft to and from the UK today.

3.14 Hence, it is our view that no credence can be placed on the short term demand projections presented in the Azimuth Reports. It is simply not credible that Manston would attain 50% of the number of freighter aircraft movements currently operated to Stansted Airport within its first year of operation or that it would match Stansted in its second operational year (Year 3 2022).

3.15 We set out, in **Section 4**, a proper analysis of the market and the competitive drivers using publicly available data to substitute for the lack of proper analysis carried out by Azimuth. This will demonstrate that there is no pent up excess demand waiting for the re-opening of Manston, leaving aside that the Airport is simply in the wrong place to serve the UK market.

[29] Azimuth Reports Vol II, para. 2.22.4
[30] Ibid, para. 2.22.5

Longer Term

3.16 The short term 10 year forecasts are then extrapolated forwards by Azimuth for the following 10 years based on an assumed growth rate in underlying dedicated freighter aircraft movements. It is important to note that, if the forecasts for the first 10 years are not properly grounded in an assessment of the market for Manston, then any extrapolation forwards will lack validity whatever the realism or otherwise of the growth rate selected. This is fundamentally the case.

3.17 Even if the short term forecasts were reliable, which they are not, we dealt at length in our November 2017 Report (Section 2) with the errors made by Azimuth in its interpretation and use of Boeing and Airbus forecasts of the potential global growth in air freight RTKs[31] as the basis for its long term trend based forecasts using a 4% per annum annual growth rate for dedicated freighter movements. We do not repeat these criticisms here but the points remain valid.

3.18 It remains significant that the latest Government UK Aviation forecasts[32] continue to assume that there will be no net growth in pure freighter aircraft to and from the UK over the period to 2050:

"Freight is not modelled in detail. An assumption about the number of freighter ATMs is nevertheless required in the model as freighters potentially affect the space for passenger ATMs available where capacity constraints exist and, as discussed in Chapter 3, CO_2 emissions. At the airport level the number of freighter movements has been volatile with some evidence of overall national decline in recent decades. In the absence of clear trends for individual airports, the modelling now assumes that the number of such movements will remain unchanged from 2016 levels at airport level across the system.

If DfT has believed that there was likely to material growth in demand for dedicated freighter aircraft, it would have made a different assumption so as not to understate the need for more airport capacity across the UK's airports and the carbon effects of growth more generally.

3.19 We know that Azimuth do not agree with this view[33] but we are unaware of any intention by DfT to revise this no net growth assumption regarding the long term growth potential for dedicated freighter movements across the UK. This is in the context of the role of Heathrow and the additional capacity to be provided by R3 in increasing capacity for freight carried in the bellyholds of passenger aircraft and even in providing some increase in capacity for dedicated freighter aircraft at the UK's principal air freight hub to the extent that there is specific demand for additional movements at Heathrow connected with its hub role. We address the role of Heathrow within the UK air freight industry and the relationship between freight carried in bellyholds of passenger aircraft and in dedicated freighters further in the next section. We addressed Azimuth's use of alternative global forecasts of freight tonnage growth as the basis for forecasting dedicated freighter movement requirements in our previous reports but we draw some additional conclusions below.

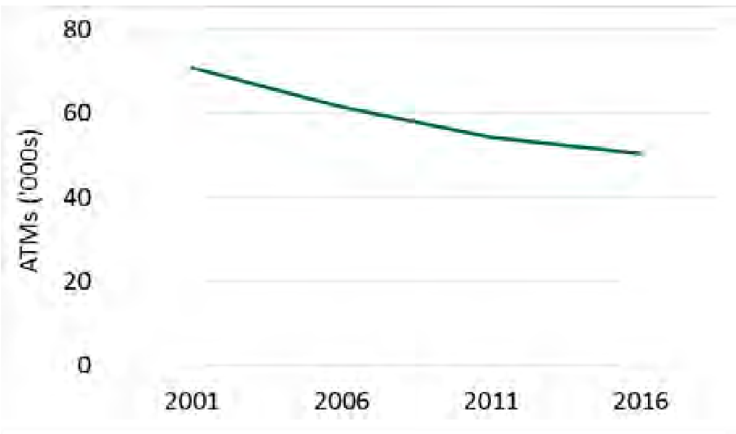
[31] Revenue Tonne Kilometers
[32] UK Aviation Forecasts, October 2017, as amended 25th January 2018, para. 2.56.
[33] Azimuth Report, Vol III, para. 2.1.14.

3.20 The trends in terms of tonnage growth are set out in paras. 4.4 and 4.5 and illustrated in Figure 4.5 of the UK Aviation Forecasts 2017. The Azimuth Report, Vol II, para 2.6.4 and Vol III para. 2.3.6, quotes from the DfT's original version of the UK Aviation Forecasts 2017. Azimuth appear not to have realised that this text was amended and an updated version issued on 25th January 2018[34].

"Freight, in terms of both tonnage and numbers of aircraft movements, has not kept pace with the growth in passenger numbers. In 2011 (70%) and 2016 (69%) most freight by tonnage is carried in the holds of passenger aircraft ('bellyhold'). Total freight carried at the UK airports rose from 2.3 million tonnes in 2011 to 2.4 million tonnes in 2016, with a growth of about 5% in the weight of cargo carried on both freighter and passenger aircraft."

3.21 The key point is that, whilst there has been growth in tonnage carried on both dedicated freighter aircraft and in the bellyholds of passenger aircraft over the 5 year period from 2011 to 2016, there has been an ongoing decline in the number of movements by dedicated freighter aircraft as illustrated in **Figure 3.1** below. Our analysis of the trends is echoed in the recent Altitude Report[35]. Notwithstanding a small increase in dedicated freighter operations in 2017, the general trend remains downwards. Our analysis of Civil Aviation Authority (CAA) Airport Statistics[36] suggests that there were just under 55,000 such aircraft movements in 2018 across all UK reporting airports[37]. This downward or static trend in relation to dedicated cargo aircraft movements across the UK as a whole is important in terms of setting a context for considering the reasonableness of Azimuth's projections by reference to the implications for the market share of the total market that it is claimed Manston could attract.

Figure 3.1: Trends in Dedicated Freighter Air Transport Movements (ATMs)



Source: DfT UK Aviation Forecasts 2017, Figure 4.5

[34] As a result of inconsistencies in the original pointed out to the DfT by York Aviation.
[35] Altitude Aviation Advisory, Analysis of the Freight Market Potential of a Reopened Manston Airport – Addendum: UK Regional Airport Financial Performance and Debt Funding Characteristics, February 2019.
[36] https://www.caa.co.uk/Data-and-analysis/UK-aviation-market/Airports/Datasets/UK-airport-data/
[37] i.e. excluding the Channel Islands and the Isle of Man.

3.22 Of the 55,000 freighter aircraft movements to/from the UK in 2018, some 34,000 movements were non-domestic; the domestic flights being mainly mail operations and feeder flights to the EMA freight hub. In terms of the domestic flights, it is important to recognise that they are counted twice in the CAA statistics, once at each end of the route, e.g. EMA and Belfast. Hence the number of such individual flights is actually under 11,000. On the basis that the small turboprop aircraft (ATR72s), making up 28% in Year 1 falling to 25% in Year 20 of the freighter movements shown in the ES Fleet mix[38], are operating principally on domestic routes, this would imply a market share of total UK domestic freighter flights starting in Manston of 13% in Year 1 rising to 40% by Year 20. This assumes no further decline in the number of domestic cargo flights, although this sector has a longstanding historic trend of decline numbers of flights. In terms of international operations, the Azimuth projections for Manston, would imply a market share of international freighter operations of 11% in Year 1 rising to nearly 40% in Year 20. If the market for Manston is narrowed down still further to principally day time operations, the asserted share of the available market would rise much further. In either case, the market share implications of Azimuth's 'forecasts' simply defy credibility in a market already well served by the better located operations at East Midlands and Stansted in addition to the contribution at Heathrow and other airports.

3.23 Azimuth use the original DfT estimate of 4% growth in tonnage carried on dedicated freighter aircraft (which was amended by DfT to 5%) over the period 2011 to 2016 as a key part of their justification for using the 4% per annum (p.a.) growth rate that they apply to the Year 10 freighter aircraft movement 'forecast' to extrapolate the freighter aircraft movement forecasts to Year 20. This leads to 2 fundamental errors:

- ✈ firstly, in applying a growth rate for cargo tonnage (or RTKs in the case of the Boeing and Airbus global forecasts cited by Azimuth) to aircraft movements ignoring the increase in tonnage carried per movement meaning that the growth in movements will always be lower over time than the growth in tonnage; and
- ✈ secondly a failure to understand the difference between the growth rate over a period of time (5, 10 or longer number of years) and an average annual growth rate applicable each year within the period to achieve that level of growth.

3.24 This latter and fundamental mathematical error undermines their use of average annual growth rates applied to derive both the longer term air freight movement and passenger growth rates and results in grossly overstated long term demand projections for Manston, leaving aside the reliability of the short term forecasts upon which the extrapolations are based. The specific errors are:

  - ✈ The DfT trend of 4% growth over 5 years that is relied on by Azimuth is equivalent to 0.8% p.a. growth which, even if the Year 10 forecasts were valid (which they are not), would reduce the Year 20 forecast of freighter aircraft movements to 12,550 aircraft movements rather than the 17,170 projected by Azimuth.

[38] ES Appendix 3.3

- ✈ The 4% trend growth in the passenger forecast is cited by Azimuth as being conservative[39] by reference to a peer review undertaken by ourselves of the passenger forecasts for Liverpool John Lennon Airport in 2017, which found growth of 50% over the period from 2016 to 2030 and 120% over the period to 2050 to be reasonable. Based on growth of over 50% (62.5%) and 120% over 24 and 44 years respectively, the average annual growth rate was just over and just under 2% p.a. respectively in the case of Liverpool, which we considered reasonable in the context of DfT's overall projections for the UK market. Hence, again, proper analysis of growth rates does not support the use of 4% p.a. growth rate adopted by Azimuth for Manston over the longer term.

We discuss the appropriate basis for passenger forecasting in both the short and longer term in the **Section 5**.

Displacement Implications

3.25 It is notable that the implication of the Azimuth freighter forecasts is that the Airport is predicted to handle 5,252 freighter aircraft movements in its first year of operation (Year 2). This is almost five times the number of freighter aircraft handled in the previous peak year for the Airport of 2003[40]. On this basis, Manston would have almost a 10% share of the total market for dedicated freighter aircraft in the UK (based on just over 55,000 such movements in the rolling year to October 2018) in its first year of operation and assuming no net growth in freighter movement activity across the UK in line with DfT assumptions, or 15% of the international freighter movements. The Year 2 figure amounts to around 25% of the total number of freighters handled at the UK's main airport for dedicated freight aircraft, East Midlands (EMA), or around 50% of those handled at Stansted in the rolling year to October 2018. As noted above, the Year 3 figure for freighter aircraft movements would place Manston on a par with Stansted within 2 years of opening. This is not credible.

3.26 The only assumption that can be made is that Azimuth/RSP are relying on freighter aircraft at Manston being wholly or largely displaced from elsewhere in order to achieve the growth projected in a single year or over 2 years. Even if there was some latent demand for additional freighter movements to the UK, which we do not believe to be the case, it is not reasonable to assume that Manston would be the first choice for such freighters. We discuss the availability of spare capacity and market trends more generally in the next section.

3.27 Although Azimuth claim that the costs to airlines, freight forwarders and shippers of switching between airports have been taken into account in preparing the forecasts[41], this is nowhere transparently explained and, in particular the implications this might have for the revenues that RSP could earn and the viability of the development overall. Azimuth helpfully identify the factors that airlines, forwarders and shippers would need to take into account in considering the desirability or otherwise of relocating operations:

- *"The cost of physical relocation*
- *Cancellation of long-term contracts*
- *Loss of economies of scale, although if an entire operation is switched, economies*
- *of scale would be gained at the new airport*

[39] Azimuth Report Vol III, para. 4.0.3.
[40] See Table 1.1 of our November 2017 report.
[41] Azimuth Report Vol III, para 2.2.10.

- *Market effects such as marketing new routes and a potential loss of custom in the*
- *early years following the switch*
- *Network effects lost by switching to a smaller airport*
- *Capacity constraints at other airports, particularly in slot allocations*
- *Sunk costs such as an airline's investment in the airport from which they are switching"*

This means that any decision to relocate to Manston would be costly and would only be taken in the face of major disadvantages. Notwithstanding the claimed advantages of a dedicated purpose built cargo airport, we do not believe that these would outweigh the costs of switching or the fundamental disadvantages of being wrongly located in terms of serving the UK market.

3.28 Given these switching costs, the only way any freighter movements could be attracted to use Manston would be by offering lower prices than elsewhere, not least to compensate for greater trucking distances and time to the principal distribution centres in the UK Midlands (see our November 2017 Report and the Altitude Aviation Advisory Report of November 2017). We understand that this was the case when the Airport was previously operational and it almost certain to be the case if it re-opens. The need to charge lower prices would necessarily have an impact on the viability of the Airport, given the scale of RSP's claimed proposed investment which we discuss further in **Section 7**.

3.29 At 17,170 freighter aircraft movements and following DfT's assumption of no or negligible growth in dedicated freighter operations to/from the UK, then Azimuth's projections would result in Manston having attained a market share of 30% over 20 years (or 50% of international freighter aircraft movements), almost entirely at the expense of other airports. Again, the implications of such displacement need to be considered, not least in terms of whether there is actually a need for Manston given the capacity available at other better located airports to meet the demand.

3.30 The key point to make here is that the Azimuth forecasts are silent on the extent to which its forecasts rely on displacement from elsewhere, which has implications for any assessment of the net economic value of activity at Manston within the socio-economic assessment when measured, as Azimuth do, at a national scale (see later in this section). When the nature of the UK air freight market is properly understood (see next section), we consider the extent of displacement of freighter activity implied if Azimuth's 'forecasts' were correct as simply implausible, further invalidating the assumptions that underpin the case for the development.

3.31 Fundamentally, the Azimuth 'forecasts' appear to rely on substantial displacement of dedicated freighter aircraft movements from other airports that have already invested in the infrastructure to handle such movements, or, as we discuss further in the next section, already have adequate capacity to handle air freight, including the reasonably expected number of dedicated freighter movements. This is not plausible. Hence, the only opportunities for Manston will, in all likelihood, be niche operations not currently being served from elsewhere. In practice, we would expect the latter outcome to be more likely, meaning that there would be very limited, if any, demand for Manston.

Fleet Mix

3.32 Even if the 'forecasts' had any credibility at a headline level, which they do not, there are substantial discrepancies in how the forecasts have been disaggregated to inform the environmental assessment. These discrepancies further undermine any credence that can be placed on the forecasts themselves, particularly given that they are essentially derived from subjective judgements as to the airlines that might operate and the types of aircraft they would use.

3.33 The fleet mix proposed for Manston is set out in Appendix 3.3 of the ES (Vol 6). The information presented shows the expected operating airlines (as discussed above), the aircraft types and whether the operation is expected to be during the day or night time. Without prejudice to our view about the realism of the level of freighter aircraft movements projected, we consider here the reliability of the specific fleet mix forecast that underpins RSP's case.

3.34 In the first instance, we note discrepancies between the mix of claimed aircraft types (sizes) set out in Appendix 3.3. of the ES and those shown in the Azimuth Report (as well as between versions of the Azimuth Report) and the mix of aircraft types shown as the basis of assessment in Table 3.7 of the ES for Year 20. We illustrate the discrepancy in **Table 3.1** below.

Table 3.1: Fleet Mix of Freighter Aircraft by Aircraft Size Category (ICAO Design Code)				
Code	C	D	E	F
Original Azimuth Vol III, Table 2	43%	42%	13%	2%
Updated Azimuth Vol III Table 2	43%	17%	40%	0%
ES Table 3.7	43%	40%	17%	0%
ES Appendix 3.3	43%	12%	40%	5%
Source: RSP Application Documents				

3.35 Hence, there appears to be confusion as to the actual forecast usage of Manston by RSP. No explanation is provided as to the reason for these discrepancies, or indeed why the fleet mix projections changed between the original version of the Azimuth Reports and the final submitted version. This is material as the airfreight tonnage 'forecasts' are apparently derived from assumptions made about the average tonnage per aircraft[42] so changing the fleet mix should inevitably have resulted in changed tonnage projections given the changing fleet mix assumed. The fact that the total airfreight tonnage 'forecasts' set out by Azimuth have not changed is a further illustration of the cavalier way in the forecasts and the whole case have been put together.

[42] Ibid, para 3.2.2.

3.36 Such inconsistencies must inevitably raise further doubts about the robustness of the forecast overall. These discrepancies have implications for the assessment of infrastructure required and the assessment of environmental effects[43] and reduce any reliance that can be placed on the assessments given that the basis of assessment appears to be different from the asserted Need Case as set out in the Azimuth Reports.

Pattern of Operations

3.37 The pattern of aircraft movements projected by RSP for Manston, in terms of its day/night balance, is inconsistent with industry norms. It is our view that the proposed day/night operating pattern is a further reason why the air freight forecasts for Manston are unattainable.

3.38 In the first instance, we have looked at the pattern of aircraft movement operations that we would expect based on the patterns seen elsewhere in the UK for similar types of aircraft, operator and destinations. Although Appendix 3.3. of the ES gives an indication of the proportion of movements by each aircraft type that would operate in the day time and the night time, no explanation is given for these day/night splits. In particular, it is not clear how the ES allocation of flights by day and night would fit with the airlines' required operating times to meet customer requirements. Whereas it may be possible to confine some specialist ad hoc freight operations to operate only within the day time period (07.00-23.00), many dedicated freighter operations are geared to collecting goods at the end of the working day, transporting them during the night and ensuring early morning deliveries the next day. This is particularly so for the integrators, for whom it is key to their business model and which are proposed in the ES forecasts to make up 48% of all freighter movements at Manston in Year 20. For an integrator, such as DHL, the timings of flights are, in large, part geared to the requirements for connecting operations at their main European hub in Leipzig and so are non-negotiable.

3.39 Without prejudice to our views on the overall number of freighter aircraft movements projected for Manston or, specifically, the likelihood an integrator operating to Manston at all (considered further in the next section), we have examined the validity of the pattern of operation proposed by RSP, particularly in relation to whether it is realistic to claim that Manston could operate as a major air freight hub with such a small number of night flights. In order to consider the reasonableness of the pattern of movements assumed by RSP (as set out in the ES), we have used our understanding of flight patterns and fleet mixes for cargo operations at other UK airports, specifically referencing the UK's main airport for dedicated freighter operations East Midlands Airport (EMA) current cargo movement schedule[44]. **Table 3.2** below shows that 56% of the total freighter aircraft movements at EMA operate between the hours of 23:00 and 07:00.

[43] For the purpose of our infrastructure assessment later in this report, we have worked from the more detailed data set out in Appendix 3.3 of the ES.
[44] EMA Cargo Schedule - http://aerofred.juice.org.uk/EMA/east_mids_cargo.html

Table 3.2: East Midlands Cargo Schedule Splits For Day Time And Night Time Movements By Operator Type				
	Integrator	**Mail**	**Other**	**Total**
Day Time Movements	37%	31%	74%	44%
Night Time Movements	63%	69%	26%	56%
Source: York Aviation Analysis of EMA Cargo Schedule[25]				

3.40 Clearly, this is significantly different from the 86%/14% day/night split of freighter aircraft movements assessed by RSP in the ES based, we assume, on the requirements proposed by Azimuth. As previously explained, this is in large part because the integrators, which make up nearly 64% of freighter movements at EMA operate to specific patterns linked to overnight delivery. It is, therefore, important to note that by RSP's forecast show that only 32% of Manston night movements are expected to be by integrators, despite such operations being projected to make up 48% of all freighter aircraft movements, whereas 70% of total night time movements at EMA are by integrators. This strongly suggests that the dependence of the integrators on night time operations has not been properly reflected in RSP's assessments.

3.41 We have used information on the patterns of operation observed for integrators, mail operators and for general air freight operations to assess the pattern of operation which the airlines would naturally seek to operate. We would have expected the rationale made for the assumed day/night time split of operations to be have been fully explained in RSP's Need Case (the Azimuth Reports) and the ES. It is not.

3.42 In the first instance, we have assumed that freighter operations are principally on weekdays and so have assumed 250 operational days per year. To the extent that some freighter operations might be at weekends, the effect of this assumption will have been to over rather than understate the number of daily movements. However, the assumption will be neutral in terms of its effect on the day/night balance of movements. We have applied RSP's assumptions as to the extent to which movements would bunch into busier periods (the 'Busy Day' multiplier as set out for each type of movement in Appendix 3.3 to RSP's ES).

3.43 Our specific assumptions for the main market sectors are as follows:

- ✈ *Integrators* - Based on the movement types expected by RSP/Azimuth to operate at Manston, with over half of the integrator movements expected to be ATR72s or other smaller Code C[45] turboprop aircraft, experience at other airports shows that these aircraft tend to operate a late evening arrival, early morning departure pattern as they act principally as domestic feeders from/to the UK's main integrator bases at East Midlands and Stansted. Closer inspection of the integrator fleet mix and, specifically, the volume of turbo props in the predicted aircraft movements by RSP has led us to estimate a higher percentage of movements requiring to operate at night than the 63% of integrator movements observed at EMA as a direct consequence of the high volume of predicted DHL/Fedex ATR72 aircraft operating feeder routes in Azimuth/RSP forecast, taking into account the times at which they will require to operate to fulfil the customer requirements. If there were fewer turboprops in the mix, this would, of course, have negative implications for the noise assessment assuming they were replaced by jets.

  Using realistic operational timings to the ES fleet mix leads to a roughly 10%/90% split of movements day to night for the integrators. EMA has a higher proportion of larger integrator aircraft in its operation as it fulfils a secondary hub role itself, which results in a proportion of the movements by these larger aircraft operating outside of the night period. In total, only 4% of integrator movements at EMA are by turboprop aircraft such as the ATRs, with a further 29% of movements by full size Code C aircraft, such as the B737. The remaining 67% of integrator movements at EMA are by the larger code D and E aircraft such as B767s and B777s. This reflects its role as an integrator hub for the UK given its central location.

  RSP's assumed mix of aircraft types for the integrator operation further highlights the lack of realism in the presumption that a substantial integrator operation is plausible at Manston, as it relies on a large number of feeder flights by small aircraft serving other hubs which would, in practice be more likely to be dispersed across a range of airports so as to serve local markets with efficient close out times for the collection of urgent packages. Manston simply could not fulfil that role and is not in the correct location to operate as a hub itself.

- ✈ *Mail* – Based on the busy day forecast calculated from RSP/Azimuth's data, there were 3 daily movements on average for postal services, which we rounded up to 4 to allow for a realistic pattern over a single 24-hour period. The RSP/Azimuth split of movements between the day and night was suggested as 50%/50%. However, as shown in **Table 3.2,** we found that 69% of mail movements were typically at night based on the EMA experience. This is hardly surprising given that the principal requirement is for overnight mail deliveries. Given the small number of such movements expected at Manston, it seems likely that all would need to operate during the night.

[45] The aircraft Codes referred to are aircraft size categories that determine the physical dimensions of the airport infrastructure required to handle them.

- ✈ *Other Freighters* – We have included all other freighter movements in this category. This is wider than the RSP/Azimuth forecast, which specifies 'Other Freighters' as relating only to a small number of movements by B737-300 freighter aircraft. For the purposes of building the busy day schedule, we have considered all non-integrator and non-mail movements as 'other'. RSP/Azimuth propose that, of all these other cargo movements, nearly 93% will be during the day. However, considering the nature of the flights proposed by Azimuth and typical operating times for these flights having regard to world time zones, we found that a more likely day/night distribution to be 80%/20%. This is closer to the split we found at EMA for general cargo operations of 74% day/26% night.

3.44 On the basis of a rational patterns of operations for RSP's claimed mix of aircraft and operators, we find that the same overall pattern of operations as EMA would be required if Manston is to allow airlines to fly when they wish to do so, i.e. 44% day and 56% night. Our analysis would strongly suggest that the pattern of day and night time operations being proposed by RSP is not realistic and that, for Manston to have any hope of attracting freighter operations in line with Azimuth's projections, there would have to be a substantially greater number and proportion of the operations taking place at night, giving rise to substantially different noise implications.

3.45 The pattern of operations put forward for Environmental Assessment by RSP, hence, runs entirely contrary to what is claimed in RSP's Statement of Reasons (para 4.23) that:

"other unique advantages of the Proposed Development include: dedicated air freight stands, aprons, handling, storage and processing facilities; prioritisation of freight with quick turnaround and unloading time of aircraft; and availability and flexibility of slots none of these advantages are likely to be sustained by any of the other airports in the south east of England",

and in the NSIP Justification Statement[46] that:

"our business model is to provide sufficient capacity to be able to accommodate aircraft when the airline wants to operate rather than to suit the airport through slot management, which requires a much greater availability of stands."

3.46 The proposals for Manston rely on constraining the times at which airlines could operate to a sub-optimal slot pattern, particularly for the intergrator and mail operations that require to operate largely at night. More likely, when coupled with the structural factors in the air freight market that we discuss further in the next section, the consequence of seeking to force an integrator to adopt RSP's proposed operating pattern reinforces our expectation that integrator operations are simply an unrealistic aspiration at Manston. This is significant as they account for 48% of the projected freighter aircraft movements in Year 20 (and higher in earlier years). If integrator operations are excluded from RSP's 'forecasts' then the number of freighter movements in Year 20 is only 8,843, leaving aside other errors and discrepancies in the assessment. Royal Mail flights, which would also require to operate at night make up a further 4.5% of freighter aircraft movements in RSP's 'forecasts'.

[46] RSP NSIP Justification, para. 29.

3.47 Furthermore, there is some confusion across the submission documents as to whether integrator operations are a core part of the demand projections in any event as the Planning Statement (para. 9.39) comments that:

"Additionally, there is the potential to attract an integrator to Manston Airport, which would dramatically increase the profitability of the airport."

This implies that this is an upside potential not part of the core Business Case as claimed to be set out in the Azimuth Reports and, hence, the assessment of need would need to exclude such operations in the core case and illustrate only the upside potential if such operations could be attracted.

Night Quotas

3.48 There remains further confusion regarding the intentions for night time operations as we understand that RSP has in public statements, on occasion, suggested that there would be no scheduled aircraft operations at night, i.e. the Airport would only accept delayed aircraft operating in the night period. Such a situation would be even more untenable for integrator and mail operations. Such a ban does not form part of the Noise Mitigation Plan and, hence, we have considered the implications of the Plan as published[47].

3.49 This gives rise to another key point regarding the fleet mix as RSP's Noise Mitigation Plan states that only aircraft of QC8 and QC16[48] will be banned from operating at night. This is inconsistent with best practice at other airports that ban scheduled operations at night by aircraft of greater than QC2 or even QC1[49]. The lax policy being adopted by RSP for Manston could act as an incentive for the operators of noisier aircraft to use the Airport within the proposed night quota available. Whilst this might bolster the attractiveness of the Airport for ad hoc freighter movements, e.g. by Russian airlines, it would not overcome the fundamental restriction on the principal operations by integrators such as DHL which would be heavily constrained by the night movement restrictions proposed in terms of the number of movements allowed within the quota.

3.50 We note that the proposed night movement quota of 3,028 QC points for the period 23.00-07.00 has been further reduced compared to the 4,000 QC points proposed for the period 23.000-06.00 at the consultation stage, with the additional 2,000 QC points available for scheduled passenger departures during the period 06.00-07.00. This imposes further severe restrictions on the ability of the cargo and passenger airlines to schedule their operations at times necessary to their operational viability in terms of meeting customer needs for delivery of goods and in ensuring optimum aircraft utilisation and efficiency.

[47] RSP 2.4: Noise Mitigation Plan.

[48] The QC (Quota Count) system is a classification system for the noise made by aircraft and has been adopted at most of the main UK airports as the basis for defining a night movement quota related not just to the number of movements but the level of noise each aircraft makes. The higher the QC number the noisier the aircraft. A movement by a QC16 aircraft would be equivalent in quota terms to 16 movements by a QC1 aircraft.

[49] Luton - https://www.acl-uk.org/wp-content/uploads/2016/10/Local-rule-1.pdf , Birmingham - https://www.acl-uk.org/wp-content/uploads/2018/10/Night-Flying-Policy-2018-2021.pdf , Stansted - https://live-webadmin-media.s3.amazonaws.com/media/3682/stn-noise-action-plan-consultation-15818.pdf.

3.51 Furthermore, examination of the day and night time split of movements as set out in Appendix 3.3 of the ES suggests that by Year 20 there are expected to be approximately 10 aircraft movements per weekday night[50] according to Azimuth/RSP's forecasts. Although the QC points per movement are not clearly set out in the ES, an approximate estimate using Heathrow's QC point attribution by aircraft type[51] would suggest that an average weekday quota count of between 8 and 8.5 based on the night movements indicated in Appendix 3.3 of the ES and assuming an even balance of arriving and departing aircraft movements per night. This would amount to around 2,460 movements per year using just over 2,000 of the 3,028 proposed night quota points, dependent on the split of arriving and departing aircraft and the precise aircraft variant used. Whilst this would allow additional movements to be scheduled at night, it would still not be sufficient to allow for an integrator operation to be established, even assuming that Manston was geographically in the right place – a point that we discuss further in the next section. However, it is notable that, assuming the noise assessment has been based on the data supplied in Appendix 3.3 of the ES, the full impact of the proposed noise mitigation strategy and quota appears have not been assessed in the ES.

3.52 Appendix 3.3 of RSP's ES indicates that none of the passenger aircraft operations would be at night. This is equally unrealistic. We set out in the next section the typical rotation pattern for a based low cost carrier (LCC) aircraft at a regional airport. These airlines maintain low fares by optimising the time that the aircraft are in the air each day. To achieve this, they typically make their first departure before 07.00 and often return after 23.00. Hence, we would expect there to be at least some night movements by passenger aircraft in addition to freighter movements. Constraining an LCC to daytime operations only would render Manston particularly unattractive as a base for aircraft.

Socio-economic Assessment

3.53 Whereas our previous criticisms of Azimuth's approach to air freight movement projections have been ignored, there appears to have been some attempt to take on board criticisms of the socio-economic assessment (Azimuth Reports Vol IV). Nonetheless, the assessment of the socio-economic impact of the development remains badly confused, unclear and riddled with errors and ultimately, even if the socio-economic assessment undertaken were robust, it would be rendered meaningless by the manifest errors in the demand 'forecasts' that feed into it. What is put forward with RSP's submission should, therefore, be accorded no weight whatsoever.

3.54 In our previous report, we considered the methodology adopted by Azimuth Associates in some detail and although some minor changes have been made to the approach reflecting our comments, little has really changed. We would, therefore, refer the Examining Authority back to our November 2017 Report[52] for a complete assessment of the RSP case. However, we would reiterate a number of key points:

[50] Freighter movements typically operate principally on weekdays.

[51] https://www.heathrow.com/file_source/HeathrowNoise/Static/HCNF_WG1_QC_and_chapter_correlation_Feb_18.pdf .

[52] York Aviation November 2017 Report, Section 5.

- The study area that is being considered by this assessment remains completely unclear and Azimuth repeatedly uses assumptions that would not be appropriate for the assessment they appear to be trying to make at the level of Kent or East Kent. At points, it appears that the impact of Manston is being considered at a UK level and multipliers are being used that reflect this size of study area. However, at the same time the Azimuth Reports and the Planning Statement talk about impacts in much more localised areas, particularly East Kent, but no change appears to be made to the multipliers to consider these smaller areas. Multipliers for smaller geographic areas must be smaller than those for larger areas as they will not include as much supply chain or as much expenditure of employees' salaries. Failure to realise this suggests a fundamental lack of understanding of how multipliers work and how they should be applied. As RSP's submission stands, it does not actually include a socio-economic impact assessment because it does not properly define the geographic area it is assessing. All that is presented are a series of random, meaningless inferences of what the impact of an airport might be.
- Azimuth continue to use an on-site employment density for a re-opened Manston that is too high. We continue to believe that Prestwick Airport is a better comparator for Manston, with a density of around 650 jobs per million passengers per annum or 100,000 tonnes of freight. Azimuth has revisited their assumptions and concluded that East Midlands Airport is an appropriate comparator, with a job density of around 887 jobs per million passengers per annum or 100,000 tonnes of freight[53]. However, what Azimuth have failed to account for is the substantial amount of non-aviation related employment based on the Pegasus Business Park at East Midlands which is included in this employment estimate. This means that the basis for the calculation used is inflated resulting in a higher employment density. If this non-aviation related employment were to be removed from the assessment the employment would actually be similar to that at Prestwick and is a better comparator to Manston given that much of the non-airport related employment at EMA relates to businesses located there adjacent to the M1 and centrally located for the three main cities in the East Midlands region.
- Azimuth are also incorrect[54] to assert that our economic assessment set out in our November 2017 Report must be wrong because our estimate of catalytic impacts in terms of jobs is lower than our estimate of direct airport related jobs (based on RSP 'forecasts'). Whilst we would agree that the catalytic effects of airports are often larger than the direct, indirect and induced effects, that does not make it true in all cases. Consideration of individual circumstances is vital. Our assessment considered a properly defined area, Kent. Given Kent's location, its industrial base, population and the size of freight catchment areas, it is unlikely that a significant number of potential freight users will be located within that area and, hence, the amount of impact captured will be relatively small. The passenger services envisaged are likely to be focussed on outbound leisure markets and, hence, inbound tourism impacts are likely to be small. In Manston's case, there is no reason to expect significant catalytic effects within a properly defined catchment area.

  In practice, the catalytic effects tend more often to manifest themselves in increased productivity and so appear as GVA[55] effects rather than necessarily employment effects. Azimuth do not appear to understand this and have not taken into account how any catalytic effects would actually materialise within the local context.

[53] This economic impact assessment was undertaken by York Aviation.
[54] Azimuth Reports Vol IV, para 4.3.6.
[55] Gross Value Added

- ✈ Following on from the failure to properly define a study area and the use of national multipliers, it should again be re-emphasised that if Azimuth are looking at national effects they failed to allow for any displacement of economic activity from other parts of the UK from the abstracting of demand from other airports. In our view, Manston is not going to generate new demand for freight services. It will have to capture demand from other airports. This will have an effect on these other airports in terms of their ability to support employment.
- ✈ Azimuth has also failed to properly define the baseline for the socio-economic assessment. Their assessment has implicitly assumed that if the RSP proposals are rejected then the Manston site will not support any economic activity. This is again inaccurate. The current owners have put forward plans for a mixed use development and this should be considered as the counterfactual for the assessment. Any impacts from RSP's proposals should be reported net of impacts from the alternative uses for the site.

Passenger Terminal Parameters

3.55 As we discuss in **Section 6**, no explanation or justification is provided for how the air freight movement or tonnage forecasts have been converted to facility requirements. The requirements are simply reported in Table 6 of Vol III of the Azimuth Reports. This is a significant gap in the justification for the scale of facilities required, as we discuss further in **Section 6**.

3.56 Despite there being no information provided in relation to the cargo terminal requirements associated with the freight tonnage forecast, some information is provided in relation to the scale of passenger terminal facilities required in Table 7 of Vol III of the Azimuth Reports. In this case, there are obvious errors of analysis in terms of the 'pax per hour' requirements set out. There can be no certainty that similar errors have not been made in assessing the facility requirements for air freight but no explanation is provided.

3.57 At para. 4.0.5 of Vol III of the Azimuth Reports, it is stated that a low cost carrier (LCC) (elsewhere shown to be assumed to be Ryanair) would base 2 aircraft at the Airport initially, increasing to 3 from Year 6. Based on the pattern of Ryanair operations seen elsewhere across their network, these aircraft are likely to all need to depart in the first operational hour of the day in order to achieve optimum utilisation of the aircraft over the day. Similarly, they are likely to arrive back at a similar time of night, particularly if night time operations after 23.00 are not expected (as indicated by the ES Appendix 3.3 data). Hence the terminal would need to be sized to accommodate the full passenger load from 3 aircraft within an hour for each of arrivals and departures. Ryanair's current fleet of aircraft (B737-800s) typically have 189 seats and, over time, these will be replaced by B737 Max aircraft of 200 seats. Hence, at Ryanair's typical summer load factor of 97%[56], the number of passengers per hour that the terminal would be expected to handle in each direction would be 550-580. It is also possible that the KLM operation to/from Amsterdam would also operate at similar times in order to maximise connections available at the Amsterdam hub increasing the number of passengers requiring to be handled within an hour.

[56] https://investor.ryanair.com/traffic/

3.58 According to Table 7 of Vol III of the Azimuth Reports, the required terminal capacity is 171 departing passengers per hour (less than the load of a single Ryanair aircraft) and 43 arriving passengers per hour or around 23.5% of the load of the smallest Ryanair aircraft. This simply does not make sense, particularly in terms of the large differential between departing and arriving capacities assumed. Should the capacity of the terminal be constrained to these levels, it is unlikely that a single aircraft could be based at Manston at all. The arrivals capacity would relate only to the ability to handle a single very small turbo-prop aircraft at any one time. We consider further the terminal capacity requirement in **Section 6**.

Conclusion

3.59 Whilst individually some of these errors and discrepancies might seem small in scale and impact, others are highly significant and serve to undermine the credibility of the whole approach outlined in the Azimuth Reports and throughout RSP's Application Documents. The combined implications are significant in terms of whether a) the application should actually have qualified as an NSIP; b) in terms of the level of demand that Manston might attract if it re-opened as an Airport and the viability of the proposed operation; and c) whether the environmental assessments undertaken are robust.

3.60 The most significant of these errors relate to:

- the lack of any soundly based forecasts – instead of forecasts based on an understanding of markets, costs and real potential, RSP's case is founded on a flawed list of airlines that it claims will definitely operate at Manston and then grow their business at Manston. This is no more than a 'guesstimate', without any supporting evidence. These are not 'forecasts' in the sense that is normally recognised in the industry;
- the lack of realism in the fleet mix overall and the assumed pattern of day/night time operations, particularly in relation to the implications for the prospect of integrator and mail operations being attracted to use Manston at all. This further undermines the credibility of the short term 'forecasts';
- the overstatement of longer term demand projections through the use of unjustified growth rates.

3.61 These errors and inconsistencies render the so-called 'forecasts' completely unreliable as a basis for assessing the extent and nature of any usage of Manston in the event that the Airport re-opens. In the next section, we set out our assessment of the market potential for Manston to assist the Examining Authority.

4 UNDERSTANDING THE AIR FREIGHT SECTOR

In this section, we summarise the performance of the UK Air Cargo market and demonstrate that there has been an inexorable trend away from the use of dedicated freighter aircraft towards a clear preference for the use of bellyhold capacity on passenger aircraft on the growing network of global air service connections. The exceptions to this are the operations of the integrators, which have well established UK operational bases, particularly at Heathrow, East Midlands and Stansted serving the main conurbations.

There is a strong concentration of freight handling and forwarding facilities in the vicinity of Heathrow, drawn by the air freight capacity offered by the global hub network of air services. This means that much airfreight is inevitably consolidated at Heathrow to avail of the lowest possible freight rates using bellyhold capacity. These facilities are being modernised to increase capacity and this will reinforce the dominant position of Heathrow in the sector. Development of the third runway at Heathrow will enable that Airport to double its freight handling capacity, principally in bellyhold capacity but also for dedicated freighter aircraft to the extent required by the integrators or to supplement bellyhold capacity in core markets and to feed the hub.

Alongside growth at Heathrow, there is increasing bellyhold capacity being made available at other airports as they develop a broader range of long haul services, in particular at Manchester. This may be expected to see further growth in consolidation activities adjacent to other major airports as their global connectivity increases.

Overall, within the context of an industry dominated by consolidation, bellyhold capacity and integrator operations, it is difficult to see any potential role for Manston other than in relation to niche services and specialist consignments, similar to the cargo handled when it was previously operational. This is unlikely to result in usage of Manston Airport by dedicated freighters to any greater extent than historically seen.

Introduction

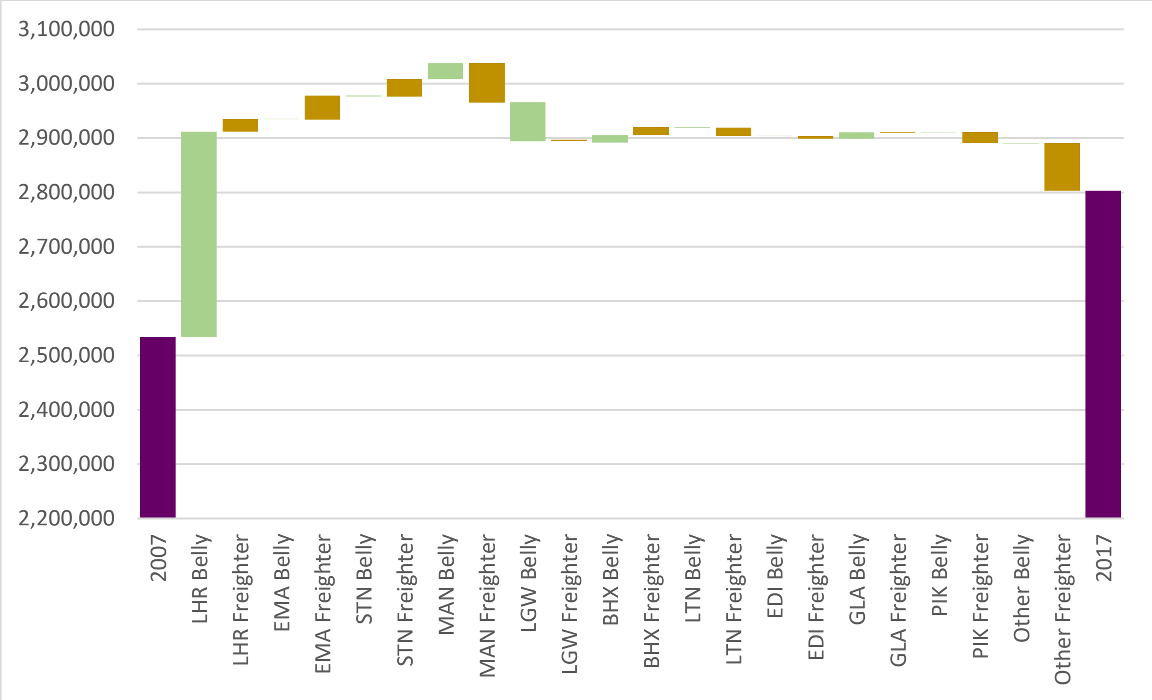
4.1 In this section, we update our consideration of the air freight sector in the UK, the way it functions and the key trends that have been observed in recent years. This analysis updates the evidence presented in our November 2017 report, including new data where it is available. However, it should be emphasised that the key messages from our previous report have not changed and our views on the key dynamics in the market and their implications for Manston similarly have not changed. The November 2017 analysis is important as it updates and correctly interprets the work that we undertook for the Freight Transport Association and TfL in 2015 upon which Azimuth still seek to rely as the basis for their justification of the number of freighter aircraft movements that Manston might attract.

Historic Performance of the UK Air Cargo Market

4.2 The evidence set out in our November 2017 Report and in the Altitude Aviation Advisory Reports[57] provides a detailed picture of the UK air cargo market over the last thirty years and we do not seek to repeat that analysis here. However, in the context of considering whether RSP has presented a compelling case for development, we have sought to re-emphasise several key themes which are central to any consideration of the UK air freight market generally and a re-opened Manston's potential market performance specifically.

4.3 What is evident is that there has been a fundamental structural shift to using available bellyhold capacity in passenger aircraft and away from pure freighter operations. This is illustrated in **Figure 4.1**, which sets out a bridge diagram between 2006 and 2017 showing the change in freight handled via bellyhold and pure freighter at major UK freight airports.

Figure 4.1: Drivers of Change in the UK Air Cargo Market – 2007 to 2017[58]



Source: York Aviation analysis of CAA Statistics

4.4 There are a number of key points to note:

[57] Altitude Aviation Advisory, Analysis of the Freight Market Potential of a Reopened Manston Airport, November 2017 and Addendum: UK Regional Airport Financial Performance and Debt Funding Characteristics, February 2019.

[58] LHR = Heathrow, EMA = East Midlands, STN = Stansted, MAN = Manchester, BHX = Birmingham, LTN = Luton, EDI = Edinburgh, GLA = Glasgow, PIK = Prestwick.

- the market has continued to consolidate into Heathrow, in particular through increased bellyhold capacity, enabled by the ongoing rebalancing of that airport's passenger network towards long haul destinations. There has been a 29% growth in tonnage carried in the bellyholds of passenger aircraft and 31% on dedicated freighter aircraft over the period 2007 to 2017[59], with Heathrow increasing its share of the total UK air freight market from 82% to 86% in terms of bellyhold freight and from 8% to 11% in terms of freight carried on dedicated freighter aircraft. This increase in market share has been achieved even in circumstances where the airport has been operating with a capacity constraint and whilst other airports have had spare capacity available for dedicated freighter aircraft, indicating that there have been other economic and structural factors at play, including the structure of the freight forwarding sector and the economics of consolidation;
- elsewhere in London, Gatwick has seen both bellyhold and freighter capacity significantly eroded as that airport has become more capacity constrained and it has focussed increasingly on low fares passenger airlines offering short haul services, albeit this trend has started to reverse as more long haul operations come on stream with Gatwick recording a 50% increase in tonnage carried on passenger aircraft between 2017 and the rolling year to October 2018;
- Stansted has seen 14% growth in freighter tonnage but has not increased its freighter activity despite having spare slot capacity available to do so strongly suggesting that the effect of any capacity constraints at Heathrow have not resulted in displaced dedicated freighter demand to other London airports;
- East Midlands, with major DHL and UPS bases, has seen 17% growth in air freight tonnage on an 11% increase in freighter movements over the period 2007 to 2017 and had been the only airport that has seen significant growth in pure freighter traffic, but again this has not offset losses in freighter traffic from elsewhere, suggesting that, for more general air cargo, bellyhold capacity is fundamentally more attractive, even potentially if this involves trucking to more distant airports;
- this is reinforced by what has happened at Manchester, which has seen 21% growth in its bellyhold air cargo market, relating to its growing long haul network, but has seen freighter traffic fall away significantly, with a 91% reduction in cargo carried in dedicated freighter aircraft despite the airport having spare capacity to handle such freighters. Again, this demonstrates that a shift to bellyhold is not driven by capacity constraints as Azimuth claim but by underpinning structural and economic factors;
- the growth in bellyhold traffic at Birmingham is also probably reflective of its growing long haul passenger network;
- in general, there has been a noticeable switch towards the use of bellyhold capacity. Since 2007, pure freighter cargo's share of the UK market has dropped from 36% to 30%, while actual freighter tonnage has dropped by 9%;
- it is interesting to note the performance of Prestwick in the context of Manston, as it provides perhaps the most obvious direct comparator, with a similar sized freighter operation in 2007 to Manston at its peak. Freighter traffic at that airport has dropped by 64% since 2007. It is also worth noting that, in the meantime, Prestwick has also had to be nationalised to maintain operations as it had been heavily loss making for a considerable period of time.

[59] York Aviation Analysis of CAA Airport Statistics.

4.5 Whilst the volume of air cargo flown to/from the UK's airports over the past 15 years has grown only incrementally, there have been considerable changes in the way that demand has been serviced, which again reflect the drivers and constraints on demand described above. Essentially, the market has been consolidating to a small number of airports and bellyhold cargo has become more dominant.

Understanding the Sub-Markets

4.6 The air freight market can be categorised into 4 sub-segments, as set out in a report by Steer for Airlines UK[60] was published by the DfT to accompany the Aviation Strategy Green Paper[61]. These are:

- ✈ **General Air Cargo** – which makes up the majority of air cargo and is carried principally by IAG Cargo (British Airways and partners), Virgin Atlantic and a number of American and Asian airlines. As Steer make clear, such cargo is predominantly carried in the bellyholds of passenger aircraft and so would not be available at all to Manston;
- ✈ **Express Freight** – carried principally by the four main integrators (DHL, Fedex, TNT and UPS). The integrators use their own aircraft for intra-European flights and on the main long haul sectors but use bellyhold capacity for the remainder of their operations. These operators are well established at East Midlands, Stansted and Heathrow, with satellite operations at other airports such Luton, Manchester, Edinburgh and Belfast. The report by Steer also makes clear, as we set out in the previous section, the high dependence of the integrators on night time operations which would rule out operations at Manston based on the proposed night flying policy:

"Integrator stakeholders consulted as part of this study stated that the way in which these operating restrictions [Night time operations] a*re applied impacts their ability to operate effectively, as the express business model (described above) is dependent on being able to ship goods during the night to enable maximum productivity for customers who rely on shipments being picked up close to the end of the working day and delivered as early as possible the next"*[62];

- ✈ **Specialist and Niche Cargo** – classified as freight that has specific requirements in terms of storage, security or regulatory requirements, including perishables or dangerous goods. Such goods are unlikely to be suitable for carriage in bellyhold capacity so may require dedicated aircraft;
- ✈ **Mail** – where international mail principally uses bellyhold capacity but chartered freighters can be used for some longer distance mail deliveries between the main centres of population in the UK.

Examination of these categories demonstrates that the only category that might have any use for Manston would be the Specialist and Niche Cargo category. Although, no data is available, this is a very small part of the overall airfreight market.

[60] Assessment of the Value of Air Freight Services to the UK Economy, Steer, October 2018, paras. 2.8 to 2.16.
[61] Aviation 2050, The Future of UK Aviation, a Consultation, Department for Transport, Cmnd 9714, December 2018.
[62] Assessment of the Value of Air Freight Services to the UK Economy, Steer, October 2018, paras. 2.33.

The Economics of Bellyhold

4.7 From discussions with airlines, we understand that modern long haul aircraft operating primarily passenger services from airports such as Heathrow or Manchester can typically carry around 15 tonnes of cargo per sector and airlines would expect to earn around 10% of total revenues from cargo. Whilst this is only indicative, it would follow that an airline may expect to earn around 0.66% of the revenues from operating a flight from 1 tonne of cargo. In contrast, a dedicated cargo flight needs to cover all of its operating costs from the cargo carried. At the average tonnage per movement projected by Azimuth for Manston[63] of c.13.9 tonnes per aircraft this means each tonne of cargo has to earn enough to cover over 7% of the costs of operating the flight. Taking an equivalent long haul aircraft (Code E), which Azimuth's work suggests could be carrying 33 tonnes per movement, this would require each tonne of cargo carried to cover 3% of the cost of the flight. Accepting that dedicated cargo aircraft like for like with the same aircraft type may have lower operating costs per flight than a passenger aircraft (no cabin crew or meals), it would also be likely that the dedicated freighter aircraft would be an older variant and use more fuel than the more modern equivalent that tends to be used on passenger operations, particularly from an airport such as Heathrow. The two factors may be expected to largely cancel each other out. On balance, then, a tonne of cargo carried in a dedicated freighter aircraft is likely to cost around 4.5 times more per tonne to transport than the same tonne of cargo carried in the bellyhold of a passenger aircraft. This will almost certainly translate into a higher price to the shipper.

4.8 It is for this reason that we see an inexorable shift from the use of dedicated freighter aircraft to bellyhold capacity due to the sheer cost advantages of availing of bellyhold capacity. The availability of bellyhold capacity is a powerful reason why the UK has lower dependence on dedicated freighter aircraft than the global average. We see this shift to bellyhold in the data from the UK regional airports noted above, which have seen little or negative growth in dedicated freighter operations (except for the integrator operations at EMA) but growth in flown cargo tonnage as their long haul passenger operations offering bellyhold capacity have grown. This demonstrates that, contrary to the assertion by Azimuth that the shift to the use of bellyhold capacity in the UK is a response to a shortage of capacity for dedicated freighter aircraft at the London airports, the shift towards a preference for bellyhold capacity for the carriage of the majority of airfreight reflects the economics of the industry, i.e. shippers and forwarders choose the most cost effective solution for moving goods from A to B which may include an element of trucking to avail of the lowest air freight rate.

4.9 Indeed, the Steer Report confirms that dedicated freighter operations are on the decline globally:

"The market for dedicated freighter services has struggled globally since the financial crisis due to falling seafreight rates and the continued rise of air passenger demand (and associated bellyhold capacity), which have driven down freighter yields. Although some UK airports have retained important integrator, and to lesser extent, freight operations, freighter activity has remained relatively flat in recent years and is currently lower than pre-crisis levels."[64]

[63] Analysis of Azimuth Report Vol III, Tables 2, 3 and 4.
[64] Assessment of the Value of Air Freight Services to the UK Economy, Steer, October 2018, para. 3.8.

4.10 The implications for Manston from this analysis are clear. Bellyhold is the preferred option for a significant proportion of the air cargo market and that this trend has intensified in recent years. This is a function of price and the relative urgency in relation to general air freight, as opposed to either express freight or niche products which may justify a higher cost dedicated freighter services such as operated at the existing integrator hubs. For express freight or niche products, shippers are prepared to pay a premium which allows the use of freighter aircraft because either speed is of the essence, or the destination is hard to reach, or the cargo is difficult to handle in some way. For general air freight, these drivers are not the same. Accepting that all air cargo is to some degree sensitive to speed of delivery, it seems that what is likely to be pushed from bellyhold capacity, in a capacity constrained environment, is less time sensitive and shippers' willingness to pay is lower. Hence, in the current market with relatively high fuel prices, freighter options are not an adequate or economically realistic substitute.

4.11 The only UK airports experiencing dedicated freighter growth are those with significant integrator activity. This suggests that Manston's likely freighter offer, on the assumption that an integrator operation would not realistically be attracted, would struggle to penetrate the market. There has been consolidation into larger airports, which again suggests that Manston will struggle to establish market presence. Finally, the experience of Prestwick, its nearest comparator in many ways, is not encouraging for Manston. Its well established dedicated freighter operation has been heavily eroded and the airport has had to be nationalised to maintain its operation. It continues to be heavily loss making, losing £7.6 million in 2017/8[65].

4.12 This is very important from the perspective of considering the potential role of Manston. It suggests it will be very difficult for the Airport to compete effectively for any traffic displaced as a result of constraints in the London market as it cannot and will not be able to provide the price, frequency and breadth of destination advantages that bellyhold freight can offer. In this context, the airports competing for cargo traffic being pushed away from Heathrow now and in the future are the large UK regional airports with growing long haul passenger networks, such as Manchester or Birmingham, and the near European global hub airports, which offer the closest substitutes to Heathrow and are within easy trucking time of, certainly, the London and South East market. In any event, bellyhold capacity at Heathrow is expected to increase substantially once the third runway becomes operational so driving down the competitive prices in the market, making it even more difficult for freighters to compete. In fact, as we have discussed above, the NPS cites one of the key reasons for the choice of the North West Runway option at Heathrow being the opportunity to double freight capacity.

The Role of Trucking

4.13 The Steer Report for Airlines UK also explains the role of trucking, noting that[66]:

"a significant amount of air freight is transported in customs-bonded trucks between the UK and continental Europe and is classified as air freight with an assigned flight number. Freight is often flown to continental Europe, particularly from Asia, as there is often more available air freight capacity than to UK airports, partly due to lack of available slots for freighter aircraft at Heathrow…………………

[65] https://beta.companieshouse.gov.uk/company/SC462050/filing-history
[66] Assessment of the Value of Air Freight Services to the UK Economy, Steer, October 2018, paras 2.24, 2.25.

In contrast to goods from Asia, Heathrow stated that goods destined for North America are also often trucked to the UK, in particular Heathrow, from continental Europe in order to take advantage of cheaper rates from the UK on North American routes. As Heathrow is the primary European hub for North American passenger connections, there is a significant level of bellyhold capacity available, which means air freight rates are cheaper compared to other European airports."

4.14 There is a further reason why trucking to airports in Europe is an inherent part of the industry as also set out in the Steer Report[67]:

"Many of the largest freight airports in the EU are concentrated in North-West Europe, which is relatively well off and densely populated (therefore generates demand for imports), and is the home of a lot of European industry (therefore produces a large amount of goods for export). The close proximity of many large freight airports to the UK may also to some extent explain why so much air freight is flown to continental Europe and trucked to the UK, as there is much greater capacity available to continental North-West Europe than to the UK."

Hence, even if Manston was operational, the structural factors that mean that freight loads are consolidated at the main freight hubs in continental Europe and then trucked to and from the UK would still result in this freight being trucked and by-passing Manston. The concentration of markets around these continental European hubs also allows them to support some dedicated freighter activity, reinforced by trucking and consolidation.

4.15 As explained above, the reasons why trucking is an inherent part of the industry is cost. It is simply cheaper in overall terms to truck to an alternative airport offering cost effective bellyhold capacity than it is to seek out dedicated freighter capacity. This applies to the vast majority of general air cargo. Ultimately, shippers and forwarders seek the cheapest option. Having a dedicated freight airport at Manston would not 'intercept' this freight travelling to and from Europe as Azimuth claim[68] as such freight would still seek the cheaper bellyhold capacity regardless of the potential option of a dedicated freighter or, where a dedicated freighter aircraft was the most cost effective option, seek to operate that aircraft to the main centres of economic activity in Central Europe or the UK's main distribution focus around East Midlands Airport[69] so as to optimise distribution of goods overall.

Heathrow

4.16 As noted above, despite the acknowledged runway capacity constraints, Heathrow has increased its share of UK air freight carried. This indicates a strong structural preference for Heathrow as the UK's main air freight hub, as identified in the NPS. It is important to understand why this is so. The Steer Report referred to at para 4.6 above makes clear the importance of Heathrow within the air freight sector:

[67] Ibid, para 3.21.
[68] Azimuth Reports Vol I, para. 6.4.13
[69] Altitude Aviation Advisory, Analysis of the Market Potential of a Reopened Manston Airport, October 2017 paras. 114, 115.

"One notable feature of the UK air freight market is the huge importance of Heathrow and its surrounding freight facilities, with most forwarders having major consolidation centres in the vicinity of the airport. Very significant volumes of air freight are trucked to such facilities near Heathrow, processed and then trucked to another airport, either in the UK or in continental Europe, without ever flying in or out of Heathrow itself."[70]

4.17 The Steer Report goes on to state:

"Historically, much of the UK air freight activity is concentrated around Heathrow due to its significantly more extensive intercontinental passenger network compared to those of other UK airports. Although this remains the case, new intercontinental passenger connections at regional UK airports have increased possibilities for transporting long-haul freight as bellyhold cargo."[71]

Hence, regional airports developing bellyhold capacity are likely to be the principal gainers from any freight displaced from Heathrow as a consequence of short term constraints until R3 is operational.

4.18 Even where capacity constraints at Heathrow are noted as a potential problem, the reasons cited in the Steer Report[72] do not lend credence to there being a need for additional air freight capacity at Manston:

"The importer stated the reason such a high proportion of its goods are flown to the UK via Europe, is because the UK's air freight capacity is not sufficient to service the required import volumes. Goods are trucked as bonded freight to avoid having to undergo Dutch or German customs procedures, as the importer incurs fewer administration costs as it is only required to deal with UK customs.

The importer stated that, as most of its imports are flown in freighter aircraft, one of the reasons why it often cannot fly its goods into the UK, is because not enough UK airlines operate these types of aircraft. Many airlines that in the past operated long-haul freighter services, for example IAG Cargo at Stansted, no longer do; therefore, there are fewer long-haul freighter options available. However, the main problem the importer cited with UK air freight capacity was the quality of the infrastructure.

The importer stated that it avoids using UK airports because they are too congested and therefore not efficient; air freight infrastructure has not been upgraded in line with increased traffic, which causes delays that can be avoided at continental European airports. The importer stated that there should be better utilisation of regional airport capacity at, for example, Manchester, which was cited as a relatively good operation with not enough freight capacity."

[70] Assessment of the Value of Air Freight Services to the UK Economy, Steer, October 2018, Executive Summary.
[71] Ibid, para. 2.36.
[72] Assessment of the Value of Air Freight Services to the UK Economy, Steer, October 2018, Case Study Example at Page 11.

4.19 Properly understood, this highlights a desire for more freighter capacity at Heathrow, concerns around infrastructure constraints at Heathrow, and issues caused by the willingness of airlines to operate such flights. As the case study makes clear, Stansted and the existing regional airports provide potential available airport capacity but the lack of airlines willing to operate dedicated freighters is the issue rather than the capacity of the airport infrastructure. To illustrate the point, Cathay Pacific Airways operated a dedicated freighter aircraft to Manchester until recently but this has been replaced by more cost effective bellyhold capacity on their now daily A350 service to Hong Kong[73].

4.20 As noted above and in RSP documents[74], there have been concerns expressed about both slot constraints at Heathrow and the adequacy of capacity for freight more generally as well as the quality of the infrastructure. However, as we have made clear at para. 2.12 above, this shortfall in capacity for air freight will be addressed by R3. Indeed, recent proposals by Heathrow Airport Ltd to introduce mixed mode operations ahead of R3 will provide short term relief to the capacity constraints over the same time period as Manston might become operational[75]. In the longer term, freight capacity at Heathrow is expected to virtually double to 3 million tonnes a year from the 1.7 million tonnes handled in the rolling year to the end of October 2018[76].

4.21 Facilities at Heathrow are also being expanded and modernised in line with Heathrow's Cargo Strategy[77]. The strategy is firmly aimed at ensuring that Heathrow is able to capitalise on the opportunity offered by R3 by providing state of the art cargo handling facilities and overcoming the identified bottlenecks and congestion, including improvements to local road infrastructure[78]. Examples of new facilities being provided include the recently opened facilities for Virgin Atlantic and Delta Airlines aimed explicitly at increasing the amount of cargo that they carry through Heathrow on their passenger operations[79]. There is clearly substantial investment being made to ensure that Heathrow can efficiently increase its cargo throughput, negating the need for spill to other airports[80].

4.22 In overall terms, then, it is clear that there are powerful structural factors as to why air freight is concentrated at Heathrow, based around the strong bellyhold offering and the existence of the freight forwarding/consolidation activity. Evidence would suggest that this is not replicable elsewhere in the UK and certainly not at a small niche airport such as Manston. This has implications for the need case for the development as a whole and, in particular, the likelihood of RSP being able to attract freight forwarders as occupiers of the proposed infrastructure at the Airport, including that on the Northern Grass.

[73] https://news.cathaypacific.com/cathay-pacific-s-manchester-service-to-go-daily-from-december-180062#
[74] RSP Planning Statement, para 6.29 and Azimuth Reports Vol I, para. 4.1.3.
[75] https://afo.heathrowconsultation.com/wp-content/uploads/sites/4/2019/01/Making-better-use-of-our-existing-runways-Final-single-pages.pdf
[76] York Aviation analysis of CAA Airport Statistics.
[77] https://www.heathrow.com/file_source/Company/Static/PDF/Partnersandsuppliers/heathrow-cargo.pdf.
[78] https://www.aircargonews.net/news/airport/single-view/news/segro-planning-to-replace-heathrows-cargo-horseshoe.html.
[79] https://www.aircargoweek.com/virgin-and-delta-to-move-into-dnata-city-east/.
[80] This does not mean that airports with growing bellyhold capacity, such as Manchester will not also increase tonnage carried nor that there will not be growth at existing integrator bases such as EMA and Stansted reflecting their key role in the UK distribution network.

The Geographic Distribution of UK Air Cargo Demand

4.23 Another key factor to understand is the geographic distribution of air freight demand. It is important not to confuse, as Azimuth do, the clear economic preference for freight to be flown out of Heathrow due to the economics of consolidation with the true origin of the demand for air freight. This is important as it influences the choices made as to how any excess freight that Heathrow cannot accommodate in future would be shipped as well as the economic choices that drive the point of consolidation in the first instance.

4.24 At the outset, it should be made clear that there is very limited data on where air cargo originates from or is destined for within the UK. However, some indications are available from other research, notably work by MDS Transmodal, in conjunction with York Aviation, for Transport for the North in relation to its International Connectivity Strategy[81]. MDS analysed a series of datasets on air freight and road haulage and estimated that around 14% of UK air freight demand originates in or is destined for the North of England, for example. We also know that air cargo is often trucked a considerable distance before being loaded on to aircraft.

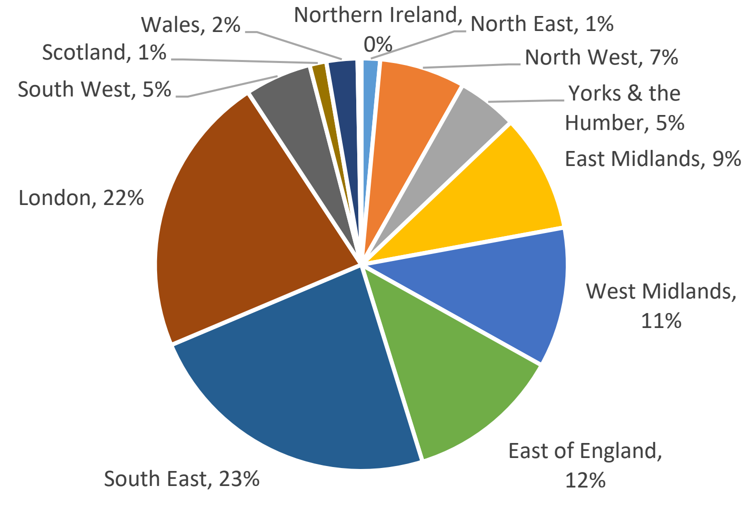
4.25 To estimate the amount of cargo tonnage originating in or destined for the different regions of the UK, we have used a simple gravity model that distributes air cargo regionally across the UK based on:

- for exports, the distribution of manufacturing employment in the UK. This is intended to reflect that air cargo exports are likely to be primarily manufactured goods;
- for imports, the distribution of UK population. This is intended to reflect that imports are in many cases destined either for consumers directly or retailers. This is clearly a simplification but we believe a sensible one given the data available;
- a relatively low distance decay factor of 1.5, reflecting the relative insensitivity of air freight to trucking times. This has also, in part, been calibrated to reflect MDS's findings for Transport for the North.

4.26 The resulting distribution of air cargo demand is shown in **Figure 4.4**. It shows that, while there is a heavy concentration of demand in the Greater South East, there is significant demand located across the country. It is misleading to assume that cargo that is currently flown from the London airports is necessarily destined for or originating in the South East and so easily available to Manston.

[81] https://transportforthenorth.com/wp-content/uploads/Final-International-Connectivity-Evidence-Report.pdf, para.

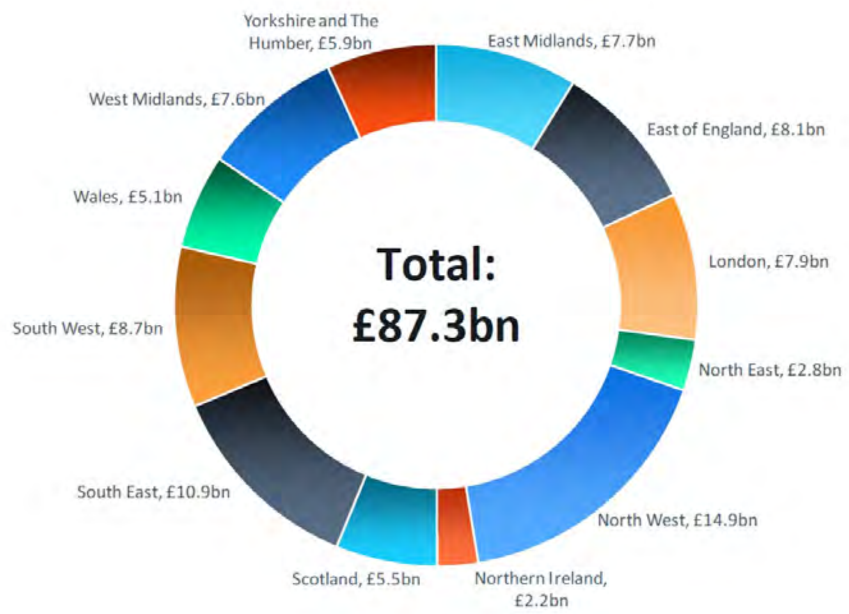
Figure 4.4: Modelled Regional Distribution of UK Air Cargo Demand



Source: York Aviation analysis of CAA Statistics, ONS and Google Maps Data

4.27 More recent analysis by Steer for Airlines UK[82] provides more specific data on the GVA value of air freight exports by air by region. This is shown in Figure 4.5.

Figure 4.5: GVA Currently Dependent on Air Freight by Region



Source: Steer 2018

[82] Assessment of the Value of Air Freight Services to the UK Economy, Steer, October 2018, Figure 5.6.

4.28 The issue for Manston is that it is poorly placed geographically to serve the totality of this demand. In the event of air cargo capacity constraints in London this demand is likely to look initially for cargo capacity closer to home at the major regional airports, particularly those that that are developing broader long haul passenger networks. Even if freighter aircraft are required for this demand, there are likely to be substantially better options than Manston, not least the national air freight hub at East Midlands, with its central location in the UK.

Air Cargo Capacity at UK Airports

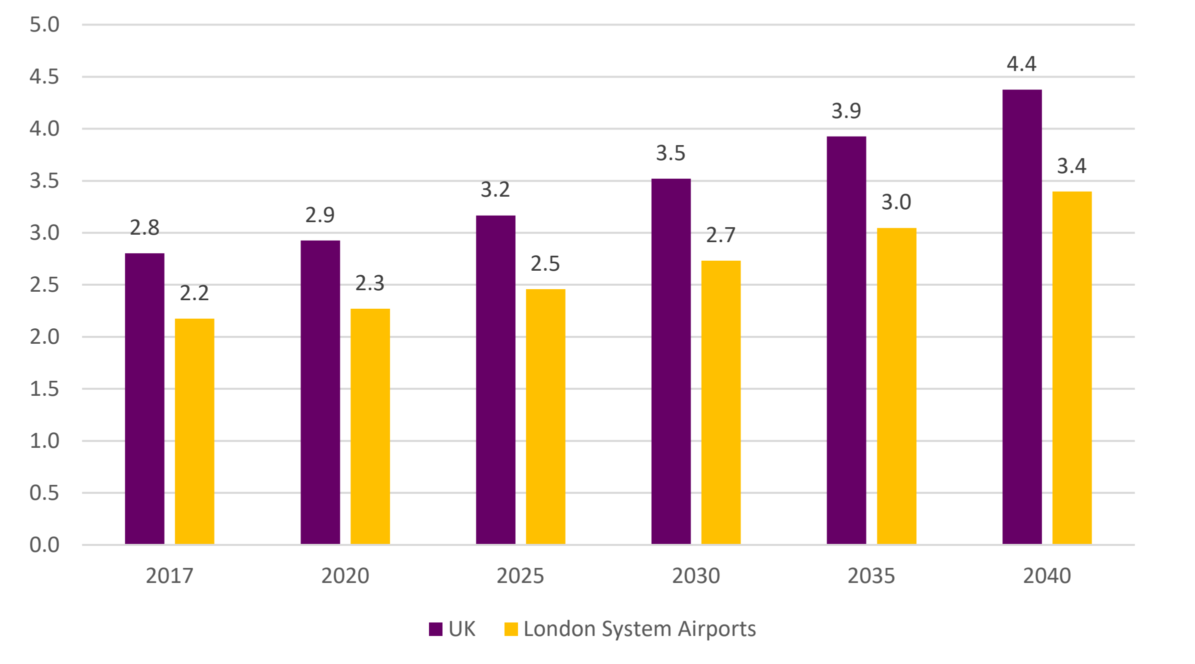
4.29 In our November 2017 Report, we set out an assessment of expected cargo tonnage growth by reference to GDP. We have updated this to enable an assessment of the extent to which there is likely to be any shortfall in capacity available across UK airports as a whole. As in our 2017 report, we have adopted a relatively simple approach, growing existing air cargo demand forward in line with GDP projections for the UK economy. This is in line with our analysis of the link between cargo volumes and the key economic drivers described in our November 2017 Report. The GDP forecasts used are the latest forecasts produced by the Office for Budgetary Responsibility at the time of writing. These are taken from:

- Economic & Fiscal Outlook (October 2018), which provides short to medium term forecasts;
- Fiscal Sustainability Report (July 2018), which provides long term forecasts for the UK economy.

4.30 These forecasts suggest average real growth in UK GDP of around 2% over the period to 2040. These forecasts are slightly lower than those used in our November 2017 report, reflecting more fully the outlook for the economy post Brexit. These slower growth rates have been offset by the uptick in growth observed in the UK air cargo market in 2017, which has increased our baseline. The resulting projections of air cargo demand at the London system airports and across the UK are set out in **Figure 4.6**. This analysis sees total UK air cargo demand reach around 4.4 million tonnes by 2040 and demand in the London system[83] of around 3.4 million tonnes by 2040.

[83] Based on the London airports current share of the national market.

Figure 4.6: Air Cargo Tonnage Forecasts (million tonnes)



Source: York Aviation

4.31 Next, we considered the extent to which the demand identified above could be met by UK airports and the London system airports. This is, again, in line with our approach taken in our work in November 2017 and with our previous research for the FTA in 2015 relied on, wrongly, by Azimuth.

4.32 The first step is to assess the extent to which the bulk of air freight demand will be accommodated in passenger aircraft. In order to estimate the likely bellyhold capacity that will be available through the period to 2040, we have produced projections of passenger ATM[84] demand for each of the top 10 freight airports in the UK in 2017, along with a residual forecast for Other UK airports. For Heathrow, Gatwick and Manchester, these forecasts have been split into domestic, EU and non-EU ATMs. The future years for each airport have been based on the ATM forecasts produced by the Airports Commission for which detailed data files have been released[85]. Years prior to the opening of Runway 3, use the Base ATMs scenario, while post opening uses the Heathrow's ATMs scenario, which reflects the third runway. This will understate the potential at Heathrow in the short to medium term if it gains approval for full mixed mode use of the runways as an interim step before R3 allowing additional global air services providing bellyhold capacity.

[84] ATM – air transport movement.
[85] https://www.gov.uk/government/publications/airports-commission-documents-and-data.

4.33 The existing freight loads per passenger ATM for each airport have been estimated using CAA Airport Statistics. These average loads have then increased by between 0.5% and 0.75% per annum at Heathrow. These rates have been slowed in the short term compared to our 2017 report to reflect the increase in average loads at Heathrow seen in the last year. CAA Airport Statistics suggest that the average tonnage per passenger ATM has grown by 8.5% in the last year. This may reflect the introduction of new aircraft such as the Airbus A350 that have higher freight capacity. The implication of this large short term change is that Heathrow's total bellyhold capacity may actually be higher than previously forecast. This ultimately reduces the chance of there being excess demand for Manston to capture and this has been a strong contributory factor to the decline in some of the forecast scenarios. Other airports have also seen some increase in average loads in the past year, which has further increased available bellyhold capacity. At these other airports, we have assumed that loads will grow at around 1.6% per annum tapering to 1.0% per annum in the longer term. This reflects trends in average loads identified from CAA Airport Statistics over recent years.

4.34 Having assessed the extent to which future air freight demand is likely to be accommodated in the bellyholds of passenger aircraft, we then consider the capacity provided by likely freighter ATMs at the existing airports handling such movements. This 'Business as Usual' assessment of freighter tonnage expected at these airports takes, as a conservative assumption, growth in freighter ATMs at each airport of 0.4% per annum, in line with expected growth rate from the Department for Transport's Aviation Forecasts 2013[86] so as not to understate any potential demand for additional air freighter movements. We have used a 0.4% p.a. growth assumption although the more recent DfT position, as reported in para 3.18 above, is that no growth is a more reasonable assumption. Taking this assumption is inherently conservative and more likely to overstate than understate the actual need for freighter movement capacity and understate the available headroom to accommodate such movements.

4.35 Once again, average loads per freighter ATM have been estimated for each airport from CAA Statistics. As with bellyhold cargo per ATM, there has been an upward trend in average loads on freighters in recent years of around 1.1% per annum (York Aviation analysis of CAA Airport Statistics). This is assumed to continue over the period. This gives us an estimate of the upper bound of tonnage likely to use dedicated freighter aircraft based on the projected movement growth set out above. We term this 'Business as Usual' Freighter tonnage, i.e. the tonnage we would expect to be carried on freighter aircraft based on extrapolation of current patterns of freighter operations at existing UK airports.

4.36 Having assessed the volume of tonnage likely to seek to use freighter aircraft, we have also taken a view as to the likely total tonnage capacity over time of the two largest freighter airports in the UK, East Midlands and Stansted, based on those airports' development plans, and the proposed increase in total cargo capacity at Heathrow, as set out within the NPS:

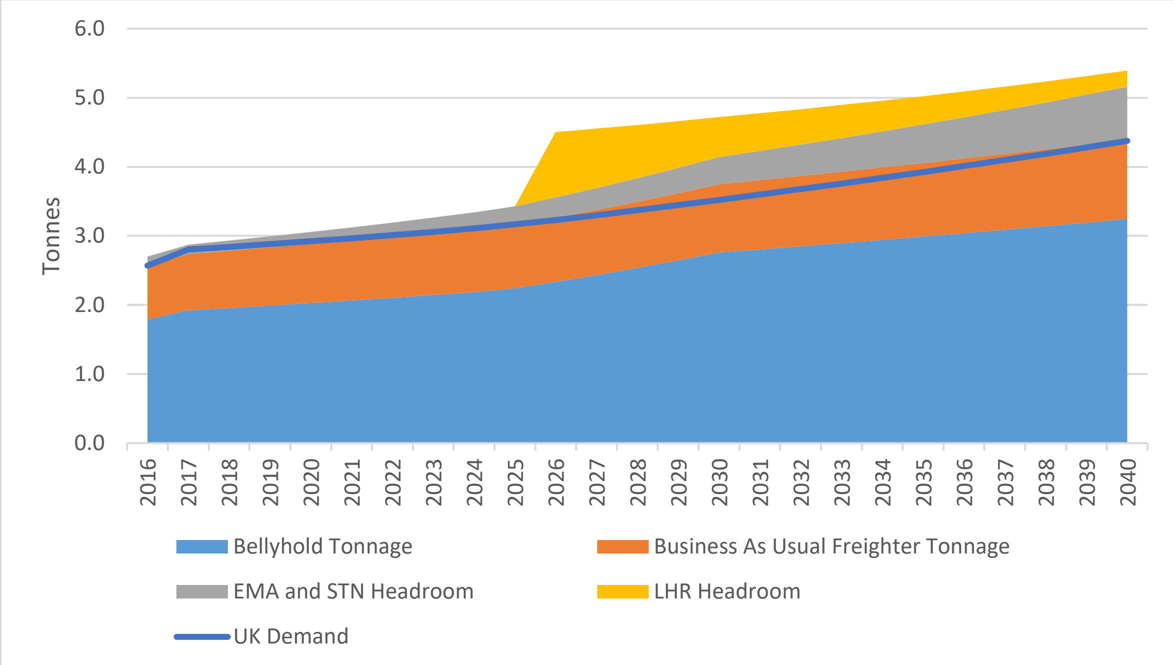
- the Stansted Sustainable Development Plan talks about developing cargo capacity to handle around 400,000 tonnes of cargo. We have assumed that current capacity is around 300,000 tonnes and that this grows steadily over time to 400,000 tonnes by 2040[87];

[86] The exception to this is the small number of freighter movements at Heathrow, which are not allowed to grow until the Third Runway is opened.
[87] Stansted Airport, Sustainable Development Plan, 2015, Summary, page 9.

- the East Midlands Sustainable Development Plan describes its runway capacity as being able to support a 10 million passenger and 1.2 million tonne cargo airport[88]. We have assumed that this capacity could be developed over time to 2040 from an assumed base capacity of 400,000 tonnes. The airport is not subject to any specific ATM limit;
- the NPS states that the development of the third runway at Heathrow will enable a doubling of freight capacity at the airport[89] This would suggest that the cargo facilities will be able to handle around 3 million tonnes per annum. We have assumed that this headroom would be available from the point of the new runway opening.

4.37 This assessment of the cargo capacity headroom at Heathrow, Stansted and East Midlands helps provide an assessment of how any excess demand identified could be handled by freighters in the UK if this were the response of the market to any shortage of bellyhold capacity, after having taken account of bellyhold capacity. The resulting estimates for air cargo tonnage capacity for the UK as a whole and the London system over time are shown in **Figures 4.7** and **4.8**.

Figure 4.7: UK Air Cargo Capacity

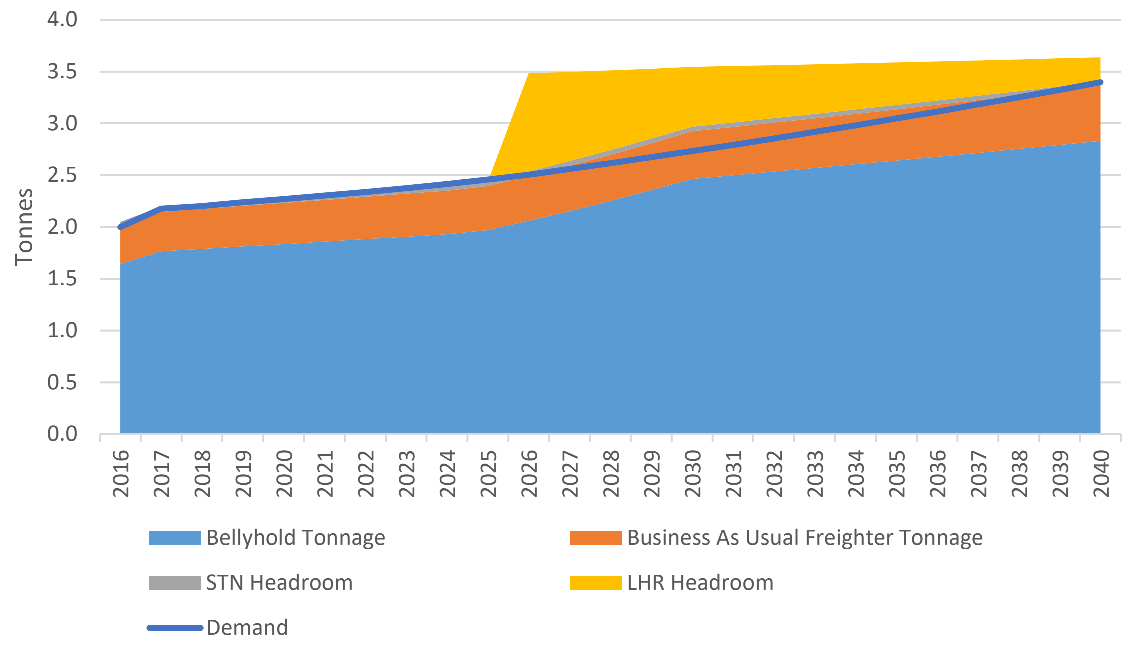


Source: York Aviation

[88] East Midlands Airport Sustainable Development Plan, 2015. Page 75.
[89] Airports National Policy Statement, 2018. Page 32.

4.38 At a UK level, our analysis suggests that there are unlikely to be capacity issues in the cargo market until well beyond 2040 even on the conservative (worst case) basis that we have adopted by retaining the DfT's 2013 projection of possible growth in freighters. Based on the latest DfT projections of no such growth, there is simply no capacity shortfall at all. Once the third runway is opened at Heathrow, there is in fact likely to be excess capacity in the market particularly in the light of the expected doubling of freight capability at the Airport as set out in the NPS, which is likely to soften demand for supporting freighter capacity dedicated to general air freight (accepting that integrator/express freight is a separate market to a significant degree).

Figure 4.8: London System Air Cargo Capacity



Source: York Aviation

4.39 The situation at the London airports is slightly different. With Heathrow's bellyhold growth relatively constrained in the short term, there could be potentially some limited capacity constraints in the very short term before mixed mode and R3 are operational. However, allowing for headroom at Stansted, there are no capacity constraints in the medium term. Once R3 is opened, excess capacity develops rapidly. The London system's freight capacity does start to fill up as Heathrow begins to fill up once again but Heathrow's freight capacity plans suggest that there will still be headroom by 2040. Assuming mixed mode (independent parallel approach operations are permitted at an early date), this shortfall will not arise.

4.40 The implications for Manston Airport are that, even in pure volume terms, push factors from other airports in London are unlikely to provide opportunities for growth before at least 2040 and beyond assuming no further airport capacity comes on stream at the main London airports. This is before any consideration is given to Manston's suitability to serve the markets in question. In the short to medium term, there might be some very limited constraint in the London system before the third runway at Heathrow is opened. However, this is largely a function of bellyhold constraints at Heathrow and it is clear that the preferred option for such freight is alternative bellyhold capacity.

4.41 Logic would suggest that what will be pushed out is relatively low yielding, general air cargo that is more sensitive to price and less sensitive to time. Essentially, this is akin to business passengers forcing leisure passengers out of Heathrow. This type of air cargo is not likely to see pure freighters as an effective alternate, given the higher prices involved. It is more likely to seek out alternative bellyhold capacity at UK regional airports (which might actually be closer to its point of origin given our analysis above) or travel via truck to the continental European airports.

Prospects for Manston

4.42 In our November 2017 Report, we set out 'realistic' forecasts of freighter movements and freight tonnage at Manston, drawing on the methodology that we used in our earlier work for the Freight Transport Association and upon which Azimuth seek to rely. In essence, these have not changed, except that our previous projections may have been on the optimistic side given the continued trend away from the use of dedicated freighter aircraft and with greater clarity regarding the expected increases in capacity for freight at Heathrow. Even on the most optimistic basis, we would not expect Manston to be able to attract more than around 2,000 annual freighter aircraft movements and, more likely, it may struggle to attract more movements than it did when previously in operation. If we were to fully update our forecasts for Manston, we would expect the realistically projected number of dedicated freighter movements to be even lower given deteriorating market conditions, increased competition and economic uncertainty.

Conclusions

4.43 Examination of market trends and the structure of the air freight market make clear that there is no role for Manston, other than possibly as a niche cargo operation, as with its historic operation. The trend in favour of bellyhold for the carriage of general air freight is clear. This freight forwarding sector is heavily concentrated around Heathrow for this very reason and the associated consolidation activity essential drives the choice of airport based on the most economical freight rates available for any consignment. This is highly unlikely to be a dedicated freighter option from an airport remotely located in East Kent.

4.44 Going forward, Heathrow will have substantially enhanced capacity for air freight operations (around double its current throughput) and modernised facilities negating any 'push' factors that might drive users to even consider Manston.

4.45 The integrators are already well established at East Midlands Airport in particular as well as using Heathrow and Stansted to serve the main markets in England, with these airports stated as having scope to increase air freight capacity by 800,000 and 150,000 tonnes per annum respectively[90]. Manston is too far from the distribution centres along the M1/M6 axis to function as an integrator base, leaving aside that the proposed night movement restrictions would render any such operation unviable for the airline/integrator.

4.46 This leaves niche/specialist cargo operations as the only possible market for Manston. This would be consistent with the types of cargo that Manston used to handle[91]. Ultimately, this is a very small market and unlikely to result in Manston handling more freighter movements than it did historically. This has profound implications for the Need Case as a whole.

[90] See para. 4.36 above.
[91] See Figure 3.9 of our November 2017 Report.

5 AIR PASSENGER FORECASTS

In this section, we set out our analysis of the passenger potential for Manston. The Azimuth Reports set out no analysis of the market and merely assert that certain airlines might operate. This is not credible and certainly not sufficient to underpin any business case for investment in the development of Manston. Given the importance of passenger related revenues to the viability of any airport's operation, this is significant.

We set out here an analysis of the passenger market that Manston might serve and demonstrate that, at best, it might achieve around half of the number of passengers that RSP's need case depends on. To do so, there will need to be an allowance for passenger aircraft movements in the night period, which have not currently been assessed in RSP's ES.

The viability to the airlines of passenger operations remains questionable and there is no guarantee that any passenger services would be viable for the airlines on a sustainable basis and without some form of public subsidy.

Basis for Passenger Forecasting

5.1 In our November 2017 Report, we set out the basis for assessing any potential for cargo operations at Manston. Whilst we indicated that more likely passenger forecast would be of the order of half[92] of those set out in the Azimuth Report, we did not set out further detail. As the passenger market is significant in terms of assessing the potential for viable operations at the Airport taken as whole, we set out further detail on the likely passenger market in this section in order to assist the Examining Authority. We have adopted the same approach to developing these forecasts as we do for other clients operating or investing in regional airports in the UK.

5.2 Whilst the need for the Airport and its designation as an NSIP is fundamentally driven by the asserted need for a dedicated air freight hub, passenger services and the economic benefits that potentially derive from such passenger flights form part of RSP's socio-economic case. Taken in the round, then, these services form part of the need case and, hence, the demand for such services requires full justification. Passenger operations, both in terms of revenues and costs, will also be key elements that underpin the financial viability of the operation and whether the proposition is likely to be economically sustainable.

5.3 Azimuth provide no details of how the specific passenger and associated aircraft movement forecasts have been built up. It is simply postulated that a number of airlines and air services might operate. This is not sufficient nor consistent with the approach to forecasting normally required to justify an airport planning application in our experience.

[92] York Aviation, November 2017, Executive Summary, para 12.

5.4 We note that RSP's Planning Statement, at para. 9.44 asserts the passenger 'forecast' of 660,000 passengers in first year of passenger operations (Year 3) is driven by lack of capacity at other London airports. This statement appears to ignore capacity developments at other London airports, including the planning approval recently granted to Stansted to increase from 35 million to 43 million passengers a year[93] or developments such as Ryanair's decision to base aircraft at Southend Airport from summer 2019[94].

Methodology

5.5 Unlike Azimuth, our approach to forecasting the potential of Manston for passenger services is to consider the level of demand in the Airport's catchment area and how this might grow in future. We accept that there is a need to consider the airline response to this demand in terms of the frequency of flights they might offer as a basis for setting out the number of passengers they might carry. However, it is not sufficient to simply assert that IF an airline was to commence services it would carry X thousand passengers, the requirement to present a compelling case requires some evidence as to the likelihood of each airline commencing services (absent any firm documented commitment), which would normally be based on the assessment of the levels of demand and whether these would be sufficient to support viable services.

5.6 Given the importance of passenger services to the viability of airport operations, developing a robust forecast of passenger demand is critical to the assessment of the overall viability and sustainability of the operation of the Airport, which we consider further in **Section 7**. We present here an assessment in a form consistent with that which would be expected in support of an airport planning application.

Kent Passenger Market

5.7 The UK Civil Aviation Authority (CAA) undertake sample surveys of departing passengers using the main UK airports on a continuous basis[95]. This data base runs to almost 200,000 records and contains information about the passengers' home or journey origin, their end destination airport and any intermediate stops, the purpose of travel, the airline flown with and other demographic information. Summary reports are published[96] but York Aviation, in common with most other experienced aviation consultants, use the raw survey data purchased from the CAA to analyse and produce passenger forecasts for airports in the UK. This data enables the scale of the market in any individual airport's catchment area to be estimated along with the nature of that demand – business/leisure, UK outbound or foreign visitor, destination or origin of the air journey.

[93] https://mediacentre.stanstedairport.com/london-stansted-gets-the-go-ahead-to-boost-the-regions-economic-growth-and-create-5000-new-jobs/

[94] https://www.independent.co.uk/travel/news-and-advice/ryanair-southend-airport-base-easyjet-cheap-flights-stansted-a8396956.html

[95] This includes all of the main London airports but not Southend. Smaller regional airports are surveyed on a more periodic basis, typically every 3-5 years.

[96] https://www.caa.co.uk/Data-and-analysis/UK-aviation-market/Consumer-research/Departing-passenger-survey/Survey-reports/.

5.8 We have analysed the 2017 CAA Survey data to look at the scale and nature of the air passenger market in Kent. We have chosen to restrict the analysis to Kent because it is unlikely that a re-opened Manston Airport would attract passengers to any substantial degree from outside of the County due to the surface journey distance and time from Manston to areas beyond Kent, as well as the fact that most of these areas are located closer to larger airports, including London Gatwick, with a much wider range and frequency of passenger services than is ever likely to be delivered at Manston. We recognise that the planned Lower Thames Crossing may make access times quicker from north of the Thames but this will, of course, also speed up journey times from Kent to larger, more established airports with broader networks and frequencies, such as London Stansted, London Luton and even London Southend. Hence, any potential passenger gain for Manston is likely to be more than offset by passengers travelling north of the river to more easily avail of a wider range of air services. There is a real risk that the attractiveness of services from the larger airports could further reduce the pool of demand available to a re-opened Manston compared to that which we have assessed below.

5.9 In 2017, as can be seen in **Table 5.1** below, the total market size for Kent was 4.97 million passengers[97]. Over 1.2 million of these are travelling to long haul points and so, other than via a hub connection, these are unlikely to be served by a re-opened Manston Airport[98]. This leaves around 3.8 million short haul and domestic passengers in the County.

Table 5.1: Kent Passenger Demand 2017

Passenger Type	All Catchment
Domestic	372,000
Long Haul	1,221,000
Short Haul	3,373,000
Grand Total	**4,966,000**
Source: CAA Survey 2017	

5.10 However, Manston Airport's location at the eastern extremity of the Kent peninsula means that the Airport is unlikely to draw equally from all districts within the County and, as such, the total underlying market for the Airport is likely to be well below 3.8 million passengers. **Table 5.2** illustrates the time taken to drive to competitor airports from key urban centres in each district. As can be seen, Manston Airport would have the shortest drive time from only 6 of the 13 Kent districts.

[97] This figure may not include some passengers who chose to use London Southend Airport which was not included in the CAA Survey for that year. We would anticipate the figure to be relatively low given the scale of operations at Southend and the route overlap with other larger airports accessible to Kent.
[98] We note the aspiration for a small number of charter flights bringing cruise passengers to Manston

Table 5.2: Drive Time to Competitor Airports from Kent Districts				
District	Manston Airport	London Gatwick	London Stansted	Southend Airport
Thanet	14	91	111	108
Canterbury	30	65	85	85
Dover	35	70	104	105
Swale	40	50	70	65
Shepway	45	65	90	90
Maidstone	45	40	60	60
Ashford	50	55	80	80
Medway	50	45	60	60
Gravesham	55	40	45	50
Dartford	60	35	45	45
Tonbridge & Malling	65	30	80	60
Sevenoaks	65	30	60	55
Tunbridge Wells	75	40	70	90
Source: York Aviation/Google Maps				

5.11 A key differentiator for Manston Airport when compared to other UK regional airports is that its location on a coastal peninsula means that it is not surrounded on all sides by population centres from which it can draw demand, with a large part of the area surrounding Manston being sea.

5.12 In making decisions on which airport to use, passengers would be likely to weigh up three key elements, service frequency (convenience), fare price and journey time/cost to airport. Of these, Manston is always likely to be beaten on the first by larger airports in the South East, whilst fares are likely to be no better than available elsewhere due to the spread of low fares airlines across all airports surrounding London. This means that the only benefit Manston Airport could offer would be on journey time savings and, even then, this would be limited in some cases. In determining the scale of the market which may, thus, be available to Manston, we have made assumptions about how much of the market could be attracted to use the Airport if services were provided based on experience at other regional airports seeking to penetrate their local market in competition with larger airports.

5.13 It is not realistic to assume that Manston Airport would be able to attract all of the market from any district, either in totality or even at individual route level for a number of reasons, but principally because:

- for many destinations, there is insufficient demand to make operations viable for the airlines even with market stimulation from low fares, meaning these passengers must be consolidated on to services at larger airports; and
- routes operated from Manston Airport would still be competing with services from other airports which may have more attractive frequencies, flight times, or fares.

5.14 It is, therefore, necessary to determine how much demand could realistically be attracted to the Airport. In our previous work in Kent, in relation to Lydd Airport, we assumed that, in core districts adjacent to the Airport, 60% of the market could be captured if regular services are operated to any given destination and that other, more distant districts, would attract a much lower % share of the total available market given competition from other airports. In practice, this approach may now be generous to the Manston because, in the intervening years since the Lydd Inquiry in 2011, there has been significant growth of low fares services from London Gatwick that will be very appealing to passengers from much of Kent. Furthermore, given how little difference there is in journey times between airports from some key districts, the attractiveness of larger airports is likely to be far higher than Manston Airport overall other than in the very local area.

5.15 The 60% level of market capture is also higher than we observe elsewhere in the UK when regional airports are in competition with their larger, more dominant, neighbours. Nonetheless, we have adopted a 60% local market capture from districts where Manston is the closest airport in order not to understate the potential demand that Manston might attract as an upper bound. We have assumed that for all other districts in Kent, 5% of passengers could be attracted to Manston. Overall, we have erred on the optimistic side in our projections of how much passenger traffic Manston could realistically attract and sustain over a 20 year period so as to indicate a maximum potential rather than a most likely forecast.

5.16 Following this approach shows that, in 2017, the total market available to the Airport would be around 1 million passengers, across all short haul and domestic routes (point to point). However, this demand is spread across a total of nearly 240 destinations (some of which were reached via hubs rather than on direct services). On the assumption that Manston Airport will neither serve all of these destinations nor have sufficient hub connectivity, notwithstanding the possibility of an Amsterdam service, to provide competitively convenient connections to all of these destinations, the figure of 1 million passengers represents an unachievable upper bound presently. The realistic potential market is substantially below this figure if the Airport was open for passenger services today.

5.17 Further analysis of this market potential for the Airport shows how quickly the demand potential falls below levels which would be considered viable for most airlines to be interested in operating a service. For an airline, the decision whether to serve an airport is not about the total level of demand in a catchment area but whether there is sufficient demand to a particular destination to make a service viable at a frequency of service sufficient to ensure that an individual route will be competitive with services from other airports and/or whether there is sufficient demand across a bundle of routes to support the basing of aircraft.

5.18 In **Table 5.3**, we set out the 30 destinations with the highest demand based on the applied market capture rates.

Table 5.3: Top 30 Market Potential in 2017	
Destination	**Potential Demand**
Alicante	38,000
Dublin	34,500
Tenerife	32,500
Palma	32,000
Glasgow	30,500
Rome (FCO)	25,500
Lanzarote	25,000
Malaga	24,500
Faro	24,500
Barcelona	23,500
Venice	22,500
Amsterdam	22,000*
Belfast (BFS)	21,500
Geneva	21,500
Mahon	19,000
Edinburgh	19,000
Malta	17,000
Oslo	14,500
Paphos	14,000
Fuerteventura	13,000
Ibiza	13,000
Lisbon	12,000
Milan (MXP)	12,000
Bucharest	12,000
Murcia	11,500
Heraklion	11,000
Las Palmas	11,000
Corfu	10,500
Madrid	10,000
Stockholm	10,000
Note: *Excludes onward connecting passengers. KLM typically expect around one third of the route to be point to point, with the remaining two thirds to be onward connecting meaning that, if it operated a service to Amsterdam, the route would carry more passengers when those connecting in Amsterdam are included.	
Source: CAA Survey 2017 and York Aviation	

5.19 On the basis that many airlines would, in our experience, be seeking at least 30,000 passengers for a summer-only service, only one destination would have achieved this level of potential demand in 2017, Malaga (Dublin would reach this level but is a year-round type destination which would likely require greater demand to be sustainable overall). This illustrates how dependent services from the Airport would be on stimulation (or destination switching[99]) to reach viable passenger levels to make them attractive to airlines.

York Aviation Passenger Forecast

5.20 In order to project forward the market, we have applied underlying demand growth rates from the DfT's 2017 UK Aviation Forecasts[100]. In the first instance, it is worth pointing out that applying growth of 2% per annum[101] to the total underlying potential market for Manston would suggest that by 2021[102], the total potential market from which Manston could draw passengers would still be less than 1.1 million passengers. On this basis, 662,000 passengers as forecast for Year 3 of RSP's Manston Airport demand forecasts[103] would amount to the Airport capturing over 60% of all available short haul demand within its reasonable catchment area based on our assumed market capture rates set out above in the first year of passenger service operations. This is simply not credible given how few of the 240 routes are likely to reach a viability threshold sufficient for an airline to commence operations in the first year.

5.21 We have developed more realistic passenger forecasts using a market-led semi-bottom-up approach which takes into account the scale of the market at route level and overlays the bottom-up likely provision of airline capacity to meet this. This is typical of approach to demand forecasting for regional airports that we undertake for numerous airport operators and investors. However, as pointed out above, the market capture assumptions used to assess the total potential market available to Manston err on the optimistic side such that the forecast represents more of an upper bound of plausibility.

5.22 Our forecasts are derived through the following steps:

- identifying the underlying demand for all routes from the catchment area (Kent);
- determining the market capture which could be achieved if services were offered from Manston Airport and applying these to the above;
- applying stimulation to the underlying demand at a route level to reflect stimulation of the market through a new route and as a proxy for destination switching;
- growing the route level demand forward by appropriate market growth rates (usually derived from the DfT UK Aviation Forecasts);
- determining the likely airline type[104], aircraft type/size and frequency to operate each route. Relevant passenger load factors are also applied at this stage based on industry norms;

[99] Passengers choosing where to fly based on the services available rather than their underlying market preference.
[100] UK Aviation Forecasts, Department for Transport, October 2017.
[101] the DfT average growth rate for short haul and domestic passengers from 2016 to 2030.
[102] Indicated as Year 3 in the RSP Planning Statement, para 3.105.
[103] RSP Azimuth Report, Vol III
[104] Low cost, full service etc.

- ✈ growing airline frequency, capacity and load factor as underlying demand grows.

5.23 The first two steps are as previously explained, with the application of 60% market share for districts which are closer to Manston Airport than others and 5% from all others. As previously identified, we believe that the 60% may be generous for a number of reasons.

5.24 In making allowance for some stimulation of the local market associated with the introduction of new services at Manston, we have been cautious for a number of reasons, in part explained previously, but also because much of the stimulation is likely to be effectively destination switching by local passengers choosing to fly from Manston rather than elsewhere rather than pure stimulation of the underlying market[105]. Taken in the round, this does not increase the overall pool of passengers from which the Airport can draw but may result in individual routes becoming viable to the airlines at an earlier date but slowing the introduction of other routes. Typically, in our experience, the level of market stimulation seen at the individual route level can be in the order of 10-40% depending on the airline and route[106]. In order to make routes financially viable, it is likely that airlines will seek to serve well established core destinations and these will be the hardest to stimulate given the sheer level of frequency already offered from competing airports. For this reason, we have adopted a 20% market stimulation rate to reflect the impact of new passenger services at Manston on individual destination markets, which may, in practice, still be too high given the likely route structure focussed inevitably on mature markets already well served. Again, we have erred on the optimistic side so as not to understate the potential.

5.25 Our growth rates are based on the DfT growth rates from 2017 and applied to the latest 2017 CAA Survey data on the scale of the local market. No further adjustments have been made to these to account for Brexit, though clearly there may be circumstances in which the growth rates are supressed by more negative economic outcomes from the Brexit process. This demand suppression would equally apply to any projections of cargo tonnage growth. The growth rates are shown in **Table 5.4** and have been used widely by ourselves in projecting demand for other clients in the UK. These are lower than those used by Azimuth of 4%, partly reflecting a proper interpretation of annual passenger growth rates (see **Section 3**) but also because they are applied to the underlying passenger demand, not the level of growth which could be seen at the individual airport level. The growth at an individual airport could be greater in any one year as new services are launched and step changes in passenger levels from the previous year are achieved. This is taken into account in our overall analysis of the potential for Manston.

[105] High levels of market stimulation were observed with the rapid growth of low fare services in the period 2002-2008 but there is significantly less scope for continued stimulation of the underlying market for air travel through further air fare reductions.
[106] This can be much higher for a limited number of routes, but these levels tend to be for first forays into new markets from much bigger airports

Table 5.4: Applied Annual Market Growth Rates		
Year	Domestic	International Short Haul
2018	1.2%	2.2%
2019	1.2%	2.2%
2020	1.2%	2.2%
2021	1.5%	2.0%
2022	1.5%	2.0%
2023	1.5%	2.0%
2024	1.5%	2.0%
2025	1.5%	2.0%
2026	1.5%	2.0%
2027	1.5%	2.0%
2028	1.5%	2.0%
2029	1.5%	2.0%
2030	1.5%	2.0%
2031	1.2%	1.8%
2032	1.2%	1.8%
2033	1.2%	1.8%
2034	1.2%	1.8%
2035	1.2%	1.8%
2036	1.2%	1.8%
2037	1.2%	1.8%
2038	1.2%	1.8%
2039	1.2%	1.8%
2040	1.2%	1.8%
2018-2040 Average	1.4%	2.0%
Source: Department for Transport		

5.26 Projecting forward the stimulated routes on this basis, we have been able to determine routes which may over time be viable for an airline to from Manston Airport. Whether they would constitute a viable operation for the Airport, particularly given the cost of building a new passenger terminal is debatable and something we consider further in **Section 7**.

5.27 We have assumed that routes would be started when stimulated demand reaches 30,000 passengers per annum. This mainly covers leisure routes, though would also cover Amsterdam and Dublin initially notwithstanding concerns that this passenger volume may not be sufficient for year round services at a reasonable frequency of service, along with Glasgow and Edinburgh over the longer term. The choice of 30,000 passengers per annum equates broadly to:

- 3 flights per week for a 30-week summer period by a 189-seat Boeing-737-800 aircraft;
- 2 flights per week, year round for a 189-seat Boeing-737-800 aircraft;
- 5 flights per week, year round by a 78-seat Dash-8-Q400 or Embraer E175 aircraft.

It should be noted that at these levels of frequency, the 60% market capture share is very optimistic given the level of comparative frequency from neighbouring airports.

5.28 For the Amsterdam route, we have assumed that KLM would potentially return to this route and, therefore, would bring benefits of hub connectivity which would increase demand for the route. We have assumed a ratio of one third point-to-point demand, and two-thirds onward connecting. However, as we have noted in **Section 3**, RSP's detailed fleet forecasts assume the route would be operated by Fokker F70 aircraft, an aircraft type now fully retired by KLM. Given the opportunity costs are higher with newer aircraft, such as the Embraer E175, than for a fully depreciated older F70 aircraft, it is not certain that operating a more marginal route to Manston would be a priority over other route opportunities with a newer more expensive aircraft.

5.29 Overall, we have assumed the following as a basis for assessing what might actually be operated:

- Ryanair would operate the bulk of services to leisure destinations along with city points of Dublin and Belfast (both at low frequency). It would use 189-seat aircraft with a starting load factor of 90% in the first year of operation, growing by 0.5% compound until a load factor limit of 93% is reached. However, there must be considerable doubt over this in the short term given recent statements by Ryanair about reducing the number of its bases due to fuel increases and lower fares realised in the market[107];
- KLM would operate the Amsterdam route with an 88-seat Embraer E175. Load factors are assumed to start at 80% and grow by 0.5% compound per annum until a load factor limit of 88% is reached. These load factors are higher than Azimuth assume but reflect the levels that the service will need to achieve long term for the airline to commit the aircraft resource to the services. This may, hence, overstate the early year forecasts;
- Flybe would operate to Glasgow and Edinburgh[108], although would not launch these routes until both are viable so as to increase market presence in Kent. Routes would be operated with Dash-8-Q400 aircraft with 78-seats and have a static load factor of 75% throughout. Due to the timing of the Edinburgh route reaching viable demand levels, this means these routes are not launched until the end of the forecast period.

5.30 **Table 5.5** presents our forecasts by route at 5-yearly intervals (plus 2039) and indicates the assumed airline and frequencies.

[107] http://www.travelweekly.co.uk/articles/322988/oleary-extends-ryanair-contract-despite-plunge-into-red.

[108] It should be noted that there is some short term doubt as to whether Flybe will continue in operation and, assuming it does, it is not clear that the prospective new owners flying under a Virgin Atlantic brand would be willing to start services at a small regional airport given the stated intention to focus on hub connections at Heathrow and Manchester, as well as serving Southend as part of the tie up with Stobart Air. There would be few alternative airlines suitable to commence domestic flights of this nature.

Table 5.5: Route Level Forecasts for Selected Years							
Destination	Airline	2021	2026	2031	2036	2040	Notes
Alicante	Ryanair	41,000	53,000	54,000	54,000	71,000	Starts 2-weekly year-round, increases over time
Dublin	Ryanair	35,000	36,000	54,000	54,000	54,000	Starts 2-weekly year-round, increases over time
Palma	Ryanair	41,000	42,000	42,000	54,000	54,000	Starts 2-weekly year-round, increases over time
Tenerife (TFS)	Ryanair	35,000	36,000	36,000	54,000	54,000	Starts 2-weekly year-round, increases over time
Glasgow	Flybe	0	0	0	0	43,000	Starts as daily service year-round
Rome (FCO)	Ryanair	20,000	31,000	32,000	36,000	36,000	Starts 2-weekly summer only, increases over time
Lanzarote	Ryanair	33,000	36,000	36,000	36,000	36,000	2-weekly throughout
Malaga	Ryanair	20,000	35,000	36,000	36,000	36,000	Starts 2-weekly summer only, increases to year-round
Barcelona	Ryanair	31,000	31,000	32,000	41,000	42,000	Starts 2-weekly summer only, increases over time
Faro	Ryanair	30,000	31,000	36,000	36,000	36,000	Starts 3-weekly summer only, increases to year-round
Venice	Ryanair	0	21,000	21,000	21,000	32,000	2-weekly summer only, increases over time
Amsterdam*	KLM	0	96,000	105,000	108,000	111,000	2-daily throughout.
Belfast (BFS)	Ryanair	0	0	30,000	31,000	32,000	2-weekly throughout
Geneva	Winter Charter	0	1,000	2,000	2,000	2,000	Starts 8 flights per winter, increases over time
Mahon	Ryanair	0	0	30,000	32,000	32,000	3-weekly summer only
Edinburgh	Flybe	0	0	0	0	30,000	5-weekly
Malta	Ryanair	0	0	0	0	32,000	3-weekly summer only
	Total	**286,000**	**449,000**	**546,000**	**595,000**	**733,000**	
Note: *Includes onward connecting passengers							
Source: York Aviation							

5.31 These passenger projections are based on the stimulated market size grown forward route by route with airline capacity increases only assumed once the underlying demand grows to a level to sustain higher frequencies. Over the forecast period, no additional routes would be expected to reach the minimum threshold of 30,000 passengers sufficient to be included in the forecast.

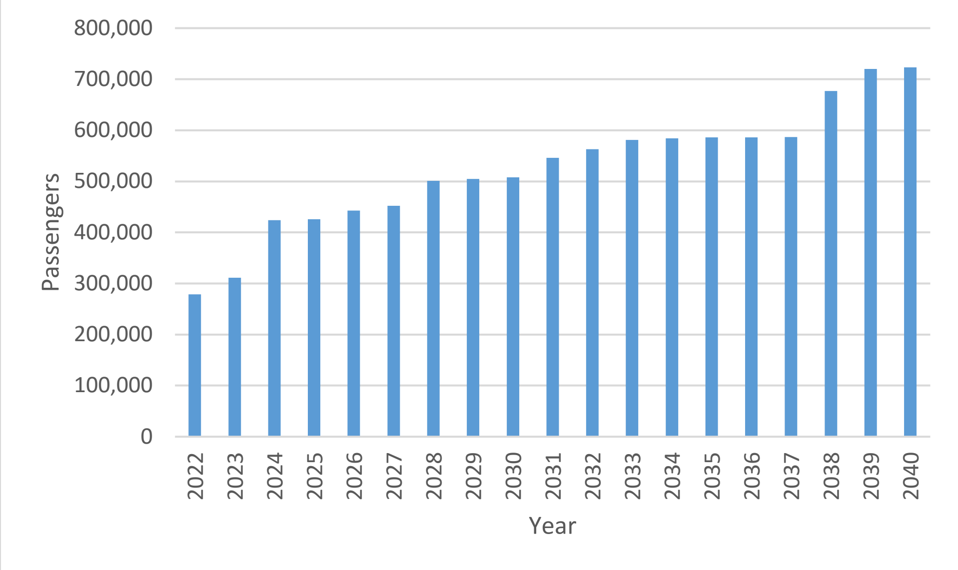
5.32 Crucially, the projected number of viable routes for the airlines and the level of activity may be insufficient to initially sustain any based aircraft by a low fares carrier (such as Ryanair) and, even in the longer term, the demand would likely only support 1 or 2 based aircraft for the summer period only. This contrasts with Azimuth's assertion that they would expect 2 based aircraft from the outset growing over time to 3. Given the nature of the underlying market, we believe this would be unsustainable which would quickly become obvious to any airline. Furthermore, for the reasons identified above, market conditions in the low cost airline sector may rule out the establishment of additional new bases in the short term unless there is a very strong local market, which is not the case at Manston.

5.33 We have not separately included outbound charter flights within the forecasts as leisure demand is already accounted for in our underlying assessment of the market so these flights would not be additional to the assessment above. Some of the routes we have identified as viable on a seasonal basis could be operated by charter airlines rather than a low fares airline; there is increasingly substitutability between the two airline types in short haul markets.

5.34 We have also not directly created a forecast for ad-hoc inbound services associated with the cruise industry. We understand the nature of these and are familiar with the historic aim of Manston Airport to attract more of these flights. It is possible that this sort of service might be attracted given the proximity to Dover but it is difficult to make a precise estimate. We note that the aircraft type assumed by Azimuth for such flights (the Boeing B757-300) has limited range and would not be able to serve Florida as indicated in the ES (Table 3.3). In any event, this aircraft is nearing the end of its operational life and any replacement aircraft is likely to be larger and with different environmental impacts. The estimate of 30,000 passengers, as shown by Azimuth, is significant and probably at the upper end of the range. Any such passengers would be additional to the forecast shown in **Figure 5.1** below, which illustrates our core passenger forecast driven by existing local demand from residents and inbound visitors for all years from 2021 to 2039.

5.35 In overall terms, our passenger forecasts suggest that by Year 20, the Airport might, as an upper bound, be able to attract around 750,000 passengers per annum but the build up to these levels of passenger throughput would be significantly slower than indicated in the RSP Application Documents. Whilst we have updated our assessment of expected levels of passenger demand to the latest full year CAA Survey data for 2017, our overall assessment of a realistic long term passenger forecast for Manston remains at around half of that suggested without supporting evidence, by Azimuth for RSP, as indicated at para. 12 of our November 2017 Report. The maximum forecast for the first year of passenger operations, Year 2, is no more than 280,000 passengers, even assuming any airline could be persuaded to commence operations at all.

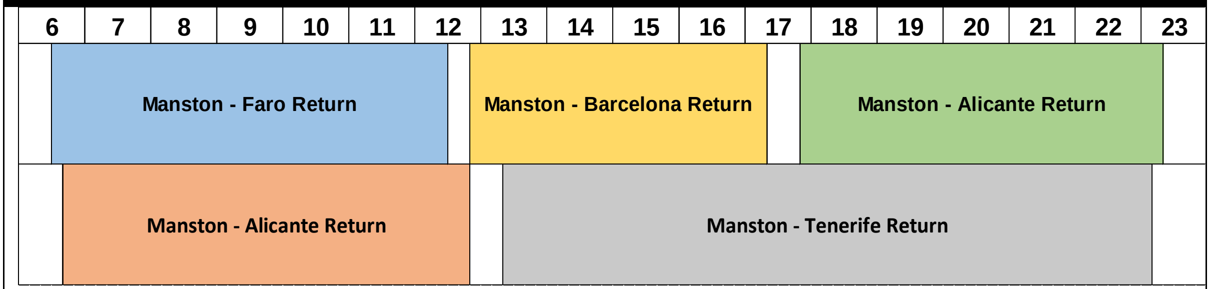
Figure 5.1: Market Based Passenger Forecasts



Source: York Aviation

5.36 Whilst the above assessment represents the potential scale of potential passenger throughput that Manston might attract if it could attract a low cost airline (LCC) to base a number of aircraft at the Airport, this is rendered unlikely given the proposed night movement restrictions in period 23.00-07.00. RSP's stated position that there would be no night flights by passenger aircraft would make it highly unlikely that an LCC would base an aircraft at Manston due to the restricted operating day over and above the market related factors highlighted above. In order to make low cost/low fare operations viable, a low cost airline would expect to be able to make their first departure before 07.00 and/or last arrival after 23.00. This is illustrated by typical aircraft rotation patterns for routes that might operate from Manston in **Figure 5.2** below, showing clearly that in order to achieve 2 or 3 rotations a day (dependent on destination) an airline would likely need to depart before 07.00 and/or arrive after 23.00. By way of illustration, Ryanair's new base at Southend has 48% of the first departures departing before 07.00 and 29% of the last arrivals arriving after 23.00. We would expect a similar pattern at Manston. However, RSP's ES suggests that there would no night movements passenger aircraft – none have been assessed for environmental impact purposes. In the alternative, night operations by passenger aircraft would crowd out freighter movements, which would further restrict the potential for viable freight operations.

Figure 5.2: Typical Low Cost Airline Aircraft Rotation Patterns



Source: York Aviation

5.37 Finally, we would note that these forecasts, whilst optimistic for a number of reasons previously explained, would only be deliverable if an airline could be persuaded to operate the services. The market is not so large, nor the competitive options sufficiently limited, that the Airport would stand out as an underserved market in its own right. Therefore, the only way in which airlines could be persuaded to operate would likely be with very attractive terms. Typically, such terms may involve:

- £0 income per passenger for one or more years from the start of services. This may be followed by gradual step changes;
- A need to underwrite new services until the routes become established, which can lead to an airport having to pay operators for a number of years;
- In addition to both of the above the airport may be expected to provide marketing support and offer accommodation and other services, such as handling, free of charge to the airline.

5.38 Terms such as these are not limited to low fares airlines and indeed major carriers such as KLM and regional airlines such as Flybe are increasingly looking for deals of this nature in the UK. If Manston were to seek to realise £2.50 per passenger as suggested in George Yerrall's 2017 analysis[109], it is more likely that no airline would be willing to take the risk of serving an airport with no track record of viable operations for the airlines or the airport as is the case at Manston. Without substantial incentives, the rational approach by the airlines is instead, to focus on continued consolidation of all regional passengers onto services from the London airports where economies of scale will allow better returns. This has implications for the revenue that could be earned from passenger services which will impact on the potential viability of the development and operation of Manston Airport, as we set out further in **Section 7**.

5.39 It is important to note that our projections are highly optimistic as the maximum passenger throughput previously handled by the Airport was 200,000 in 2005 when EUJet was the principal airline operator. This airline ceased trading as its operations were fundamentally unviable. Subsequent operations by Flybe also failed as they were not viable for the airline. The KLM service to Amsterdam which operated prior to the Airport's closure in 2014 was subject to marketing support from the County Council amounting to at least £100,000 paid via the Airport[110]. In other words, there is no track record of sustainable passenger operations for the airlines at Manston without some form of public sector support. We would expect the same to be true in future if airlines are to be attracted to commence operations in the first place and deliver the longer term passenger potential that we have assessed.

Conclusions

5.40 We have set out in full our market assessment for passenger services at Manston, in part to provide the Examining Authority with an example of the type of market analysis that it would be normal practice to present in support of a planning or development consent application. The RSP case contains no such systematic presentation of the market nor reasoned analysis of how airlines are likely to respond to the market.

5.41 Proper analysis of the market confirms that Manston is, at best, only likely to attract around half of the number of passengers claimed, without analysis, by Azimuth Associates over the 20 year period of the projections. This has inevitable implications for both the scale of facilities required and the viability of the airport operation as a whole.

5.42 It is highly likely that attracting such services will require support from the public sector as well as highly discounted airport charges. Past experience would suggest that there would remain a high risk of the airlines failing to sustain the routes on a viable basis.

[109] George Yerrall Proof of Evidence Appendix 3 submitted to the Planning Inquiry into the Application by Lothian Shelf (718) Limited relating to Buildings 1, 2, 3 and 4 at Manston Airport. (2017), Table 1.
[110] http://www.airportwatch.org.uk/2013/03/farnborough-turns-away-private-flyers/.

6 JUSTIFICATION FOR THE FACILITIES PROPOSED

The RSP Application Documents fail to set out any material that justifies the extent of facilities proposed by reference to their own 'forecasts' both for the core airport infrastructure and any claimed associated development on the Northern Grass.

In this section, we have considered the infrastructure that would be required if RSP/Azimuth's air freight forecasts were correct to assist the Examining Authority. This is without prejudice to the evidence that strongly suggests that they are unattainable. We have set out the basis for estimating the required number of stands and cargo terminal infrastructure to enable RSP's forecasts to be accommodated based on the times that airlines would wish to fly, including the required night operations.

Based on proper analysis of airline operating patterns, the maximum number of stands that would be required, even allowing a buffer for resilience, would be 10. Based on global benchmarks, the scale of cargo sheds could also be substantially reduced, probably to around 1/3 of the scale indicated.

As far as the Northern Grass is concerned, the list of airport related uses provided in response to questions from the Examining Authority is no more than a list of uses that may be required at an airport without any specific reference to whether they are actually needed at Manston or, indeed, the extent to which these uses would need to be accommodated in an airside location in any event.

Based on East Midlands Airport (EMA) and its Pegasus Business Park, despite the major freight hub activity, only around 13,000m^2 of accommodation within the business park is airport related other than hotels. The remainder of the occupiers are non-airport related and therefore not relevant to RSP's asserted used for the Northern Grass. It is simply not credible that Manston could sustain more of these airport related activities than the UK's main dedicated freighter hub at EMA.

6.1 In this section, we concentrate principally on the infrastructure required to handle RSP's projected air freight forecasts and the extent to which the scale of the proposed Master Plan has been justified. This is important in the context of the DCO and justification for the acquisition of land. Whilst we present here an assessment of the infrastructure required if RSP/Azimuth's 'forecasts' were correct, this is without prejudice the clear evidenced view within the remainder of this report that they are not. We have based our assessment here on the more detailed information set out at Appendix 3.3 of the ES, notwithstanding the discrepancies between this information and that set out in the Azimuth Reports and elsewhere as highlighted in **Section 3**.

6.2 We consider separately the extent to which the core aviation infrastructure has been justified and then the use of the 'Northern Grass'.

6.3 A further consideration is the capability of the infrastructure proposed in the RSP Master Plan as this capability is material to whether the impacts of the proposed development have been correctly assessed.

Infrastructure Required to accommodate RSP's Aviation Forecasts

6.4 The Master Plan presented by RSP for the Manston Airport site is shown at **Figure 6.1**. It makes use of the full length of the runway and provides a full length parallel taxiway. The western side of the site is dedicated to freight handling activity and has 19 full Code E aircraft stands[111] for cargo flights and 4 large cargo sheds totalling 65.500m^2 for the processing of freight supported by truck loading and parking areas. The eastern side of the site shows as a new passenger terminal and apron along with a MRO hangar and apron. The existing private aircraft handling facility (FBO) and fire station site are retained. We understand that four phases of development are planned[112] as illustrated in RSP's Design and Access Statement. Notwithstanding our view as to the significantly lower potential demand that might realistically be attracted to a re-opened Manston Airport, we focus here on the overall scale of facilities required at Year 20 based on RSP's forecasts for that year and whether there is an evidenced justification for this scale of facilities in the highly unlikely event that these 'forecasts' were deliverable.

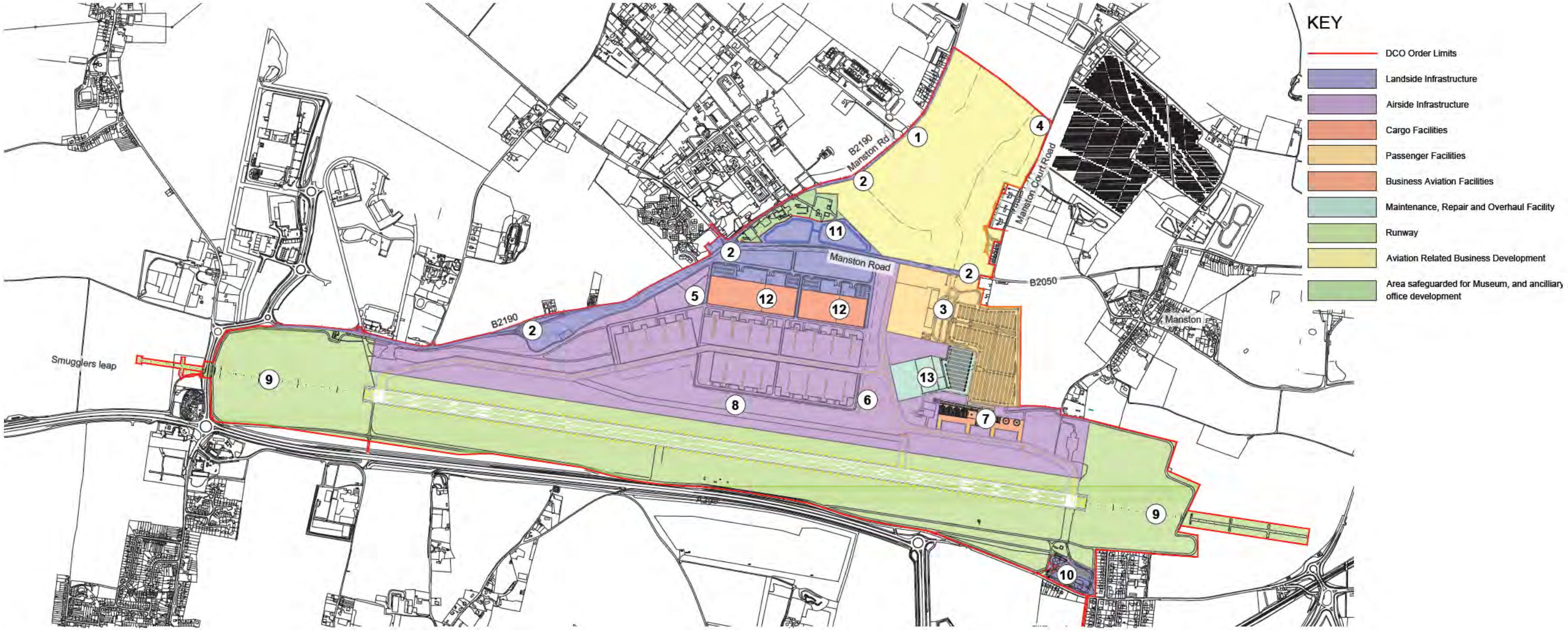
6.5 RSP projects that Manston will need to be able to handle 17,170 cargo related ATMs and that 1.4 mppa[113] will be handled by Year 20. Given that this level of throughput forms the basis of the Environmental Assessment, prima facie it would be reasonable to assume that the infrastructure shown in the Master Plan should reflect that required to handle this level of aircraft movement and passenger activity.

6.6 We note that the RSP Design and Access Statement (sections 3.01, 3.02) states that the requirement of 19 Code E stands for cargo aircraft was a given input assumption in the Client Brief, along with the requirement for 65,500m^2 of cargo facilities[114]. The Need Case for an airport development would normally be expected to set out clearly and transparently how these requirements have been derived from the demand forecasts. We would have expected the Application Documents to contain a specific justification of the scale of airside facilities proposed by way of, as a minimum:

- an indicative busy day schedule of aircraft movement by type time of day;
- a quantification of the number of aircraft stands required to handle those aircraft movements by reference to the schedule;
- the volume of cargo expected each day, the proportion expected to use the cargo facilities on-site and off-site[115], the time such cargo is expected to remain in the warehousing on-site, conversion of the volumes and dwell time to the storage space required.
- similarly for the passenger terminal requirements and number of stands required.

[111] It is unclear how the Code F aircraft shown within the fleet mix at Appendix 3.3 of RSP's ES will be accommodated.
[112] Azimuth Reports Vol III, para 5.1.2.
[113] Million passengers per annum.
[114] We note also that the DAS states that the brief was to double the size of passenger terminal facilities and add 1 passenger aircraft stand. As discussed in Section 3 of this Report, the justification for the scale of passenger terminal facilities given in the Azimuth Reports Vol III is nonsensical.
[115] Much of the cargo previously using Manston was trucked directly off-site from the aircraft side. This is common practice for some types of cargo, particularly where the integrator or forwarder has established consolidation and breakdown facilities located more centrally to the market.

Figure 6.1: RSP Masterplan – Proposed Site Layout



Source: RSP Design and Access Statement

6.7 Such information is missing from all of the key documents where it would normally be found in an airport development application, including the Planning Statement, the ES Scheme Description (Chapter 3), the Design and Access Statement and the Need Case (Azimuth Reports). As we pointed out in **Section 3**, to the extent that there is are any parameters given for the scale of facilities required in relation to the passenger terminal, these are fundamentally flawed.

6.8 Absent such a coherent explanation of how the forecasts translate into a physical requirement for infrastructure, leaving aside the validity of the forecasts themselves, the need for the facilities cannot be stated to have been justified. This is particularly relevant in the context of the required CPO which requires a compelling case to be made for the precise area of land that it is proposed be acquired.

6.9 To assist the Examining Authority, we now set out some of the key considerations in terms of the scale of facilities required relative to what is proposed in the RSP Master Plan.

Stand Requirements

6.10 As we have noted earlier, not all of the aircraft that RSP project to use Manston are Code E aircraft. Leaving aside the discrepancies between the reported aircraft mix in various parts of the Application Documents that we have highlighted in **Section 3**, 40% of aircraft movements are projected to be by smaller Code C aircraft, within which many are very small turbo-prop aircraft. It is normal practice to accommodate 2 Code C aircraft side by side within the area of 1 Code E stand. Hence, the total number of Code E stands required does not equate to the total number of aircraft requiring a stand at the same time. Furthermore, as Code C aircraft are shorter in length than Code E aircraft and, to the extent that all of the stands would not be required to accommodate Code E aircraft based on the proposed fleet mix, the length of a number of the stands could be materially shortened so reducing the overall apron area required[116]. Adoption of such principles would be consistent with ensuring efficient use of space and not over-designing the infrastructure. This would reduce the area of apron actually required to accommodate forecast demand.

Efficient Use of Stands

6.11 Taking into account that a Code E stand can accommodate more than 1 of the smaller aircraft types simultaneously and given the high proportion of such aircraft in the overall fleet mix, it is possible to assess how many aircraft a day each stand would be required to accommodate on RSP's 'forecasts' by using the phased provision of stands set out in the Design and Access Statement and the aircraft movement forecasts set out at Appendix 3.3 of the ES.

[116] The depth of a Code C stand is less than a Code E stand so the use of a Code E stand solely for 2 smaller aircraft does not use all of the stand depth as Code C aircraft are shorter nose to tail, leaving wasted space.

6.12 Using the Busy Day Multipliers set out in Appendix 3.3 to the ES, which show the extent to which the number of movements on a busy day is expected to be compared to an average day in the year, and assuming that freighter operations are typically in weekdays, i.e. only 250 days in a year, the number of peak/busy day aircraft movements by freighter aircraft that RSP claim would use Manston can be estimated. This starts at 24 (23.55) aircraft movements over a 24 hour day in Year 1, increasing to 73 (72.82) aircraft movements a day in Year 20. The number of aircraft requiring to park on a stand would be half the number of movements[117] and this can be converted to a Code E equivalent number of aircraft taking into account the projected fleet mix. Based on the 8 stands to be provided at Phase 1 rising to 19 stands by Year 20, the number of Code E equivalent aircraft that would be expected, on RSP's projections, to use each stand on a busy day would be 1.24 in Year 1 rising to 1.53 in Year 20. The number would be lower on an average day and even lower on an off-peak day. In other words, RSP are providing sufficient stand capacity for over 60% of all daily aircraft movements to be accommodated on stand at the same time. This represents a massively inefficient solution.

6.13 Based on a rational pattern of freighter aircraft operations, as set out at para. 3.44 above, we have set out an indicative stand utilisation chart based on the operating times and stand occupancy times for similar types of aircraft and types of operation (integrator, mail, general freight etc) based on equivalent operations at East Midlands. This is set out at **Appendix E**. This analysis shows an average stand occupancy time of around 3.5 hours within 24 hour period but this is affected by the assumption that, as at EMA, there may some aircraft that stay for longer than 8 hours in order to fit with EMA's integrator secondary hub role for DHL. We have assumed that there could be some similar operations at Manston in the unlikely event that it developed a hub role in order to be conservative in our assessment.

6.14 However, in practice, our analysis shows that the average stand occupancy time for freighter aircraft excluding these movements, is around 2¼ hours, consistent with the assumption of 2.5 hours set out at para. 4.5 of our November 2017 Report and as adopted by RSP[118]. On a conservative basis, our analysis shows no more than 9 Code E equivalent stands would be required to accommodate RSP's forecasts based on realistic patterns of airline operation. If the long stopping aircraft were not in the mix at Manston, as it is not realistically likely to become a secondary hub for an integrator, then it is probable that no more than 6 Code E equivalent stands would be required to meet the airline requirements.

6.15 As we have made clear in **Section 3** above, applying the proposed night movement quota would almost certainly result in a large part of RSP's freighter movement 'forecast' not operating due the effect of the restrictions on the commercial viability of the operation to the airlines, leaving aside the broader question of market viability overall. If, hypothetically, the airlines were willing to operate from Manston at commercially sub-optimal times, this would require extensive changes to the operating pattern but would still be containable within 6 to 9 Code E equivalent stands as a maximum.

6.16 RSP seek to justify the excessive provision of infrastructure by referring to the need for resilience:

[117] A movement comprising the arrival or departure of an aircraft from the runway.
[118] RSP NSIP Justification Statement, para. 22.

"The reason that the physical capability of the Proposed Development is much higher than the expected operational level is twofold. First, significant 'headroom' is required to be able to withstand operational issues that regularly arise and so is for reasons of resilience."[119]

6.17 In the first instance, allowance is typically made for a 'buffer' of time between planned operation of aircraft off of and on to a stand. This allowance is evident in the stand allocation chart at **Appendix E**[120]. This provides resilience for a normal level of operational delay. Over and above that it is normal practice in planning airport facilities to allow 10% additional stands for unforeseen events, e.g. stand outage, aircraft technical delays etc. In the case of Manston, this would require no more than 1 additional resilience stand to be available. Hence, at the very maximum, the number of stands required for 17,170 movements would be no more than 10. Furthermore, the requirement for these stands assumes that no use could be made of any of the passenger apron for cargo operations. Given the high proportion of smaller aircraft types in the fleet mix, this would also be eminently possible so reducing the required number of cargo aircraft stands further.

6.18 RSP appear to have assumed more than 100% over provision with 19 stands compared to the maximum of 9 stands operationally required. As explained earlier, this is a maximum stand requirement and, assuming that Manston could not fulfil a secondary hub role for an integrator, the required number of stands would be materially less.

Cargo Terminal Requirements

6.19 In association with proposed the 19 Code E cargo aircraft stands, the RSP Design and Access Statement Section 1.05 also states that the Brief required the provision of 65,500m^2 of cargo facilities, which is shown on the Master Plan to be 4 large cargo sheds in standard portal frame structures. Again, no justification is provided for this requirement and no explicit linkage is made to the forecasts of tonnage requiring to be processed through the facilities.

6.20 RSP themselves make reference[121], in their Masterplan Design Principles, to the objective that their development:

"'Sustains the improvements to operational efficiency for as many years as is practicable"

This appears to be something of an oxymoron given the above assessment of the efficiency with which the proposed stands would be utilised.

[119] Ibid, para. 29.
[120] We have allowed 30 mins to be cautious for freighter operations. For passenger operations a buffer of 15-20 mins would be more usual.
[121] RSP Planning Statement, para 4.14.

6.21 In the light of the claim about efficiency, we would have expected to see a calculation of the floor area of cargo facilities set out by reference to industry standards. The industry standards are set out in the IATA ADRM[122] explains that a cargo facilities size is a function of its proposed processing capability which it sets out under three categories of operation; Low Automation (mostly manual), Automated (average) and Highly Automated. The processing capability for each category is set by a tonnes per m^2 multiplier ranging from 5 to 17. It is worth noting however that some facilities across the world far exceed the top end of this range with facilities that process possibly more than 30 tonnes of cargo per m^2 of facility.

6.22 Given that Manston is intended by RSP to be a state of the art cargo handling facility, it is reasonable to assume that the tonnage per m^2 multiplier should be towards the top end of the range compared to older facilities which may not have been designed to modern standards. However, the multiplier used by RSP to size the cargo facilities appears to be of the order of 5.2 tonnes per m^2, i.e. at the bottom of the range when a more reasonable multiplier for a modern facility would be expected to be of the order of 13.5 tonnes per m^2. The cargo sheds at Manston, as with number of stands to be provided, are substantially oversized relative to the required throughput, by an order of 3 times at least.

6.23 It would appear that the scale of facilities proposed by RSP may have been based, to some extent on East Midlands Airport (EMA), which has a combined cargo shed footprint of approximately 80,000 m^2 and processed a total of over 375,000 tonnes of air cargo in 2018 at a usage multiplier of 4.7 tonnes per m^2. However, this is not a valid comparison for two principal reasons:

- Cargo handling facilities at EMA have been recently extended and are unlikely, therefore, to be operating at capacity at current tonnage levels;
- EMA operates as a hub for domestic road freight in addition to air freight given its position in the centre of the country and proximity to the M1.

For example, the Design and Access Statement for DHL's application to expand its cargo hub terminal makes clear that the primary reason for this expansion was to handle more road freight[123]. Manston is simply in the wrong place for this type of operation and, in any event, extensive road freight operations have not been assessed as part of the Transport Assessment.

6.24 Moreover, the assessment assumes that all of the cargo using aircraft at Manston needs to be handled in on-site cargo sheds. This is unlikely to be the case. Previous Manston operations were based on much of the freight being taken from the aircraft side straight off-site for distribution without entering the on-site cargo sheds, despite these sheds being underused and with ample capacity to handle all of the freight using the Airport. Given the structure of the industry and dependence on consolidated distribution centres in easily accessible locations, we would expect this pattern to continue if Manston re-opened, meaning that Manston would, in practice, require sufficient space for only a proportion of the cargo flown through the Airport to use the sheds, with the remaining freight trucked off-site in bonded trucks to be customs cleared at consolidation or distribution centres elsewhere.

[122] IATA (International Air Transport Association) Airport Development Reference Manual (ADRM) Edition 10, 2017.

[123] https://plans.nwleics.gov.uk/publicaccess/files/2928B5D0A88323F668C0208F281F5AC5/pdf/15_00319_FULM-DESIGN___ACCESS_STATEMENT_PART_1-341251.pdf, page 22.

Overall Capability of the Infrastructure

6.25 As RSP has acknowledged[124], the capability of the infrastructure applied for is at least 83,220 freighter aircraft movements a year. At a projected usage of only 17,170 freighter aircraft movements a year, this is clearly a highly inefficient development. Whilst some discrepancy would be expected between the theoretical capability of airport infrastructure and the practically achievable capacity when actual airline requirements are taken into account, the scale of the discrepancy is far in excess of what would normally be expected.

6.26 In essence, RSP plan to use only 20% of the available aircraft movement slot capability (as defined by the number of stands) that they plan to provide at Manston. As we discuss in the next section, this low utilisation rate of available capacity is highly inefficient and will inevitably result in a lack of viability of the investment. Medium sized airports in the UK typically operate at around 45 to 50% of available slot capacity when the peaks and troughs of airline demand are taken into account. Generally, operations are considered effectively unconstrained, in terms of allowing airlines the ability to operate at times at or close to when they would prefer, up to around 60% utilisation of available capacity. Beyond 70-75% utilisation, an airport is typically considered congested. Gatwick operates at well over 80% of its current capacity and Heathrow at around 99%.

6.27 By any measure, the level of utilisation proposed for Manston is below what would be reasonably expected. At 50% utilisation of available capacity, Manston as planned by RSP could accommodate almost 45,000 freighter aircraft movements a year without undue constraint on the airlines' ability to operate at commercially desirable times, leaving aside the obvious night movement constraint discussed in **Section 3**. It is important to stress that this does not mean there would be a market or need for it to handle this level of movements for the reasons outlined elsewhere in this report. Nonetheless, in order to reasonably accommodate the demand levels asserted as the need for the development and requiring to be assessed in terms of the likely significant effects[125], i.e. 17,170, this would imply a requirement for infrastructure of no more than 40% of the scale of the overall development proposed on the basis of efficient usage of the infrastructure. Any development of facilities above this level could be deemed excessive relative to efficient use of infrastructure and land in the longer term even if the 'forecasts' were correct. To the extent that the 'forecasts' are overstated, the requirement for infrastructure would come down pro-rata.

6.28 Whilst our assessment of the required number of stands takes into account realistic operating patterns which, as is made clear in our November 2017 Report[126], is necessary to assess the capacity of the infrastructure, this is not directly comparable to the theoretical capability of the infrastructure as RSP themselves accept. It remains the case that there is latent capability in the existing airport infrastructure at Manston that would be sufficient to allow it to handle the number of aircraft movements put forward by RSP as required in Year 20 without the need for RSP's development.

[124] RSP 2.3 NSIP Justification, para. 23.

[125] Ibid, para. 26.

[126] York Aviation, November 2017, paras. 4.6 and 4.7.

Passenger Facilities

6.29 As we have already noted in Section 3, the basis upon which the passenger terminal and apron facilities have been planned is unclear given the obvious errors in the design parameters set out. The proposed passenger terminal is stated in the Design and Access Statement (DAS) to have a footprint of 2,200m^2 initially, increasing to 4,500m^2 as demand requires[127]. However, there is lack of clarity as to what is actually proposed as the DAS variously refers to different footprints for the terminal. Whilst Vol 1, para. 2.01 cites the size as being 2,400m^2, the DAS also refers to there being only an extension of the existing passenger facilities rather than a new terminal (para. 1.05). The scale of the facility has not been justified even if it was clear what is proposed.

Other Aviation Facilities

6.30 RSP also cite a requirement for the Master Plan to accommodate other uses, namely General Aviation, Aircraft Recycling, and Maintenance Repair and Overhaul (MRO). As with the core air freight and passenger projections, RSP provide no assessment of the market for such activities specifically at Manston nor any justification for the scale of facilities proposed. To the extent that these occupy a material part of the site proposed to be acquired through compulsory purchase, this represents a substantial omission. As we set out at para. 2.65 of our November 2017 Report, these are highly competitive markets in terms of the number of airports seeking to attract such activities. In terms of Business Aviation, Manston is too far from London to be a major player in this market. The third opportunity, the MRO sector, other than related directly to major airline operations at larger airports, is limited in the UK as is evidenced by the recent failure of Monarch Engineering. Aircraft recycling has also been slow to develop despite active interest and operations at airports such as Newquay and Durham Tees Valley. We see very limited scope for Manston to attract these activities to any material extent so as to justify facilities beyond those that already exist on the airfield.

Northern Grass

6.31 To the north of the site, on the 'Northern Grass', a general business park development is shown. The RSP Design and Access Statement (Vol 3) shows the Northern Grass area laid out as a fairly conventional business park with a mixture of B8 warehouse units and B1 office buildings, each with their own car parking areas associated. In total, 105,100m^2 of accommodation is proposed and the DAS shows all of this being built out by Phase 2 of the development (Years 2-4). These buildings are located entirely on the landside of the B2050 and so will be unsuitable for activities integrally linked with the direct operation of the Airport.

6.32 The only justification originally given for these facilities were general statements about providing for airport related businesses "critical" to running the Airport:

"The Northern Grass area will accommodate infrastructure critical to the running of the airport including airport related businesses which do not require an airside location."[128]

[127] RSP Design and Access Statement Vol 4, para 7.17.4.
[128] RSP Planning Statement, para 3.76.

and

"A Business Park consisting of B1 and B8 units accommodating airport related businesses"[129]

6.33 These statements provided no justification for the scale of development proposed and how this relates to the operation of the Airport. RSP's Statement of Reasons simply says that this area has *"sufficient space on the Northern Grass to accommodate airport - related businesses that can be seen occupying premises in and adjacent to the vast majority of UK and European airports"*. This provides no specific justification for why any such uses would seek a site adjacent to Manston nor why they would qualify as associated development.

6.34 A further list of potential uses was set out in Appendix to the updated NSIP Justification Statement (published on 25th January 2019):

- *"radar equipment and its accompanying safeguarding clearances (these also limit the building heights across the remainder of the Northern Grass),*
- *airport management offices offering visibility over the airfield, with associated marketing suites and secure storage for equipment and materials that do not require an airside location (i.e. inside the security fence),*
- *offices and crew facilities for airlines (passenger and cargo),*
- *offices and flight planning facilities for flight schools,*
- *catering operation for passenger and business aviation flights,*
- *covered secure and valet parking operations,*
- *rental car operators – overnight garage, cleaning and office facilities,*
- *garage and offices for airside public transport providers,*
- *airport taxi company garage, cleaning and office facilities,*
- *vehicle depots and storage facilities for air cargo handlers and associated logistics*
- *companies,*
- *specialist bonded warehouses and other facilities (e.g. stables and other animal handling and veterinary facilities) that do not need to be constrained by an airside location,*
- *offices and warehousing for storage associated with MRO and aircraft recycling (including parting out) operations,*
- *office and storage facilities for outsourced contractors providing services to the airport (e.g. – maintenance, security, operations) that do not need to be airside,*
- *project offices for construction companies working on the airport, and*
- *offsite offices for Border Force, Police.*

[129] Ibid, para. 3.76.

6.35 However, this list appears to comprise not of airport-related businesses needing a landside location but of a mixture of essential airport facilities which would need to be located within the zone to the south of the B2050, e.g. airline crew offices, offices for Border Force, flight briefing facilities and facilities, garages for airside transport given that vehicles will typically not be licensed for the public highway, and those which do not appear relevant to the proposed use of Manston, e.g. airport taxi garages, covered valet parking, catering for passenger and business aviation flights. There remains a complete absence of any justification for the totality of the development proposed in this landside area save that RSP has indicated that it *"will seek to provide to the Examining Authority further examples of this type of airport-related development from other UK airports and important cargo led airports in Europe and North America."*

6.36 Taking into account the projections for Manston upon which RSP seek to base their case, the most relevant comparator, in this regard, remains EMA in the UK. East Midlands Airport has an associated landside business park, Pegasus Business Park comprised of c.52,000m^2 of accommodation. However, of this, c.16,000m^2 is comprised of 3 hotels associated with 4.9 million passengers using the Airport in 2018. Of course, hotels do not form part of the proposed used for the Northern Grass at Manston and, in any event, there is ample local supply in Ramsgate and Margate, as well as the Holiday Inn Express at Minster adjacent to the Airport, for any usage associated with the significantly lower volume of passengers projected by RSP. Of the remaining 36,000m^2 at EMA's Pegasus Business Park, many of the premises are vacant or occupied by non-airport related tenants amounting to around 23,000m^2, based on an examination on Google Earth. The proximity to the M1 and a location in the centre of the three East Midlands cities makes the site attractive to a broader range of non-aviation related business seeking proximity to the motorway. This leaves around 13,000m^{2}of accommodation occupied by what would be deemed airport-related or ancillary uses on RSP's definition.

6.37 There can be no justification for the scale of development proposed for the Northern Grass relative to the scale of operation which RSP put forward for Manston. By way of a further example, the proposed New Century Park Business Park proposed for land adjacent to Luton Airport comprises just under 60,000m^2 of accommodation, including a hotel of 6,600m^2[130]. Of the remainder, 11,100m^2 are expected to be used for airport-related business, with the remainder for general warehousing and office use. This has to be seen within the context of Luton being an airport handling over 17 million passengers a year with 1,400 freighter aircraft movements and over 22,000 tonnes of freight annually with plans for further expansion.

Conclusions on Justification for the Scale of Facilities

6.38 Without prejudice to our view that demand to use Manston is not likely to be anything like 17,170 cargo aircraft movements a year, we consider that the land required to accommodate such a number of movements would be substantially less than shown on the RSP Master Plan. The RSP Application Documents fail to set out any evidence or calculations to justify the extent of facilities proposed by reference to their own 'forecasts' both for the core airport infrastructure and any claimed associated development on the Northern Grass.

130 https://planning.luton.gov.uk/onlineapplications/files/5562977400C860F9DD68F7F243FEB90B/pdf/17_02300_EIA-Planning_Statement_Addendum_Final_V2-769078.pdf, page 31.

6.39 To assist the Examining Authority, we have set out the basis for estimating the required number of stands and cargo terminal infrastructure to enable RSP's forecasts to be accommodated based on the times that airlines would wish to fly. This does, of course, confirm the extent to which there would be dependence on night flying. Based on proper analysis of airline operating patterns, the maximum number of stands that would be required, even allowing a buffer for resilience, would be 10. Based on global benchmarks, the scale of cargo sheds could also be substantially reduced. This represents a topside estimate of the infrastructure required to handle RSP's 'forecasts' so as to provide sufficient capacity at the times that airlines would wish to fly and fully taking into account the need for resilience. This is not the same as the theoretical capability of the infrastructure, nor comparable to the capability of the existing infrastructure at the Airport if it re-opened.

6.40 As far as the Northern Grass is concerned, the list of airport related uses provided in response to questions from the Examining Authority is no more than a list of uses that may be required at an airport without any specific reference to whether they are actually needed at Manston or, indeed, the extent to which these uses would need to be accommodated in an airside location in any event. We can see no justification for the inclusion of the 'Northern Grass' within the DCO as associated development as there will be little requirement for the relocation of freight forwarding activity from adjacent to the UK's main cargo hub at Heathrow or elsewhere to Manston and any requirement could be accommodated south of the B2050. The development on the Northern Grass site appears to be speculative commercial development which, based on the precedent at East Midlands Airport – the UK's principal airport for pure freighter operations – would be expected to be largely for non-aviation related uses and, therefore, not qualify as associated development.

7 IMPLICATIONS FOR VIABILITY AND FUNDING

In the absence of any assessment of the Business Case for the development within the RSP Application Documents, in this section we have undertaken an assessment of the potential viability to assist the Examining Authority to assess the likelihood of the development plan being implemented if consented.

Our analysis shows that the RSP proposals for Manston Airport are not commercially viable even based on their optimistic traffic 'forecasts'. Fundamentally, the analysis of potential viability strongly suggests that no rational private sector investor would fund the re-opening of Manston Airport on the basis proposed by RSP. The Airport was never previously a financially viable operation and we see no reason for this to be any different in future.

When properly analysed, there is little prospect of the operation generating sufficient revenues to cover the costs for the investors nor deliver any returns on the investment for the foreseeable future. In the absence of evidence to the contrary, it is our judgement that investment would not be forthcoming to the extent necessary to even secure the re-opening of the Airport.

The upfront costs of re-opening the Airport, on the basis of a minimum initial capital spend of £145m for Phases 1 and 2, are such that EBITDA losses and a cash flow negative position are inevitable even with this lower magnitude of expenditure, i.e. replicating the position that existed historically and which, ultimately led to the Airport's closure.

Clearly, to the extent that traffic growth does not materialise as RSP envisage following the initial investment, it is clear that the financial position of the Airport would be materially worse.

Introduction

7.1 RSP's Funding Statement provides no information regarding the viability of the operation of the Airport on the scale proposed, nor sufficient information for an investor to consider whether it would be willing to contribute towards the funding of the investment. The only statement regarding the viability of the project is at para. 20 of the Funding Statement relating to capital costs estimates at para. 15:

"RiverOak has taken expert advice from RPS on the cost estimate for the project that is the subject of the application. The initial phase of the project, which will bring the airport back into use, is estimated to cost about £100 million. The cost of developing the remaining phases of the project over a 15-year period is estimated to be an additional £200 million, i.e. a total of £300 million. This cost estimate includes the cost of implementing the project, the cost of construction and the funding of the acquisition of the necessary rights over land, including any interference with rights"

"RiverOak has assessed the commercial viability of the project in the light of this information and is confident that the project will be commercially viable and will therefore be fully funded if development consent is granted"

7.2 As Altitude Aviation Advisory set out in their Addendum Report[131], this falls far short of the information that investors or lenders would require in order to consider whether or not to provide finance for the re-opening of the Airport. A full Business Plan and Business Case, accompanied by detailed financial modelling and sensitivity testing would be required. The information that would normally be expected within a Business Plan sufficient to secure investment are set out in Altitude's Addendum Report[132]. This accords with our experience in preparing such advise for investors in airports.

7.3 Although as noted in para, 2.5 above, the Planning Statement and ES assert that the Business Case and Business Plan are set out in the Azimuth Reports, these reports contain no financial analysis at all. Indeed, the Azimuth Report Vol II (para. 6.1.1) expressly refers to RSP needing to draw up a future marketing and development plan, which would necessarily need to form a crucial part of the Business Plan to inform the viability assessment. Hence, the Examining Authority has no basis for assessing the likelihood of the development being viable on an ongoing basis or whether it is likely to attract investment such that it would proceed at all. These matters are further explored in the Altitude Addendum Report.

7.4 The RSP Planning statement also claims, at para. 6.47, claims Funding Statement complies with Airports NPS requirement that development will be cost efficient for users. This would clearly not be the case if the costs of the excessive infrastructure, as discussed in the previous section, were passed onto users. A key issue that we go on to consider in this section is whether the development would be viable and at an efficient or competitive price for users even based on RSP's overstated 'forecasts'.

Assessment of the Financial Viability of Re-opening Manston Airport

7.5 In this section, we consider the financial viability of RSP's proposals for Manston Airport. The assessment of viability is crucial, as unless the operation of the Airport can be financially viable, it cannot survive in the medium to long term. If it cannot survive, it makes the investment and development superfluous and the Airport will not deliver any of the economic benefits claimed by Azimuth in Volume IV (albeit we believe these to be substantially overestimated in any case). Nor would the opening of an airport on an interim basis before failing comprise of a compelling case in the public interest for the development. A non-viable airport operation would in fact act as a drag on the economy as it would be abstracting resources that could be used more efficiently for other purposes.

7.6 Our assessment of potential viability has been undertaken using a range of information:

- ✈ we have been provided with historic and projected financial information on the operations of the Airport when it was still operating and used this information, along with the published accounts, to assess the potential EBITDA[133] performance of the Airport, taking into account the scope for material improvements in financial performance;
- ✈ we have used historic operating data provided to us along with CAA Statistics to identify key metrics for the Airport;

[131] Altitude Aviation Advisory, Analysis of the Freight Market Potential of a Reopened Manston Airport – Addendum: UK Regional Airport Financial Performance and Debt Funding Characteristics, February 2019.
[132] Ibid, Section 4, Figure 3.
[133] EBITDA – Earnings before Interest, Tax and Depreciation/Amortisation.

- ✈ we have examined the financial analysis of the RSP proposals prepared by George Yerrall on behalf of RSP[134]. This includes, in particular, assumptions around the potential capital expenditure relating to RSP's plans and its phasing. There is no more recent information on capital expenditure phasing has been brought forward by RSP so we have retained this as our basis for assessing the costs of development;
- ✈ our experience of unit revenues for aeronautical activities (including cargo handling) at UK and European airports;
- ✈ the traffic forecasts for the Airport set out by Azimuth, albeit, as described in **Sections 3**, **4** and **5**, we do not believe that these forecasts are anywhere close to being achievable.

7.7 We note that, whilst the RSP Funding Statement[135] asserts confidence in the Business Plan for the Airport, we have seen no other explanation of this than is contained in George Yerrall's 2017 analysis which we, therefore, assume represents the basis upon which this assertion is made.

7.8 We have structured this section as follows:

- ✈ Previous Financial Performance;
- ✈ Economics of Attracting Operations;
- ✈ Airport Profit & Loss;
- ✈ Covering the Costs of Investment.

Previous Financial Performance

7.9 The poor financial performance of Manston Airport previously was, ultimately, the reason for its closure. The Airport had been loss making for a considerable period of time. Our analysis is based on the Airport's report and accounts and financial information provided to us by the current owners which sets out the Airport's Profit & Loss performance for the financial years 2011/12 and 2012/13. Key parameters from this analysis are set out in **Table 7.1**.

[134] George Yerrall Proof of Evidence Appendix 3 submitted to the Planning Inquiry into the Application by Lothian Shelf (718) Limited relating to Buildings 1, 2, 3 and 4 at Manston Airport. (2017)
[135]RSP Funding Statement, para. 20.

Table 7.1: Manston Airport Historic P&L Performance (£000s)		
	FY2011/12	**FY2012/13**
Freight Related Revenue	£1,275	£1,398
Passenger Related Revenue	£105	£23
Fuel	£575	£280
Other	£700	£450
Property Revenue	£248	£155
Concession & Retail Revenue	£68	£16
Total Revenue	**£2,971**	**£2,322**
Operating Expenditure	**-£5,724**	**-£4,496**
EBITDA	**-£2,753**	**-£2,174**
Depreciation	-869	-£749
Amortisation		£105
EBIT	**-£3,622**	**-£2,818**
Interest and Similar Charges	-720	-£731
Net Profit before Tax	**-£4,342**	**-£3,549**
Source: York Aviation analysis of Report & Accounts and Stone Hill Park data.		

7.10 The extent of losses was significant at between £2.2 million and £2.8 million per annum on an EBITDA basis. It should also be recognised that these were years in which Manston's freight throughput was close to its historic peak.

7.11 There are several points to drawn out from this analysis that are important in considering Manston's future potential viability. We contrast these with the only financial information relating to the potential viability of a re-opened Manston put forward by RSP, contained in George Yerrall's Proof of Evidence to the Manston Change of Use Inquiry in 2017[136]:

- this historic analysis gives significant clues as to what revenues might be achievable in Manston's market place. The analysis suggests that Manston was achieving around £45 per tonne of cargo, which appears to include both landing fees and cargo handling revenue. We understand that these figures may have been inflated in the short term due to temporary contract that was lucrative for the Airport and that the underlying earnings potential per tonne was below this figure. £45 per tonne is approximately what George Yerrall has assumed for landing fees alone at Manston in his modelling. He then assumes a further £63 per tonne (at Year 5) for cargo handling. This does not appear credible given historic performance[137];

[136] George Yerrall Proof of Evidence Appendix 3 submitted to the Planning Inquiry into the Application by Lothian Shelf (718) Limited relating to Buildings 1, 2, 3 and 4 at Manston Airport. (2017)
[137] Ibid, Page 3.

- in 2011/12, when the Airport was handling around 35,000 passengers, it was achieving passenger related aeronautical charges income of around £3 per passenger. This, however, reflects rates being paid by Flybe and a small number of charter operations, which typically pay higher charges. George Yerrall assumes £2.50 per passenger will be attained in Year 5[138]. However, this is almost certainly too high, for the reasons outlined in **Section 5**, in the light of the significant incentive payments Ryanair, and probably the other carriers, will require to commence operations and based on our experience of the charges that they are prepared to pay at small airports;
- retail and concession revenue was around £1.95 per passenger in 2011/12. In our experience, this seems reasonable given the scale of operations and we would expect some growth in passenger income over time to reflect improved retail offer and similar as the passenger numbers grow. George Yerrall uses a £3 per passenger figure over the whole period[139]. This appears optimistic in all but the later years of the RSP's 'forecasts';
- operational expenditure (OPEX) per workload unit[140] was around £17.50 in 2011/12. This is exceptionally high and we would not expect this to be reflective of the OPEX per workload unit that could be achieved in the unlikely event that the levels of throughput projected by RSP/Azimuth were achieved. George Yerrall's analysis suggests OPEX per workload unit of around £11 in Year 5 dropping to around £8 in Year 25[141]. Our modelling based on the financial information we have reviewed and experience at other small regional airports suggests that these assumptions may actually be slightly too high.

7.12 It is clear from this analysis that there are substantial challenges in making Manston Airport commercially viable. This is partly about volumes, in that in its previous guise operations were too small to cover its fixed costs and realise economies of scale, but volumes in themselves are a significant challenge as has been set out earlier in this report. However, it is also about yields. To the extent that any figures have been produced by RSP (in George Yerrall's 2017 Proof of Evidence), they appear, in our experience, to rely on assumptions around the yields that the Airport can achieve that are substantially out of line with its historic performance, especially in the cargo market, even with significant investment in the product offered by the Airport, and taking into account the assumption that low fares airlines are expected to deliver much of the passenger throughput.

Economics of Attracting Operations

7.13 Prior to presenting our own assessment of the Airport's viability, it is important to consider the economics of attracting operations to Manston Airport as these clearly influence the assumptions made, particularly those around revenues.

[138]Ibid, Page 3.
[139] Ibid, Page 3.
[140] Workload Unit or WLU is a method of standardising combined throughput of an airport. 1 WLU comprises 1 million passengers or 100,000 tonnes of cargo per annum.
[141] Ibid, Page 4.

7.14 Fundamentally, an airport's attractiveness is about the market that it provides access to, the price at which it offers its services and the availability of other options (competition). Other factors are clearly important, such as the quality of infrastructure, but these are less important than the fundamental drivers identified. It is worth considering Manston's position in relation to these factors in both the cargo and passenger market.

7.15 In relation to cargo, Manston is not well located. It is on a peninsula at the periphery of the UK. Its local market is very limited and it is, in reality, peripheral to the London and south east markets, with relatively poor links to the motorway network. In terms of competition, although it has no competition locally, there are a wide range of airports better placed to serve the London and South East market. As we have seen above, although there may be some very minor and fleeting capacity issues in London in the very short term, capacity for additional cargo at these airports is unlikely to be an issue until well beyond 2040. This suggests that Manston's only lever for attracting traffic is price. It needs to offer its services at a significantly lower price in the market than its better geographically placed competitors (which it should be noted also have first mover advantages as well as the overwhelming advantages at Heathrow with a third runway and with its concentration of forwarding and consolidation activity).

7.16 Based on discussions with Manston's previous cargo management, we understand that this is precisely the situation that the Airport was in before it closed. Its only way to attract cargo traffic was to 'buy' it in by significantly undercutting charges and handling rates at other airports. There is no reason why this is likely to have changed given our analysis of the market set out in **Section 4**. We, therefore, believe that its historic cargo revenue performance is probably a strong guide to the future. However, we have assumed that, in the highly unlikely event that the Airport is able to establish itself in the market to the degree suggested by RSP, it may be able to begin to raise prices in the longer term.

7.17 The situation in the passenger market is essentially the same. The Airport has a very limited local market, particularly given that a significant proportion of its natural catchment area is sea. It is peripheral to the London and South East market and there are a wide range of airports better placed to serve this market. Once again, therefore, its only lever to attract traffic is price. Azimuth's passenger 'forecasts' (and indeed our own) essentially identify a low fares intensive airport, with a single hub service and some charter activity. This is likely to be an airline market heavily driven by price and potential market incentives, such as marketing support. This means that net revenues to the Airport from direct passenger charges are likely to be very low, particularly in the first few years of operation when start up incentives will undoubtedly need to be in place.

7.18 Overall, any assessment of the commercial viability of Manston Airport needs to be realistic about its situation and the yields that it is likely to be able to achieve. It should also be recognised that, however low its pricing, it still suffers from fundamental weaknesses that will mean attracting traffic will be very difficult. It remains our assessment that the Airport, if re-opened, would be unlikely to attract more movements by dedicated freighter aircraft than it previously handled and certainly no more than 2,000 such movements per year even in the long term.

Manston Airport Profit & Loss

7.19 Notwithstanding the lack of credibility of the 'forecasts' presented by RSP, York Aviation has undertaken an assessment of the commercial viability of re-opening Manston Airport based on the traffic 'forecasts' that underpin RSP's proposals (as presented in the Azimuth reports).

7.20 In the absence of any specific information provided by RSP in connection with the Application other than an estimate of £100 million to bring the Airport back into operation and a further £200 million of investment over the remaining period, we have based the phasing of the capital expenditure on that set out in George Yerrall's 2017 Proof of Evidence and taking into account the phasing information set out in RSP's Design and Access Statement. This has been adjusted to remove the development costs of the Northern Grass, as these should not be considered within an assessment of the core Airport operation's viability, albeit that they may provide a source of cross subsidy to support any losses that the Airport makes.

7.21 As noted above, RSP's Funding Statement[142] that states that the cost of Phase 1 is £100m, which we estimate comprises of:

- £25m is the minimum to reinstate the airfield to usable condition, including refurbishment works to the runway and re-equipping existing facilities such as the Control Tower and Fire Station;
- each stand, of which 8 are specified for Stage 1[143], is expected to cost £2.84m[144];
- the passenger terminal to be available for the commencement of operations in Year 2.

It is also assumed that this will need to include other costs, such as S106 payments and the cost of the other facilities, including the fuel farm, that RSP claim are necessary for the Airport to be operational[145].

7.22 The remaining costs are stated as a further £200m over 15 years, of which Stone Hill Park estimate £80m would be required to fund the B1/B8 development and associated infrastructure development on the Northern Grass. We have excluded this cost for the purpose of assessing the viability of the Airport in its own right absent any facilities providing a cross subsidy to core airport operations. On this basis, we estimate the indicative phasing of capex required to be:

- Years 0/1 £100m
- Years 3/4 £45m
- Years 9/10 £29m
- Year 13 £16m
- Year 16 £15m
- Year 19 £15m

[142] RSP Funding Statement, para. 15.
[143] RSP Design and Access Statement, Section 5.
[144] RSP Funding Statement, Appendix 3.
[145] This list of requirements is not necessarily accepted by Stone Hill Park as being strictly necessary for the Airport to re-open based on its previous operations.

7.23 To the extent that we have omitted the costs associated with any facilities essential for the operation of the Airport, we may have understated the capex costs required to secure the level of operations claimed. We have used the capital cost phasing as set out above within our assessment of the potential cash flow implications of the development to inform an assessment of the likelihood of the development attracting private sector investment. We have assumed that any costs already incurred by RSP are sunk costs and not included within our analysis.

7.24 Central to this assessment has been the development of a 'bottom up' P&L model for the Airport, based on the previous financial performance of the Airport taken from previous report and accounts, financial information about the previous operations provided to us, as well as assumptions around potential revenue metrics based on our broader market experience.

7.25 In developing this model, we have made a number of core assumptions:

- in relation to cargo revenues, we have taken the average revenues per tonne from the previous financial reports, including projections for 2014/15 as the basis for performance in the first seven years from the re-opening of the Airport, which is the point at which it is handling over 100,000 tonnes per annum. At this point, we have assumed that the airport has gained enough market power to introduce a freight handling fee of £5 per tonne in addition to the basic landing fee related revenue. This is assumed to step up by £5 every five years until Year 20 so increasing revenues. Given that the historic revenues included handling and given that we expect a substantial part of any tonnage to be trucked directly offsite, this is likely to be a highly optimistic assumption;
- passenger revenues are assumed to be £3.50 per passenger for the Hub Service, £1 per passenger for low fares airlines, net of incentive payments, and £5 per passenger for charter airlines. These are in line with our experience of what airlines are paying at UK airports currently. All are subject to discounts in the early years of operation to reflect the fact that Manston will need to offer significant incentives to airlines to offset risks in the early years;
- we have assumed fuel revenues will grow with total aircraft movements. However, we are aware that previous fuel prices at the Airport were higher than elsewhere given the relatively low volumes sold and that most customers bought fuel elsewhere. Hence, using historic fuel prices may overstate the revenue potential or the total revenues if price deters airlines from purchasing fuel;
- in relation to the 'Northern Grass', we have excluded this revenue from our analysis as it is not a core airport operation. As described above, we have also removed the capital expenditure relating to the development;
- in relation to other activities that might develop on site as proposed by RSP (such as MRO, aircraft dismantling etc.), we have not examined these propositions in detail. We have instead assumed that the Airport will receive ground rent from existing floorspace and that GA activity will reach similar levels to previously by around Year 5. We do not believe that any income from other activities is likely to be significant in the overall scheme of RSP's proposals and that, in most cases, the ability to secure these activities is little more than speculation.

7.26 The results of our analysis of the potential profitability that Manston could attain in the highly unlikely event that the RSP/Azimuth 'forecasts' of usage could be attained are set out for a number of representative years below in **Table 7.2**[146]. Our assessment suggests that Manston Airport could, on this basis, achieve total annual revenues of around £29.9 million by Year 20. Over the period, whilst the Airport is able to achieve significant economies of scale, with operating expenditure going from around £7.6 million in Year 2 to £22.9 million in Year 20, the core airport operation is only just EBITDA positive in Year 15. This performance immediately raises considerable doubts about the viability of RSP's proposals given the high levels of capital expenditure required to bring the Airport into full operation.

Table 7.2: Manston Airport Profit & Loss Assessment (£ million)

	Year 2	Year 5	Year 10	Year 15	Year 20
Aviation Revenue	**£4.5**	**£9.9**	**£13.5**	**£18.0**	**£25.6**
of which Freight Landing Fees	*£4.0*	*£7.3*	*£8.9*	*£11.3*	*£14.3*
of which Freight Handling	*£0.0*	*£0.0*	*£1.1*	*£2.7*	*£6.8*
of which Passenger Related	*£0.0*	*£0.9*	*£1.4*	*£1.7*	*£2.0*
of which Fuel	*£0.2*	*£0.6*	*£0.7*	*£0.8*	*£0.9*
of which Other	*£0.3*	*£1.1*	*£1.3*	*£1.4*	*£1.6*
Property Revenue Existing Portfolio	£0.2	£0.2	£0.2	£0.2	£0.2
Concession & Retail Revenue	£0.0	£1.5	£2.3	£3.1	£4.1
Total Revenues	**£4.8**	**£11.6**	**£16.0**	**£21.3**	**£29.9**
Operating Expenditure	**£7.6**	**£14.9**	**£16.6**	**£20.6**	**£22.9**
EBITDA (Airport Operations)	**-£2.8**	**-£3.3**	**-£0.6**	**£0.8**	**£7.0**
EBITDA Margin	**-58%**	**-28%**	**-0%**	**4%**	**23%**

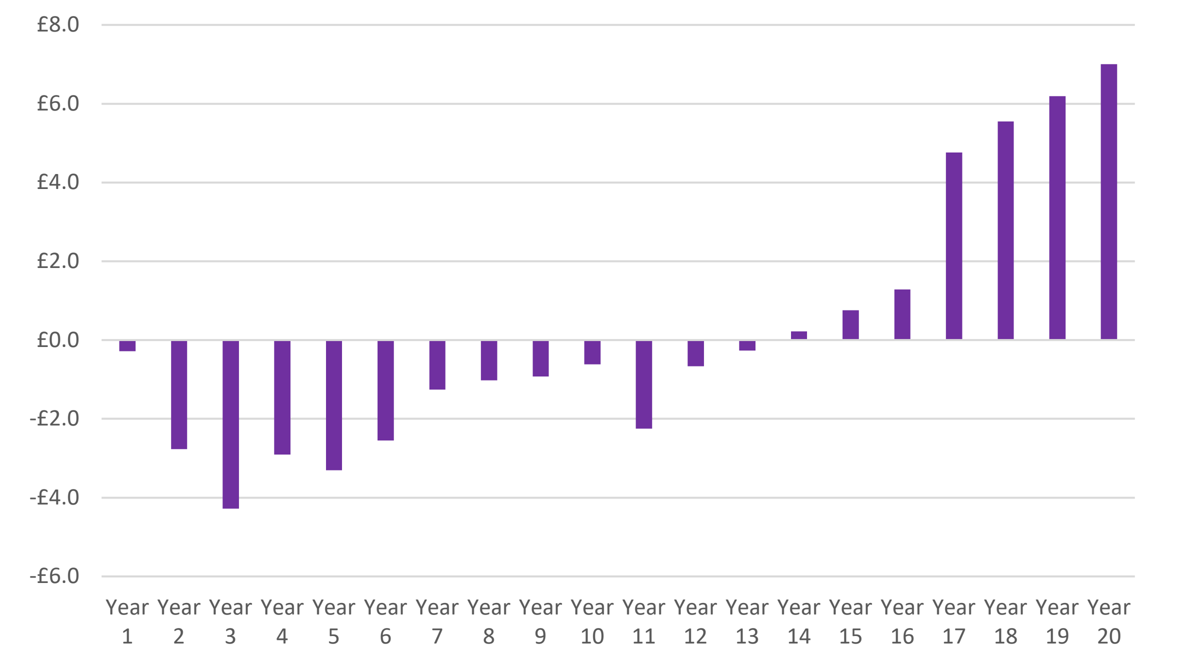
Source: York Aviation

7.27 It is important to note that, if we have been over optimistic in terms of our assumptions particularly in relation to the ability of Manston to earn cargo handling income in addition to landing fee related income, or in relation to the ability to achieve positive airport charges income from passenger flights, then the EBITDA will have been overstated. In particular, we have taken no specific account of the factors identified by Azimuth in relation to the costs of attracting traffic to Manston (as set out at para. 3.27 above) nor, it would appear did George Yerrall in his 2017 assessment. These would need to be reflected as additional costs or as revenue foregone. By way of illustration, stripping out cargo handling revenues would result in a net EBITDA of £0.2m even by Year 20, with greater losses in the early years. This highlights the extreme fragility of the expected financial performance of Manston even if RSP's highly optimistic throughput forecasts could be attained. There are a significant number of downside risks to the achievement of even this level of income and returns.

[146] We have assessed profitability at EBITDA (Earnings before Interest, Tax and Depreciation) level as this is a key metric used by investors and funders to consider the attractiveness of an airport investment. This, by definition, excludes interest charges on any debt, depreciation charges and tax payments.

7.28 The EBITDA performance over time is illustrated in **Figure 7.1**. The core airport operation is EBITDA negative for the great majority of the forecast period even assuming RSP/Azimuth's forecasts are delivered in full. It is important to note, as emphasised above, that the ability for the operation to deliver any profits, even in Year 14 and beyond, depends on a series of highly optimistic assumptions that may not be realisable in the market so we would emphasise that what is presented here is an upper bound estimate to illustrate the commercial risks that the investment would face even on a highly optimistic set of assumptions, i.e. this is very much a 'high case' position and not representative of the downside risks that an investor would certainly need to factor in before deciding if and how much it was willing to invest. These downside risks would become very apparent in any due diligence process ahead of investment and an investment case would, in all probability, have to be based on little or no prospect of operating profits even by Year 20.

Figure 7.1: EBITDA of Manston Airport by Year Scenario (£ million)



Source: York Aviation

7.29 This performance is in stark contrast to the position put forward by George Yerrall[147] on behalf of RSP in 2017, which remains the only information on the potential viability of the scheme put forward by RSP. That assessment sees the Airport EBITDA positive from Year 2 and achieving an EBITDA of £35.5 million by Year 20. Ultimately, we believe that this is driven by the unrealistic assumptions around revenues adopted, particularly in relation to revenues from cargo handling. If, as we believe strongly, the demand projections for the Airport are unrealistic, any assessment of profitability will be substantially overstated, i.e. the potential for viable operations to be attained will be significantly worse.

[147] George Yerrall Appeal Proof of Evidence Appendix 3. (2017), Page 9.

7.30 It should be noted that the financial performance that we project is not out of line with what is seen across the UK Regional Airport sector, as set out in Altitude's Addendum Report[148]. Indeed, based on 3.1m Workload Units identified in the Altitude Report, the EBITDA per Workload Unit of £2.25 would place Manston at the upper end of the range of performance, exceeded only by Humberside, Norwich and Southampton – all airports with high dependence on more lucrative business related travel and with strong markets serving the north sea oil and gas industry. This only serves to emphasise the optimism within the assumptions that we have used.

Covering the Costs of Investment

7.31 Below, we have used our analysis of Manston Airport's ability to generate cash in terms of EBITDA to consider whether it could support the costs of RSP's investment at the Airport and provide a commercially viable return. It is important here to note that George Yerrall himself, even though asserting that Manston would have pricing power, recognised that EBITDA may not be the most relevant measure when it comes to considering an investment with a high dependence on capital expenditure up front.

"Similarly profit margins mean nothing in isolation. The quid pro quo for profit margin in the Airport business is Capital Expenditure ("CapEx"). Whilst the market "Wisdom" around an airport EBITDA margin refer to an excess of 40%, this must be qualified by understanding the CapEx requirements, costs and most importantly the CapEx cycle. Passenger Airports require less CapEx at the outset, but thereafter require similar amounts deployed at more frequent intervals than their Cargo relatives"[149]

7.32 George Yerrall goes on[150] to make the point that:

"Net Income is a better guide than EBITDA to the profitability and inherent value of the Cargo business as it includes the normalisation of CapEx through our true depreciation curves."

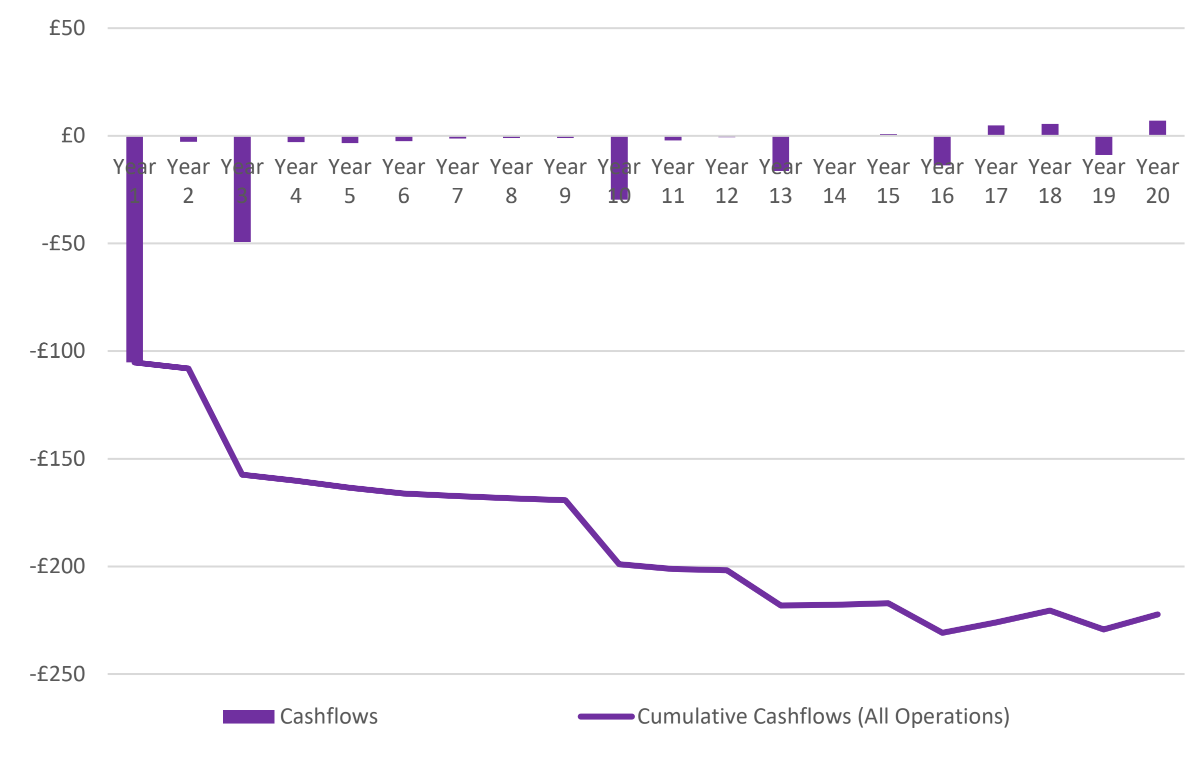
We do not have sufficient information regarding the specific assets and their costs to prepare depreciation curves for RSP's proposed investment in Manston so, for illustrative purposes, we have set out a cash flow analysis. The results are in stark contrast to the picture painted by George Yerrall as set out in his Figure 10.

7.33 In undertaking our analysis of the cash flow implications, we have used the RSP capital expenditure programme set out in George Yerrall's analysis[151] as a basis, as set out in para. 7.22 above, adjusted for capital expenditure relating to the Northern Grass. It should be noted that we have not made any explicit allowance for the substantial land acquisition or blight costs in relation to the re-opening of the Airport which are likely to become payable, in the main, before development could commence.

[148] Altitude Aviation Advisory, Analysis of the Freight Market Potential of a Reopened Manston Airport – Addendum: UK Regional Airport Financial Performance and Debt Funding Characteristics, February 2019, Section 4.
[149] George Yerrall Appeal Proof of Evidence Appendix 3. (2017), para. 5.
[150] Ibid, para 27.
[151] Ibid, Page 5.

7.34 **Figure 7.2** shows the yearly cashflows and cumulative cashflows for Manston Airport over the 20 year forecast period. The results of this analysis suggest very strongly that RSP's proposals, even on their own highly optimistic traffic forecasts and with revenue assumptions that may not be capable of realisation in the market, are nowhere close to being commercially viable. The cumulative cash position is still substantially negative in Year 20 (-£222 million). An investor would have to bear a negative and deteriorating cash position for well over 20 years even on our most optimistic set of assumptions. This would simply not be rational behaviour for a commercial investor.

Figure 7.2: Scenario 1: RSP Proposals Cumulative Cashflows for Manston Airport (£ million)



Source: York Aviation

7.35 The financial performance is in fact so poor that it is not actually possible to calculate an Internal Rate of Return (IRR). This is further evidence that no rational commercial investor would fund RSP's plans. By way of reference, it is worth noting that the allowable return at Heathrow set by the CAA is currently 5.35%. This is the rate of return allowed for one of the most stable, established and low risk airport assets in the world. We would typically expect an IRR of between 7% and 9% for an established UK regional airport. For a high risk investment such as re-opening a previously failed small regional airport, we would expect rates of return substantially in excess of that.

7.36 For Manston to offer a rate of return that would be commercially attractive to an investor or funder, perhaps around 15%, average aeronautical charges at the airport would need to be 275% higher throughout the forecast period than we have assumed. This would mean average aeronautical charges per workload unit of around £18. For comparison, aeronautical charges per workload unit at East Midlands were around £2.80 and around £5.10 at Stansted in the last available year. In other words, charges would have to be so high that it would render completely uncompetitive and it would become even more certain that RSP's traffic 'forecasts'. could not be achieved.

7.37 Further considerations relating to the fundability of the proposed development are set out in full in Altitude's Addendum Report.

Conclusions

7.38 In the absence of any assessment of the Business Case for the development within the RSP Application Documents, we have undertaken an assessment of the potential viability to assist the Examining Authority to assess the likelihood of the development plan being implemented if consented.

7.39 Our analysis shows that the RSP proposals for Manston Airport are not commercially viable even based on their unreasonably optimistic traffic 'forecasts' and taking a number of optimistic revenue assumptions. Fundamentally, the analysis of potential viability strongly suggests that no rational private sector investor would fund the re-opening of Manston Airport on the basis proposed by RSP. The Airport was never previously a financially viable operation and we see no reason for this to be any different in future. When properly analysed, there is little prospect of the operation generating sufficient revenues to cover the costs for the investors nor deliver any returns on the investment for the foreseeable future. In the absence of evidence to the contrary, it is our judgement that investment would not be forthcoming to the extent necessary to even secure the re-opening of the Airport.

7.40 Even if the Airport re-opened on the basis of a minimum initial capital spend (£145m for Phases 1 and 2), this would inevitably limit the operation to a scale where ongoing EBITDA losses were inevitable, i.e. replicating the position that existed historically and which, ultimately led to the Airport's closure.

7.41 Clearly, to the extent that traffic growth does not materialise as RSP envisage following the initial investment, it is clear that the financial position of the Airport would be materially worse.

8 CONCLUSIONS

8.1 This report updates and adds to the analysis of the flaws in RSP's Need Case, as set out principally in the Azimuth Reports, as presented in our November 2017 Report. In practice, the Azimuth Reports are little changed and, to the extent that new material has been added, do not address or rectify the substantial errors that we identified in the analysis contained therein.

8.2 Our November 2017 Report made clear that:

- RSP's analysis of our earlier work for the Freight Transport Association (FTA) and Transport for London (TfL) was flawed and this work did not support RSP's conclusion that there would be a substantive or sustainable role for Manston in the UK air freight industry.
- The remaining evidence relied on by RPS to justify its Need Case is almost entirely based on circumstantial evidence related to the shortage of airport capacity principally for passenger flights, that can also carry bellyhold cargo, in the circumstances where no additional capacity is provided at any of the London Airport. This is simply irrelevant, particularly given that it is Government policy to promote the development of a third runway at Heathrow.
- The analysis presented by Azimuth to support RSP's case shows a lack of understanding of the economics of the air freight market, especially in failing to recognise the economic drivers that prioritise the use of bellyhold capacity over dedicated freighters.
- Manston's past operation was economically inefficient due to the inherent lack of viability. Reopening the Airport has no realistic prospect of success as there are more economically efficient alternatives available for any freight displaced from Heathrow in the short term, pending the development of a third runway.
- Azimuth's 'forecasts' rely strongly on the attraction of an integrator but Manston is too peripheral for integrator operations serving the UK.
- Azimuth's interview survey, used as further justification for RSP's freight movement forecasts, relies on a small list of mainly local companies with something of a vested interest in seeing Manston re-opened and does not provide a basis for the specific aircraft movement forecasts upon which the case relies, not least as it is not possible to relate the proposed services to be operated with the responses by the interviewees. There is simply no explanation for, or justification for, the services postulated by Azimuth. There is a total lack of credibility in the approach adopted.
- To illustrate this lack of credibility of the forecasts, in Year 2 (the first operational year), a cargo throughput of nearly 100,000 tonnes is forecast by Azimuth. This would make Manston the 5th largest freight airport in the UK in its first year after re-opening. It would make Manston the 3rd busiest airport in the UK in terms of tonnage carried on dedicated freighter aircraft. This is simply not a credible proposition.
- Proper analysis of the UK air freight market showed that there is plenty of freighter capacity at Stansted and East Midlands Airport to accommodate any growth required in dedicated freighter operations such that there will be no shortage of capacity across the UK and no role for Manston in accommodating traffic spilled from other airports. These airports are better located relative to the market and the key locations for distribution within the UK.
- Our estimate was that Manston would, at best, be able to attain 2,000 annual air cargo aircraft movements by 2040 and it is equally plausible that it might not achieve more than 750 such movements annually as operated when it was previously open.

- ✈ Our initial assessment of the passenger market was that the throughput might, at best, be around half of that projected by RSP and, hence, given the dependence on passenger related income for the financial viability of airport operations, this would impact substantially on the viability of the proposal.
- ✈ Our assessment was that the existing infrastructure at Manston Airport, if made good, would be capable of handling 21,000 annual air cargo aircraft movements. The actual usage of that capability would depend on the pattern of operation and how the infrastructure was used on a day by day basis.
- ✈ We also gave provisional consideration to the land required to accommodate future forecast demand. Without prejudice to our view that demand to use Manston is not likely to be anything like 17,171 cargo aircraft movements a year, we considered that the land required would be substantially less than shown on the RSP Master Plan and that the proposed land take is excessive and without justification in terms of the compulsory acquisition of the land, particularly given the inherent implausibility of the demand forecasts upon which the assessment was made.
- ✈ We could see no justification for the inclusion of the 'Northern Grass' area within the DCO on the basis of it being for associated development. There will be little requirement for or likelihood of the relocation of freight forwarding activity from adjacent to the UK's main cargo hub at Heathrow or elsewhere to Manston.
- ✈ Azimuth made errors in the assessment of the socio-economic implications of the proposed development, particularly in terms of the use of inappropriate multipliers, the assessment of impacts a national scale, rather than the local scale in East Kent as implied by Azimuth, and should have taken displacement of activity from other UK airports fully into account, reducing the impacts well below those stated.

8.3 Our overall assessment in November 2017 was that RSP's case lacked any real credibility. Nothing has fundamentally changed and to the extent that there have been changes, for example in the formal designation of the Airports NPS and the progress towards the development of a third runway at Heathrow, the need for Manston is even less than we previously assessed.

8.4 In updating of our previous work, we have taken particular cognisance of the requirement for RSP to present a compelling case in the public interest to justify the compulsory acquisition of land. This goes beyond the theoretical test of the capability of the infrastructure proposed but must, necessarily, consider the likelihood and extent of the level of usage of that infrastructure and the extent to which there would be wider public benefit from the land being used in that way.

Aviation Policy

8.5 The whole of the RSP need case for the development of an air freight hub at Manston is based on the Azimuth Reports. A flawed interpretation of Aviation Policy is still set out in Azimuth's Volume I, which seeks to infer support for the development of a mainly freight airport at Manston based on the evidence before the Airports Commission of the potential damage to the UK economy if no additional hub airport capacity for passengers was provided at Heathrow (or a reasonable alternative to Heathrow). This was never a relevant basis for considering whether there was a case for re-opening Manston as a primarily air freight airport, as the vast majority of the economic benefit cited relates specifically to the benefits to passengers in the main using global passenger services from an expanded hub Heathrow – a need that Manston patently cannot and does not claim that it will be able to meet.

8.6 The clear decision by Government in favour of the building of an additional runway at Heathrow will transform capacity available to the air freight sector. There can be no doubt that the use by RSP of pre-NPS evidence on the need to address the shortage of airport capacity overall to serve London is misleading and incorrect. Properly interpreted, Government Aviation Policy makes clear that expansion of capacity at Heathrow, allowing more global air connections providing additional bellyhold capacity and scope, if required, for more dedicated freighter movements at Heathrow, is the identified means of meeting future air freight demand, along with the continued role for East Midlands and Stansted as air freight gateways with ample spare capacity.

Errors and Inconsistencies of Analysis

8.7 In this report, we have identified further inconsistencies and mathematical errors in the 'forecasts' presented by Azimuth and others in the RSP team to justify the proposed development at Manston. Whilst individually some of these errors and discrepancies might seem small in scale and impact, others are highly significant and serve to undermine the credibility of the whole approach outlined in the Azimuth Reports and throughout RSP's Application Documents. The combined implications are significant in terms of whether a) the application should actually have qualified as an NSIP; b) in terms of the level of demand that Manston might attract if it re-opened as an Airport and the viability of the proposed operation; and c) whether the environmental assessments undertaken are robust.

8.8 The most significant of these errors relate to:

- ✈ the lack of any soundly based forecasts – instead of forecasts based on an understanding of markets, costs and real potential, RSP's case is founded on a flawed list of airlines that it claims will definitely operate at Manston and then grow their business at Manston. Several of these airlines do not operate air freight services at all and others would be unlikely to operate to Manston for the reasons we set out. Hence, the list presented no more than a 'guesstimate', without any supporting evidence. These are not 'forecasts' in the sense that is normally recognised in the industry;

- the lack of realism in the fleet mix overall and the assumed pattern of day/night time operations, particularly in relation to the implications for the prospect of integrator and mail operations being attracted to use Manston at all. This further undermines the credibility of the short term 'forecasts' as, contrary to what RSP claim, airlines would not be able to operate to Manston on an unconstrained basis to meet their own commercial requirements but would be so constrained during the night period as to make the majority of the operations claimed by Azimuth unviable for the airlines;
- the overstatement of longer term demand projections through the use of unjustified growth rates due to mathematical errors made by Azimuth.

8.9 These errors and inconsistencies render the so-called 'forecasts' completely unreliable as a basis for assessing the extent and nature of any usage of Manston in the event that the Airport re-opens.

Understanding the Air Freight Market

8.10 Examination of market trends and the structure of the air freight market make clear that there is no role for Manston, other than possibly as a niche cargo operation, as with its historic operation. The trend in favour of bellyhold for the carriage of general air freight is clear. This freight forwarding sector is heavily concentrated around Heathrow for this very reason and the associated consolidation activity essential drives the choice of airport based on the most economical freight rates available for any consignment. This is highly unlikely to be a dedicated freighter option from an airport remotely located in East Kent.

8.11 R3 will provide for a doubling of air freight capacity at Heathrow, mainly in bellyholds of passenger aircraft but also scope for dedicated freighters to the extent that these are required to feed the hub at Heathrow. Indeed, the ability to provide a step change in capacity for air freight was one of the principal reasons why the Government chose the specific proposal for the development of a new runway. Freight facilities at Heathrow are actively being modernised and extended in anticipation of that growth of cargo activity there.

8.12 The integrators are already well established at East Midlands Airport in particular as well as using Heathrow and Stansted to serve the main markets in England. Manston is too far from the distribution centres along the M1/M6 axis to function as an integrator base, leaving aside that the proposed night movement restrictions would render any such operation unviable for the airline/integrator.

8.13 This leaves niche/specialist cargo operations as the only possible market for Manston. This would be consistent with the types of cargo that Manston used to handle. Ultimately, this is a very small market and unlikely to result in Manston handling more freighter movements than it did historically. This has profound implications for the Need Case as a whole, not least as it seems likely that any freighter activity would in fact need to be displaced from elsewhere through price incentives as there are few, if any, natural market drivers which would make Manston the first choice location and given the switching costs identified by Azimuth.

Air Passenger Forecasts

8.14 As with the asserted air freight 'forecasts', Azimuth provide no quantified analysis of the market to justify the passenger forecasts. The passenger element of the forecasts will be a vital element in considering the potential viability of the Airport as, generally, passenger operations offer better margins for an airport than cargo operations given the ability to earn revenue from shops and car parking. Furthermore, much of the asserted economic benefit from the Manston operation stems from passenger flights rather than cargo operations.

8.15 To assist the Examining Authority, we have set out in full our market assessment for passenger services at Manston. We have undertaken this analysis on the same basis as we would for any UK regional airport and presented it in a form that would be normal practice at an airport planning inquiry. Such analysis is completely missing from the Azimuth Reports.

8.16 Proper analysis of the market confirms that Manston is, at best, only likely to attract around half of the number of passengers claimed, without analysis, by Azimuth Associates of the 20 year period of the projections. This has inevitable implications for both the scale of facilities required and the viability of the airport operation as a whole. It is highly likely that attracting such services will require support from the public sector as well as highly discounted airport charges. Past experience would suggest that there would remain a high risk of the airlines failing to sustain the routes on a viable basis.

Infrastructure Requirements

8.17 Without prejudice to our view that demand to use Manston is not likely to be anything like 17,170 cargo aircraft movements a year, our analysis shows that the land required to accommodate such a number of movements would be substantially less than shown on the RSP Master Plan. The RSP Application Documents fail to set out any material that justifies the extent of facilities proposed by reference to their own 'forecasts' both for the core airport infrastructure and any claimed associated development on the Northern Grass.

8.18 To assist the Examining Authority, we have set out the basis for estimating the required number of stands and cargo terminal infrastructure to enable RSP's 'forecasts' to be accommodated based on the times that airlines would wish to fly. This does, of course, confirm the extent to which there would be dependence on night flying. Based on proper analysis of airline operating patterns, the maximum number of Code E equivalent stands that would be required, even allowing a buffer for resilience, would be 10. This is an assessment of the required capacity to handle flights at the times airlines would wish to operate which is not the same as the assessment of the theoretical capability of the existing or planned infrastructure at Manston.

8.19 Based on global benchmarks, the scale of cargo sheds could also be substantially reduced to may be no more than 1/3 of the size proposed by RSP. Overall, even in the highly unlikely event that RSP/Azimuth's 'forecasts' were realised, the overall scale of development required would be no more than of the order of 40% of that proposed in RSP's Master Plan.

8.20 As far as the Northern Grass is concerned, the list of airport related uses provided recently by RSP is no more than a list of uses that may be required at an airport without any specific reference to whether they are actually needed at Manston or, indeed, the extent to which these uses would need to be accommodated in an airside location in any event. We can see no justification for the inclusion of the 'Northern Grass' within the DCO as associated development as there will be little requirement for the relocation of freight forwarding activity from adjacent to the UK's main cargo hub at Heathrow or elsewhere to Manston and any requirement could be accommodated south of the B2050.

8.21 The development on the Northern Grass site appears to be speculative commercial development. The total extent of landside airport related uses at East Midlands Airport, other than hotels which do not feature as part of Manston's plans, is 13,000m^2, or 13% of the scale of development proposed for the Northern Grass by RSP. Hence, based on the precedent at East Midlands Airport – the UK's principal airport for pure freighter operations – the extent of the proposed development on the Northern Grass means that it would be expected to be largely for non-aviation related uses unconnected to the operation of the Airport.

Viability

8.22 In the absence of any assessment of the Business Case for the development within the RSP Application Documents, we have undertaken an assessment of the potential viability to assist the Examining Authority to assess the likelihood of the development plan being implemented if consented. Our assessment is inherently optimistic and represents a 'high case' not the most likely outcome.

8.23 Our analysis shows that the RSP proposals for Manston Airport are not commercially viable even based on their unreasonably optimistic traffic 'forecasts'. Fundamentally, the analysis of potential viability strongly suggests that no rational private sector investor would fund the re-opening of Manston Airport on the basis proposed by RSP as the development is likely to deliver negative returns to investment for the foreseeable future.

8.24 The Airport was never previously a financially viable operation and we see no reason for this to be any different in future. When properly analysed, there is little prospect of the operation generating sufficient revenues to cover the costs for the investors nor deliver any returns on the investment for the foreseeable future. In the absence of evidence to the contrary, it is our judgement that investment would not be forthcoming to the extent necessary to even secure the re-opening of the Airport.

8.25 Clearly, to the extent that traffic growth does not materialise as RSP envisage following the initial investment, it is clear that the financial position of the Airport would be materially worse. It is our assessment that, even if initial investment was forthcoming, which we doubt, it is inevitable that the Airport would close again in the medium term due to lack of inherent viability.

Overall Conclusion

8.26 Fundamentally, the whole Need Case for the development of Manston as an air freight hub is infected with flaws and errors of understanding such that the so-called 'forecasts' of air freight and passenger demand have no credibility at all. Even if they were credible, the scale of development proposed is unjustified and excessive. The development and operation of the Airport would simply be unviable and incapable of attracting competent investors.

APPENDIX A: CV FOR LOUISE CONGDON

Louise Congdon
Managing Partner

Curriculum Vitae

- Louise is an experienced airport planner and strategist with 42 years' experience in the aviation industry for the UK Civil Aviation Authority, Birmingham and Manchester Airports; at a senior management level for 17 years. She set up York Aviation as Managing Partner in September 2002.
- At Manchester Airport, Louise played a key role in influencing UK and European aviation policy debates and was responsible for corporate strategy, business planning, forecasting, and overall aviation policy development, including the strategy and concepts behind the Airport's Development Strategy, the second passenger terminal, and the second runway. Louise gave the principal evidence on Need at the Public Inquiry into the Second Runway and also presented evidence on the need cases at Public Inquiries into Liverpool Airport and Doncaster Sheffield Airport.
- During this time, Louise chaired committees and represented both the UK Airport Operators Association and ACI EUROPE (the relevant trade bodies for airports) in discussions with the UK Government and European Commission in relation to slot allocation, ground handling, airport capacity and airspace. Louise was a member of the Government working party (RUCATSE) which previously recommended the development of a third runway at Heathrow in 1993. Louise was actively involved in the preparations for the Future of Air Transport White Paper of 2003, including acting as chair for a number of consultation events both before and after leaving Manchester Airport to set up York Aviation.
- Louise has also given evidence on need and economics at Public Inquiries into Stansted Airport Generation 1, Farnborough Airport Weekend Movements, London Ashford Airport, Redhill Airport, Belfast City Airport Seat for Sale Limit and London City Airport Development Programme.
- Louise has a BA (SOC SCI) Hons in Geography, Class 2.1, from the University of Sheffield 1974, and a Master of Transport Design, from the University of Liverpool 1976 (including thesis on National Airport Planning). Louise was appointed specialist adviser to the House of Commons Transport Select Committee from 2011 to 2014.

Selected Personal Relevant Experience with York Aviation

- Department for Transport: Advice in connection with technical issues relating to the Airports National Policy Statement (2017-9);
- London Luton Airport Ltd – Ongoing (since 2006) assignment to provide advice to the local authority owned company on air traffic forecasting and strategic airport development options for Luton and the potential financial and commercial implications;
- London City Airport – ongoing support in relation to air traffic forecasting and capital expenditure proposals, technical due diligence in respect of refinancing, development of the need and economic case for the City Airport Development Programme, due diligence connected with the acquisition of the Airport in2006 and in 2016, development of an updated Master Plan (ongoing since 2005);
- Transport for the North - support for an international connectivity study to identify the future strategic role of international air services and passenger sea travel in supporting economic growth across the Northern Powerhouse (2016);
- Transport for London – support in relation to the development of air transport policy and submissions to the Airport (2011 and 2013/14);
- Civil Aviation Authority (with Europe Economics) – advice in relation to Heathrow Airport's surface access strategy and the relationship to airport charges;
- Scottish Enterprise/Scottish Government – socio-economic assessment of Prestwick Airport and strategic options (2012/13), support for route development activity (2018);
- Leeds Bradford Airport – vendor due diligence in relation to the sale of the Airport (2006/7) and vendor diligence on refinancing (2016/2017)
- Belfast City Airport – economic and forecast advice in relation to the Seat for Sale Limit (2013-2015), support to 3i on the acquisition of the Airport (2016);

- Technical Airport Capacity Advice to the London Assembly Transport Committee (2013);
- Northern Ireland Government – contribution to air connectivity research (2014);
- Durham Tees Valley Airport – Business Plan advice to local authority shareholders (2013/4 and 2018);
- City of Gloucester/Cheltenham Borough Council – Review of Gloucestershire Airport Asset (2014); subsequent commissions to review airport governance and assist in the preparation of a Strategic Business Plan (2014/15) and Viability Assessment (2017);
- Advice to the Welsh Government in connection with the acquisition of Cardiff Airport (2013) and subsequent route development advice (2014/5);
- Support to an investor in Belgrade Airport (2017);
- Development of an Aviation Strategy for England's Regional Development Agencies (2002/5);
- Other clients include:

  States of Jersey

  States of Guernsey

  Isle of Man Government

  Blackpool Council

  Ryanair

  Birmingham Airport

  City of London Corporation

  Aberdeen Airport

  Edinburgh Airport

  Liverpool Airport

  Antin Infrastructure Partners

APPENDIX B: YORK AVIATION NOVEMBER 2017 REPORT

York Aviation

STONE HILL PARK LIMITED

SUMMARY REPORT ANALYSING USE OF YORK AVIATION MATERIAL BY RIVEROAK STRATEGIC PARTNERS LIMITED AND ASSESSMENT OF CAPABILITY OF MANSTON AIRPORT

NOVEMBER 2017

York Aviation	Originated by: Louise Congdon/James Brass/Niall Gunn/Richard Connelly Dated: 10th November 2017 Reviewed by: Richard Kaberry Dated: 13th November 2017

STONE HILL PARK LIMITED

SUMMARY REPORT ANALYSING USE OF YORK AVIATION MATERIAL BY RIVEROAK STRATEGIC PARTNERS LIMITED AND ASSESSMENT OF CAPABILITY OF MANSTON AIRPORT

Contents

EXECUTIVE SUMMARY

1. York Aviation was appointed by Stone Hill Park Limited (SHP) in September 2017 to review the evidence presented by RiverOak Strategic Partners Limited (RSP) in connection with RSP's prospective application for a Development Consent Order (DCO) for the redevelopment and re-opening of Manston Airport as a hub for international air freight services, which also offers passenger, executive travel and aircraft engineering services.

2. We were the authors of two specific reports upon which RSP seek to rely in making their case, namely a report for the Freight Transport Association (FTA) and Transport for London (TfL) in 2015 and a note on Freight Connectivity for TfL in 2013. The first of these documents was used by RSP in its public consultation and this may have led respondents to believe that we were supporting the re-opening of Manston, which is not true and, as we go onto explain in this report, our analysis in these documents for the FTA and TfL does not support RSP’s conclusion that there would be a substantive or sustainable role for Manston in the UK air freight industry.

3. The RSP case is principally based on circumstantial evidence presented in the Volumes I to IV of *Manston – A Regional and National Asset* prepared by Dr Sally Dixon of Azimuth Associates (June 2017 consultation version). Much of the material upon which Azimuth seek to rely as the basis of RSP’s case relates to the economic costs to the UK if additional passenger hub capacity is not provided in the South East of England by 2050. This is not relevant to the specific question as to whether there would be sufficient demand for pure freighter movements to be operated to/from Manston in the foreseeable future or by their assessment year 2040.

4. The analysis presented by Azimuth shows a lack of understanding of the economics of the air freight market. This leads to a misinterpretation of our work, upon which Azimuth seek to rely to support RSP’s case. Just because there could be excess air freight demand in 2050, compared to the bellyhold capacity available in the absence of further runway capacity at the UK’s main hub, it does not follow that displaced bellyhold freight will seek a more expensive pure freighter service from a relatively nearby airport over the use of available bellyhold capacity from a more distant airport which can be provided at a lower cost to the shipper with only a marginal penalty in terms of the overall shipment time.

5. Fundamentally, Manston’s past operation was economically inefficient due to the inherent lack of viability. Hence, reopening the Airport, in the face of a very limited niche market, has the potential to damage the productivity of the UK aviation sector overall, particularly, as we have demonstrated in our own assessment of cargo demand for Manston in Section 3 of this report, that there are more economically efficient alternatives available for any freight displaced due to specific capacity constraints at Heathrow both now and in the future.

6. Manston is too peripheral for integrator operations serving the UK. Integrators have a strong preference for locations more centrally located in the UK with good road access to all of the major markets. The availability of land for warehouses, for example as suggested in terms of the use of the ‘Northern Grasslands’ part of the overall Airport site, is far less important than a location central to the market and the availability of good road access, neither of which are characteristics of Manston. It is simply in the wrong place to serve the market being located at the far south east at the end of a peninsular, away from the main centres of population and distribution in the UK.

7. In the absence of hard market evidence of the need for Manston Airport, Azimuth undertook an interview survey to supplement RSP's case and to inform the forecasts. However, the list of interviewees was small, dominated by mainly local companies with something of a vested interest in seeing Manston re-opened. Even so, if anything, the views of those interviewed by Azimuth suggest that there would, at best, be a limited role for Manston. The one airline interviewed made clear that *"success at Manston depended upon identifying a niche market and becoming known for excellence. In particular, suggestions included a perishables centre, handling of live animals, easy access for charter flights, and handling cargo that is not necessarily straightforward"*. The scale of this opportunity was never quantified by Azimuth. It is clear, however, that the realistic expectation for Manston is for a small niche operation rather than as a general 'overspill' cargo airport for London.

8. The outputs from these interviews are then used by Azimuth as a basis for postulating a number of cargo aircraft movements that might operate at Manston. However, it is not possible to relate the proposed services to be operated with the responses by the interviewees. There is simply no explanation for, or justification for, the services postulated by Azimuth. At the very least, there is a lack of transparency in the approach adopted.

9. In our view, the Azimuth cargo movement forecasts simply lack credibility. To illustrate this lack of credibility of the forecasts, in Year 2 (the first operational year), a cargo throughput of nearly 100,000 tonnes is forecast by Azimuth. This would make Manston the 5th largest freight airport in the UK in its first year after re-opening (compared to 2016 actual throughput at the other airports). This would place it close to the scale of freight operations at Manchester Airport, which includes a substantial amount of bellyhold freight. It would make Manston the 3rd busiest airport in the UK in terms of tonnage carried on dedicated freighter aircraft. This is simply not a credible proposition. This lack of credibility is important in reaching any decision under section 23 of the Planning Act 2008 (as amended).

10. We have updated and further developed our analysis of the UK air freight market from that previously undertaken in 2013 and 2015 for TfL and for the FTA and TfL (RSP seek to rely on our 2013 and 2015 work as corroboration of their own cargo movement forecasts). When properly interpreted, our forecasts of air freight demand and capacity across the UK as a whole, taking the role of bellyhold fully into account, show that, to the extent that there is any need for additional pure freighter movements, there is plenty of freighter capacity at Stansted and East Midlands to accommodate any growth. These airports are better located relative to the market and the key locations for distribution within the UK. Overall, we conclude from this analysis that there will be no shortage of freighter capacity in the UK in the period up 2040 (RSP's assessment end date) and that overspill from other airports would not provide a rationale for re-opening Manston.

11. Taking the most optimistic basis for assessing its potential role, we have estimated that Manston might be able to achieve at most 4,470 annual air transport movements by cargo aircraft by 2040, but this is highly unlikely given its location and the clear market trend away from the use of dedicated freighter aircraft. Our more likely projection is that it might attain 2,000 annual air cargo aircraft movements by 2040 and it is equally plausible that it might not achieve more than 750 such movements annually. These are all far below Azimuth's projection, upon which RSP rely, of 17,171 annual cargo aircraft movements.

12. Our initial assessment of the passenger market is that the throughput might, at best, be around half of that projected by RSP and, hence, given the dependence on passenger related income for the financial viability of airport operations, this will impact substantially on the viability of the proposal. The other activities suggested by RSP, such as business aviation, maintenance, repair and overhaul, and aircraft dismantling are highly competitive markets and, to the extent that Manston might attract any such operations, these are unlikely to contribute substantially to the overall viability of the Airport.

13. The existing infrastructure at Manston Airport, if made good, is capable of handling 21,000 annual air cargo aircraft movements[1]. The actual usage of that capability would depend on the pattern of operation and how the infrastructure was used on a day by day basis. Our assessment, therefore, provides essential missing information from RSP's materials to date which is necessary for the purposes of section 23 of the Planning Act 2008 (as amended), for assessment purposes under the Environmental Impact Assessment Regulations and for consultation purposes.

14. Without prejudice to our view that demand to use Manston is not likely to be anything like 17,171 cargo aircraft movements a year, we have considered the land required to accommodate such a number of movements. Our assessment is that the land required would be substantially less than shown on the RSP Master Plan and that the proposed land take is excessive and without justification in terms of the compulsory acquisition of the land. Any development required to handle 17,171 annual movements by air cargo aircraft can all be accommodated to the south of the B2050 and, even allowing for passenger operations and other activities, would not require all of the airfield land to the south of the road. Obviously, on the basis of more realistic forecasts of future demand, the area required to support the ongoing operation of the Airport would be materially smaller.

15. We can see no justification for the inclusion of the 'Northern Grasslands' area within the DCO on the basis of it being for associated development. There will be little requirement for or likelihood of the relocation of freight forwarding activity from adjacent to the UK's main cargo hub at Heathrow to Manston, as suggested by RSP, and any requirement for such activity specifically to support the proposed level of freight activity at Manston could easily be accommodated on land to the south of the B2050. The development on the 'Northern Grasslands' site appears to be speculative commercial development which, based on the precedent at East Midlands Airport – the UK's principal airport for pure freighter operations – would be expected to be largely for non-aviation related uses.

[1] Based on an 18-hour operational day. Should a night time noise policy be agreed with Thanet District Council pursuant to the existing planning agreement that enabled a longer operational day and/or a number of scheduled night movements, then the capability could, in theory, be higher than 21,000 annual cargo aircraft movements.

16. In terms of the socio-economic implications of the proposed development, Azimuth have shown a lack of understanding of how such impacts should properly be calculated. Leaving aside the use of inappropriate multipliers, the impacts have been assessed at a national scale and should have taken displacement of activity from other airports fully into account, reducing the impacts well below those stated. Furthermore, the assessment should have considered the impact on alternative uses of the site, including SHP's proposed mixed use development and the socio-economic benefits deriving therefrom. We have set out a more realistic and robust assessment, which shows that the local impacts within Kent, even on Azimuth's forecasts, would be substantially less than claimed and it is these lower order effects which would need to be balanced with the environmental and other impacts in assessing the acceptability of the proposed development against the alternatives.

17. Unsurprisingly, the socio-economic impacts associated with the Airport are lower still on the basis of more realistic forecasts of likely usage if it re-opened. The operation is simply of a much smaller scale such that, in Year 2, it would generate only 452 jobs, 17% of Azimuth's estimate of 2,654. By Year 20, the differential is even larger, with the Azimuth estimates reaching over 30,000 jobs compared to our estimate of just over 1,000 jobs. Once again, the evidence presented by Azimuth on behalf of RSP cannot be relied upon. It is infected with the flaws in the traffic forecasting methodology identified previously but also the approach to identifying socio-economic impacts is, in itself, badly flawed. The socio-economic impacts are, as a result, massively overstated. In any event, these benefits would not be realised if the Airport ceases operation again due to it not being commercially viable.

18. As well as the Azimuth reports which form the basis of RSP's case, we have also reviewed a number of other reports on the potential for Manston. In overall terms, we agree with Aviasolutions for Thanet District Council that there is little realistic prospect of the re-opening of Manston Airport being a commercially viable proposition. We have reviewed their original report and the more recent reports and concur with their views on the overall structure of the UK air cargo market, noting that they, unlike Azimuth, have correctly understood the implications of our 2015 work for the FTA. We do not accept Northpoint's rebuttal of the Aviasolutions work. Like Azimuth, Northpoint's work is largely aspirational without any robust evidence or analysis of the market. Northpoint, too, misinterpret our previous work for the FTA and TfL.

19. In overall terms, we do not consider that the case that the re-opening of Manston Airport would constitute a Nationally Significant Infrastructure Project has been robustly made or substantiated. In any event, given that the baseline capability of Manston Airport is at least 21,000 annual cargo air transport movements (see section 4), this means that RSP must, effectively, be seeking to increase the capability of Manston Airport from 21,000 annual air transport movements by cargo aircraft to at least 31,000 such movements each year, a level of activity which has not been consulted on or assessed in RSP's Preliminary Environmental Information Report (PEIR). Indeed, RSP's consultation material does not provide any detail as to what the increase in capability would be as a result of its proposals (i.e. the increase in capability as a result of its proposed alteration to Manston Airport). As a minimum, the increase in capability would be to 31,000 annual air transport movements by cargo aircraft, but in our view their proposals would result in a significantly higher 'new' capability which is not revealed or assessed by RSP.

20. Our overall assessment is that RSP have failed to provide their own evidence of the capability of Manston Airport and the amount by which their proposals would increase that capability by. Rather, the only information that they present is a forecast of future freight demand, which has no credibility as explained in this report. There are, hence, major omissions in RSP's consultation material. This failure means that, in our opinion, the requirements in section 23 of the Planning Act 2008 (as amended) have not been satisfied. In essence, we would have expected RSP to be able to show:

- the capability of Manston Airport of providing air cargo transport services;
- the amount by which RSP is proposing to increase that capability by and thus the "new" capability; and
- a credible forecast for why that 'new' capability is required.

None of this information is provided by RSP.

1 INTRODUCTION

1.1 York Aviation was appointed by Stone Hill Park Limited (SHP) in September 2017 to review the evidence presented by RiverOak Strategic Partners Limited (RSP) in connection with RSP's prospective application for a Development Consent Order (DCO) for the redevelopment and re-opening of Manston Airport as a hub for international air freight services, which also offers passenger, executive travel and aircraft engineering services.

1.2 York Aviation is a specialist air transport consultancy that focusses on airport planning, demand forecasting, strategy, operation and management. The company was established in 2002. We offer a broad range of services to airports, airlines, governments, economic development organisations and other parties with an interest in air transport. Our team is a mixture of experienced air transport professionals and economists. Key members of the team have substantial experience of airport operations and development gained through working for Manchester Airports Group. Our core services include:

- business planning and strategy;
- capacity and facilities planning;
- master planning and planning application support;
- demand forecasting;
- economic impact assessment and economic appraisal;
- policy and regulatory advice;
- route development;
- transaction support.

1.3 Our clients include:

- Transport for London;
- Transport for the North;
- Department for Transport;
- Scottish Enterprise;
- Northern Ireland Government;
- Manchester Airports Group;
- Birmingham Airport;
- London City Airport;
- London Luton Airport;
- Ryanair;
- Freight Transport Association.

As well as numerous investors in airports and other parties with an interest in the development, operation and management of airports in the UK and abroad.

1.4 Louise Congdon, Managing Partner of York Aviation has provided evidence in relation to the need for and economic impact of airport development at several airport public inquiries, including Manchester Runway 2, Liverpool Airport, Doncaster Sheffield Airport, Stansted Generation 1, London Ashford Airport (Lydd) and London City Airport.

1.5 We were the authors of two specific reports upon which RSP seek to rely in making their case, namely a report for the Freight Transport Association (FTA) and Transport for London (TfL) in 2015 and a note on Freight Connectivity for TfL in 2013. The first of these documents was used by RSP in its public consultation and this may have led respondents to believe that we were supporting the re-opening of Manston, which is not true and, as we go onto explain in this report, our analysis in these documents for the FTA and TfL does not support RSP's conclusion that there would be a substantive and sustainable role for Manston in the UK air freight industry.

Historical Position

1.6 Manston Airport closed to commercial operations in May 2014, following several unsuccessful attempts to attain commercially viable operations. In the decade prior to closure, the Airport did manage to attract some cargo and passenger activity but not to levels that could ensure financial and commercial viability for its owners. The historic traffic performance is set out in **Table 1.1**. The Airport's cargo traffic peak was in 2003.

Table 1.1: Historic Commercial Traffic at Manston Airport

	Passengers	Cargo (tonnes)	Air Transport Movements[2] (excl. Air Taxis)	of which, Cargo Aircraft Movements[3]	Total Aircraft Movements
2003	3,256	43,026	1,106	1,081	24,934
2004	101,328	26,626	3,333	730	23,324
2005	204,016	7,612	4,631	177	21,358
2006	9,845	20,841	461	322	16,687
2007	15,556	28,371	608	444	21,521
2008	11,625	25,673	540	412	19,269
2009	5,335	30,038	583	485	18,902
2010	25,692	28,103	1,151	491	16,260
2011	37,169	27,495	1,472	419	18,695
2012	8,262	31,078	687	432	14,688
2013	40,143	29,306	1,640	511	17,504
Source: CAA Airport Statistics					

[2] Air Transport Movements (ATMs) are those services sold to the public as distinct from private flights or those operated on behalf of individual companies using their own aircraft. All substantive cargo operations in the UK would be treated as air transport movements. Aircraft movements are all aircraft movements at an airport, including 'touch and go' landings by flying school aircraft.

[3] Based on more detailed records maintained by the former airport operator, it would appear that CAA data may not record all empty cargo positioning flights. However, we do not have complete data. The total number of cargo flights could, hence, be somewhat greater than shown.

1.7 Table 1.1 shows that the number of air cargo movements and the tonnage carried was fairly consistent over the last 10 years of the Airport's operation, but these operations were not sufficient to support a commercially viable operation at the Airport.

1.8 We address the realistic levels of freight demand that Manston Airport might attract if re-opened in **Section 3** of this report.

The Application

1.9 RSP's prospective DCO application is predicated on its proposed alterations to the Airport's infrastructure, the effect of which is expected to increase by at least 10,000 a year the number of cargo air transport movements (CATMs) a year that the Airport is capable of accommodating. In practice, the case set out in the consultation documents produced by RSP and used in the Preliminary Environmental Information Report (PEIR) are predicated on it being able to attract and handle a forecast of 17,171 CATMs and 1.4 million passengers per annum (mppa) by 2039 and all of the assessments are made on this basis.

1.10 In order for RSP's proposals to be considered a Nationally Significant Infrastructure Project (NSIP), which can be taken forward using the DCO procedure under the Planning Act 2008 (as amended), it must comprise of an alteration to an airport which would *"increase by at least 10 million per year the number of passengers for whom the airport is capable of providing air passenger services"* or *"increase by at least 10,000 a year the number of air transport movements of cargo aircraft for which the airport is capable of providing air cargo transport services."*[4] [5] In this case, the relevant criterion relates to air transport movements for cargo aircraft. It is clear, therefore, that validating the capability of Manston Airport of providing air cargo transport services is vital to determining the legitimacy of a DCO.

1.11 RSP's prospective DCO application does not provide any explanation or understanding of the capability of the Airport before its proposed alteration is made. The capability of the Airport is a necessary component of Section 23(5) of the Planning Act 2008 (as amended), as it is from that figure that a prospective applicant must consider the effect of its proposed alteration, which must be expected to have the effect of an increase of at least 10,000 annual air transport movements by cargo aircraft. Without identifying the capability of Manston Airport, one does not have all of the components required under section 23 of the Planning Act 2008 (as amended) for a decision to be made as to whether the proposed alteration falls within section 23. In addition, an applicant must then explain what the 'new' capability would be following its proposed alteration in order to then assess the effects of the proposed alteration. We consider this further in **Section 4**.

[4] Section 23(5) of the Planning Act 2008 (as amended).

[5] It is noted that the Planning Act 2008 (as amended) also refers to an increase in permitted use as a relevant criterion. In this case, the existing planning consent under which Manston operated contained no limit on the number of annual aircraft movements permitted although there was a prohibition on night movement of aircraft between 23.00 and 07.00 in force, pending agreement to a night movement policy with the local planning authority, Thanet District Council. In any event, the increase would still need to be at least 10,000 per year in the number of air transport movements of cargo aircraft for which the airport is permitted to provide air cargo transport services.

1.12 A further consideration is the extent of development proposed in terms of its capability of supporting the projected number of movements but, more importantly, given that RSP is seeking to compulsory acquire the entirety of the Manston Airport site from SHP, whether the land area proposed is actually necessary in order to handle the projected number of aircraft movements and whether there is a *"compelling case in the public interest"* for its acquisition[6]. This requires consideration as to whether the case for the development and re-opening of Manston Airport is *"compelling"* and whether the full extent of land required has been fully justified. We consider this in Section 4 of this report.

1.13 We consider the socio-economic case for the development in **Section 5** of this report.

This Report

1.14 RSP sets out its strategic case and need for the re-opening of Manston Airport as a hub for international air freight in 4 volumes prepared by Dr. Sally Dixon of Azimuth Associates (Azimuth), namely '*Manston Airport - a Regional and National Asset, Volumes I-IV; an analysis of air freight capacity limitations and constraints in the South East and Manston's ability to address these and provide for future growth; June 2017'.* **Section 2** of this report reviews this analysis and the extent to which the analysis presented by Azimuth justifies the forecast cargo and passenger activity projected for Manston. This is important for the purposes of section 23 of the Planning Act 2008 (as amended) and whether the analysis presented by Azimuth provides a compelling case in the public interest for the acquisition of the site through compulsory acquisition procedures.

1.15 Within this report, we address, in particular, the use made by Azimuth of analysis that we undertook for Transport for London[7] and for the Freight Transport Association[8] in connection with the work of the Airports Commission and the need for new hub airport capacity for London. For reasons which will be made clear, the York Aviation work relied upon by RSP does not, and cannot be taken to, support RSP's proposed alteration to Manston Airport and, therefore, cannot be relied upon by RSP, the Planning Inspectorate, the Secretary of State and any future appointed Examining Authority (should RSP submit the application and the Secretary of State accepts the application). Given the errors in the interpretation and use of our work by Azimuth, we are concerned that the consultation carried out to date has not properly informed the public in respect of the valid interpretation of our work regarding the prospects for the viable operation of Manston as a freight airport.

1.16 We also review independent reports produced variously by Aviasolutions (Avia) for Thanet District Council in September 2016 and August 2017 and Northpoint Aviation Services (Northpoint) for RSP. This peer review of the other reports is at **Section 6** of this report. To the extent that we agree with these other reports, we do not repeat the detailed analysis in this report but reference the corroborating evidence as appropriate.

[6] Department for Communities and Local Government, *Guidance on compulsory purchase process*, October 2015, page 6.
[7] Referenced by Azimuth as Transport for London (TfL), *Note on Freight Connectivity*, unpublished paper 2013. For the avoidance of doubt, this note as made available by TfL under a Freedom of Information Request is appended to this report at **Appendix A**.
[8] York Aviation (2015), *Implications for the Air Freight Sector of Different Airport Capacity Options*.

1.17 Our conclusions are presented in **Section 7**.

2 CRITIQUE OF RSP APPROACH TO FORECASTING

2.1 In this section, we review the work of Azimuth that forms the justification for the DCO and was part of RSP's consultation documents in June and July 2017. The work is presented in 4 volumes:

- Volume I: Demand in the south east of the UK
- Volume II: A qualitative study of potential demand
- Volume III: The forecast
- Volume IV: The economic and social impact of airport operations

This section also addresses the basis of the demand forecasts for Manston as set out in Volumes I, II and III, focussing principally on air freight in this summary report. We address the socio-economic assessment in Volume IV in Section 5 of this report. Given the repetition of much of the material across the first three volumes of Azimuth's work, we have grouped issues broadly under the appropriate volume in this section.

2.2 We do not, in the main, dispute the accuracy of the factual detail, some relevant and some not, set out in the Azimuth reports or the veracity of the secondary evidence presented. We do, however, have serious and considerable issues in relation to the interpretation and the completeness of this evidence base, in particular relating to the use of previous York Aviation reports, and the inferences and conclusions drawn from it. Ultimately, we consider that the case put forward by Azimuth is weak and unsubstantiated as the extensive evidence base presented does not, in reality, support the conclusions drawn which, in many cases, go well beyond what can reasonably and sensibly be inferred from the information presented. Much of the information is effectively circumstantial and falls far short of making a compelling case, or indeed any case, that the demand forecasts would be capable of being realised.

2.3 Although Azimuth state at paragraph 1.2.1 of Volume 1 *"RiverOak, who specialise in identifying profitable market opportunities, has identified the substantial need for additional and specialised airport capacity for dedicated freighters in the southeast of England"*, we are unaware of any other research upon which RSP rely. All other documents produced in support of the prospective DCO appear to rely on the work of Azimuth.

2.4 In essence, the work of Azimuth sets out to address three key questions, which they assert provide the answer as to whether there is a compelling case in the public interest for the development of Manston Airport sufficient to meet the test for the inclusion of compulsory acquisition powers as part of the DCO. These are largely addressed in Volumes I and II, and lead on to the preparation of demand forecasts set out in Volume III. The three tests put forward by Azimuth are:

- *Does the UK require additional airport capacity in order to meet its political, economic, and social aims?*
- *Should this additional capacity be located in the South East of England?*
- *Can Manston Airport, with investment from RiverOak, relieve pressure on the UK network and meet the requirement of a nationally significant infrastructure project?*

2.5 At the outset, we query whether these are the correct questions to be addressed in terms of the case that RSP seek to make for the use of Manston as a major freighter hub. As is clear from the draft Airports National Policy Statement (NPS)[9], the first two questions relate to the requirement for more capacity at the UK's main passenger hub airport at Heathrow. The updated draft NPS makes clear at paragraph 1.30 that, in relation to the Government's preferred solution of a new northwest runway at Heathrow:

"Consideration has been given to alternative solutions to the preferred scheme, and the conclusion has been reached that there are no alternatives that would deliver the objectives of the Airports NPS in relation to increasing airport capacity in the South East and maintaining the UK's hub status."

2.6 Hence, these first two questions are not relevant to considering whether there is a need for dedicated freighter capacity at Manston sufficient to meet the tests for a DCO. Manston would make no contribution to meeting the identified requirement of passenger hub capacity for the UK or for the South East of England. Furthermore, the draft NPS makes clear, at paragraph 1.39 in relation to any other development consent application for airport development, that:

"Nevertheless, the Secretary of State considers that the contents of the Airports NPS will be both important and relevant considerations in the determination of such an application, particularly where it relates to London or the South East of England. Among the considerations that will be important and relevant are the findings in the Airports NPS as to the need for new airport capacity and that the preferred scheme is the most appropriate means of meeting that need."

2.7 This confirms that the proposed northwest runway at Heathrow addresses the identified need as set out by the Airports Commission for new airport capacity in the South East of England and that this provides a context against which any other DCO application would need to be assessed.

Demand in the South East of the UK (Volume I)

2.8 As has been noted above and in the most recent 2017 reports from Avia, much of the analysis presented by Azimuth relates to the evidence for a shortage of airport capacity overall in the South East of England and, specifically, the work of the Airports Commission relating to the need for additional hub airport capacity serving both the needs of passengers and of air freight. Much of the evidence presented by Azimuth to justify the existence of an airport capacity shortfall in the South East of England relates to the shortfall in capacity for passenger aircraft and, specifically, a shortage of capacity at the main aviation hub at Heathrow as noted above. This does not provide any underpinning justification for the specific development that RSP proposes at Manston, which comprises a specialist freight airport with a small number of low fare, regional and charter flights for passengers.

[9] Department for Transport, *Revised Draft Airports National Policy Statement: new runway capacity and infrastructure at airports in the South East of England*, October 2017. Note that the provisions referred to have not changed since the original draft as of February 2017, which pre-dated RSP's consultation.

2.9 Azimuth cite a number of reports which highlight the potential shortage of airport capacity, not just in the UK but across Europe, and the economic costs of not addressing these shortfalls. Azimuth then seek to imply that Manston could provide part of the solution and contribute to delivering these benefits. This is not justified and creates a false impression of the potential economic significance of RSP's proposals. A key point is that the reports relied on by Azimuth need to be seen in the context in which they were written, namely to set out the economic consequences of the failure to address the shortage of hub airport capacity principally for passengers but also providing bellyhold capacity for freight in the UK. All of the reports pre-date the Government's decision to promote an additional runway at Heathrow and were largely directed at ensuring that a positive decision was taken regarding the development of additional runway capacity.

2.10 Furthermore, the reference at paragraph 5.1.4 to concern expressed in the Aviation Policy Framework[10] regarding the implications of capacity shortfalls on the range of destinations served does not, as Azimuth infer, indicate a need for additional aircraft movements by dedicated freighter aircraft as these would require a concentration of freight flows to a specific destinations to fill a single aircraft at a time. Rather, the Aviation Policy Framework refers to the need for a wide range of global destinations being available at the UK's national hub airport, offering passenger and bellyhold capacity so as to maximise the choice and convenience for both passengers and shippers[11] of airfreight. It is this variety of destinations and, importantly, the high frequencies of service that lead the market to favour a bellyhold hub and spoke system so that freight can reach its end destination in the most efficient and cost effective way possible.

2.11 In the light of the Government's support for the provision of a third runway at Heathrow and the potential for further development of airport capacity beyond 2030[12], the use of these economic assessments of a constrained situation to 2050 is no longer relevant, if indeed it ever was, as a context for the potential re-opening of Manston as a freight airport. The use of this data by Azimuth to support RSP's proposals is disingenuous at the very least.

Reliance on York Aviation work

2.12 Ultimately, Azimuth rely heavily on two existing pieces of research undertaken by York Aviation during the Airports Commission process. The first an unpublished note for Transport for London (TfL) prepared in the early stages of that process (see Appendix A), and a later more detailed piece of research undertaken for the Freight Transport Association (FTA), in conjunction with TfL[13]. Both documents considered the overall position of the air freight market in the London system and what might be the circumstances of that market in 2050 under different assumptions regarding runway capacity development in the South East. Whilst we continue to believe that, in the very long term, there will be excess demand for air freight and that existing infrastructure in the London area will struggle to service this demand, more recent developments lessen the capacity pressure.

[10] Department for Transport, *Aviation Policy Framework*, 2013.
[11] Shippers are the originators of the airfreight, i.e. the exporters or importers.
[12] Department for Transport, *Beyond the Horizon The future of UK Aviation*, Call for Evidence, July 2017, paragraph 7.23.
[13] The FTA report being included explicitly in RSP's consultation documents on its website.

2.13 The key point, however, is that, to the extent that there is excess air freight demand in the long term, it does not follow that there will be a market for Manston, as asserted by Azimuth, as any excess demand at the Heathrow hub does not lend itself to being displaced onto dedicated freighter operations at Manston, for reasons we explain later in this section. To the extent that there is any role for additional freighter aircraft to accommodate some part of the displaced demand, there is ample spare capacity at other airports in the short to medium term at least. Thus, the York Aviation work relied upon by RSP does not, and cannot be taken to, support the need for a re-opened Manston Airport as a freight airport and cannot be so relied upon by RSP, the Secretary of State, the Planning Inspectorate and any appointed Examining Authority (should RSP submit its application and the Secretary of State accepts the application).

2.14 Specifically, Azimuth seek to rely on estimates presented in our reports of the number of freighter movements which might be required to carry the freight tonnage that could be displaced from the London airports in 2050 if there is no additional capacity provided by that date. It is important to note that our reports for TfL and the FTA went on to explain why there were other alternatives, such as regional airports or trucking to Europe, which would be favoured to meet demand ahead of any residual use of more dedicated freighters.

2.15 Despite the reports being very clear, when read in their entirety, that the solution to any shortage of capacity would <u>not</u> be extensive use of pure freighter aircraft, Azimuth rely on the freighter movement equivalents from our reports as justification for their projections of freighter movements at Manston both in the short to medium term and up to 2039. There are a number of problems with this approach:

- The analysis as at 2050 is not representative of the position at 2039 or any earlier date;
- The Government is committed to there being a third runway at Heathrow, with a major justification being the increase in bellyhold freight capability at the UK's principal freight hub;
- Gatwick has increased its effective hourly movement capacity, enabling more passenger aircraft and associated bellyhold capacity, particularly related to recent expansion of the long haul network;
- Stansted has 20,500 annual movements that are reserved for freighter aircraft, of which only around half are currently used. The Airport's Sustainable Development Plan[14] sets out an aspiration to grow cargo, including on dedicated freighter aircraft, to 400,000 tonnes annually;
- Regional airports have developed additional long haul services, providing additional bellyhold capacity, and have plenty of spare capacity to accommodate additional freighter aircraft movements to the extent that there is any need for more pure freighter capacity;
- The Government has not ruled out the provision of further additional airport capacity beyond 2030.

2.16 Fundamentally, the use of theoretical levels of excess air freight demand at 2050 cannot be used to underpin short to medium term forecasts for the expected usage at Manston or an assessment as to whether it could be viably developed in the meantime, regardless of the precise timing of the delivery of the third runway at Heathrow.

[14] Stansted Airport Ltd, *Sustainable Development Plan 2015*, Summary.

Transport for London

2.17 At the outset, it is important to note that our 2013 paper for TfL (referenced by Azimuth as an unpublished TfL note[15]) points out the UK did not then appear to be disadvantaged in terms of air freight capacity and that there was still substantial capacity for freighter movements remaining at Stansted. This is an important consideration in terms of short term forecasting and should have informed Azimuth's thinking.

2.18 In this paper for TfL, we estimated the excess air freight that could not be accommodated in bellyhold capacity on passenger aircraft under different scenarios of additional capacity at the London airports and converted that excess to an equivalent number of freighter movements. The 54,000 potential additional freighter movements that Azimuth (and Northpoint) cite at paragraph 3.4.5 are the additional freight carrying capacity required in the event of there being no further runway capacity at any of the London airports[16] (a severely constrained scenario) that is simply no longer realistic as we have set out above. Azimuth's (and Northpoint's) use of this figure as a potential market for Manston is misleading.

2.19 The note then goes on to set out how this requirement for additional freight capacity might be met and the economic consequences. In the first instance, we noted that around 14,000 additional freighter movements could be accommodated in the London system if no capacity expansion takes place, and this included the use of additional available freighter slots at Stansted. Azimuth appear to have taken our inclusion of Manston, as an example of a smaller airport in the South East that could accommodate some movements, as an indication that it could play a substantial role, wrongly stating in the Executive Summary and at paragraph 3.4.5 that we said that Manston was expected to handle 14,000 freighter movements. Manston was given simply as an example of an airport with freighter activity at the time of writing (2013) with the potential to accommodate some additional movements (as we set out in Section 4 of this report, the capability of Manston Airport is 21,000 annual cargo aircraft movements before allowing for any night operations).

2.20 In essence, our assumption was that, across the London airports (including Manston albeit on the periphery of the South East of England), it was plausible that, by 2050, double the number of existing freighter movements could be accommodated compared to 2012. If anything, the correct inference to draw from this is that we expected the number of freighter movements to double from 2012 levels, i.e. to around 1,000 movements a year at Manston.

2.21 Beyond this, the question of how excess freight demand in the London system in the future will be served is largely left open in our 2013 note but we made clear, at paragraph 26, that we believed the two most likely options would be greater use of bellyhold capacity and freighter operations at UK regional airports, noting Birmingham, East Midlands and Manchester particularly, or the trucking of freight to major European hub airports with substantial route networks and bellyhold capacity. This reflects the growing role of regional airports in serving their local freight markets (avoiding the need to truck to London), while balancing particularly the attractiveness of the substantial bellyhold capacity, lower air freight rates, and flexibility offered by the major continental hubs. We discuss this further below in relation to the economics of the air freight sector.

[15] See Appendix A.

[16] Based on the Airports Commission capacity assumptions.

2.22 Our TfL note also makes clear (paragraph 25) that, to the extent that there was a capacity constraint, the first consequence might well be less capacity for transit freight through the UK airports, prioritising freight to and from the UK. Ultimately, our TfL note concludes that:

"In the constrained, max use, case, there would be severe limitations of pure freighter movements at the London airports, which could amount to around 26% of the required air freight capacity to/from London. The extent to which this would act as a limitation on overall air freight volumes would depend on the extent to which the freight is still carried from regional airports or by truck. Clearly this would impact on the cost/efficiency of shipment, which in turn could impact on freight volumes carried. Again, it is outside the scope of the current exercise to assess these effects.

Overall, in assessing the economic value for air freight between the scenarios, the main difference is likely to lie in producer costs passed through to users and the impact that would have on business costs and hence output/freight generated. It would not be safe to assume that the reduction in cargo ATMs at the London airports necessarily translates to lost shipment value in its entirety."

2.23 Azimuth, at paragraph 3.3.2, incorrectly characterises our note to TfL as expressing a concern about the amount of trucking to Europe. Significantly, the last part of paragraph 9 is omitted by Azimuth. When looked at in its entirety, it is evident that we were noting that trucking is an inevitable part of the market, for reasons which we explain later in this section:

"However, the role of the low countries and Germany in acting as the major freight centre in western Europe is noticeable. In total, the main German freight airports handled almost 4.2 million tonnes of freight in 2012 which, when combined with the Netherlands and Benelux countries, amounted to 7.2 million tonnes of air freight flown. These airports have developed major and specialist air freight roles, with freight being trucked from all over Europe to feed these freight hubs. The integration of trucking with air freight should not be overlooked, even within the UK. In practice, it is unlikely that the UK could replicate this role, even with unconstrained airport capacity, due to its island location on the western edge of Europe."[17]

2.24 In other words, our assessment was that there would not, in effect, be a shortage of capacity for freight, albeit that there would be some loss of producer efficiency by way of increased trucking and time related costs, which would be small in the context of the overall cost of air freight transport. Our summary conclusion in this note makes this clear:

"The key difference between these two scenarios would be in terms of the efficiencies and economies of scale gained by the industry arising from the concentration of freight activity at a single hub. In both cases, the overall volume of air freight to and from the UK is expected to be broadly the same, although the actual freight carried including transit freight would be higher in the hub case. However, under the new hub scenario, savings from greater efficiency may be passed onto users, so reducing shipping costs and facilitating trade leading to higher freight volumes, but it is beyond the scope of the current exercise to assess this. "[18]

[17] See Reference 6, paragraph 9.
[18] Ibid, paragraph 30.

2.25 We were cautioning against the assumption that there would be a requirement for more capacity for dedicated freighter aircraft in a constrained scenario as there would be other more cost effective routes by which the freight would be carried, albeit at a higher cost than with the availability of more bellyhold capacity under a 4-runway hub scenario as being advocated by TfL at the time. Use of more dedicated freighter aircraft would represent a further increase in cost for shippers as we explain further later in this section.

Freight Transport Association

2.26 Our work for the FTA and TfL in 2015[19] again identified the potential for excess demand for air freight in the London system by 2050 and converted this number to freighter movements to demonstrate the point that a four runway hub could house this excess demand in one place. If this demand could not be served in the London system, the report makes clear our belief that it would then be trucked to alternate airports that offer significant options in terms of bellyhold freight or freighter operations. In this context, the bellyhold capacity and destinations offered by the continental hubs are a decisive factor in determining how the market will be served due to the range of destinations served and the lower costs inherent in using bellyhold freight. These continental airports act as freight consolidation hubs for the whole of Europe given their more central locations and, hence, offer consolidation advantages and more competitive freight rates.

2.27 Azimuth's interpretation of our work for FTA appears to erroneously assume that excess demand in the London system will need to be met by additional freighter movements from an airport in the vicinity of London. For instance, at para 4.2.3, they state that *"Even so and as York Aviation figures show, there will be a shortfall of slots for dedicated freighters, likely to be in the region of 45,000 by 2050"*. Whilst our report does estimate that the excess air freight demand with a third runway at Heathrow would be around 1.2 million tonnes by 2050, equivalent to 45,000 additional freighter movements, at no point does our report say that this is how the market could or should be served. Indeed, as we state on Page 20 of our FTA report *"we have assumed that freighter aircraft primarily act as a means to supplement bellyhold capacity where insufficient bellyhold capacity is available"* and our later analysis of how the market might react to this excess tonnage focusses on this assumption by considering the attractiveness of alternative airports in terms of both passenger and freight services on offer. We continue to be of the view that bellyhold capacity elsewhere will be the primary alternate given the price advantages, the flexibility offered by the long haul networks of major airports, including those on Continental Europe, and the low cost of trucking as our report for FTA makes clear.

2.28 By the time of this report for FTA, Manston had closed but, even if it had not and had been included within our modelling work, the lack of bellyhold capacity and limited overall market presence would have meant it could only be projected to capture a very small percentage of the excess demand. For instance, East Midlands, an airport with around 10 times the freight throughput of Manston, and only 1 hour further away from London than Manston (and substantially closer than Manston to many of the major regional markets and manufacturing centres) captured only 8% of the excess demand in our 2015 modelling. In the Heathrow 3rd runway scenario, this equates to around 100,000 tonnes in 2050. This would equate to around 3,600 additional freighter movements in 2050.

[19] See paragraph 1.14 above.

The Economics of the Air Freight Industry

2.29 Throughout the analysis, Azimuth appear to assume complete interchangeability between bellyhold freight, pure freighter operations and express/integrator operations without any analysis of the economic drivers for the use of each type of freight transport and the economics of trucking of air freight between the UK and Europe. This is a fundamentally unrealistic assumption and leads to a misrepresentation of the market opportunity for pure freighters.

2.30 In our work on international connectivity for Transport for the North (TfN) in 2016 (in conjunction with MDS Transmodal[20]), we identified the key characteristics of the air freight market. We identified that air freight can, in principle, be broken down into three main sectors:

(i) bellyhold, where cargo is carried principally in wide-body long-haul passenger jets[21]. Shippers are able to take advantage of flights to a wide variety of destinations from the main hub airports such as Heathrow and from other major European hubs, e.g. Frankfurt and Paris, similarly offering a wide range of global destinations on passenger flights;

(ii) freight only services, which are viable on only a handful of routes and/or for specialist commodities on an ad hoc basis. This is an increasingly limited sector in the UK due to the variety of bellyhold routes available and the strong presence of the integrators in the market;

(iii) express 'parcel' type services that operate on a hub and spoke network basis by 'integrators' (typically DHL, Fedex and UPS). These services increasingly carry larger consignments and East Midlands and Stansted Airports dominate the UK market, feeding bigger hubs located more centrally within Europe.

2.31 In general, air freight is seeking door to door journey times of the order of 4-5 days, which is possible using bellyhold through major hub airports, whilst integrator freight will generally seek a door to door journey time of no greater than 2 days.

2.32 The majority of tonnage moves by bellyhold as, in essence, this capacity is sold at marginal cost, with the majority of the airlines' operating costs covered by the passengers carried. The market is dominated by Heathrow and the other major European passenger hub airports because the sheer range and frequency of services provides a competitive environment which typically delivers the lowest freight rates and the greatest range of destinations served. There is high locational inertia in the air freight sector, which is likely to remain focussed around Heathrow for the foreseeable future as it is expected to remain by far the largest UK airport for cargo. In our TfN work, we estimated that around 70% of freight from the North of England in 2015 was trucked to or from other hubs for uploading, with some freight trucked to Heathrow for consolidation by the freight forwarders before being trucked back to Manchester to avail of bellyhold capacity there. Assuming similar proportions from other regions of the UK, it is clear that at least a part of any excess demand at the London airports is likely to be satisfied at regional airports, not least as airports such as Manchester, Birmingham and Edinburgh increase their range of direct long haul services offering bellyhold capacity.

[20] Transport for the North, *International Connectivity Evidence Report*, York Aviation/MDS Transmodal July 2016, Appendix C.

[21] Short haul flights provide small amounts of bellyhold capacity but, generally, low fares airlines do not carry cargo within their operating model.

2.33 The integrator sector carries more urgent parcel traffic based upon hub and spoke networks offering (typically) two day intercontinental transits. Spoke services from the UK from East Midlands and Stansted serve central European hubs at airports such as Brussels and Frankfurt. The need for frequency tends to mean that, typically, only one 'spoke' can be justified per integrator per country and these spoke services tend to be centrally located to maximise accessibility from all parts of Great Britain. East Midlands Airport is ideally placed in this regard. The integrators are increasingly using bellyhold capacity as well, essentially acting as freight forwarders in this regard.

2.34 A handful of freight only services complement bellyhold and integrator services where there is sufficient cargo to justify dedicated aircraft to a particular destination. There are a small number of scheduled freighter services which circumnavigate the globe, picking up and dropping off cargo at each point. More often, dedicated freighter services, other than those linking with major cargo hubs such as Hong Kong, Seoul or Dubai, operate on an ad hoc basis dealing with special consignments, such as large loads, or specific commodities where time is of the essence, such as the perishables trade, which was previously the principal cargo usage at Manston. Whilst there is some cascade from bellyhold to pure freighter operations where capacity is not available or time is critical, ultimately, it is the economics of the operation which is key. It does not follow that displaced bellyhold freight will seek a more expensive pure freighter service from a nearby airport over the use of available bellyhold capacity from a more distant airport.

2.35 In particular, we identified that the high cost of air freight leads to a pressure to be cost effective and the role of freight forwarders[22] in consolidating loads in order to secure the lowest possible freight rates. Cargo, other than integrator operations, tends to be assembled by specialist air freight forwarders, which cluster around the major hub airports so as to avail of the competitive freight rates on offer. As the road transport costs are very low compared to the value of the cargo and the air freight costs, air cargo is often trucked long distances to find capacity (at a lower freight rate). This forms an important driver in how freight moves from its origin to the actual airport of uploading and applies both within the UK and between the UK and Europe.

2.36 The charges levied per tonne of cargo for the long haul flight leg are high relative to inland haulage costs so that a relatively small difference in air freight rates between different airports will easily cover any additional costs for road haulage. It is for this reason that the majority of air freight will always gravitate towards bellyhold where there is capacity available, even if there is a substantial road haul as part of the journey. Given the wide range of bellyhold services available from the UK, which will increase following the development of a third runway at Heathrow and long haul service growth elsewhere, it is reasonable to expect that pure freighter operations will continue to make up a declining share of the market.

[22] A freight forwarder, forwarder, or forwarding agent is a person or company that organizes shipments for individuals or corporations to get goods from the manufacturer or producer to a market, customer or final point of distribution. For example, the freight forwarder may arrange to have cargo moved from a plant to an airport by truck, flown to the destination city, then moved from the airport to a customer's building by another truck.

2.37 Trucking of air freight is not a new phenomenon. The work by Steer Davies Gleave for the Department for Transport (DfT) in 2010[23] estimated that over 50% of air freight leaving the UK for Europe was trucked rather than using the bellyhold of passenger aircraft. In other words, airlines are using trucks rather than aircraft to distribute freight arriving on and connecting to their global passenger (bellyhold) and freighter operations. At the time of this analysis, Manston was still operational. If it was more economical to use a pure freighter service from Manston rather than trucking over the Channel, this would have been happening in 2010 but it was not. Other than the potential additional border checks as a consequence of Brexit, Azimuth advance no reasons why freight would switch from the cheaper trucking/bellyhold model to expensive pure freighter operations. We believe that the economics of air freight will continue to favour the use of bellyhold freight, other than for a minority of consignments, to and from the UK even if there is a lengthy trucking leg.

Manston in the context of the drivers of air freight

2.38 At Para 4.0.2, Azimuth suggest the reasons why cargo airlines choose airports. In reality, Manston does not fulfil a number of these key criteria meaning that, even in the most favourable circumstances, it can never be more than a niche player in the market. Specifically:

- It does not provide convenient access to the main markets;
- The drive time to Central London is nearly two hours[24];
- The great majority of the Airport's natural catchment is sea and there is very limited evidence of any local demand base;
- Competition is strong from the London airports, with already established freight forwarding and a wide range of bellyhold capacity;
- Given that the Airport is closed and staff dispersed, Manston would not provide any advantages in terms of experience of cargo handling and is likely to offer only marginal advantages in terms of the speed of transit through the Airport;
- Manston could potentially offer lower airport costs, albeit this would impact on the viability of the Airport, but these lower airport costs and any reduction in flying time would not offset the additional cost of freighter transport compared to bellyhold;
- It is also unclear as to what extent night time operations will be an option at Manston given the operating constraints under which the Airport formerly operated which prohibited scheduled night flying[25].

[23] Steer Davies Gleave, *Air Freight: Economic and Environmental Drivers and Impacts*, March 2010
[24] Based on Google maps standard driving speeds.
[25] Azimuth Vol 1 paragraph 7.1.6 quotes from a 2005 MORI survey that people were not impacted by night flights but this would reflect that there were no scheduled night flights when the airport was operational. Local resident support for re-opening (paragraph 7.1.1) needs to be seen in this context. We note that RSP's Consultation Overview Report states (on page 11) that *"Air freight operations would be predominantly during the daytime, in accordance with operations at other similar air freight airports. There may be a requirement for a small number of night-time flights, the details of which will be determined as part of the on-going project design, taking account of feedback from the Statutory Consultation, and presented with the DCO and assessed within the Environmental Statement. For the purpose of the PEIR assessment, and as a worst case, the working assumption is that there might be a maximum of eight (8) aircraft movements at night between the hours of 2300 and 0600."*

2.39 A key consideration is Manston's geographic position substantially away from the economic spine of the UK and with very limited local demand. It is remote from most markets with a journey time to the M25 of nearly 1 hour and accessibility beyond would be subject to the general levels of traffic congestion in the London area. Azimuths's suggestion (paragraph 1.2.2) that Manston might effectively serve as a 4th runway for Heathrow for air cargo flights is merely fanciful given the journey time of 1¾ hours, which is little shorter than the time from Heathrow to East Midlands Airport with an already well developed infrastructure for handling air freight and more likely to fulfil such a role in relation to freight overspill from Heathrow that is time critical or of such a special nature as to warrant the use of pure freighter aircraft.

2.40 Many of the other points raised by Azimuth regarding security, e-commerce and just-in-time delivery are all factors relating to the overall efficiency of the industry. If anything, what the analysis presented by Azimuth demonstrates is the importance of developing efficient freight networks serving the whole of the UK rather than the need for a re-opened freight focussed airport in the South East of England. Manston could only recapture economic benefits from cargo being trucked to the continent, as asserted at paragraph 4.8.4, to the extent that it provides a more economically efficient solution. Manston was not viable in the past and there do not appear to be significant changed circumstances that would make it viable in the future. This lack of inherent viability is indicative of the fact that it did not provide an economically efficient solution.

2.41 One of the key reasons that the UK aviation sector is so productive, as cited by Azimuth at paragraph 5.2.1, is that it allows the market to work. Inefficient and unnecessary actors in the market are allowed to fail. There is a strong argument to suggest that the closure of Manston is simply a part of the process of the market working and delivering more efficient solutions. The argument around the importance of the sector and Manston's role only applies if it is commercially viable (and makes an adequate return to shareholders) and represents an economically efficient allocation of resources. Otherwise, it will in fact damage the productivity of the UK aviation sector.

2.42 Azimuth asserts, paragraph 6.2.2, that the perceived lack of investment in Manston by the previous owners was an impediment to freight growth. However, this is at odds with previous statements by former operators of the Airport and comments by interviewees, in Azimuth's Volume I, on the quality of service received by customers at Manston. In its 2002 results, the Wiggins Group plc claimed that, following investment, Manston was capable of handling 200,000 tonnes of cargo a year[26]. The subsequent owners, Infratil, published a Master Plan in 2009[27] which identified triggers when there might need to be some increase in cargo aprons or warehousing at 100,000 tonnes and 200,000 tonnes of cargo annually. Given that peak tonnage was 43,000 tonnes, this does not suggest that lack of capacity or shortage of investment was an impediment to increasing cargo volumes at Manston in the past, rather the limitation was the market.

[26] https://www.investegate.co.uk/wiggins-group-plc---230-/rns/final-results/200207300700452686Z/

[27] Manston, *Kent International Airport Master Plan*, November 2009, page 62.

2.43 The only specific impediment to increasing throughput cited by Azimuth is a limitation to 1 aircraft being handled at a time but we understand that this was not the case, albeit supervised taxi-ing procedures had to be put in place when there were 2 aircraft using the apron at the same time. In practice, it does not appear that lack of investment was an issue which impacted on freight throughput. Rather, it must be assumed that the previous owners did not believe there was a viable economic case for investment. Lack of investment does not necessarily mean constrained demand and it may simply be that there was not sufficient demand to justify investment and that the market was functioning properly.

Qualitative assessment of demand (Volume II)

Forecasting Methodology

2.44 Volume II of Azimuth's work begins with an assessment of different forecasting approaches for cargo, noting that forecasting of cargo is not as well developed as that for passenger activity. We agree that air freight forecasting is difficult and that there is a lack of hard data. However, we do not agree with Azimuth's assertion that quantitative methods are, therefore, not suitable and that qualitative methods are more appropriate. The evidence cited by Azimuth at Table 3 does not support this conclusion and suggests that causal methods (regression analysis) remain the most appropriate for forecasting demand for cargo and freighters. Such an approach is far more akin to the type of analysis undertaken by York Aviation in its work for TfL and FTA and upon which Azimuth seek to rely as a basis for the scale of activity that Manston might attract.

2.45 Whilst we understand the reason for Azimuth's assertion that it <u>may</u> not be appropriate to extrapolate Manston's future performance from its historic performance, this does not take away from the importance of grounding any future forecast in quantitative evidence of the drivers of the market and how these might change in the future. In any event, the assertion is at odds with the reliance placed by Azimuth on our quantitative assessments of 'spill' from the London airports at 2050, in the circumstances of no additional runway at Heathrow, as corroboration of their qualitative projections for Manston to 2039. To reiterate, reliance on these estimates is not appropriate for considering the potential role for Manston, not least as they relate to 2050 and cannot be applied to 2039, or any earlier year, without working through from first principles how any constraints in the London system might bite and the likely market reaction.

2.46 As well as reviewing forecasting methodologies, Azimuth sets out some air freight growth forecasts produced by others. At paragraph 3.6.1, Azimuth cite the DfT's assumption for growth in freighter movements in its 2013 UK Aviation Forecasts at 0.4% p.a[28]. The DfT makes clear that the growth in freighter flights is seen as a residual, representing the share of freight on pure freighter flights after allowance is made for bellyhold cargo being the primary mode. It is clear that the DfT is expecting the share of the market using pure freighters to and from the UK to continue to decline. Indeed, the most recent UK Aviation Forecasts published by the DfT[29] suggest that there is expected to be no growth in the number of pure freighter movements to and from the UK above 2016 levels in the period to 2050. Hence, any increase in freight movements at Manston would have to come at the expense of other airports. We discuss the ability of other airports to handle such movements in Section 3.

2.47 Given the existence of a definitive 'official' UK forecast for freighter movements over the period to 2050, it is not clear why Azimuth rely on global forecasts for air freight produced by the manufacturers Boeing and Airbus for the purpose of selling aircraft (paragraph 2.1.10) as a basis for the longer term projections of freighter movements at Manston in their Volume III (paragraph 2.3.2). The global growth rates cited by Azimuth are inappropriate for projecting growth in freighter movements at Manston for several reasons:

- ✈ They relate to RTKs (Revenue tonne kilometres) (Boeing[30]) and FTKs (Freight tonne kilometres) (Airbus[31]) and will reflect increased tonnage per aircraft, including freight carried in the bellyholds of passenger aircraft, and longer sector lengths as well as any growth in aircraft movements;
- ✈ The projections relate to growth in air cargo at the global level and lower growth is clearly shown as expected to/from and between more advanced economies such as the UK;
- ✈ In the case of Airbus, specific lower growth rates are cited for growth in freight tonne kilometres in freighter aircraft (2.6% p.a. compared to 3.8% per annum in their latest forecasts which are lower in any event than the previous forecasts used by Azimuth). Even then, this growth rate relates to FTKs not to freighter movements.

2.48 Taken together, these reports point to a declining market share for freighter aircraft in mature markets such as the UK, where there is a good supply of bellyhold capacity. It is, hence, not reasonable to use the Boeing and Airbus growth rates as a basis for projecting future growth in movements by pure freighter aircraft to and from the UK, particularly given the existence of DfT projections for such movements. Rather than being conservative, as suggested at paragraph 2.3.2 in Volume III, the use of a 4% per annum growth rate for years 10 to 20 at Manston is highly optimistic, and is certainly not supported by the DfT's analysis of the UK market.

[28] Department for Transport, *UK Aviation Forecasts 2013,* paragraph 3.49.
[29] Department for Transport, *UK Aviation Forecasts*, October 2017, paragraph 2.56. The decline in pure freight movements since 2001 is illustrated in Figure 4.5.
[30] Boeing, *World Air Cargo Forecast 2016-2017*, page 2.
[31] Airbus, *Growing Horizons – Global Market Outlook 2017/2036*, page 101. Note that the 2016 version to which Azimuth refer is no longer available on the Airbus website.

Interviews

2.49 Having rejected the recognised methodologies for forecasting freight demand at an airport, Azimuth rely on interviews with 24 individuals and/or organisations as set out in Table 4 of their report. To a large extent, these are people with past connections with Manston and who may not have a totally unbiased view on the desirability of it re-opening. It is notable that few cargo airlines or large scale air freight operators were interviewed, rather the list is dominated by local interested parties and logistics firms, not all of which are still in business. In some cases, throughout the remainder of Volume II, individuals are referred to who are not listed in Table 4 and, in other cases, individuals or organisations are referred to in different terms to those listed in the table. This does not suggest a very robust or rigorous approach to setting out the potential for Manston. Although the framework of questions is set out at paragraph 4.3.1, we are unable to identify any questions that would enable an assessment to be made of future passenger or freight volumes that would be likely to use Manston and which could be used as the basis for any forecast of future usage.

2.50 In the light of this, the remainder of Volume II is largely a qualitative description of current problems experienced in transporting cargo in general in the UK and in terms of past operations at Manston. These do not, however, provide any insight into the potential scale of demand for freight or passenger services at Manston. Essentially, it constitutes a speculative description of where there might be opportunities if Manston re-opens. We highlight the speculative nature of some of these comments relating to freight activity below. Taking Azimuth's categories in turn:

Process and Issues associated with airfreight

2.51 This analysis is generic and of no direct relevance to the potential for Manston. In particular, no linkage is drawn between the commodities which typically use air freight set out at paragraph 5.1.2 and the economic sectors active in Kent. Significantly, at paragraph 5.1.5, Azimuth cite a respondent that made clear that *"tendered"* prices determine how air freight moves. This is a powerful reason why bellyhold will in most instances win over pure freighter operations. Issues of price for pure freighter operations are reinforced at paragraph 5.1.10, particularly in relation to the risks associated with higher fuel prices.

2.52 There are then a number of comments regarding the current difficulties of operating at Heathrow at paragraph 5.1.6ff. It is recognised that there are few realistic slots available for additional freighter operations at Heathrow so unsurprisingly Coyne Airways cite a difficulty for them if they sought to fly to Heathrow on an ad hoc basis. However, in reality, this airline is not a major player in the UK or Europe, operating a small number of weekly flights from Amsterdam to feed its network of flights within the Caspian Sea region[32]. Comments from ACC Shipping and Active Transport need to be read in the context that they are local Kent shippers and transporters of cargo that have a vested interest in seeing Manston re-opened.

[32] http://www.coyneair.com/caspian_schedule.htm

Future trends in airfreight

2.53 To some extent, the issues highlighted here regarding security relate to the specific issues around Calais at the time when the interviews were carried out but the situation has now changed since October 2016. It is recognised that security of air freight is an increasing concern globally but this would apply at Manston as well as elsewhere.

2.54 Again, paragraph 5.1.15 highlights the dominance of bellyhold freight. Whilst noting that the A380 aircraft has more limited space for bellyhold cargo than B747s at paragraph 5.1.14, Azimuth neglect to point out that other new aircraft, such as B787 and A350 aircraft, do not suffer from similar reductions in space and capacity and continue to offer substantial bellyhold opportunities and capacity.

Motivation to use Manston

2.55 The response cited at paragraph 5.1.19 makes clear that the most important factor in considering freighter operations is *"cost, speed and access to road networks"*, which is not a condition which Manston can meet for the majority of the UK. The local transport firms (paragraph 5.1.21) clearly saw an advantage for them in Manston re-opening but it is far less clear that this was reflected by the broader industry. Significantly, paragraph 5.1.20 does not address the operational reasons why major freight forwarders seek to locate close to Heathrow, Stansted or East Midlands, except possibly for their city centre sales offices.

2.56 The response quoted at paragraph 5.1.23 makes clear that for Manston to be an attractive option to freighter operations, it would need to offer night operations. In the light of the past ban on scheduled night flying, this would be a major change to operating mode, with consequential environmental impacts. Furthermore, RSP's position in relation to whether scheduled night flights will be allowed or not is ambiguous (see paragraph 2.37 above) and we understand that some supporters of the re-opening have said that such operations would not be allowed. In the event that night flights are not allowed or heavily restricted, this would further diminish the attractiveness of Manston for pure freighter operations (comparisons with the major European freight hub at Frankfurt as included by Azimuth are simply not realistic).

Demand model and data for Manston Airport

2.57 This section does not, in fact, contain any data for Manston nor set out a view on how future demand might be modelled.

Freight focussed findings

2.58 The one airline interviewed made clear (paragraph 5.2.3) that *"success at Manston depended upon identifying a niche market and becoming known for excellence. In particular, suggestions included a perishables centre, handling of live animals, easy access for charter flights, and handling cargo that is not necessarily straightforward"*. We would have expected the remainder of the report to concentrate on quantifying the size of this niche market, including any Brexit implications for exports (paragraph 5.2.1). It is clear, however, that the realistic expectation for Manston is for a small niche operation rather than as a general 'overspill' airport for London.

2.59 The spurious suggestion that freight might be *"banned"* from Heathrow (paragraph 5.2.6) and Manston might benefit is clearly nonsense in the context of the Government's support for a third runway to provide capacity for freight in the bellyholds of passenger aircraft as much as for passengers.

2.60 Whilst the suggestion from Coyne Airways about the potential for Manston to offer fuel cost savings when flying south from the UK (paragraph 5.2.11) is interesting, it appears not to take any account of the locations where freight is generated in the UK or where it is consolidated into viable loads. It does not seem likely that Coyne Airways would itself relocate its one European feeder service from Amsterdam to Manston given this would increase rather than decrease fuel burn. As noted earlier, the real reason freight is trucked across the channel is to avail of cheaper freight rates available at the main European hub airports, which act as focal points for cargo for the whole of Europe.

2.61 Azimuth also claim that the bellyhold model is broken and that there is about to be a shift back to pure freighter operations at paragraph 5.2.25 but this is pure speculation and at odds with other industry commentators (see Airbus freighter forecasts which project an increasing share of bellyhold globally[33]) and the UK Government's view as expressed by the Department for Transport.

2.62 Whilst paragraph 5.2.24 says there was underinvestment in facilities by the previous owners, the quotation from Finlays at paragraph 5.2.26 makes clear that Manston previously offered a good level of service. Hence, there is little evidence to suggest that underinvestment was any impediment to Manston attaining its natural share of the market in the past. Although Finlays have now relocated their operation back to Stansted, we would accept that they might choose to return to Manston with a similar number of movements as previously if the facilities were re-instated and provided the cost of operating was competitive compared to Stansted. There may also be scope for some humanitarian and military flights (paragraph 5.2.48) but these will be small in number and not the basis for a viable operation of the Airport.

2.63 At paragraph 5.2.45, Fedex's criteria for an airport to be attractive to an integrator are set out and these seems to describe the characteristics of their main UK base at Stansted. There is then a discussion about some of the problems DHL perceive at Heathrow but, of course, DHL's principal UK operation is focussed at East Midlands where they have an extensive operation. From our work with the integrators and with the Freight Transport Association, we know that Manston is too peripheral for integrator operations serving the UK. Integrators have a strong preference for locations more centrally located in the UK with good road access to all of the major markets. The availability of land for warehouses (paragraph 6.2.6) is far less important than a location central to the market and the availability of good road access, neither of which are characteristics of Manston. This would apply equally to the suggestion that Amazon might locate there or that the Airport could become a base for drone operations (6.3.24-27). It is simply in the wrong place to serve the market being at the far south east at the end of the country on a peninsula.

[33] See Footnote 31.

2.64 The comparisons to Frankfurt Airport, in terms of the ability to sustain a freight operation without night movements, are simply irrelevant given that Frankfurt carries the second highest freight tonnage of any European airport and acts as a major cargo hub for air and road freight given its highly central location. Much of Frankfurt's cargo is carried in the bellyholds of passenger aircraft and this underpins the freight hub role. Given that Manston does not have anything like the overall market attractiveness of Frankfurt, for many reasons, any constraint on night operations would be a major impediment to freighter operations.

2.65 We do not discuss the passenger market in this report, albeit we have reviewed Azimuth's forecasts and disagree with their conclusions, which we can report upon should any application be made by RSP. The latter parts of Azimuth's Section 5 mention opportunities around ancillary activities such as MRO, aircraft recycling, flying schools and business aviation. We would simply highlight, at this stage, that these areas are highly competitive markets and it is not immediately obvious why Manston would provide an attractive option for operators in these markets when compared to what is often global competition. Nor is it evident that such activities would contribute substantially to the viability of Manston.

Analysis and Conclusions

2.66 Sections 6 and 7 of Azimuth's Volume II, go on to discuss what this means for Manston and draw conclusions. In general terms, Azimuth seek to draw conclusions about the cargo performance of Frankfurt, Heathrow and Stansted airports which are not consistent with the actual facts.

2.67 Again, there is reliance on our work for TfL and the FTA (paragraph 6.1.8) to justify the conclusions reached. As stated above this work does not support RSP's case.

2.68 Azimuth then identify that there are sectoral and geographic markets for which Manston has potential but there is no quantification of the scale of these markets. This is a fundamental gap if the scale of any potential opportunity is to be understood.

2.69 At paragraph 6.3.1, Azimuth set out 9 potential scenario drivers for Manston. However, it is not clear how these scenario drivers have been taken forward to the forecasts set out in Volume III, which do not set different potential scenarios for growth. If we take each of these drivers in turn:

1. *The UK's position in Europe* – Azimuth appear to assume that there will be an opportunity for multi-hop freighter services from Manston but it is far from clear that the traffic rights for such services will continue to be available post-Brexit.
2. *Changes to fuel prices* – in the face of the decline in the value of sterling, these are more likely to work against the operation of more freighter aircraft.
3. *The availability of more efficient aircraft* – the introduction of B787 and A350 aircraft will increase bellyhold capacity rather than reduce the capacity.
4. *Onshoring of manufacturing in the UK* – it is not clear how this is relevant given Kent does not have a strong manufacturing base.
5. *Changes to logistics and transport systems in Kent* – this is a circular argument as it relies on the re-opening of Manston driving a step change in the logistics and transport sector in Kent.

6. *Dramatic changes to economic performance* – it is noted that these are not factored into the forecasts but to the extent that there are Brexit effects on the economy, these would reduce trade and demand for air freight.

7. *Manston becomes a major integrator/forwarder base -*

8. *Manston becomes an Amazon base -*

9. *Manston becomes a hub for drone activity –*

   for the reasons noted above, all three of these seem highly unlikely and are, at best, pure speculation with no evidence base whatsoever.

2.70 Section 7 sets out the conclusions from Volume II. According to Azimuth (paragraph 7.1.1), the key issues that are seen to favour Manston are:

- Lack of available slots at other South East airports;
- Bumping of freight from passenger aircraft;
- Security issues particularly with outsized cargo;
- Speed of turnaround.

However, our analysis of the factors would suggest that, other than perhaps the last two factors, there are few factors which would favour Manston and, in any event, these could be replicated by other airports closer to the main UK distribution centres, such as Doncaster Sheffield Airport, if these were deciding factors in the market.

2.71 Based on their analysis, Azimuth then set out (at paragraph 7.1.2), the markets which it believes that Manston could attract:

- Parcels and packages through an integrator;
- Perishables including fruit, vegetables, flowers, fish, and shellfish;
- Outsized freight;
- Formula One and luxury cars;
- Live animals;
- Time sensitive items such as aircraft [parts] and the oil and gas industry;
- Humanitarian and military flights.

In addition, some passenger operations along with a number of ancillary activities such as recycling, MRO[34] etc. are postulated for Manston.

[34] Maintenance, repair and overhaul of aircraft

2.72 Whilst, except for integrator operations, they are plausible markets for some potential operations from Manston, Azimuth make no assessment of the potential quantum of local demand as a basis for assessing how big a market there is. Whilst seeking to discredit analytical methods for projecting future demand at Manston, at the same time, Azimuth rely heavily on estimates made by us and using such methods that suggest there would be excess demand in the London system at 2050 if there is no new runway at all. Fundamentally, Azimuth make no assessment of the viability of what might be on offer or address any concerns as to why such operations have not secured a viable future for the Airport previously.

2.73 The key conclusion drawn by Azimuth is that *"This report demonstrates the potential demand for Manston Airport, indicating its viability and clearly showing that Manston Airport is a valuable local, regional and national asset, providing airport infrastructure badly needed by the UK."* (Paragraph 7.0.1) There is, quite frankly, no factual basis for Azimuth to make this claim. Azimuth claim that the capacity is *"badly needed by UK"* but this is linked to erroneous use of the economic costs of there being no further runway capacity in the UK (see paragraph 2.6 of this report) and a lack of understanding of the air freight market.

2.74 In summary, Azimuth's insistence that Manston's past market performance is not a relevant consideration in understanding how it might perform in the future is both erroneous and contradictory to the evidence put forward to support the qualitative market forecasting approach. The interview findings presented are clearly focussed towards operators that have used Manston in the past and would be pleased to be able to use it again but the evidence presented does not suggest that operators would do more than reinstate past operations. This did not result in an airport that was viable and certainly did not result in annual cargo air transport movements predicted by Azimuth. In our view, and having regard to the evidence, it is unlikely that circumstances have changed so dramatically in the intervening period since the Airport was last operational that there is likely to have been a fundamental change in its ability to capture market share. Its previous cargo performance remains the best starting point from which to consider its future.

2.75 In defence of their position, Azimuth cite lack of investment by the previous owners as being a key cause of Manston's inability to fulfil its potential previously but this is not borne out by the interview responses as the quality of service was noted as good. Fundamentally, the failure to consider the drivers of the Airport's previous performance effectively is a key error which infects the subsequent forecasts presented. The limited size of the market is perhaps the best explanation as to why there was not still further investment in developing the facilities as the operation was fundamentally not viable and it would have been imprudent to invest further.

Forecasting (Volume III)

2.76 The forecasts set out in Volume III draw extensively on the analysis in Volumes I and II. Although stated to be derived on a 'bottom up' basis (Executive Summary Page 1) and claimed to be more conservative than top down, econometrically driven, projections, reliance is still placed, at paragraph 1.1.1, on our quantitative work for TfL/FTA to justify/verify the overall quantum of movements projected, stating *"Rather than merely extrapolating past activity, studies that have focused on the 'lost' or suppressed demand include York Aviation's work (2015, p. 19)."* This work was itself fundamentally top down, based on examining past activity and its implications for the future. Azimuth rely on this as, effectively, the only quantitative evidence presented of a possible level of future demand which might be available to Manston. However, for the reasons set out earlier, Azimuth has incorrectly interpreted our findings and their use of our data to support RSP's case cannot be relied on.

2.77 Paragraph 2.1.2 again suggests that the literature review undertaken showed that *"a qualitative approach was the most appropriate method through which to gather data on the potential demand for an individual airport"*. Whilst we agree that freight forecasting is difficult, as Azimuth themselves note, at paragraph 2.1.4, qualitative forecasts still need to be based on *"market data"* and, at paragraph 2.1.6, Azimuth go on to refer to the anecdotal information collected in the interviews as primary market data. Overall, this anecdotal evidence does not provide a basis for the development of a forecast of future usage nor for the presentation of a business case of the proposed development.

2.78 To further justify the approach to forecasting, Azimuth claim that the Airports Commission recommended the use of a Delphic approach. This is not strictly true as what the Airports Commission actually said was:

"In cases where there is limited or no data available, judgement based forecasting, using techniques such as the 'Delphi Method' is applied. This approach involves experts in the field considering historical patterns to predict future trends and is often used in conjunction with both naïve and causal models to compare forecast trends. The Delphi method is considered especially useful for long term forecasting (20-30 years) and is effective in drawing on existing knowledge to identify areas of agreement and disagreement in forming the forecast. However, for complex themes the Delphi Method is not always considered appropriate as there is no way of testing different outcomes e.g. through scenario testing."[35]

2.79 First of all, the Delphi Method involves <u>a number</u> of independent experts considering historic patterns of data and forming a judgement based forecast. Results are shared and refined until a consensus is reached amongst experts. This is not the same as a single judgemental based forecast as Azimuth have presented, based not on historic data but some unquantified estimate of 'lost' demand. In any event, we would question the appropriateness of this methodology, for the reasons that the Airports Commission cite, namely the importance of scenario testing in the context of a forecast to be used for a planning application, particularly one where the applicant is purporting to promote a NSIP under Section 23 of the Planning Act 2008 (as amended) and seeking to demonstrate that there is a compelling case in the public interest for the compulsory acquisition of the Airport site.

[35] Airports Commission, Discussion Paper 01, *Aviation Demand Forecasting*, February 2013, Paragraph 2.8

Freight Forecasts

Short to Medium Term (10 years)

2.80 Azimuth place reliance on both the overspill argument (paragraph 2.2.2) and that there will be a reversal away from the existing preference for bellyhold for most types of air freight, despite the overwhelming evidence that this is likely to remain the case in future due to the lower freight rates available. Azimuth's claim is not supported by the facts, current market trends or by other industry observers including the DfT and Airbus.

2.81 Furthermore, Azimuth appear to assume that, to the extent there is overspill seeking freighter capacity as an alternative, that Manston would be the only solution. This is not the case given available capacity for freighters at airports such as East Midlands (particularly well placed for the distribution of goods across the UK), Stansted and Doncaster Sheffield. These airports are already established and operational and, therefore, well placed to deal with any such requirements in the short to medium term using their existing infrastructure and without the need for any compulsory acquisition of land.

2.82 At paragraphs 2.2.6 and 2.2.7, Azimuth set out the methodology they have used for deriving freight movements and tonnage for Manston. In essence, these movement forecasts are entirely based on claimed confidential discussions with airlines, airports and others involved in the industry, which are then converted to freight tonnage based on the capacity of each aircraft and assumed load factors. These discussions would appear to be different from the list of interviewees reported in Volume II, which included only 1 airline (unlikely itself to relocate its single European operation to Manston) and no other airports. Although it is claimed (paragraph 2.2.9) that switching costs have been taken into account, there is no explanation as to how these costs have been factored into the assessment of what operations Manston might attract. It is likely that RSP would need to incentivise such a switch of activity and this would impact on the overall viability of the Airport, particularly in the early years. A further consequential issue arising from this is the economic cost of displacement of activity, which we discuss further in Section 5, as this needs to be accounted for in economic assessment of RSP's proposal.

2.83 A vague list of potential operations is set out at paragraph 3.2.3, albeit with specific assumptions then stated about the loadings on each. However, the basic information regarding the likely annual frequency of each operation is not given, which is essential to enable an understanding of the likelihood of such operations using Manston in the context of the UK air cargo market as a whole and taking into account ongoing operations at other airports. Paragraph 3.2.3 appears to set out simply a list of generic airlines that might offer services if Manston is re-opened. It provides no insight into whether the demand to fill those services will be there or whether the services could be operated viably by the airlines concerned and at what weekly or annual frequency. This is simply not an appropriate or robust basis for a forecast.

2.84 Whilst accepting that there may be confidentiality concerns in revealing the specific plans of any individual airline, this is all the more reason why there needs to be some underpinning analysis of the potential scale and viability of each specific market identified in the forecast in order to provide some basis for asserting that any of the airlines might operate to the destinations postulated. As presented, the aircraft movements and the consequential tonnage forecasts are entirely hypothetical with no obvious linkage back to any of the evidence presented in the earlier volumes. This is not acceptable given the implications and importance of any proposed application for a DCO and the requirement that a compelling case be demonstrated for the purpose of compulsory acquisition. At the very least, there is a lack of transparency in the approach that needs to be explained so that consultees can understand the forecast and in order to determine whether or not the proposed DCO application falls within Section 23 of the Planning Act 2008 (as amended).

2.85 To illustrate the lack of credibility of the forecasts, Table 1 shows for Year 2 (the first operational year), a throughput of nearly 100,000 tonnes. This would make Manston the 5th largest freight airport in the UK in its first year after re-opening (compared to 2016 actual throughput at the other airports). This would place it close to the scale of freight operations at Manchester Airport, including bellyhold freight. It would make Manston the 3rd busiest airport in the UK in terms of tonnage carried on dedicated freighter aircraft. This is simply not a credible proposition. It is simply at odds with the verifiable evidence and contrary to all experience there is of operations at Manston. If there is a short term market of that scale available for Manston, why did it historically not exceed 43,000 tonnes (2003)? Without full explanation of the scale of each of the markets and a reasoned justification for the number of movements assumed for each of the operations identified at paragraph 3.2.3, the forecasts as presented cannot be considered robust and substantial further evidence is required to validate the basis of the RSP DCO proposal.

Long Term (10-20 years)

2.86 As noted earlier in this section, the long term forecasts wrongly apply a 4% per annum growth rate as a basis for deriving the longer term freighter aircraft movement forecasts for Manston. To reiterate, this is inappropriate and unrealistic given that it is based on forecasts by Airbus for freight tonne kilometres at the global level[36]. Even if the short term forecasts were credible, which they are not, their extrapolation is on an unrealistic basis. At most, any extrapolation should more realistically have been based on the 2013 DfT freighter movement growth rate of 0.4% per annum and the latest DfT estimates[37] suggest that even this may be too high.

2.87 Table 6 then sets out the infrastructure requirements for cargo, which are based entirely on the forecasts put forward. However, even then, we are not told how these infrastructure requirements have been derived in terms of the operating pattern over the day, turnaround times, the number of night movements and other key assumptions for each aircraft type stated or indeed how they relate to the capability of Manston Airport with its existing infrastructure. Such information is critical to validate the infrastructure required (if indeed any is required given our assessment of the capability of Manston Airport), as well as to carry out the assessment of the environmental impacts.

[36] Now reduced to 3.8% in the latest Airbus forecasts.
[37] Department for Transport, UK Aviation Forecasts, October 2017, paragraph 2.56.

Passenger Forecasts

2.88 Although not the main focus of this summary report, we note that the passenger forecasts, set out by Azimuth in Section 2.4, suffer from many of the same problems as the freight forecasts. They appear to be based almost entirely on supposition and inferences that cannot be relied upon. There appears to be no consideration of what is known about market sizes, nature or previous performance, nor a recognition of the extent to which growth will need to be incentivised through discounting of airport charges and marketing support payments. Similarly to the freight forecasts, and for reasons that are not given, Boeing global growth rates appear to be used by Azimuth for passenger operations beyond year 10 rather than the UK specific forecasts produced by the DfT[38], which are substantially lower. This, once again, is a substantial overstatement of the potential for growth.

Overall Conclusions on Forecasts

2.89 Azimuth's entire analysis of the air freight market is focussed on the existence of a theoretical opportunity based on estimates of spill from London in the event of the third runway at Heathrow not being built or being delayed, an unsupported hypothesis that there is a trend away from bellyhold freight, and based on a small sample of interviews with largely marginal players in the UK air freight sector and/or local interests.

2.90 Azimuth's reports do not at any point provide any substantive evidence or analysis as to whether Manston Airport can effectively, viably and sustainably compete in that market. Azimuth's reports do not explain how Manston Airport will be able to price effectively against the bellyhold rates offered by growing established and operational UK regional airports or the continental hubs. Azimuth's reports do not explain how Manston Airport will compete against the range of destinations offered by the long haul passenger networks of the continental hubs or the much greater freighter network offers of East Midlands or Stansted airports. We agree that there may be a niche market for Manston, just as there was previously, and that this market will probably grow in the future in line with the pure freighter market overall (noting that the DfT does not see growth in this market to 2050), but we cannot see how Manston will provide a sufficiently attractive alternative in a broader freight market to attract a market share sufficiently large as to reach the volume and movement numbers envisaged by Azimuth and required to justify RSP's proposals to be considered under the Planning Act 2008 (as amended). Indeed, if we look at past history, it seems highly unlikely that commercially viable operations for the Airport would be attainable for the foreseeable future.

2.91 In overall terms, the forecasts presented by Azimuth at Table 1 of Volume III are simply not credible and do not provide a robust basis for promoting a DCO. We present analytically derived cargo movement forecasts in Section 3 of this report to evidence and support this conclusion that any future projected use of Manston Airport would be significantly lower than that asserted by RSP.

[38] Department for Transport, UK Aviation Forecasts 2013 and 2017.

2.92 In terms of Azimuth's key questions, as set out at paragraph 2.3 at the start of this section, the first two tests may well be met in terms of the need for more airport capacity in the South East of England. That is why the draft Airports National Policy Statement is promoting the development of a third runway at Heathrow as a solution in the period up to 2030. The first two questions are, therefore, irrelevant to RSP's proposals. However, in relation to the third test, the key point is that for Manston to be a long term solution to the UK's capacity problems, it must be a sustainable, commercial proposition, capable of attracting airlines, passengers and shippers to use it. Azimuth's analysis ignores the history at Manston and does not provide any evidence to conclude that any future projected use of Manston Airport would require an increase in the capability of the Airport.

2.93 Indeed, whilst we have provided in this report our assessment of the capability of Manston Airport (Section 4), we note that nowhere has RSP done the same exercise. The failure of RSP to provide their own evidence of the capability of Manston Airport and the amount by which the proposals would increase that capability by is a major omission in RSP's consultation material. Rather, the only information that they present is a forecast of future freight movement demand, which has no credibility as explained in this report. This failure means that, in our opinion, the requirements in Section 23 of the Planning Act 2008 (as amended) have not been satisfied. In essence, we would have expected RSP to be able to show:

- the capability of Manston Airport of providing air cargo transport services;
- the amount by which RSP is proposing to increase that capability by and thus the "new" capability; and
- a credible forecast for why that 'new' capability is required.

None of this information is provided by RSP.

3 FREIGHT FORECASTS

Introduction

3.1 In this section, we present our view of demand in the UK air cargo market at present and consider how this market will develop in the future, setting out a number of potential cargo forecast scenarios for Manston Airport specifically over the period to 2039/40 (RSP's assessment year). This is a more robust approach than the qualitative approach adopted by Azimuth and builds on the approach adopted in our work for TfL and the FTA, by updating this work and assessing Manston's potential share of the market. This is the correct way to use our earlier work to inform an assessment of the potential at Manston.

3.2 The analysis presented here builds on our previous work but supersedes it and extends it in terms of:

- considering changes in the market and circumstances since the time of the previous research, notably the decision to move forward with a third runway at Heathrow, the increasing long haul passenger operations at regional airports and the continued commitment from Stansted Airport to the freight market through its future plans;
- examining the demand and capacity position not only in London but across the UK as a whole;
- analysing potential cargo capacity growth in more detail using Airports Commission traffic forecast data, not available at the time of our previous work;
- more explicitly considering the nature of air cargo that might be affected by any form of constraint within the London airport system or in the UK;
- providing some indication of how cargo demand is spread geographically in the UK to aid consideration of how it might be served in the future.

3.3 Our previous work did not consider in detail the role that might be played by Manston Airport or indeed other UK regional airports. It considered, in broad terms, the effect of a constrained London system capacity on freight demand and how this demand might be met within the confines of the capacity position at the time, noting particularly the role that might be played by the major continental hub airports, given the price advantages that they might offer through the availability of bellyhold capacity.

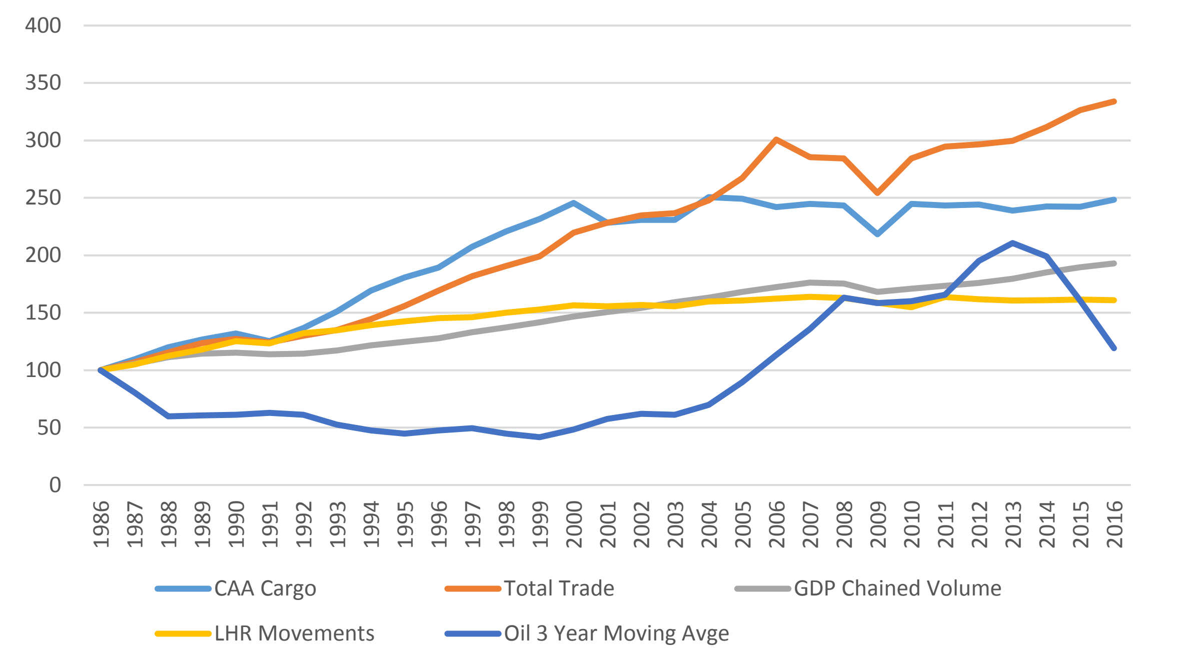
3.4 In this report, we now consider specifically the potential role for Manston by way of a scenario analysis that draws on the analysis of the overall market and the past performance of the Airport. The use of scenarios rather than a single forecast is intended to show a range of possible outcomes for Manston, allied to an assessment of the likelihood that the scenarios might be achieved in a manner which properly reflects the uncertainties identified in air freight forecasts.

Historic Performance of the UK Air Cargo Market

3.5 Our assessment of the quantum of air freight demand in the UK is fundamentally driven by analysis of the past performance of UK air cargo against a range of key economic and market indicators, notably UK trade in goods, GDP, oil price and ATM numbers at Heathrow. **Figure 3.1** shows the indices for these various metrics over time (with each indicator set to 100 in 1986).

3.6 This analysis reveals a number of interesting patterns. Until around 2000, UK air cargo was strongly related to UK trade in goods, with what would appear to be some stimulus provided by falling oil prices that would have made the cost of air cargo relatively more competitive with other cheaper modes. However, in around 2000, the market changed and this relationship appears to break. UK trade in goods continues to grow but growth in air cargo essentially stalls.

Figure 3.1: UK Air Cargo and Economic Metrics (Index: 1986 = 100)



Source: CAA Statistics, ONS

3.7 It is, therefore, helpful to look at why this might have happened. There are two main factors that need to be considered. The first is the oil price, which, through much of the late 80s and 90s, had been on a relatively benign downward trend. However, in around 2000, it started to rise again, accelerating through the mid-2000s and peaking in around 2013. The price of fuel is a key factor in the attractiveness of air cargo compared to other modes, particularly for pure freighter services, where the full direct operating costs of the flight must be borne by the cargo being shipped (as opposed to bellyhold freight where direct operating costs are largely covered by passenger operations, with cargo revenue essentially treated as a marginal benefit). This change in oil prices slowed demand for air freight globally and, in particular, drove users towards bellyhold rather than freighter options[39]. We set out the effect in the UK further below.

[39] Department for Transport, *UK Aviation Forecasts 2013*, paragraph 3.48, Steer Davies Gleave for Department for Transport, *Air Freight: Economic Drivers and Environmental Impacts*, 2010, Executive Summary.

3.8 The second point to note is the relationship to Heathrow ATMs. Up until around 2000, Heathrow was still growing its annual ATMs, which ultimately was driving the availability of bellyhold capacity in the UK air freight market. However, with runway capacity constraints biting, from around 2000, the rates of growth in ATMs at Heathrow initially slowed dramatically then stalled as it reached its consented limit.

3.9 When these two factors are combined, it is possible to understand what has happened in the UK air cargo market. It also has two key implications for considering the growth of the air cargo market moving forward and specifically in relation to Manston:

- it is reasonable to assume that the fundamental link between economic or trade growth and air cargo still exists and that, ultimately, with economic growth and increasing trade, demand for air cargo will grow. However, with oil prices remaining higher than seen in the past, it is likely that the growth path will be lower. We have assumed that it is likely to be more in line with the growth in real GDP over time;
- the capacity position at Heathrow is clearly a constraining issue for UK air freight demand but it is noticeable that this constraint has not resulted in significant gains being made by other airports in the London system. This suggests that, while there is probably a degree of constrained demand in the London system at present, this is affecting bellyhold air cargo and that is not translating through into substantially greater freighter growth at, for instance, Stansted or East Midlands. We examine this issue further below.

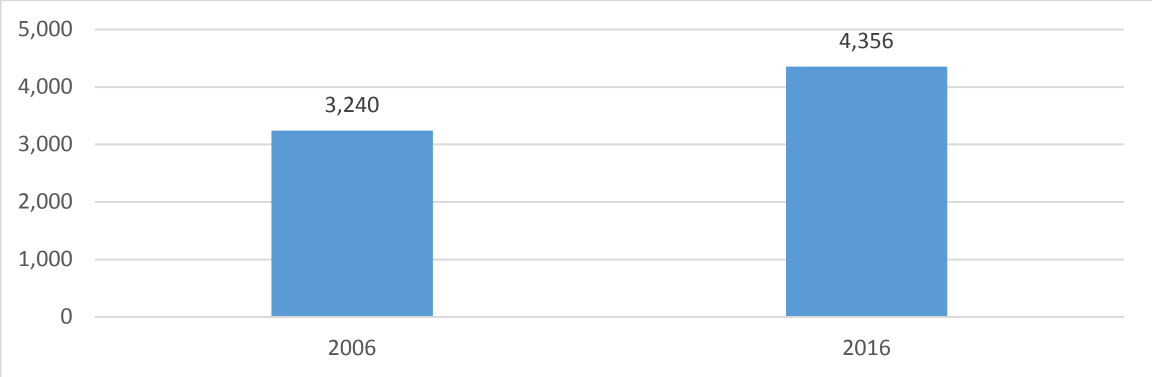
3.10 This is particularly important as it suggests that the market for bellyhold freight is different from that for pure freighter traffic. This is a function of price and urgency in relation to general air freight, as opposed to either express freight or niche products. For express freight or niche products, shippers are prepared to pay a premium which allows the use of freighters because either speed is of the essence or the destination is hard to reach or the cargo is difficult to handle in some way. For general air freight, these drivers are not the same. Accepting that all air cargo is to some degree sensitive to speed of delivery, it seems that what is likely to be being pushed from bellyhold capacity, in a capacity constrained environment, is less time sensitive and shippers' willingness to pay is lower. Hence, in the current market with relatively high fuel prices, freighter options are not an adequate substitute.

3.11 This is very important from the perspective of considering the potential role of Manston. It suggests that it will be very difficult for the Airport to compete effectively for any traffic displaced as a result of constraints in the London market as it cannot and will not be able to provide the price, frequency and breadth of destination advantages that bellyhold freight can offer. The airports competing for cargo traffic being pushed away from Heathrow, now and in the future, are the large UK regional airports with growing long haul passenger networks and the near European global hub airports, which offer the closest substitutes to Heathrow and are within easy trucking time of, certainly, the London and South East market. In any event, bellyhold capacity at Heathrow is expected to increase substantially once the third runway becomes operational so driving down the competitive prices in the market, making it even more difficult for freighters to compete. Even if there are delays to the provision of additional runway capacity at Heathrow, we would not expect a change to the pattern of behaviours observed since 2000, namely that cargo displaced from Heathrow will be trucked to other airports with available competitively prices bellyhold capacity.

3.12 Whilst the volume of air cargo flown to/from the UK's airports over the past 15 years has remained relatively static, there have been considerable changes in the way that demand has been serviced, which again reflect the drivers and constraints on demand described above. Essentially, the market has been consolidating to a small number of airports and bellyhold cargo has become more dominant.

3.13 The Herfindahl-Hirschman index (HHI) is a commonly accepted measure of market concentration[40]. **Figure 3.2** shows the HHI for the UK air cargo market in 2006 and in 2016. The change in the concentration level in the market over the last 10 years has been marked. The HHI for the UK air cargo market has increased by around 34%. The consolidation in the UK air cargo market in the last 10 years has resulted in an increase in the HHI of nearly 1,100. This continued concentration in the market can also be seen by examining the drivers of change in UK air cargo over the last decade. **Figure 3.3** sets out a bridge diagram between 2006 and 2016 showing the change in freight handled via bellyhold and pure freighter at major UK freight airports.

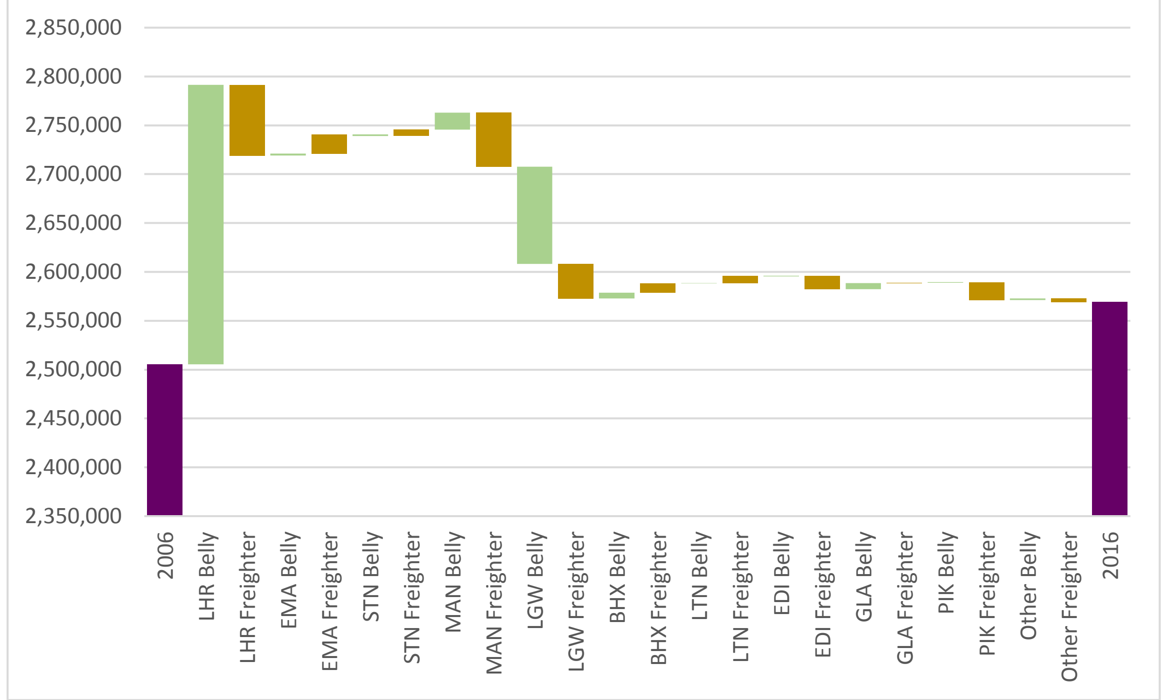
Figure 3.2: UK Air Cargo Market Herfindahl-Hirschman Index of Market Concentration



Source: York Aviation analysis of CAA Statistics

[40] It is calculated by squaring the market share of each firm competing in a market, and then summing the resulting numbers, and can range from close to zero to 10,000. The closer a market is to being a monopoly, the higher the market's concentration (and the lower its competition). If, for example, there were only one firm in an industry, that firm would have 100% market share, and the HHI would equal 10,000, indicating a monopoly. If there were thousands of firms competing, each would have nearly 0% market share, and the HHI would be close to zero, indicating nearly perfect competition.

Figure 3.3: Drivers of Change in the UK Air Cargo Market – 2006 to 2016



Source: York Aviation analysis of CAA Statistics

3.14 There are a number of key points to note:

- the market has continued to consolidate into Heathrow through increased bellyhold capacity due to the increasing focus on long haul destinations. These gains have been offset by significant erosion of freighter capacity;
- elsewhere in London, Gatwick has seen both bellyhold and freighter capacity significantly eroded as that airport has become more capacity constrained and it has focussed increasingly on short haul low fare passenger services, albeit this trend is starting to reverse as more long haul operations come on stream. Stansted and Luton have seen some growth in freighter tonnage but this does not come close to offsetting what has been lost from elsewhere with Stansted heavily focussed on the integrator and express services market;
- East Midlands, with major DHL and UPS bases, has been the only airport that has seen significant growth in pure freighter traffic, but again this has not offset losses in freighter traffic from elsewhere, suggesting that, for more general air cargo, bellyhold capacity is fundamentally more attractive, even potentially if this involves trucking to distant airports;
- this is reinforced by what has happened at Manchester, which has seen growth in its bellyhold market, relating to its growing long haul network, but with its freighter traffic falling away. The growth in bellyhold traffic at Birmingham is also probably reflective of its growing long haul passenger network;
- in general, there has been a noticeable switch towards the use of bellyhold capacity. Since 2006, pure freighter cargo's share of the UK market has dropped from 37% to 30%, while actual freighter tonnage has dropped by 17%;

- the performance of Prestwick (PIK) provides perhaps the most obvious direct comparator to Manston, with a similar sized freighter operation in 2006 to Manston at its peak. Freighter traffic at that airport has dropped by 64% since 2006. In the meantime, Prestwick was nationalised to maintain operations as it had been heavily loss making for a considerable period of time.

3.15 The implications for Manston are clear. Bellyhold is the preferred option for a significant proportion of the air cargo market and this preference has intensified in recent years. The only airports experiencing freighter growth are those with significant integrator activity. This suggests that Manston's likely niche freighter offer will struggle to penetrate the market. There has been consolidation into larger airports, which again suggests that Manston will struggle to establish market presence. Finally, the experience of Prestwick, its nearest comparator in many ways, is not encouraging for Manston. Prestwick's well established pure freighter operation has been heavily eroded and the airport has had to be nationalised to maintain its operation due to inherent lack of commercial viability.

The Geographic Distribution of UK Air Cargo Demand

3.16 At the outset, it should be made clear that there is very limited data on where air cargo originates from or is destined for within the UK. However, some indications are available from other research, notably recent work by MDS Transmodal, in conjunction with York Aviation, for TfN in relation to its International Connectivity Strategy[41]. MDS analysed a series of datasets on air freight and road haulage and estimated that around 14% of UK air freight demand originates in or is destined for the North of England. We also know that air cargo is often trucked a considerable distance before being loaded on to aircraft.

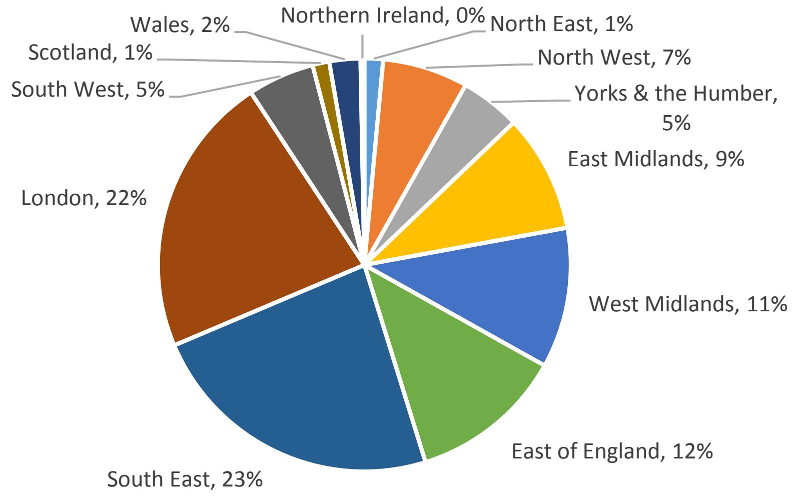
3.17 We have, therefore, developed a simple gravity model that distributes air cargo regionally across the UK based on:

- for exports, the distribution of manufacturing employment in the UK. This is intended to reflect that air cargo exports are likely to be primarily manufactured goods;
- for imports, the distribution of UK population. This is intended to reflect that imports are, in many cases, destined either for consumers directly or retailers. This is clearly a simplification but we believe a sensible one given the data available;
- a relatively low distance decay factor of 1.5, reflecting the relative insensitivity of air freight to trucking times. This has, in part, been calibrated based on observed distance decay factors using data available in the TfN work. This is generic and we have no reason to believe that the balance between trucking costs and the use of air freight would vary across the UK.

3.18 The resulting distribution of air cargo demand is shown in **Figure 3.4**. While there is a heavy concentration of demand in the Greater South East, there is significant demand located across the country. The issue for Manston is that it is poorly placed geographically to serve this demand, even for London and the South East, particularly once the location of distribution centres for import freight, which cluster around the M1 and M6, is taken into account.

[41] Transport for the North, *International Connectivity Evidence Report*, York Aviation/MDS Transmodal July 2016, Appendix C.

Figure 3.4: Modelled Regional Distribution of UK Air Cargo Demand



Source: York Aviation analysis of CAA Statistics, ONS and Google Maps Data

3.19 In the event of air cargo capacity constraints in London, this demand is likely to look initially for cargo capacity closer to home at the major regional airports, particularly those that are developing broader long haul passenger networks. Even if freighter aircraft are required for this demand, there are likely to be substantially better options than Manston. Not least the national freight hub at East Midlands, with its central location in the UK and excellent multimodal connectivity to a wide geographic area.

Future Demand for Air Cargo in the UK

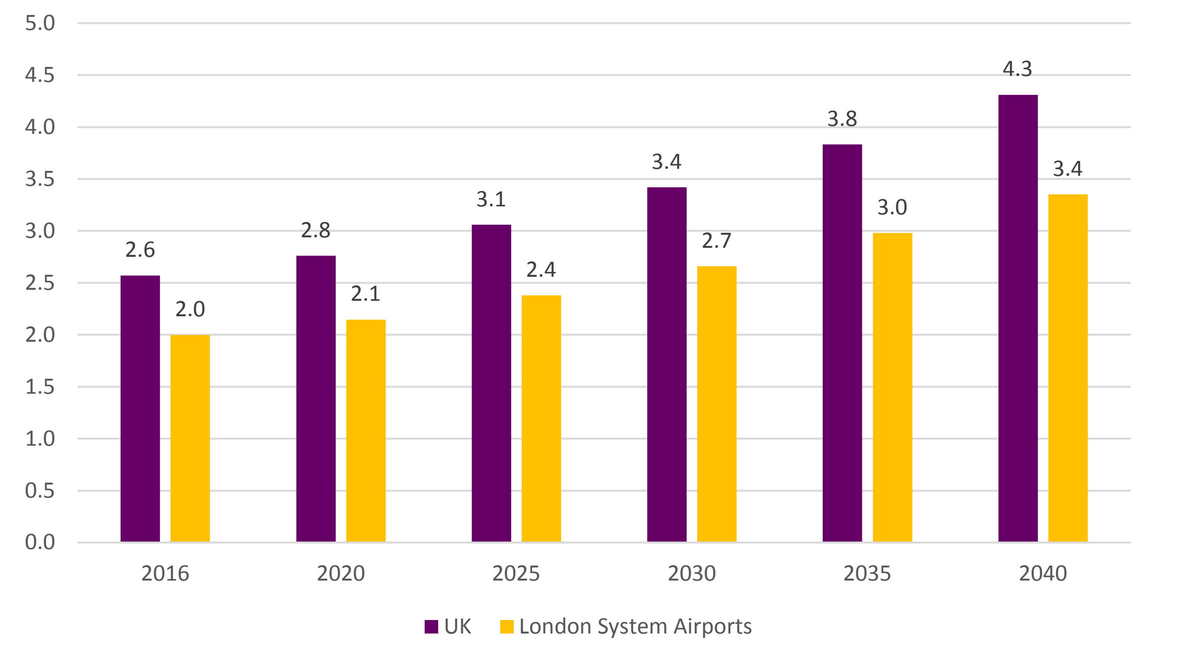
3.20 The initial step in producing our cargo forecasts for Manston is to consider the likely size of the London system and UK air cargo markets in the period to 2040. This is an unconstrained forecast and does not, at this stage, consider whether capacity will be available to deliver this demand.

3.21 In line with our analysis above and consistent with our 2015 report for the FTA, we adopted a relatively simple approach, growing existing air cargo demand forward in line with GDP projections for the UK economy. The GDP forecasts used are the latest forecasts produced by the Office for Budgetary Responsibility at the time of writing. These are taken from:

- Economic & Fiscal Outlook (March 2017), which provides short to medium term forecasts;
- Fiscal Sustainability Report (January 2017), which provides long term forecasts for the UK economy.

3.22 These forecasts suggest average real growth in UK GDP of around 2.2% over the period to 2040. The resulting projections of air cargo demand at the London system airports and across the UK are set out in **Figure 3.5**. This analysis sees total UK air cargo demand reach around 4.3 million tonnes by 2040 and demand in the London system[42] of around 3.4 million tonnes by 2040. At this stage, we have assumed that the split of tonnage between the London airports and the rest of the UK remains as currently, driven by the large concentration of freight forwarders in the vicinity of Heathrow in the light of its major air freight hub role. This may well overstate the scale of demand in London given increasing long haul networks at regional airports.

Figure 3.5: Air Cargo Tonnage Forecasts (million tonnes)



Source: York Aviation

Air Cargo Capacity at UK Airports

3.23 The second stage in our assessment is to consider the extent to which the demand identified above could be met by UK airports and the London system airports. This is, again, in line with our approach taken in our work for the FTA in 2015. However, the analysis undertaken for this research is more detailed, uses more up to date and detailed information on future passenger ATM forecasts and, specifically, considers Stansted's more recent statements in relation to continuing growth in the cargo market to around 400,000 tonnes[43] and removal of the existing 35 mppa passenger planning cap and extension to 43 mppa[44]. Had we been specifically asked, we would have advised Azimuth of the need to carry out such an assessment so as to understand the implications of our earlier work for TfL and the FTA.

[42] Based on the London airports current share of the national market.
[43] Sustainable Development Plan – Stansted Airport (March 2015).
[44] Press Release – Stansted Airport (17 October 2017).

3.24 In order to estimate the likely bellyhold capacity that will be available through the period to 2040, we have produced projections of passenger ATM demand for each of the top 10 freight airports in the UK in 2016, along with a residual forecast for Other UK airports. For Heathrow, Gatwick and Manchester, these forecasts have been split into domestic, EU and non-EU ATMs. The future years for each airport have been based on the ATM forecasts produced by the Airports Commission for which detailed data files have been released[45]. Years prior to the opening of Runway 3 at Heathrow, uses the Base ATMs scenario, while post opening uses the HAL ATMs scenario, which reflects the third runway.

3.25 The existing freight loads per passenger ATM for each airport have been estimated using CAA Statistics. These average loads have then increased by 1.0% per annum tapering to 0.5% per annum for Heathrow and 1.6% per annum tapering to 1.0% per annum for other airports. This reflects trends in average loads identified from CAA Statistics over the last five years.

3.26 In relation to pure freighter capacity, we have, in the first instance, considered what might be termed a business as usual view of capacity moving forward. This considers the likely number of freighter ATMs that might be flown rather than considering the actual movement capacity of individual airports, which may be greater. This is, ultimately, a more stringent view of capacity moving forward and is more likely to lead to a conclusion that there is a lack of freighter capacity to meet any demand than simply considering what any given airport could actually handle, especially given that Stansted is some distance from its freighter ATM cap and East Midlands is not close to any form of ATM limit. To enable this analysis, we have grown freighter ATMs at each airport by 0.4% per annum, in line with the expected growth rate from the DfT's Aviation Forecasts 2013[46]. However, we note that the most recent DfT forecasts[47] suggest that no growth in freighter movements to or from the UK is now expected. Hence, our use of the previous DfT growth rate may overstate the market for pure freighter operations but we have retained this approach so as not to understate the extent of any potential overspill market for Manston.

3.27 Once again, average loads per freighter ATM have been estimated for each airport from CAA Statistics. As with bellyhold cargo per ATM, there has been an upward trend in average loads on freighters in recent years of around 1.1% per annum (York Aviation analysis of CAA Statistics). This is assumed to continue over the period.

3.28 In addition to this business as usual view, we have also taken a view as to the likely total tonnage capacity over time of the two largest freighter airports in the UK, East Midlands and Stansted, based on those airports' development plans:

- the Stansted Sustainable Development Plan talks about developing cargo capacity to handle around 400,000 tonnes of cargo. We have assumed that current capacity is around 300,000 tonnes and that this grows steadily over time to 400,000 tonnes by 2040;

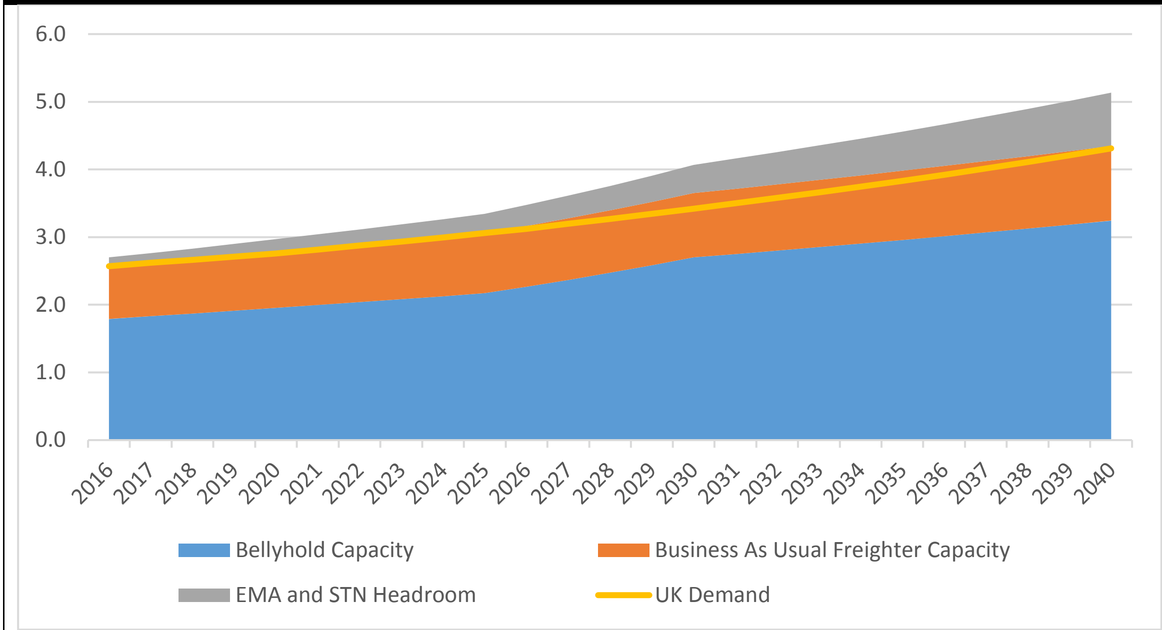
[45] https://www.gov.uk/government/publications/airports-commission-documents-and-data.
[46] The exception to this is the small number of freighter movements at Heathrow, which are not allowed to grow until the Third Runway is opened.
[47] Department for Transport, *UK Aviation Forecasts*, October 2017, paragraph 2.56.

- the East Midlands Sustainable Development Plan describes its runway capacity as able to support a 10 million passenger and 1.2 million tonne cargo airport[48]. We have assumed that this capacity could be developed over time to 2040 from a base capacity of 400,000 tonnes.

3.29 This assessment of the cargo capacity headroom at Stansted and East Midlands helps provide a view of how any excess demand identified could be handled by freighters in the UK if this were the response of the market to any shortage of bellyhold capacity, although it is important to note that we do not believe this would be the primary market response given the lower cost of bellyhold alternatives. It should, however, be recognised that the speed of build-up of this headroom is to a significant degree a matter of conjecture. There will be infrastructure developments required to enable capacity but, if demand were there, it is likely that these could be brought forward as they would be incremental expansion of existing facilities which could be phased in to meet demand more easily and cheaply than the substantial cost involved in re-opening Manston.

3.30 The resulting estimates for air cargo capacity for the UK as a whole and the London system over time are shown in **Figures 3.6** and **3.7**.

Figure 3.6: UK Air Cargo Capacity

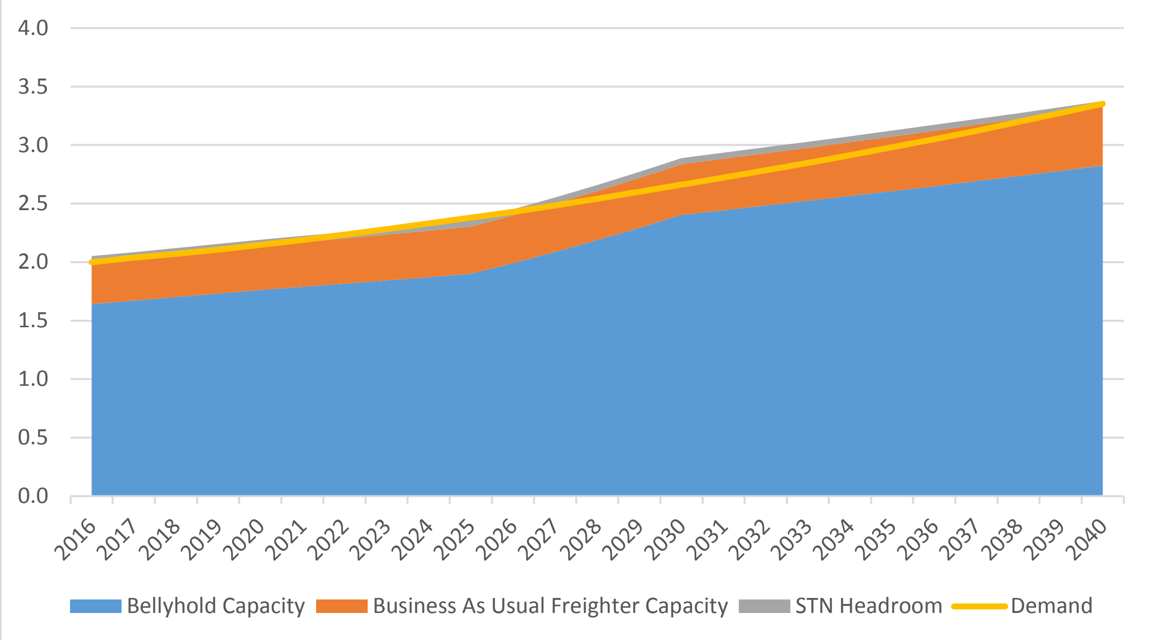


Source: York Aviation

[48] East Midlands Airport Sustainable Development Plan, 2015. Page 75.

3.31 At a UK level, our analysis suggests that there are unlikely to be capacity issues in the cargo market prior to 2040 even on a Business As Usual Freighter Capacity basis. Once the third runway is opened at Heathrow, there is in fact likely to be excess capacity in the market, which is likely to soften demand for supporting freighter capacity dedicated to general air freight (accepting that integrator/express freight is a separate market to a significant degree). It should, however, be noted that capacity on a Business As Usual Freighter Capacity basis is likely to become constrained shortly after 2040 but this can easily be addressed by exploiting the inherent airport capacity headroom still available at Stansted and East Midlands if it is appropriate to serve the market in that way. Overall, we can conclude from this analysis that there will be no shortage of freighter capacity in the UK before 2040 and overspill from other airports would not provide a rationale for re-opening Manston.

Figure 3.7: London System Air Cargo Capacity



Source: York Aviation

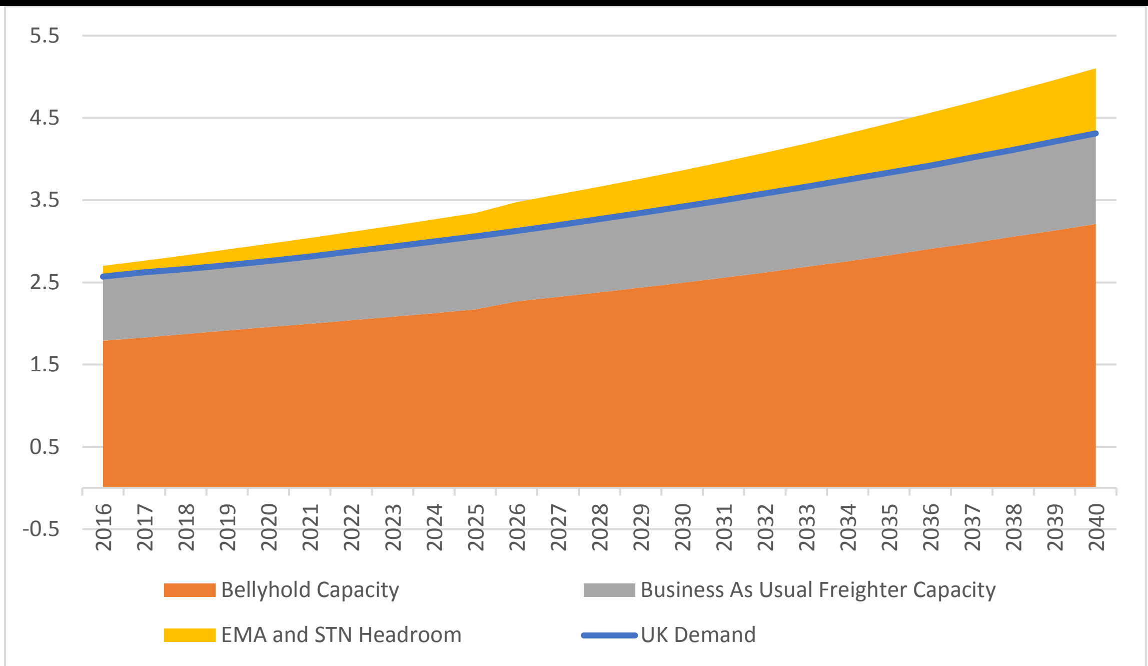
3.32 The situation at the London airports is slightly different if we assume that London maintains its market share of the overall market and there is no natural 'clawback' to the regions. With Heathrow's bellyhold growth relatively constrained, there are potentially some limited capacity constraints in the medium term before the third runway opens but, if there was demand, we would expect Stansted to develop additional freighter capacity sooner. Any constraint would be fleeting. Once the third runway is opened, excess capacity develops rapidly. Potential capacity issues do not then start to re-emerge until around 2040, when it appears that Heathrow is likely to become runway capacity constrained once more.

3.33 The implications for Manston Airport are that, even in pure volume terms, push factors from other airports in London are unlikely to provide opportunities for growth before 2040, and this is before any consideration is given to Manston's suitability to serve the markets in question. In the short to medium term, there is likely to be some limited constraint in the London system before the third runway at Heathrow is opened. However, this is largely a function of bellyhold constraints at Heathrow and it is highly questionable as to whether the type of cargo that is likely to be forced out will be suitable for Manston or indeed would switch from bellyhold to pure freighter operations at all.

3.34 Logic would suggest that what will be pushed out is relatively low yielding, general air cargo that is more sensitive to price and less sensitive to time. Essentially, this is akin to business passengers forcing leisure passengers out of Heathrow. This type of air cargo is not likely to see pure freighters as an effective alternate, given the higher prices involved. It is more likely to seek out alternative bellyhold capacity at UK regional airports (which might actually be closer to its point of origin given our analysis above) or travel via truck to the continental European airports.

3.35 Our analysis here has been predicated on the construction of a third runway at Heathrow, as this is clear stated Government policy. In the event that the third runway is delayed or does not happen at all, it is expected that there would be other adjustments in the UK air transport market, including the provision of more long haul services from other airports offering bellyhold capacity. In this case, whilst there could theoretically be a level of capacity shortfall at the London airports assuming that they maintain a constant market share, we would expect demand and capacity to keep pace at the UK level as growth at regional airports is accelerated. This is illustrated in **Figure 3.8**. We consider that analysis at the UK level remains the most relevant and this does not suggest that there will be a capacity shortfall before 2040.

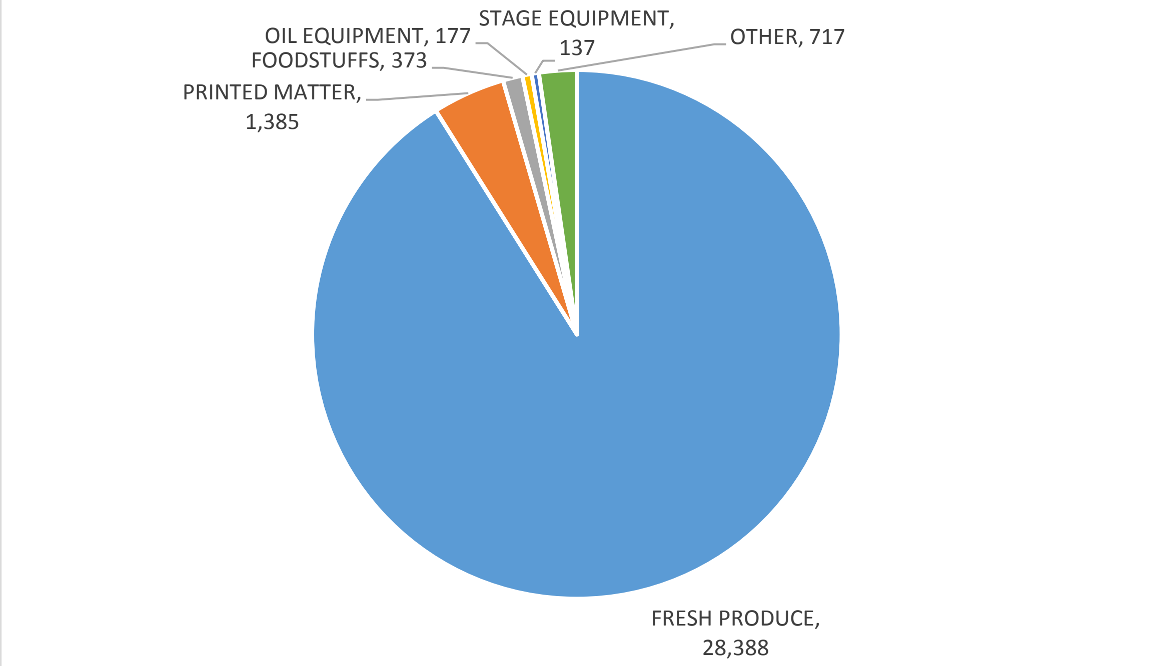
Figure 3.8: UK Air Cargo Capacity with No Third Runway at Heathrow



Source: York Aviation

3.36 An examination of the nature of cargo traffic that used Manston in the past also supports this assessment. Data provided to York Aviation by the current owner and set out in **Figure 3.9** shows that the Airport was essentially an import point for fresh produce (91% of total tonnage in 2012). This is a time critical market with associated high yields (hence allowing freighter operations) but also one that is dominated by Heathrow through its perishables hub and its bellyhold capacity to Africa. It is unlikely that Heathrow would shed significant amounts of this traffic with cargo constraints and certainly it would likely gain market share once the third runway is opened. Heathrow remains better located for the distribution of this produce to the core London market given its location inside the M25.

Figure 3.9: Air Cargo at Manston by Commodity Type in 2012 (tonnes)



Source: York Aviation analysis of Stone Hill Park data

3.37 It should also be remembered that this assessment assumes that Stansted does not accelerate its cargo development plans to meet any excess demand that is suitable for freighter activity. Indeed, we understand that the perishables activity that used to use Manston has shifted back to Stansted and that the operation at Manston was supported by low charges to the airline to compensate for the less attractive location.

Specific Air Cargo Market Forecasts for Manston Airport

3.38 Building on the analysis above, we have considered three scenarios for future cargo growth at Manston Airport. In each case, we have considered the likelihood of the scenario coming forward. It should be noted that, in the air transport market, demand is the driver of airport usage not capacity. Provision of capacity at Manston is no guarantee that airlines, shippers and passengers will use it unless there is demand and Manston represents the most efficient way for that demand to be met.

Scenario 1: Relief for Capacity Constraints in London (Highly Optimistic and very unlikely)

3.39 In this scenario, we have assumed that Manston is able to capture the excess demand that is seen in the London system in the medium term when only Freighter Business As Usual capacity is considered. It is then able to maintain its market share into the long term, even once the excess demand has disappeared with the appearance of the third runway.

3.40 We ultimately regard this scenario as highly optimistic and very unlikely to occur. We do not believe that the nature of excess demand is likely to suit freighter operations. This fits with the current market, where Heathrow is almost certainly constrained in terms of its ability to offer bellyhold capacity and yet there remains significant freighter capacity elsewhere and there has been no upturn in the demand for air freighter operations. We also feel it is highly unlikely that Manston could maintain market share in the context of the opening of a third runway at Heathrow. Even in the absence of a third runway, pure freighter capacity at Manston is not likely to be attractive for most of the freight displaced which would still choose cheaper bellyhold capacity available elsewhere in the UK and Europe.

3.41 We consider this scenario to be an upper bound to the envelope for Manston Airport. Even in this scenario, forecast tonnage only reaches around 105,000 tonnes by 2040 or around 4,470 cargo aircraft movements. The estimate of aircraft movements assumes loads similar to that of Manchester Airport's current freighter operations, growing by around 1.1% per annum. This appears to be a relatively low loading compared to Manston's previous operations[49] (hence providing a higher ATM number for any given tonnage and thus likely to overstate the number of movements).

3.42 We note that Azimuth have assumed an even lower tonnage per cargo air transport movement of under 20 tonnes, so leading to an overstatement of the number of aircraft movement at any predicted tonnage, but this does not appear realistic based on Manston's past operations nor tonnages seen elsewhere.

[49] We estimate that the number of tonnes per cargo ATM previously at Manston was 35-40 tonnes, taking into account empty aircraft backhauls.

Scenario 2: Manston Achieves Its Previous Market Share (More Likely but still with optimistic elements)

3.43 This scenario assumes that Manston essentially re-enters the market as a niche player in the key markets that it served previously, mainly fresh produce. This reflects the view that, in reality, very little has changed in the market compared to when Manston was last operational, not least that Heathrow was already suffering from runway capacity issues prior to 2014. There are no major changes that we would consider sufficient to alter Manston's attractiveness fundamentally compared to 2014. We note Azimuth's contention that Brexit will make trucking to Europe more difficult but would point out that the freight involved is most likely to be general air cargo heading for bellyhold capacity that is relatively less sensitive to time and that additional regulatory burdens are likely to be found at airports as well post Brexit. Hence, the impact on relative transit times may actually be comparatively limited. Furthermore, it is far from clear to us, from the evidence presented by Azimuth, that there were concerns regarding the quality of service offered at Manston historically sufficient to have constrained its share of the market in the past. Hence, it is not unreasonable to start from a position that its past market share was representative of what it might attain in future and that the provision of more infrastructure would not give rise to a change in the market or a higher level of underlying demand.

3.44 We regard this as the most likely of our three scenarios but it also has optimistic elements. Notably, it is highly optimistic to assume that Manston will be able to maintain market share in the face of expanded capacity at Heathrow. We would also note that the Airport was not viable at similar demand levels previously and would appear to have only been able to reach its recorded market share by 'buying' traffic through very low airport charges based on our discussions with SHP and its staff that worked at the Airport when operational. In this scenario, the Airport reaches around 47,000 tonnes by 2040 and around 2,000 cargo aircraft movements.

Scenario 3: Relief for Capacity Constraints in London (More Realistic but still with some optimism)

3.45 Scenario 3 is a variant of Scenario 1 that takes a more realistic view on how the limited excess demand in London in the medium term (allowing for pure freighter Business as Usual activities only) might be served. We would view this scenario as substantially more realistic than Scenario 1 but still with highly optimistic elements.

3.46 In this scenario, the excess demand is split as follows:

- 50% is assumed to be to diverted via truck to make use of bellyhold capacity at UK regional airports or at the continental hubs in Europe. This reflects the view that, in the majority of cases, this freight is likely to be relatively price sensitive, less time critical general air cargo for which pure freighters are not likely to be an appropriate substitute;
- the remainder is assumed to be split evenly between East Midlands, Stansted and Manston airports. This is, again, probably an optimistic assumption given the economies of scale and better proximity to markets overall offered by the other two airports compared with Manston.

3.47 Once the excess demand in London has peaked (just before the opening of a third runway), Manston is assumed to be able to maintain its market share into the future. This is again an optimistic assumption given what will be an excess of capacity in the market for much of the following period through to 2040. This scenario involves the lowest cargo throughput of the three options. By 2040, the Airport is handling only 17,500 tonnes of freight and handling around 750 aircraft movements each year.

Summary of Cargo Forecast Scenarios

3.48 The cargo tonnage and freighter ATMs associated with each of the three scenarios are set out below in **Table 3.1**.

Table 3.1: Summary of Manston Cargo Forecast Scenarios						
	Scenario 1: Relief for London (Highly Optimistic)		Scenario 2: Previous Market Share		Scenario 3: Relief for London (More Realistic)	
	Tonnes	ATMs	Tonnes	ATMs	Tonnes	ATMs
2020	7,608	402	30,359	1,605	1,268	67
2021	18,407	963	30,966	1,619	3,068	160
2022	31,758	1,643	31,616	1,635	5,293	274
2023	45,571	2,332	32,280	1,652	7,595	389
2024	59,860	3,029	32,958	1,668	9,977	505
2025	74,638	3,736	33,650	1,684	12,440	623
2026	76,205	3,773	34,357	1,701	12,701	629
2027	77,958	3,818	35,147	1,721	12,993	636
2028	79,751	3,863	35,956	1,742	13,292	644
2029	81,585	3,909	36,782	1,762	13,598	651
2030	83,462	3,955	37,628	1,783	13,910	659
2031	85,381	4,002	38,494	1,804	14,230	667
2032	87,345	4,050	39,379	1,826	14,557	675
2033	89,354	4,098	40,285	1,848	14,892	683
2034	91,409	4,147	41,212	1,869	15,235	691
2035	93,511	4,196	42,159	1,892	15,585	699
2036	95,662	4,246	43,129	1,914	15,944	708
2037	97,958	4,300	44,164	1,939	16,326	717
2038	100,309	4,355	45,224	1,964	16,718	726
2039	102,716	4,411	46,310	1,989	17,119	735
2040	105,182	4,468	47,421	2,014	17,530	745
Source: York Aviation						

3.49 Our updated analysis of the market and specific consideration of three potential scenarios for freighter growth at Manston Airport demonstrate that, even on the most optimistic assumptions, it is not likely to generate above 4,470 annual movements by air cargo aircraft. On a more realistic basis, it might attain similar levels of tonnage as seen in 2003 by 2040 but with a higher number of aircraft movements due to the assumption we have made that freighter loads would be similar to those seen elsewhere in the UK rather than the higher loads actually observed at Manston in the past. On past performance, the number of movements at Manston might well be lower. **None** of our scenarios suggest that there is a need to increase the capability of Manston Airport given our assessment in Section 4.

4 CAPABILITY OF THE SITE

4.1 Our start point for this assessment is the capability of the Airport site based on its historic and consented planning status and on the basis that the existing infrastructure could all be 'made good'. This assessment is based on the existing Lawful Use in planning terms. The existing Airport's permitted use is for civil aerodrome use, and there are no conditions limiting either passenger numbers or ATMs.

Capacity of Existing Facilities

4.2 In the first instance, it is important to highlight that Manston Airport did not operate under any form of restriction on the number of aircraft movements. The planning agreement between TDC and Manston Airport, which governed the permitted activity of the Airport, was entered into in 2000. In respect of night-time flying it sets out the limitations on such operations until a "Night-time Flying Noise Policy" is in place. Clause 1.1 of the Second Schedule states:

"The Owner agrees not to cause suffer or permit any Regular Night Flying Operations at any time (subject to Paragraph 1.4 below) before a Night-time Flying Noise Policy shall have been prepared and a copy lodged with the Council."

Further, it defines:

"Regular Night Flying Operation means Flight movements which are scheduled or programmed and which occur frequently or regularly to the same or similar patterns for the same operator during Night-time"

4.3 It is understood that the Night-time was defined as 23.00-07.00, though Manston Airport was also seeking a Night Quota Period which would have run from 23.30-06.00. In practice, there were a number of night movements which were deemed to be ad-hoc and often driven by technical delays but that were permitted to operate in any event.

4.4 We have assessed the capability of the existing infrastructure at Manston Airport assuming that the range of existing facilities, as at the time of its closure, are made good. There are three principal elements – runway, passenger and freight:

- **Runway:** for the handling of commercial passenger and freight aircraft, the runway would operate without a parallel taxiway. The current marked parallel taxiway is too close to the runway centreline to allow such aircraft to taxi independently of a runway movement. Landing and departing flights would then need to back track along the runway to and from the entry/exit taxiways. The achievable maximum runway rate with this operation might be around 20 to 24 flights per hour depending on the mix of aircraft types. This runway movement rate, even at 50% utilisation of available slots, would be capable of accommodating around 64,000 aircraft movements a year. However, we recognise that this is in excess of the capability of the passenger and freight handling facilities as existing.

- ✈ **Passenger:** the passenger apron has been designed to accommodate 4 E-Jet FK100 passenger aircraft. These aircraft types are now rare and have a wingspan that is much less, at 28 metres, than the typical low fares airline Code C type aircraft that Ryanair, easyJet and Wizzair, for example, use. These airlines typically use aircraft such as the B737-800 and A320, with wingspans of 36 metres. On this basis, the passenger apron would be able to accommodate up to 3 of these larger Code C aircraft simultaneously and could, in the alternative, be used for handling cargo flights. The terminal itself is quite compact and would have a maximum of 6 check-in desks and very small baggage make up area, and a departure lounge that could depart a maximum of 2 flights within the same 30 to 40-minute period, with an hourly capacity in total of around 250 passengers. There are more than 1,000 car parking spaces. We estimate that the passenger terminal at its current size could support around 0.7 to 0.9 mppa based on there being up to two based Code C aircraft with a reasonable number of other visiting flights across a typical day.
- ✈ **Freight:** the aircraft parking area close to the freight sheds can park up to 2 or 3 small to medium sized cargo aircraft or one large aircraft. There are two freight sheds that were originally organised to be used one for imported freight and one for export. Adjacent to these is an 'equine' handling facility for processing livestock. In practice Manston, when operational, normally handled one large freight aircraft at a time due to size and juxtaposition of the freight sheds and apron to each other and the single taxiway connecting to the runway. Whilst Manston handled up to 30,000 tonnes of freight at its peak, our understanding is that the freight facilities could have handled substantially more tonnage.

4.5 Our assessment into the capability of Manston Airport is based on the reinstatement of the runway, air traffic control, fire station, navigational aids, apron (stands) and taxiways. We have taken into account the use of both apron areas, one to the west adjacent to the cargo sheds and one to the east, adjacent to the passenger terminal. These could accommodate collectively up to 4 freight aircraft simultaneously. The assessment is also based on an 18-hour operational day (allowing for a small number of ad hoc night movements consistent with previous operations) and with a turnaround window of up to 2½ hours from the arrival to departure of each freight aircraft resulting in the capability of each stand to handle over 7 aircraft rotations a day, or over 14 cargo aircraft movements.

4.6 On this basis, across a year, this would equate to a capability for at least 21,000[50] annual air cargo aircraft movements with the existing consented infrastructure, subject only to reinstatement. This assessment is consistent with the assertion made in presentations on behalf of RSP[51], which stated that the 10,000 cargo aircraft movement threshold, necessary to pass the Section 23 test in the Planning Act 2008 (as amended), could be met by providing for 14 aircraft arrivals and 14 aircraft departures each day. As the existing infrastructure could provide for 4 cargo aircraft being handled simultaneously, this would equate to 20,440 annual air transport movements by cargo aircraft. This would be more than sufficient to accommodate any reasonable forecast of the cargo related movement demand that Manston might attract as we have set out in Section 3.

[50] Should a night time noise policy be agreed with Thanet District Council pursuant to the existing planning agreement that enabled a longer operational day and/or a number of scheduled night movements, then the capability could, in theory, be higher than 21,000 annual cargo aircraft movements.
[51] RSP, Presentations for Thanet District, Dover District, and Canterbury City Councils

4.7 We recognise that the actual usage of that capability will depend on how an airport is used in terms of the daily and seasonal pattern of movements but this does not, of itself, reduce the capability offered by the existing consented infrastructure for air transport movements. Our assessment, therefore, provides essential missing information from RSP's materials to date which is necessary for the purposes of section 23 of the Planning Act 2008 (as amended), for assessment purposes under the Environmental Impact Assessment Regulations and for consultation purposes.

Land Required to accommodate RSP's Forecasts

The RSP Master Plan

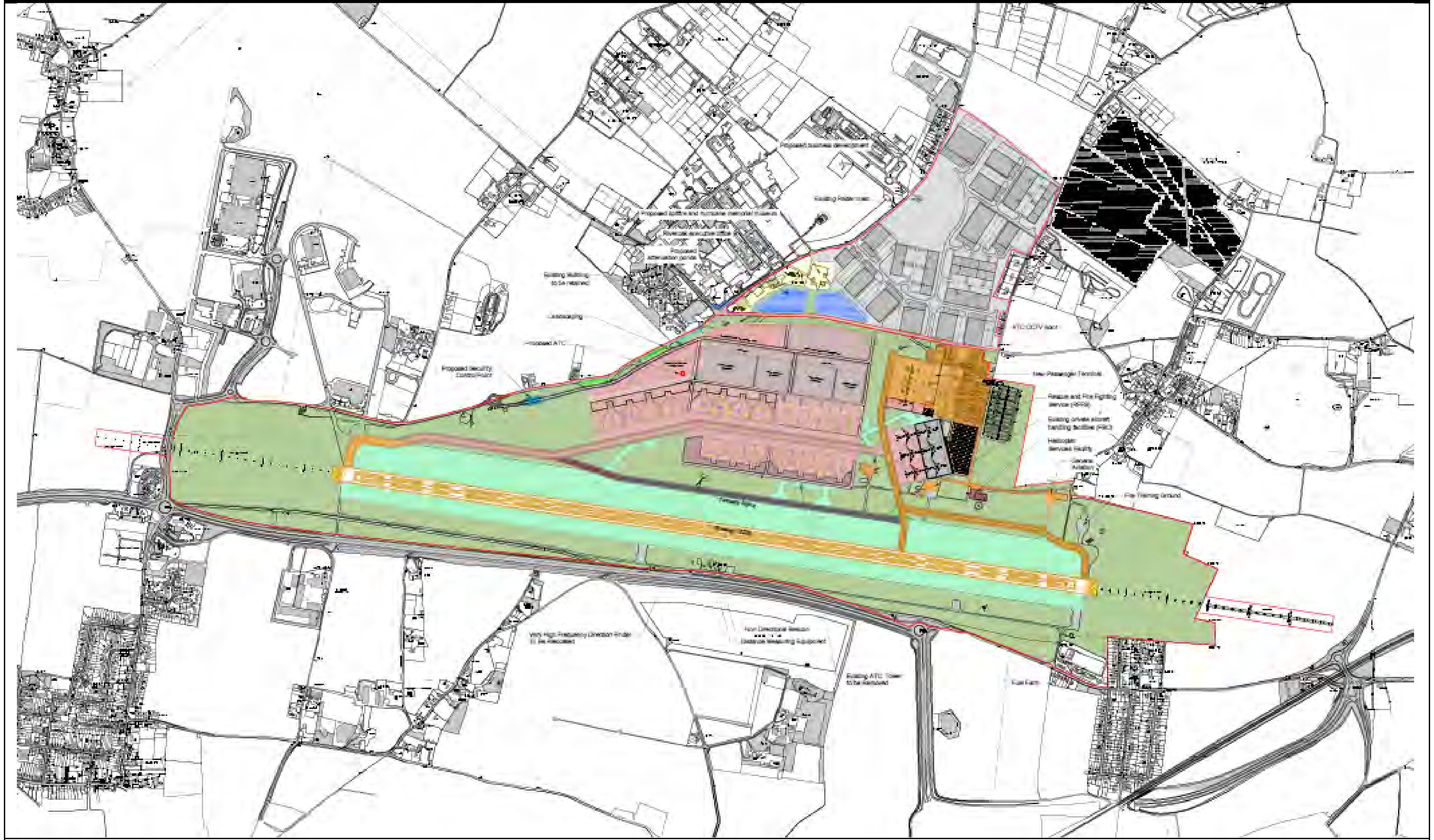
4.8 The Master Plan presented by RSP for the Manston Airport site is shown at **Figure 4.1**. It makes use of the full length of the runway and provides a full length parallel taxiway. The western side of the site is dedicated to freight handling activity and has 19 Code E aircraft stands for cargo flights and 4 large cargo sheds for the processing of freight supported by truck loading and parking areas. The eastern side of the site shows as a new passenger terminal and apron along with a MRO hangar and apron. The existing private aircraft handling facility (FBO) and fire station site is retained. We are not entirely clear how such works would be phased, although we understand that 4 phases of development are planned. RSP projects that Manston will need to be able to handle 17,171 cargo related ATMs and that 1.4 mppa of passengers will be handled by 2039. These represent the basis for the proposed DCO application and we assume, therefore, that these will be the limits on the number of movements and passengers which the site would be capable of accommodating as these form the basis for the assessment of environmental and other impacts. However, this is unclear from the consultation documentation.

4.9 We are unclear why 19 Code E stands are proposed given that the fleet mix at 2039[52] shows 85% of aircraft (at 17,171 annual cargo aircraft movements) being by aircraft smaller than Code E dimensions. Even allowing for some larger Code F types (<2% of movements), it would be possible to reduce the area of apron required for the fleet mix proposed, leaving aside whether 19 stands are required for the simultaneous parking of cargo aircraft at any one time, which we discuss further below.

4.10 To the north of the site, on the 'Northern Grasslands', a new development is shown, which appears to consist of commercial sheds and factory buildings with no obvious connection to the operation of the Airport being located entirely on the landside of the B2050. We assume that RSP's intention is to lease out these landside commercial buildings on this northern site so as to provide a rental income to cross subsidise the operation of the Airport. We discuss the need for this land further below.

[52] Azimuth Volume III, Table 2.

Figure 4.1: RSP Masterplan – Proposed Site Layout



Source: RSP

Land Required

4.11 Without prejudice to our position that we do not consider that RSP's proposals are credible in terms of the level of demand that might be attracted to Manston, we do not consider that the scale of development proposed by RSP for 17,171 cargo related movements is necessary, justifiable or reasonable, based on the principles set out at paragraph 4.5 above.

4.12 At **Figure 4.2**, we illustrate the justifiable and reasonable extent of land required at Manston Airport to support a cargo operation of 17,171 ATMs and passenger operation of 1.4 mppa (even though we do not accept that these ATMs and passenger numbers can be reached). This is based on our experience of airport operations around the world.

4.13 We recognise that there could be an opportunity for maintenance hangars for heavier aircraft maintenance activities but the need for these will not necessarily be triggered by the establishment of passenger operations. Depending on the nature of the freight and passenger carriers that set up services at Manston, the need for maintenance hangars cannot be ruled out and we have allowed for one twin bay hangar with a footprint of approximately 6,000m2 or two single bay hangars at 3,000m2 each.

4.14 It is also reasonable to expect that there will be some business and some general aviation activity. However, unless a bespoke FBO is set up, which we believe is unlikely given the distance from the main business aviation market in London and with Biggin Hill much closer to the core market, there would be very limited use by business aviation. Any small general aviation or flying school activity can be accommodated within the land area shown. These facilities, and any aircraft dismantling activity as also suggested in Azimuth's forecasts, would need to have direct airside access and so would need to be located to the south of the B2050. In other words, all of the operational facilities to support the operation of the Airport would require to be located to the south of the road and not on the 'Northern Grasslands' site.

4.15 We have clearly marked the area of land to the south of the B2050 that is not required for the defined airport operations in green on Figure 4.2. To the north of the Airport site, the 'Northern Grasslands' are marked in yellow and is not required for the scale of airport activity proposed by RSP. We discuss the potential use of this area further below. Figure 5.2 clearly shows that the extent of airport land needed to support the scale of freight and passenger activity proposed by RSP is significantly less than that proposed by the RSP. There are surplus areas of land within the core airport site as well as the 'Northern Grasslands' that are not required to support the throughput proposed.

Figure 4.2: Airport Land for 17,121 Freight ATMs and 1.4 mppa Operation – Surplus Land: Airport Land (Green), Northern Grasslands (Yellow)

Source: York Aviation

4.16 We summarise at **Table 4.2**, those facilities proposed by RSP in its Master Plan but are not, in fact, required to support essential airport operations.

Table 4.2: Classification of RSP Proposed Airport Facilities at Manston Airport		
	RSP proposed airport-related development	**Facilities not Essential for an Operational Cargo Airport**
4	Retention & Extension of Passenger Apron	✓
11	New replacement Passenger Terminal building	✓
12	New and extended passenger car parking areas	✓
23	Relocation of the two existing museums	✓
24	Demolish old Control Tower in northern area	✓
25	Airport related businesses on Northern Grasslands	✓
26	New MRO aircraft maintenance hangars	✓
27	New FBO in refurbished business aviation terminal	✓

4.17 Although a replacement radar is shown by RSP re-using the old radar tower within the 'Northern Grasslands' area, it is not clear that a replacement radar would actually be required, although a radar service would be required. It is likely that a radar service could be procured more cheaply by buying in radar coverage from an alternative radar position rather than re-providing a radar on site. This is increasingly common practice at smaller airports. In the event that a replacement radar was required, this would not need to be located on the 'Northern Grasslands' but could be located within the airfield site to the south of the B2050.

4.18 In terms of the use of the 'Northern Grasslands', there is no particular requirement for extensive freight forwarding facilities on site as consolidation of loads is likely to continue to take place in and around Heathrow as currently. Any freight forwarding activity directly to support 17,171 cargo aircraft movements is likely to be containable within the area shown for freight warehousing within the airfield site.

4.19 No other justification is given for the extent of the commercial development shown on the 'Northern Grassland' part of the site. In our view, it is certainly not 'associated development' required to support the operational airport, other than in terms of providing a financial cross subsidy from rental income for general commercial buildings.

4.20 The need, then, for such an extensive development across the 'Northern Grasslands' cannot, in our opinion, be justified and is substantially in excess of what is seen elsewhere. The scale of supporting infrastructure proposed appears substantially greater than exists at the UK's main pure freight hub at East Midlands. We have seen no reasoned justification for the scale of facilities proposed. It appears to cover an area (c.48 hectares), which is more than double the size of the associated Pegasus Business Park area at East Midlands Airport (c.21 hectares), which currently handles virtually the same cargo tonnage as projected by Azimuth for Manston at 2039. Furthermore, it is significant that a substantial part of the East Midlands area is occupied by hotel development (3 hotels) in support of the much greater passenger throughput at that airport, a Regus office complex, and many of the other occupiers of sites within the Pegasus Business Park are not related to the activity at the Airport and include companies such as PwC, Laser Optical Engineering, Nikon Metrology UK, Medstrom Healthcare, Rail Vision and PKF Cooper Parry making use of an accessible location close to the M1. None of these activities would be essential in relation to freight activity at the airport and so would not meet the test for associated development required for inclusion with a DCO.

Realistic Requirements

4.21 Clearly, as is evident from earlier sections of this report, our opinion is that RSP's projections for the use of Manston Airport cannot be realised. Hence, the area of land required to accommodate lower levels of activity would be proportionately smaller, occupying a substantially smaller area of land to the south of the B2050 than shown on Figure 4.2.

Conclusions on Capability

4.22 The existing infrastructure at Manston Airport, if made good, would be capable of handling 21,000 annual air cargo transport movements[53]. However, the actual usage of that capability would depend on the pattern of operation and how the infrastructure was used on a day by day basis.

4.23 Without prejudice to our view that demand to use Manston is not likely to be anything like 17,171 cargo aircraft movements a year, we consider that the land required to accommodate such a number of movements would be substantially less than shown on the RSP Master Plan.

4.24 We can see no justification for the inclusion of the 'Northern Grasslands' within the DCO as associated development as there will be little requirement for the relocation of freight forwarding activity from adjacent to the UK's main cargo hub at Heathrow to Manston and any requirement could be accommodated south of the B2050. The development on the Northern Grasslands site appears to be speculative commercial development which, based on the precedent at East Midlands Airport – the UK's principal airport for pure freighter operations – would be expected to be largely for non-aviation related uses.

[53] Based on an 18-hour operational day. Should a night time noise policy be agreed with Thanet District Council pursuant to the existing planning agreement that enabled a longer operational day and/or a number of scheduled night movements, then the capability could, in theory, be higher than 21,000 annual cargo aircraft movements.

5 SOCIO-ECONOMIC IMPACT

Introduction

5.1 In this section, we examine the socio-economic benefits that are put forward by Azimuth and the flaws that are apparent in their approach. These render the socio-economic case put forward unreliable. We then move on to provide our own estimates of the socio-economic impacts of Azimuth's traffic forecasts based on more appropriate assumptions and also set out the socio-economic impacts associated with our own traffic forecasts to provide a more reasonable basis for considering the extent of the benefits that might realistically accrue from the re-opening of the Airport.

Comments on Azimuth Socio-Economic Assessment

5.2 Volume IV of the Azimuth's Report sets out the socio-economic case for the DCO for Manston. This assessment naturally relies on the traffic forecasts presented in Volume III. This means, of course, that the socio-economic assessment is rendered unreliable by the failings of the traffic forecasting approach and the incorrect inferences drawn from the assessment of the market. However, there are also substantial failings in relation to the methodology used for the socio-economic impact assessment itself, which result in significant over estimates of the impacts. We would also re-emphasise that the Airport must be commercially viable to be able to deliver these benefits, otherwise it will simply fail and no level of benefit will be delivered. RSP has not clearly demonstrated that the operation of the Airport would be viable at any level of throughput and, in the light of the conclusions of Aviasolutions in their advice to Thanet (see Section 6 of this report), viability must be in serious doubt based on our analysis of the likely usage as set out in Section 3. This renders any analysis of the socio-economic impacts to a large extent moot. Setting aside the issue that the Airport is highly unlikely to be viable and that the traffic forecasts set out are significantly overstated, we have identified below a number of key flaws in Azimuth's approach and analysis of the economic impacts.

5.3 At the outset, it is probably helpful to highlight the key area in which we agree with Azimuth's analysis and conclusions. We agree that the East Kent area is in need of regeneration. It is simply that we do not believe that Manston Airport can deliver the benefits set out. Any attempt to re-open the Airport is not likely to succeed as it is hard to see that viability could be attained with realistic forecasts of usage. Another failure of the Airport would be more likely to damage the image of Kent as a place to invest than enhance it.

5.4 Azimuth spend some time considering the appropriate employment density on which to base an assessment of direct employment. They ultimately conclude that East Midlands Airport provides an appropriate comparator (see paragraph 4.1.4 of Volume IV). This information is then used to drive large parts of the benefit calculations for Manston. York Aviation provides economic impact advice to MAG in relation to both its major freight airports, East Midlands and Stansted. From this knowledge, we would suggest that the job numbers quoted and used here are an incorrect base as they include substantial numbers of non-airport related jobs located on the business park at East Midlands Airport, discussed in the previous section. This means that the employment density used by Azimuth is far too high for genuine airport related activity. In any event, the employment at East Midlands is higher than might be anticipated anyway given the very significant employment supported at the site by DHL's UK main base of operations, which is not likely to be replicated at Manston.

5.5 We accept that it is difficult to identify an ideal comparator for a re-opened Manston in the UK but would suggest that an airport such as Glasgow Prestwick would be a much more appropriate comparator. The Airport has a low fares operation by Ryanair and has a reasonably significant pure freighter operation (although this has been substantially larger in the past). There is also detailed information on the economic impact of that airport in the public domain from work undertaken by both York Aviation[54] and SQW[55]. We have used information from this research later in this section to provide a more realistic base for assessing the economic impact of Manston.

5.6 The multipliers used by Azimuth for indirect and induced employment and economic activity in their assessment are simply inappropriate. Firstly, the multipliers adopted are for the impact at a national level. The study area for this economic assessment and the focus of Azimuth's comments is the sub-region around Manston Airport. Multipliers appropriate to this much smaller area should have been used and would have been substantially smaller. Secondly, the multiplier used (2.1) is a European average taken from research by InterVISTAS for ACI EUROPE[56]. The adoption of this Europe-wide multiplier is strange given that that the research does actually provide a specific multiplier for the UK[57], which is substantially smaller at 1.5. Use of the appropriate multiplier would, of course, have significantly reduced the job impacts suggested, even at a national scale.

5.7 There is a further issue in relation to the use of an inappropriate multiplier covering national level effects in that displacement of activity from other airports should have been taken into account. To the extent that any of the activity projected for Manston is displaced from other airports, as our analysis strongly suggests it will be, there will be a relative reduction in employment and economic activity in the vicinity of these other airports. So whilst, correctly calculated, the employment and economic effects local to Manston would be additional, the effect of displacement of activity would need to be netted off wider national or regional (South East) impact assessments.

[54] The Economic Impact of Glasgow Prestwick Airport – York Aviation (2012). http://www.evaluationsonline.org.uk/evaluations/Search.do?ui=basic&action=show&id=509
[55] Economic Impact of Glasgow Prestwick Airport – SQW (2008). http://www.sqw.co.uk/files/4413/8712/8925/99.pdf.
[56] The Economic Impact of European Airports – InterVISTAS for ACI Europe (2015).
[57] Ibid. Page 103.

5.8 As well as using a multiplier for indirect and induced impacts, a multiplier is used to assess the wider catalytic employment[58]. The multiplier used is taken from out of date research for ICAO[59] and it should be said that catalytic impacts remain a difficult area in terms of quantification. There is not sufficient detail in the ICAO report[60] that Azimuth rely on to understand how this catalytic multiplier has been derived. However, again, there are issues with the use of this multiplier. Firstly, it appears to be a global multiplier, which would again be completely inappropriate for use in considering sub-regional impacts around Manston and it has been wrongly applied to total job numbers rather than direct job numbers. In practice, the correct approach would have been to consider the specific additional connectivity that Manston Airport might provide for Kent and assess how this might relate to attracting additional business activity and tourism to the area.

5.9 In examining the employment projections presented (Section 5.1 of Volume IV), it appears that no allowance has been made for either productivity growth or returns to scale over time and as the Airport grows. While information on potential on-site productivity growth can be hard to come by, we would expect some allowance to have been made. A typical figure might be around 2% per annum based on our experience at other airports. The result of this omission is that future direct job numbers, in particular, are likely to be significantly overstated given the compounding effect of failing to account for productivity growth.

5.10 Section 7 of Volume IV discusses other socio-economic impacts. In particular, it talks about contributions to GDP. Para 7.1.1 describes GDP as *"a monetary measure of the state of a Region's or a Country's economy"*. This is not correct. It is a measure of the size of the economy. It does not comment on the state of the economy or the prosperity or wealth within it. The calculations of GDP impacts presented are based on the job numbers estimated earlier in the report. They are, therefore, likely to be significant overestimates given the flaws in the demand forecast method and the job density and multiplier assumptions.

5.11 The comments in Paragraph 7.1.7 describing how Manston could contribute significantly to Thanet's Economic Growth Strategy aspirations in terms of GVA per job and per capita are, in reality, unsupported. Given the methodology adopted, which essentially measures Manston's impact at a national level, it is actually very difficult to know what the effect might be on the Thanet economy. Undoubtedly, the Airport could support local jobs if it is re-opened but, in reality, the number of those jobs and their value has not been effectively calculated here. The aviation supply chain in the UK is heavily concentrated around the major airports, particularly in relation to air cargo. So, in practice, much of the economic benefit claimed would be realised in and around Heathrow rather than locally if Manston were to re-open. To the extent that any activity would be displaced to Manston, there would be negative economic implications elsewhere.

[58] Catalytic employment is related to additional economic activity generated in areas adjacent to an airport as a result of the additional connectivity offered by the airport.
[59] ICAO – International Civil Aviation Organisation, which is the inter-governmental body which regulates air transport globally.
[60] ICAO – Economic contribution of civil aviation: Ripples of prosperity, 2000.

The Socio-Economic Impact of the Azimuth Traffic Forecasts

5.12 Below, we have set out an estimate of the socio-economic impacts of the Azimuth traffic forecasts using more appropriate assumptions. We have retained the same basic analytical framework, which considers direct, indirect, induced and catalytic impacts, but we have used different basic assumptions in all areas:

- we have estimated the direct employment associated with the re-opening of the Airport based on employment densities observed at Glasgow Prestwick Airport during the production of our 2012 report for Scottish Enterprise[61]. This includes considering which elements of on-site employment are likely to be driven by passenger growth and which by cargo growth. Given the slightly differing approach, it is hard to provide a perfect comparison of job density. However, in Year 3, when both cargo and passenger operations begin, the York Aviation job density is around 650 jobs per million workload units, compared to around 890 assumed by Azimuth;
- we have used an indirect and induced multiplier for Kent of 0.4[62]. This is again taken from our work on Prestwick and reflects impacts of that airport in the Ayrshire economy, which would seem a sensible comparator. This multiplier is also in line with the benchmark multipliers set out in the Homes and Communities Agency Additionality Guide (2014)[63]. At this level, displacement affects do not need to be accounted for albeit they would still arise to the extent that activity at Manston displaces activity elsewhere;
- we have used catalytic multipliers for air freight taken from Steer Davies & Gleave's report on the UK Air Freight Industry for the DfT[64]. This identified national level catalytic multipliers for air freight of 3.46 and 3.76 (inclusive of the direct impact). There is no simple way to adjust these multipliers to the Kent economy. We have, therefore, reduced these multipliers by 75%. This is broadly akin the difference between sub-regional and national level multipliers for indirect and induced effects. As with all estimates of catalytic impacts, these should be regarded with some caution in the absence of a more detailed and specific assessment of the potential effects;
- we have assumed productivity growth at Manston Airport of around 2% per annum. This is typical of our experience of productivity growth rates at UK airports;
- in order to estimate the GVA impacts of the re-opening of the Airport, we have used GVA per job estimates from ONS for Kent. On-site jobs are assumed to generate GVA in line with the Transportation & Storage sector (£57,763), while jobs in the wider economy are assumed to reflect the average GVA per job for Kent (£52,623).

5.13 In **Tables 5.1** and **5.2**, we have set out our estimates of the socio-economic impact of the Azimuth traffic forecasts compared to the original estimates produced by Azimuth.

[61] *The Economic Impact of Glasgow Prestwick Airport* – York Aviation (2012).
[62] Note that this excludes the initial direct effect.
[63] See page 36.
[64] *AIR FREIGHT Economic and Environmental Drivers and Impacts* – Steer Davies and Gleave for DfT (2010). Page 106.

Table 5.1: Employment Impact of Manston Airport – YAL Socio-Economic Assumptions Comparison					
	Y2	**Y5**	**Y10**	**Y15**	**Y20**
Azimuth Impact Assumptions with Azimuth's freight + passenger forecast					
Direct	856	2,150	2,749	3,438	4,271
Indirect & Induced	1,798	4,515	5,773	7,220	8,970
Catalytic/Wider	0	8,601	10,996	13,753	17,085
Total	**2,654**	**15,266**	**19,518**	**24,411**	**30,326**
YAL Impact Assumptions with Azimuth's freight + passenger forecast					
Direct	688	1,555	1,791	2,033	2,291
Indirect & Induced	275	622	716	813	917
Catalytic/Wider	475	1,073	1,236	1,403	1,581
Total	**1,439**	**3,250**	**3,743**	**4,249**	**4,789**
YAL Total as % of Azimuth	**54%**	**21%**	**19%**	**17%**	**16%**
Source: York Aviation and Azimuth Associates					

Table 5.2: Gross Value Added Impact (£ million) – YAL Socio-Economic Assumptions Comparison					
	Y2	**Y5**	**Y10**	**Y15**	**Y20**
Azimuth Impact Assumptions with Azimuth's freight + passenger forecast					
Direct	£43	£108	£138	£173	£215
Indirect & Induced	£78	£195	£250	£312	£388
Catalytic/Wider	£0	£391	£499	£625	£776
Total	**£121**	**£694**	**£887**	**£1,110**	**£1,379**
YAL Impact Assumptions with Azimuth's freight + passenger forecast					
Direct	£41	£99	£126	£158	£197
Indirect & Induced	£15	£36	£46	£58	£72
Catalytic/Wider	£25	£61	£78	£97	£121
Total	**£82**	**£196**	**£250**	**£313**	**£389**
YAL Total as % of Azimuth	**68%**	**28%**	**28%**	**28%**	**28%**
Source: York Aviation and Azimuth Associates					

5.14 The differences between the two sets of estimates are marked. Our assumptions result in economic impacts being around a half to two thirds of those estimated by Azimuth initially. However, the gap widens over time as the impact of Azimuth's failure to allow for productivity growth and high multiplier assumptions feed through. In our view, the Azimuth estimates simply cannot be relied upon as a measure of the potential economic impacts of re-opening of Manston Airport. Not only are they infected by the errors in traffic forecasting, but the approach itself is highly flawed. A more realistic and robust assessment suggests that the local impacts within Kent, even on Azimuth's forecasts, would be substantially less than claimed and it is these lower order effects which would need to be balanced with the environmental and impacts in assessing the acceptability of the proposed development, including the loss of SHP's proposed mixed use development and the socio-economic benefits deriving therefrom.

A More Realistic View of the Socio-Economic Impacts of Manston

5.15 As we have described above, the socio-economic assessment undertaken by Azimuth was destined to fail before it started because of the failings in the traffic forecasts that feed the approach. We do not consider there is any realistic prospect of the Airport attaining 10,000 annual movements by cargo aircraft and the build up of traffic would be materially slower than Azimuth estimate.

5.16 We have, therefore, set out below an assessment of the socio-economic benefits that might be associated with re-opening Manston on the basis of York Aviation's most likely cargo forecast (that Manston is able to regain its previous market share) and our passenger forecasts, which are around half those assumed by Azimuth. Once again, we have used our socio-economic impact assumptions as described above. The resulting employment and GVA impacts are again set out compared to Azimuth's assessment of the economic impact of reopening Manston in **Tables 5.3** and **5.4**.

Table 5.3: Employment Impact of Manston Airport – YAL Forecasts Comparison

	Y2	**Y5**	**Y10**	**Y15**	**Y20**
Azimuth Impact Assumptions with Azimuth's freight + passenger forecast					
Direct	856	2,150	2,749	3,438	4,271
Indirect & Induced	1,798	4,515	5,773	7,220	8,970
Catalytic/Wider	0	8,601	10,996	13,753	17,085
Total	**2,654**	**15,266**	**19,518**	**24,411**	**30,326**
YAL Impact Assumptions with YAL's freight + passenger forecast					
Direct	216	391	409	442	486
Indirect & Induced	87	156	164	177	194
Catalytic/Wider	149	270	283	305	335
Total	**452**	**817**	**856**	**925**	**1,015**
YAL Total as % of Azimuth	**17%**	**5%**	**4%**	**4%**	**3%**
Source: York Aviation and Azimuth Associates					

Table 5.4: Gross Value Added Impact (£ million) – YAL Forecasts Comparison

	Y2	**Y5**	**Y10**	**Y15**	**Y20**
Azimuth Impact Assumptions with Azimuth's freight + passenger forecast					
Direct	£43	£108	£138	£173	£215
Indirect & Induced	£78	£195	£250	£312	£388
Catalytic/Wider	£0	£391	£499	£625	£776
Total	**£121**	**£694**	**£887**	**£1,110**	**£1,379**
YAL Impact Assumptions with YAL's freight + passenger forecast					
Direct	£13	£25	£29	£34	£42
Indirect & Induced	£5	£9	£11	£13	£15
Catalytic/Wider	£8	£15	£18	£21	£26
Total	**£26**	**£49**	**£57**	**£68**	**£83**
YAL Total as % of Azimuth	**21%**	**7%**	**6%**	**6%**	**6%**
Source: York Aviation and Azimuth Associates					

5.17 Unsurprisingly, the socio-economic impacts associated with the Airport are reduced even further on the basis of more realistic forecasts. The operation is simply of a much smaller scale. In Year 2, in generates 452 jobs, only 17% of the Azimuth estimate of 2,654. By Year 20, the differential is even larger, with the Azimuth estimates reaching over 30,000 jobs, but with our estimates at only just over 1,000. More likely, the Airport would cease operating again due to the inability to attain viable operations. In these circumstances, it becomes a moot point as there would be no jobs and economic impact over the medium to long term.

Conclusion

5.18 Once again, the evidence presented by Azimuth on behalf of RSP cannot be relied upon. It is infected with the flaws in the traffic forecasting methodology identified previously but the approach to identifying socio-economic impacts is, in itself, badly flawed. The socio-economic impacts are, as a result, massively overstated and, in any event, would not be realised if the operation of the Airport is not commercially and financially viable.

6 PEER REVIEW OF OTHER REPORTS

6.1 In this section, we set out a brief review of other reports produced on the potential for a re-opened Manston Airport.

Aviasolutions for Thanet

Commercial Viability of Manston Airport – September 2016

6.2 We note that this assessment was focussed on the likely viability of a re-opened Manston Airport. Hence the main focus was on scenarios for passenger growth as passenger operations make a significantly greater financial contribution to operating an airport given the ability to earn revenue from retail, catering and car parking as well as direct revenue from airport charges (landing, aircraft parking, passenger fees and any cargo handling fees). We note that Avia took a much more optimistic view than we do of the scope for passenger overspill from the main London airports to Manston but, to an extent, these scenarios were designed to assess whether re-opening Manston would be commercially viable rather than to assess a realistic level of demand.

6.3 Having assessed the historical performance of Manston, Avia assumed that it would be possible for the Airport to regain the broad level of cargo activity that is was handling before it closed. This is not dissimilar to our 'most likely' assumption. Significantly, Avia noted that:

"Our freight interviews indicated that the demand to use the airport for freight was very limited. This, in large parts, is due to two factors; the infrastructure investments that have already been made by the industry around Heathrow and Stansted, and the geographical location of the airport. Infrastructure, and the associated knowledge, skill and supporting industry at airports such as Heathrow and Stansted, as well as the major European hubs such as Frankfurt, and Paris, would be almost impossible for Manston to replicate. The geographic location of the airport, tucked into the corner of the UK, cannot compete with airports such as East Midlands for Integrator services that are sold as fast delivery, due to the increases in surface transportation times. The interviews did however indicate that charter services and ad-hoc freighter flights would certainly return, providing some revenue income for the airport"[65].

This accords with our view of the most likely prospects for Manston.

6.4 Overall, the Avia 2016 work concluded that Manston was not likely to be a commercially viable prospect if re-opened, certainly if it is assumed that another runway would be built at either Heathrow or Gatwick. We concur with this conclusion and, on the basis of our more realistic assessment of the level of passenger demand that the Airport might attract, commercial viability is even less likely to be attained.

[65] Aviasolutions, *Commercial Viability of Manston Airport*, September 2016, Section 8.3.

Local Plan Representations - Final Report – August 2017

6.5 This report largely deals with individual specific representations one at a time. Overall, Avia conclude that their *"opinion, based on updated market information since the publication of our previous study, is consistent with our earlier view that Manston Airport does not represent a financially viable investment opportunity under normal market conditions."*[66]

6.6 In relation to these representations, Avia state clearly that:

"The Local Plan Representations do not make a credible case, nor provide the evidence for AviaSolutions' to change its views on the financial viability of Manston Airport. We remain of the view that whilst Heathrow Airport continues to offer substantial freight capacity to a truly global network, and Stansted Airport utilises only around half of the statutory provision of air freighter movements, the London air freight market has capacity to grow without the re-introduction of capacity at Manston Airport. Freight Forwarders have invested heavily in infrastructure around these core airports, carriers have developed their networks as such, and without clear value drivers that support relocating services to Manston Airport, the case remains to be made that demand exists for a freight facility at Manston Airport. This view is reinforced by the empirical evidence of multiple failed attempts to develop profitable operations at the airport."[67]

6.7 Again, Avia's analysis concurs with our own in terms of the limited role that there would be for a re-opened Manston Airport given the evolution of the air freight market. We concur with Avia's analysis of the potential for other activities at Manston such as business aviation or aircraft dismantling and note that, in our experience, income generation from such activities would be low.

6.8 We note that, in this report, Avia correctly interpret our work for the FTA in terms of the potential for the equivalent of 80,000 air freighter movements to be accommodated away from the main London airports by 2050 in the event of no new runway being constructed. As Avia note, this demand is likely to be accommodated at a variety of other airports, including Manchester and East Midlands, with the former offering a substantial amount of bellyhold capacity by that date and the latter offering a dedicated freighter service. Displacement to regional airports is also a logical response given the amount of cargo from the regions which is currently trucked to the London airports. We have had no dialogue with Avia regarding the interpretation of our work but their interpretation of it confirms that Azimuth have simply misused headline figures from our work to support RSP's case without considering or understanding the broader meaning of our analysis in 2015 as Avia demonstrate.

[66] Aviasolutions, *Local Plan Representations - Final Report*, August 2017, Executive Summary.
[67] Ibid.

Review of Azimuth and Northpoint Forecasts for Manston – August 2017

6.9 In this report, Avia conclude that the Azimuth and Northpoint forecasts are *"highly ambitious"* and that *"the likelihood of these forecasts being realised is very low"*[68]. Avia do not, themselves present any updated forecasts of their own in this report. They make clear that neither report presents *"a credible case"* sufficient for Avia to change its view on the likelihood of viable commercial operations being attained at Manston Airport.

6.10 Avia conclude that:

"We remain of the view that whilst Heathrow Airport continues to offer substantial freight capacity to an extensive global network, and Stansted Airport offers capacity for air freighter movements, the London air freight market has capacity to grow without the re-introduction of capacity at Manston Airport. Freight Forwarders have invested heavily in infrastructure around the UK's core cargo airports and carriers have developed their networks as such. Without clear value drivers that support relocating services to Manston Airport, the case remains to be made that demand exists for a freight facility at Manston Airport.

Provision of capacity alone is no guarantee of financial success, a view reinforced by the empirical evidence of multiple failed attempts to develop profitable aviation operations at Manston Airport."[69]

This accords with our view.

6.11 Like ourselves, Avia point out[70] that provision of infrastructure is not of itself sufficient to ensure a financially viable airport at Manston and that this will depend on the demand that can be attracted. Avia conclude, like ourselves, that *"Azimuth's report does not provide sufficient evidence of demand at Manston Airport from air freight operators to support the required investment in facilities and profit generation potential to re-establish Manston Airport as a going concern."*[71] Avia, like ourselves, highlight that if there had been a market for Manston to accommodate any overflow from Heathrow, this would have been evident prior to the Airport's closure in 2014. Avia also conclude[72], in relation to the extensive interviews carried out by Azimuth, that they largely address the overall issues of airport capacity in the South East of England and do not effectively explain why Manston, at the tip of Kent, would be an attractive solution for the UK air freight sector.

6.12 Avia also note that the other activities that Manston might attract, as suggested by interviewees, such as maintenance, repair and overhaul, aircraft dismantling, a fixed based operator for business aviation and the establishment of an integrator base could have been attracted previously if there was demand at Manston but that such demand was not evident. We concur that the reports of interviews set out by Azimuth do not constitute real evidence of actual demand for such facilities or the likelihood of them locating at Manston.

[68] Aviasolutions, *Review of Azimuth and Northpoint Forecasts for Manston*, August 2017, Executive Summary
[69] Ibid.
[70] Ibid, page 9.
[71] Ibid.
[72] Ibid, page 11.

6.13 Like ourselves, Avia point out that Azimuth's freight forecasts would suggest that Manston would be a major presence in the UK air freight market from Year 2[73] and that by the end of the period would be on a par with the UK's main freight hub at East Midlands by 2039. They go on to note that the methodology adopted by Azimuth to forecast cargo movements could be acceptable, which we take to mean a 'bottom up' movement driven approach. However, they caution that the primary data used (from the interviews) *"has significant potential to exaggerate or overstate the market"*[74]. As Avia note, the aspirations of the interviewees, that as we have noted earlier were largely local interests in Kent, would need to be tempered by commercial realism and the risks attaching to the operations put forward. Avia conclude, in relation to Azimuth's freight forecasts, that *"the probability of such an outcome remains very low"*[75]. We concur.

6.14 In overall terms, Avia conclude that there is nothing in the Azimuth analysis which would give rise to them changing the conclusions set out in their earlier 2016 report.[76]

6.15 Avia then go on to consider the Northpoint report, discussed further below, which was prepared as a direct rebuttal of their 2016 report. In the first instance, they note that they do not accept that the benchmark airports[77] cited by Northpoint as comparators for what Manston could be are relevant:

There are clearly structural and geographical reasons as to why each of these airports is different to the proposal for Manston Airport. As such, suggesting these are comparable benchmarks is not realistic. In order for Manston Airport to acquire the status of these airports it would need to demonstrate key elements of development, namely; commitments from key express players (DHL / UPS / FedEx / Amazon / Alibaba); an ability to operate night operations with few regulatory restrictions; and geographical advantages from nearby cities, industrial parks, and population centres.

We agree. These benchmark airports serve different roles, principally based around their selection by large integrators/distributors as main distribution hubs for large urban conurbations. These are simply not comparable to Manston and it would be misleading to believe otherwise.

[73] Ibid, Section 2.3.2.
[74] Ibid, Section 2.3.3.
[75] Ibid.
[76] Ibid, page 15.
[77] Alliance Fort Worth in Texas, USA, Hamilton Airport in Ontario, Canada, Bergamo in Italy, Liege in Belgium and Leipzig in Germany.

6.16 In relation to air freight forecasts, Avia again note RSP's reliance on our work for the Freight Transport Association. Again, Avia correctly interpret this work as being based on the assumption that *"freight growth is bellyhold focussed"* going on to note that our *"report also questions Boeing and Airbus' forecast growth rates, which are utilised in the long term growth forecast by Dr Dixon."*[78] Avia go on to note Northpoint's use of the 55,000 air cargo movements figure from our earlier work for Transport for London (2013) and cite Northpoint's claim that we asserted that Manston was the only realistic opportunity to accommodate this level of freighter movements if they were displaced. As we have discussed at length in Section 2, this is simply a misapplication of our 2013 work. Unsurprisingly, Avia could not find these figures in the 2015 report for the FTA.

6.17 Avia also highlight Northpoint's misinterpretation of the interaction between bellyhold and pure freighter demand. We agree with their conclusions in this regard, which explain why the market for more pure freighter operations to/from the UK is limited:

"AviaSolutions' experience in the freight industry is that many bellyhold operators can, when supply exceeds demand, reduce rates to such a level as to cover the marginal cost of freight plus a margin. The business is often operated as an addition to the passenger service, and therefore its real marginal costs are low. It is simply impossible for a freighter operator to reduce its rate to match this marginal cost and operate at profitably [SIC]. *Therefore, freighters tend to operate on thick routes where the economies of scale of a freighter operation can be realised. These routes are also curtailed by a non-related market, that of passenger demand. Where large scale passenger demand exists e.g. UK to USA, a residual effect of this is large scale freight capacity, which is unmatched to demand. The reverse can be seen on routes to the East, where passenger demand is less, but freight demand, particularly inbound to the UK, is high. As such, many freighters operate on these routings."*[79]

We agree that the extensive passenger based route network and the availability of bellyhold capacity limits the need for a substantial pure freighter operation to/from the UK, in contrast with other parts of the world where passenger air route networks are less developed. This is why global data on the demand for air freighters is simply not relevant in the UK context.

Northpoint

6.18 We have largely addressed key points of Northpoint's rebuttal of the original Aviasolutions work above on the basis of Avia's most recent report. We highlight here a few other key observations on Northpoint's *"The Shortcomings of the Avia Solutions Report and an Overview of RSP's Proposals for Airport Operation at Manston"* prepared for RSP.

6.19 As with Azimuth's work, the key criticism of this work is that it is based on assertion rather than evidence or systematic analysis of the potential market for Manston. As noted above, benchmark airports in the middle of Continental Europe or adjacent to major conurbations in the US and Canada do not provide robust examples of how Manston might develop given its geographic position. Northpoint set out that:

[78] Ibid, page 17.
[79] Ibid, Section 3.1.6.

"RSP's plans are centred on a developing a strategically important air cargo operation focused dedicated freighters importing and exporting a range of perishable and high-value/time-critical goods to markets in London and across the wider south-east." [80]

And that these operations would be supplemented by a *"modest"* passenger offering, a variety of business and general aviation activities as well as maintenance, repair, overhaul and aircraft dismantling activities. However, the report does not, itself set out how the scale of such activity could be assessed and whether it would, in combination, secure a viable operation.

6.20 In terms of forecasting the volume of air freight that Manston might secure, Northpoint make an unsubstantiated leap from noting the reasons why Heathrow is dominant in the market to asserting that the key determinant for pure freighter operations is the infrastructure provided at an airport and supply driven factors, noting that it is important that these latter are *"transparent"*[81]. We have already noted the lack of transparency in relation to the air cargo forecasts produced by Azimuth upon which RSP rely. Nor are the projections set out in Northpoint's Appendix A any more transparent in terms of how the estimated tonnage to be accommodated by freighter movements at Manston has been derived.

6.21 Although lacking transparency, it would appear that Northpoint, like Azimuth, have relied on Boeing's global forecasts for freight revenue tonne kilometres as a basis for projecting UK air cargo tonnage[82]. For the reasons set out in Section 2, this is inappropriate and will lead to a material overstatement of the overall market.

6.22 Like Azimuth, Northpoint see cross channel movement of air cargo as an opportunity for pure freighter operations at Manston[83] rather than simply the natural economic response to shortage of bellyhold capacity at Heathrow. Northpoint then seek to rely on our assessment of displaced tonnage equivalent to 55,000 annual movements by air cargo aircraft in 2050 from our 2013 work for TfL as corroborating evidence of Manston's potential[84]. This is to misrepresent the conclusions from this work, which indicated clearly that, in practice, there was unlikely to be a problem even if Heathrow did not get a third runway, albeit that there might be some additional trucking costs to make use of bellyhold capacity in Europe. This would still be cheaper for shippers than the alternative use of pure freighter aircraft from Manston or elsewhere. Furthermore, in assessing the scope for airports to accommodate more freighter aircraft[85], we do not agree with their assessment in respect of Stansted for the foreseeable future and Northpoint appear to ignore the main pure freight hub at East Midlands.

[80] Northpoint, *The Shortcomings of the Avia Solutions Report and an Overview of RSP's Proposals for Airport Operation at Manston*, paragraph 1.3.
[81] Ibid, paragraph 2.4.
[82] Ibid, paragraph 2.18.
[83] Ibid, paragraph 2.21.
[84] Ibid, paragraph 2.24.
[85] Ibid, paragraph 2.30.

6.23 In dismissing the potential for these other, established airports, Northpoint seek to highlight the constraining effect of night movement restrictions on air cargo operations. By inference, then, Northpoint appear to assume that Manston will not suffer from such restrictions so making it more attractive. This appears to be corroborated at Appendix A[86] where it is claimed that the presence of a logistics centre at Manston without significant night movement restrictions would be one of the attractions and a factor in the forecasts being attainable. However, it is our understanding that night movements will at best be limited to 8 per night and could be limited further if the promises of no night movements are upheld.

6.24 In relation to the potential in the aircraft maintenance and dismantling/recycling market[87], we note that these are activities being 'chased' by many airports. There is no analysis of competition nor of the likelihood of Manston capturing any of these activities in Northpoint's report. In any event, the level of activity generated by such activities is unlikely to make the difference between the Airport being viable or not.

6.25 Overall, Northpoint present no real evidence in its Conclusions[88] to substantiate why the operation at Manston could be viable. Its forecasts of cargo movement and passenger demand are no more transparent nor based on market analysis than those set out by Azimuth and do not justify why the RSP application would meet the tests set out in Section 23 of the Planning Act 2008. In general, we agree with Avia's conclusions regarding the robustness of this report.

[86] Ibid, Appendix A, A.8.
[87] Ibid, Section 4.
[88] Ibid, Section 5.

7 CONCLUSIONS

7.1 In this report, we have examined the case for RSP's proposed development at Manston Airport. Our overall assessment is that RSP have failed to provide their own evidence of the capability of Manston Airport and the amount by which their proposals would increase that capability by (all we have are forecasts which have no credibility as explained in this report). This results in glairing omissions in RSP's consultation material. This failure means that, in our opinion, the requirements in section 23 of the Planning Act 2008 (as amended) have not been satisfied. In essence, we would have expected RSP to be able to show:

- the capability of Manston Airport of providing air cargo transport services;
- the amount by which RSP is proposing to increase that capability by and thus the "new" capability; and
- a credible forecast for why that 'new' capability is required.

None of this information is provided by RSP.

7.2 RSP's case is principally based on circumstantial evidence presented in the Volumes I to IV of *Manston – A Regional and National Asset* prepared by Azimuth Associates. Much of the material upon which Azimuth seek to rely as the basis for the case for Manston relates to the economic costs to the UK if additional passenger hub capacity is not provided in the South East of England by 2050. This is not relevant to the specific question as to whether there would be sufficient demand for pure freighter aircraft movements to be operated to/from Manston in the foreseeable future.

7.3 The analysis presented by Azimuth shows a lack of understanding of the economics of the air freight market. This leads to a misinterpretation of work by ourselves, upon which Azimuth seek to rely to support their case. Just because there could be excess freight demand in 2050 in the absence of further runway capacity at the UK's main hub, it does not follow that displaced bellyhold freight will seek a more expensive pure freighter service from a relatively nearby airport over the use of available bellyhold capacity from a more distant airport which can be provided at a lower cost to the shipper with only marginal penalty in terms of time. Our previous work simply cannot be relied on to support RSP's case.

7.4 Fundamentally, Manston's past operation was economically inefficient due to the inherent lack of viability. Hence, reopening the Airport, in the face of a limited market, has the potential to damage the productivity of the UK aviation sector overall, particularly, as we have demonstrated in our own assessment of cargo demand for Manston in Section 3 that there are more economically efficient alternatives available for any freight displaced due to specific capacity constraints at Heathrow both now and in the future.

7.5 Whilst there may be a role for Manston, on the margin, providing some niche specialist air freight operations, the market for such services is small and often ad hoc, which will impact on the prospects for a viable operation of the Airport.

7.6 Manston is too peripheral for integrator operations serving the UK. Integrators have a strong preference for locations more centrally located in the UK with good road access to all of the major markets. The availability of land for warehouses, for example as suggested in terms of the use of the 'Northern Grasslands' part of the overall airport site, is far less important than a location central to the market and the availability of good road access, neither of which are characteristics of Manston. This would apply equally to the suggestion that Amazon might locate there or that the Airport could become a base for drone operations. It is simply in the wrong place to serve the market being in the far south east at the end of a peninsular, away from the main centres of population and distribution in the UK.

7.7 In the absence of hard market evidence of the need for Manston Airport, Azimuth undertook an interview survey to supplement the need case and inform the forecasts. However, the list of interviews was small, with few national players interviewed compared to a large number of local companies with something of a vested interest in seeing Manston re-opened. Even so, if anything, the views of those interviewed by Azimuth suggest that there would, at best, be a limited role for Manston. The one airline interviewed made clear that *"success at Manston depended upon identifying a niche market and becoming known for excellence. In particular, suggestions included a perishables centre, handling of live animals, easy access for charter flights, and handling cargo that is not necessarily straightforward"*. The scale of this opportunity was never quantified by Azimuth. It is clear, however, that the realistic expectation for Manston is for a small niche operation rather than as a general 'overspill' airport for London.

7.8 The outputs from these interviews are then used by Azimuth as a basis for postulating a number of cargo aircraft movements that might operate at Manston. However, it is simply not possible to relate the proposed services to be operated with the responses by the interviewees. There is a complete absence of any explanation for or justification of the services postulated. At the very least, there is a lack of transparency in the approach that needs to be explained so that consultees can understand the basis of what is proposed and to ascertain whether there is a credible forecast for why an increase in Manston's capability is required.

7.9 In our view, the Azimuth forecasts simply lack credibility. To illustrate this lack of credibility of the forecasts, in Year 2 (the first operational year), a cargo throughput of nearly 100,000 tonnes is forecast by Azimuth. This would make Manston the 5th largest freight airport in the UK in its first year after re-opening (compared to 2016 actual throughput at the other airports). This would place it close to the scale of freight operations at Manchester Airport, which includes a substantial amount of bellyhold freight. It would make Manston the 3rd busiest airport in the UK in terms of tonnage carried on dedicated freighter aircraft. This is simply not a credible proposition. This lack of credibility is important in reaching any decision under Section 23 of the Planning Act 2008 (as amended).

7.10 We have updated and further developed our analysis of the UK air freight market from than previously undertaken for TfL and the FTA, and upon which RSP seek to rely as corroboration of their own cargo movement forecasts. When properly interpreted, our forecasts of air freight demand and capacity across the UK as a whole, taking the role of bellyhold fully into account, show that there is plenty of freighter capacity at Stansted and East Midlands to the extent that there is a need for more pure freighter capacity. Overall, we conclude from this analysis that there will be no shortage of freighter capacity in the UK before 2040 (RSP's forecast assessment year) and that overspill from other airports would not provide a rationale for re-opening Manston.

7.11 Our initial assessment of the passenger market is that the throughput might, at best, be around half of that projected by RSP and, hence, given the dependence on passenger related income for the financial viability of airport operations, this will impact substantially on the viability of the proposal. The other activities suggested by RSP, such as business aviation, maintenance, repair and overhaul, and aircraft dismantling are highly competitive markets and, to the extent that Manston might attract any such operations, this are unlikely to contribute substantially to the overall viability of the Airport.

7.12 The existing infrastructure at Manston Airport, if made good, is capable of handling 21,000 annual air cargo aircraft movements[89]. The actual usage of that capability would depend on the pattern of operation and how the infrastructure was used on a day by day basis. Our assessment, therefore, provides essential missing information from RSP's materials to date which is necessary for the purposes of Section 23 of the Planning Act 2008 (as amended), for assessment purposes under the Environmental Impact Assessment Regulations and for consultation purposes.

7.13 Without prejudice to our view that demand to use Manston is not likely to be anything like 17,171 cargo aircraft movements a year, we have considered that the land required to accommodate such a number of movements. Our assessment is that the land required would be substantially less than shown on the RSP Master Plan and that the proposed land take is excessive and without justification in terms of the compulsory acquisition of the land. Any development required to handle 17,171 annual movements by air cargo aircraft can all be accommodated to the south of the B2050 and, even allowing for passenger operations and other activities, would not require all of the airfield land to the south of the road. Obviously, on the basis of more realistic forecasts of future demand, the area required to support the ongoing operation of the Airport would be materially smaller.

7.14 We can see no justification for the inclusion of the 'Northern Grasslands' within the DCO on the basis of it being for associated development as there will be little or no requirement for the relocation of freight forwarding activity from adjacent to the UK's main cargo hub at Heathrow to Manston and any requirement to support Manston operations could be accommodated south of the B2050. The development on the 'Northern Grasslands' site appears to be speculative commercial development which, based on the precedent at East Midlands Airport – the UK's principal airport for pure freighter operations – would be expected to be largely for non-aviation related uses.

[89] Based on an 18-hour operational day. Should a night time noise policy be agreed with Thanet District Council pursuant to the existing planning agreement that enabled a longer operational day and/or a number of scheduled night movements, then the capability could, in theory, be higher than 21,000 annual cargo aircraft movements.

7.15 In terms of the socio-economic implications of the proposed development, Azimuth has shown a lack of understanding of how such impacts should properly be calculated. Leaving aside the use of inappropriate multipliers, the impacts have been assessed at a national scale and should have taken displacement of activity from other airports fully into account, reducing the impacts below those stated. Furthermore, the assessment should have considered the impact on alternative uses of the site, including SHP's proposed mixed use development and the socio-economic benefits deriving therefrom. We have set out a more realistic and robust assessment, which shows that the local impacts within Kent, even on Azimuth's forecasts would be substantially less than claimed and it is these lower order effects which would need to be balanced with the environmental and impacts in assessing the acceptability of the proposed development.

7.16 Unsurprisingly, the socio-economic impacts associated with the Airport are reduced even further on the basis of more realistic forecasts of likely usage if it re-opened. The operation is simply of a much smaller scale. In Year 2, in generates 452 jobs, only 17% of the Azimuth estimate of 2,654. By Year 20, the differential is even larger, with the Azimuth estimates reaching over 30,000 jobs, but with our estimates at only just over 1,000.

7.17 Once again, the evidence presented by Azimuth on behalf of RSP cannot be relied upon. It is infected with the flaws in the traffic forecasting methodology identified previously but the approach to identifying socio-economic impacts is, in itself, badly flawed. The socio-economic impacts are, as a result, massively overstated. In any event, these benefits would not be realised if the Airport ceases operation again due to it not being commercially viable.

7.18 As well as the Azimuth reports which form the basis of RSP's case, we have also reviewed a number of other reports on the potential for Manston. In overall terms, we agree with Aviasolutions for Thanet District Council that there is little realistic prospect of the re-opening of Manston Airport being a commercially viable proposition. We have reviewed their original report and the more recent reports and concur with their views on the overall structure of the UK air cargo market, noting that they, unlike Azimuth, have correctly understood the implications of our 2015 work for the FTA. We do not accept Northpoint's rebuttal of the Aviasolutions work. Like Azimuth, Northpoint's work is largely aspirational without any robust evidence or analysis of the market. Northpoint, too, misinterpret our previous work for the FTA and TfL.

7.19 **In overall terms, then, we do not consider that the case for the development of Manston Airport has been robustly substantiated. In any event, the capability of the existing infrastructure at the Airport, once made good in line with existing planning consents, is at least 21,000 annual air transport movements by air cargo aircraft. This means that, in practice, RSP are seeking permission to increase the number of cargo air transport movements that Manston Airport is capable of handling from 21,000 to at least 31,000 a year, well beyond the level assessed in the PEIR. Indeed, RSP's consultation material does not provide any detail as to what the increase in capability would be as a result of its proposals (i.e. the increase in capability as a result of its proposed alteration to Manston Airport). As a minimum, the increase in capability would be to 31,000 annual air transport movements by cargo aircraft, but in our view their proposals would result in a significantly higher 'new' capability which is not revealed or assessed by RSP.**

APPENDIX A

York Aviation

Transport for London

Note on Freight Connectivity

1. This note explains the approach taken to estimating the number of pure freighter air transport movements at the London airports in 2050 under three different scenarios of capacity growth:

    - Maximum use of existing capacity;
    - 2+2+2 – additional runways at each of Gatwick and Stansted;
    - New 4 runway hub.

2. The number of additional freighter movements required depends on the volume of passenger flights providing bellyhold capacity under the different scenarios. Under the constrained Max Use scenario, 48,000 pure freighter movements could be required, up from 14,000 at the London airports today. As there would be no spare runway capacity at the main London airports, this capacity would need to be provided from smaller airports serving the London area or from regional airports, with loss of economies of scale and producer efficiency, or through trucking to alternative hubs in Europe with implications for speed of transit.

3. With the provision of additional runways, increased bellyhold capacity reduces the number of additional freighter movements required to 28,000 and 21,000 respectively under the 2+2+2 and 4 runway hub scenarios. In both cases, we believe there will be sufficient runway capacity available to accommodate these freighter movements, albeit the 2+2+2 scenario will still result in dispersal of air freight capacity across a range of airports with the consequent loss of economies of scale and efficiency which could be attained at a single hub.

Freight Volumes

4. In 2012, the London airports handled 1,805,761 tonnes of freight[1]. Only 17% of this freight was flown on pure freighter aircraft. 83% was flown in the bellyhold of passenger aircraft. This may be as a result of limited capacity for freighter operations at Heathrow, where the bulk of air freight consolidation activity is concentrated. However, it may equally reflect the scale of bellyhold capacity offered at Heathrow, which reduces the need for pure freighter capacity to serve the London market as a whole.

5. Using data from ACI EUROPE[2], the volume of freight flown from the London airports is compared with that flown from other key European cities in Table 1.

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[1] CAA Airport Statistics.
[2] The small discrepancy to CAA Statistics is noted but it is not considered to be material. The * against Hahn indicates estimated freight taken from airport's own website.

Table 1

	Tonnes
Heathrow	1,464,596
Gatwick	97,565
Stansted	214,904
Luton	29,637
London	**1,806,702**
Paris CDG	1,935,180
Paris Orly	94,700
Paris	**2,029,880**
Frankfurt	1,986,180
Frankfurt Hahn*	223,000
Frankfurt	**2,209,180**
Amsterdam	1,483,450
Milan MXP	405,858
Milan LIN	15,513
Milan BGY	116,733
Milan	**421,371**
Brussels	394,870
Luxembourg	614,906
Madrid	359,360
Zurich	281,683
Vienna	178,128
Dublin	102,717
Lisbon	90,264
Helsinki	176,987

6. There is no clear evidence that London is currently disadvantaged in terms of air freight capacity as the majority of freight is flown from Heathrow in the bellyhold of passenger aircraft rather than in pure freighter aircraft. To the extent that there is a need for freighter capacity, it can be provided at Stansted where there is ample spare capacity for additional movements and areas are set aside to increase aircraft parking and freight handling facilities if required. Although it is possible that limitations on bellyhold capacity at Heathrow may force greater trucking of freight to Europe, this is not evident from a comparison of overall air freight carried compared to other major European countries. In any event, the fact that freight is trucked rather than flown to Europe may have only a marginal impact on total transit times and, hence, limited economic detriment.

7. As well as the main city airports, there are a number of other specialist freight airports in both the UK and western Europe. Those handling over 75,000 tonnes in 2012 are shown in Table 2.

Table 2

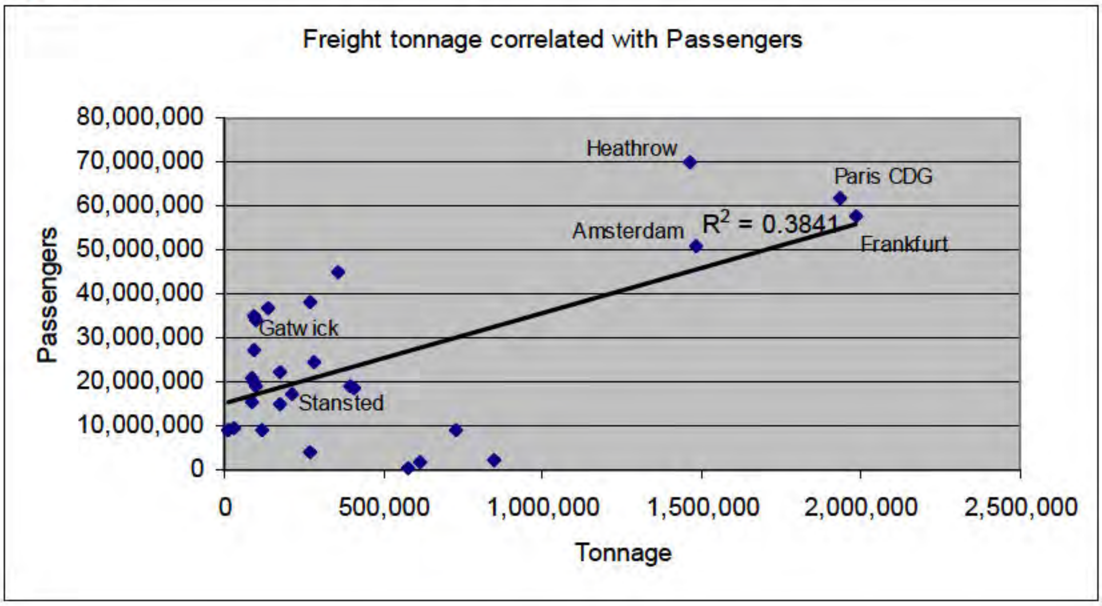
	Tonnes
Manchester	97,215
East Midlands	267,350
Cologne	730,040
Munich	272,203
Dusseldorf	86,729
Leipzig	846,086
Rome	135,777
Liege	577,226

8. Overall, on the basis of substantial air freight flows recorded by ACI EUROPE, the UK handled around 2.2 million tonnes of flown freight, France a similar amount, Italy around 600,000 tonnes and Spain around 500,000 tonnes. This does not suggest that the UK is disadvantaged in terms of freighter capacity overall currently.

9. However, the role of the low countries and Germany in acting as the major freight centre in western Europe is noticeable. In total, the main German freight airports handled almost 4.2 million tonnes of freight in 2012 which, when combined with the Netherlands and Benelux countries, amounted to 7.2 million tonnes of air freight flown. These airports have developed major and specialist air freight roles, with freight being trucked from all over Europe to feed these freight hubs. The integration of trucking with air freight should not be overlooked, even within the UK. In practice, it is unlikely that the UK could replicate this role, even with unconstrained airport capacity, due to its island location on the western edge of Europe.

10. There is some correlation between air freight flown to/from an airport and passengers carried as shown in Figure 1 below but this relates in large part to belly hold capacity. Figure 1 shows the correlation between flown freight and passengers across 29 European airports in 2012 as recorded by ACI EUROPE and which were either major airports in terms of freight handled or secondary airports serving the same cities.

Figure 1



Freighter Operations

11. The pattern of freighter operations is complex. As well as air freight carried in the bellyhold of passenger aircraft, there are freight charters for specialist and ad hoc consignments and large numbers of flights by the integrators (DHL, Fedex, UPS) etc. Obtaining detailed timetable information for freight operations is not possible as most do not publish timetables. Only scheduled freighter operations are shown in OAG and there is some uncertainty over whether this data is comprehensive.

12. Using OAG data for the week of 17th June 2013, the London airports have 49 scheduled freighter departures (98 freighter movements). According to CAA statistics for 2012, there were just over 14,000 freighter aircraft movements at the London airports or around 270 per week. This suggests that the OAG recorded movements account for only around 37% of total freighter aircraft movements to/from the London airports.

13. Similar data has been extracted for other western European airports. The table in Appendix A summarises the main pattern of freighter departures at airports with more than 30 freighter departures per week. This table also includes the principal UK freight airports and secondary airports serving major cities which in combination had more than 30 scheduled freighter departures per week in June 2013.

14. The number of scheduled freighter departures at the main freight airports is summarised in Table 3 along with the freight tonnage handled and passengers carried. It is evident that there is no clear correlation between freight tonnage handled and the weekly number of scheduled departures. This is illustrated in Figure 2. Amsterdam and Frankfurt have a high number of scheduled movements relative to the total volume of air freight whilst Paris and Heathrow handle similar volumes of air freight but with significantly fewer scheduled movements. We believe that the principal reason for these differences is in the relative importance of bellyhold freight but also the extent to which integrator activity is present; for example Fedex has its principal European hub in Paris and its movements are not recorded in OAG.

Figure 2

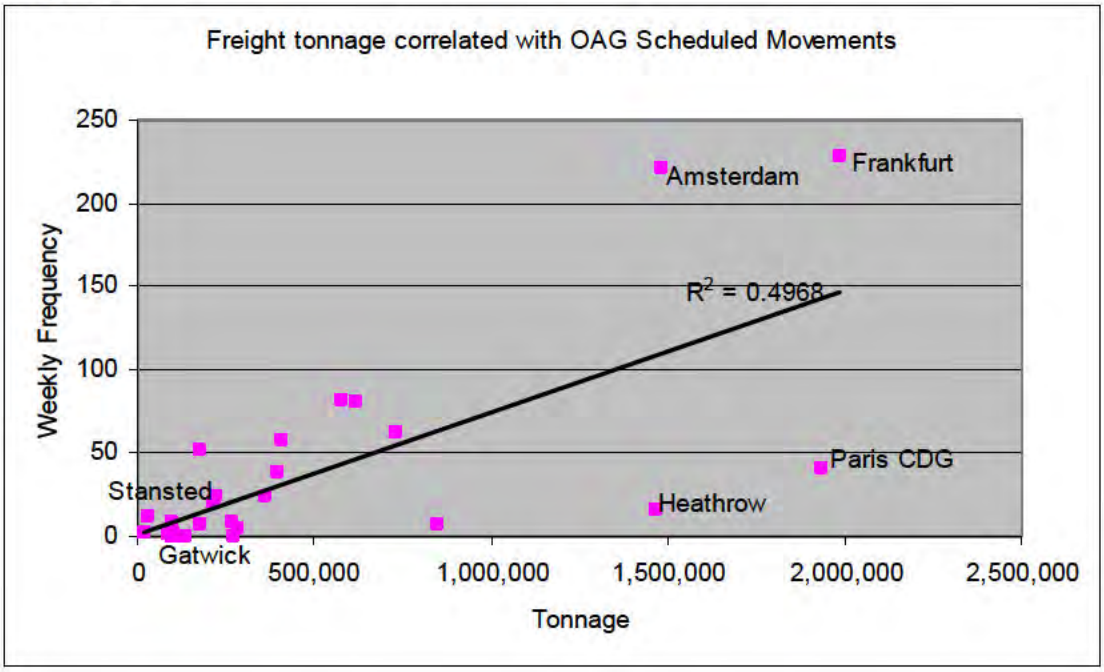


Table 3

	Freight tonnes	Pax	2013 wk freighters
Heathrow	1,464,596	70,038,804	16
Gatwick	97,565	34,222,405	0
Stansted	214,904	17,463,794	21
Luton	29,637	9,630,128	12
Manchester	97,215	19,841,747	8
East Midlands	267,350	4,086,849	9
Paris CDG	1,935,180	61,611,934	41
Paris Orly	94,700	27,232,263	0
Frankfurt	1,986,180	57,520,001	228
Frankfurt Hahn*	223,000		24
Cologne	730,040	9,280,070	62
Munich	272,203	38,360,604	0
Dusseldorf	86,729	20,833,246	1
Leipzig	846,086	2,279,221	7
Amsterdam	1,483,450	51,035,590	221
Milan MXP	405,858	18,522,760	58
Milan LIN	15,513	9,176,997	3
Milan BGY	116,733	8,888,017	0
Rome	135,777	36,980,161	0
Brussels	394,870	18,943,688	38
Liege	577,226	300,813	82
Luxembourg	614,906	1,912,806	81
Madrid	359,360	45,175,501	24
Barcelona	96,519	35,131,771	2
Zurich	281,683	24,751,649	5
Vienna	178,128	22,165,650	52
Dublin	102,717	19,096,572	1
Lisbon	90,264	15,301,236	1
Helsinki	176,987	14,859,981	7

*2011 data from airport website

15. Examination of the detailed information set out in Appendix A also shows how complex the pattern of freighter operations actually is. Few freighters, particularly those serving markets beyond Europe, operate on a strict point to point basis. Many transit more than one of the main European freight airports and a number of points overseas. Examination of arriving freighter patterns also reveals that the inbound pattern does not necessarily mirror the outbound pattern. Hence, there is already considerable flexibility to add new points if the market warrants.

16. Some freighters operate simple round trips. Others operate on a triangular basis, e.g. Lufthansa operating Frankfurt-Dallas-Detroit-Dallas-Manchester-Frankfurt. Inbound freight from the US to Manchester will be flown direct but outbound freight will transit Frankfurt. Other freighters operate effectively round the world journeys, e.g. British Airways operating Chicago-Houston-Stansted-Dammam-Dubai-Shanghai.

17. There is simply no way of knowing how much of the freight capacity on such aircraft is assigned to or used by freight originating in or destined for any airport, which may vary day by day. Freighter departures are, hence, not a reliable proxy for how much air freight capacity is available to uplift goods to and from any country or city.

18. Overall, our analysis of current freighter operations suggests that it is hard to distinguish a relationship between freighter movements and tonnage of freight carried.

19. Nor is it evident that the UK air freight capability is adversely affected today by shortage of capacity at Heathrow. There is ample spare airport capacity at Stansted for pure freight aircraft to the extent that there is demand for such aircraft operations given the amount of bellyhold capacity available at Heathrow. The volume of freight uplifted probably reasonably reflects the UK market, allowing for transit freight, and the limitations of the UK acting as a hub for freight trucked from continental Europe based on its geographic position. The principal issue is one of producer efficiency as a consequence of splitting locations, with the bulk of freight forwarding/consolidator activity being located around Heathrow and freight needing to be trucked to Stansted, Luton, or continental hubs. Whilst concentrating all freight activity at the main hub might make additional freighter flights viable by facilitating onward connections between bellyhold freight and pure freight operations, it is not clear the extent to which this would result in higher volumes of air freight being carried to/from the UK (as distinct from transit freight) as the UK does not appear to be significantly underperforming in aggregate terms compared to countries such as France, Spain or Italy.

Predicting Future Freighter Operations

20. In order to predict the volume of freighter activity in future at the London airports, we have developed a simple spreadsheet as set out in Table 4.

21. We have first projected forward total flown freight demand to and from London[3] on the assumption that it grows in line with overall passenger demand growth at 2.1% per annum in the absence of any specific forecasts of freight tonnage from DfT. We note that the DfT 2013 forecasts only give information for expected growth in pure freighter movements at 0.4% per annum but the basis of this is not clearly stated. Prima facie, this appears to understate unconstrained demand for pure freighter movements over the period to 2050.

22. In contrast, OE have identified that the expected average freight growth to and from Europe would be in the range 3.37% (Boeing) to 3.99% (Airbus). However, this would lead to substantially higher estimates of freight tonnage growth than passenger growth. Recent trends would suggest this to be unlikely so we have adopted the more cautious approach of using the same underlying growth as for passengers.

23. We have then estimated the bellyhold capacity offered at the London airports in 2050 based on the current average tonnage carried per international movement in 2012 at Heathrow, including both EU and non-EU flights, based on CAA Airport Statistics assuming average tonnes per movement increase by 0.5% per annum. This allows us to estimate the residual volume of freight under each scenario which would need to be accommodated on pure freighter aircraft.

[3] This is a simplifying assumption as it assumes the same proportion of UK regional air freight is trucked to London for uplift and the same proportion of freight is trucked to the continental freight hubs. On balance, this is likely to be a neutral assumption for the situation of unconstrained hub capacity as the proportion of regional freight flying direct from major regional airports might be expected to increase, particularly as more long haul flights develop, whilst the proportion being trucked from London to Europe might be expected to decrease with unrestricted capacity available.

Table 4

	2012	2050 Max Use	2050 2x2x2	2050 New Hub
Freighters 2012	14,123			
Freight in Freighters	310,022			
Total Freight	1,805,761	3,977,759	3,977,759	3,977,759
Tonnes per freighter	21.17	25.59	25.59	25.59
Tonnes per international bellyhold movement London	1.76	2.13	2.13	2.13
Forecast International Movements	834,725	1,051,034	1,298,981	1,375,452
Bellyhold Capacity	1,469,116	2,235,836	2,763,285	2,925,960
Freighter tonnage required		1,741,923	1,214,474	1,051,799
Freighter movement		68,077	47,463	41,106
Additional Freighters Required		53,954	33,340	26,983

24. We estimate that the number of freighters required to accommodate projected air freight demand would rise from 14,000 in 2012 to around 41,000 in the New Hub case, 47,000 in the 2+2+2 case and 68,000 in the Max Use case. In both the New Hub case and 2+2+2 case, we estimate there will be sufficient runway capacity available to accommodate these movements at 2050, at the New Hub and/or Stansted respectively. However, in the Max Use case, the London airports will, by definition, be full with passenger aircraft movements. Whilst we believe there will still be a small number of pure freighter operations accommodated in off-peak periods (as today at Heathrow), the number of freighter operations will be constrained.

25. It is reasonable to assume that around 14,000 freighters a year could still be accommodated in the vicinity of London by using capacity at airports such as Manston, which already handles some long haul freighters. However, capacity equivalent to an additional 54,000 freighter movements per year could be required to ensure demand is met, although this could be mitigated to an extent if the freighter capacity was prioritised for freight to and from the UK with less transit freight.

26. A key question is the extent to which such freighter capacity would be provided at airports such as East Midlands, Manchester and Birmingham. This could serve to reduce trucking movements from the regions to London, as take place today, with environmental benefits but it would reduce producer efficiency through split operations. In the absence of detailed data regarding freight trucking movements today, it is difficult to determine whether this would have positive or negative impacts overall..

27. In terms of the specific destinations of future freighter movements, our analysis of the existing patterns of service reveals the difficulty of defining market demand and aircraft routings. We do not believe it is sensible to attempt to determine the future geographic split by destination in either the constrained or unconstrained cases as a single freighter may serve a variety or markets as necessary. In the constrained case, it is likely that more freight would be trucked to the continental hubs as well as to UK regional points, which would potential add to shipment costs.

Conclusions

28. Overall, we have made a best estimate of the number of freighter aircraft movements likely to be using the London airports (or near London airports) under each of the capacity scenarios. These are as follows:

- ✈ Maximum use of existing capacity 14,000
- ✈ 2+2+2 – additional runways at each of Gatwick and Stansted 33,000
- ✈ New 4 runway hub 27,000

29. In the latter two cases, our assessment is that, across both bellyhold capacity and pure freighter activity, there would be sufficient capacity to meet expected demand for air freight to and from the UK. Our estimates for additional freighter capacity are substantially above those made by DfT. Hence, to the extent that our baseline is understated (although we do not believe this to be substantial) due to the current patterns of trucking freight to the continent, this will offset any overstatement as a consequence of assuming higher growth than DfT and by reductions in the amount of trucking to London from regional airports due to expected growth in their own freighter operations over the period to 2050.

30. The key difference between these two scenarios would be in terms of the efficiencies and economies of scale gained by the industry arising from the concentration of freight activity at a single hub. In both cases, the overall volume of air freight to and from the UK is expected to be broadly the same, although the actual freight carried including transit freight would be higher in the hub case. However, under the new hub scenario, savings from greater efficiency may be passed onto users, so reducing shipping costs and facilitating trade leading to higher freight volumes, but it is beyond the scope of the current exercise to assess this.

31. In the constrained, max use, case, there would be severe limitations of pure freighter movements at the London airports, which could amount to around 26% of the required air freight capacity to/from London. The extent to which this would act as a limitation on overall air freight volumes would depend on the extent to which the freight is still carried from regional airports or by truck. Clearly this would impact on the cost/efficiency of shipment, which in turn could impact on freight volumes carried. Again, it is outside the scope of the current exercise to assess these effects.

32. Overall, in assessing the economic value for air freight between the scenarios, the main difference is likely to lie in producer costs passed through to users and the impact that would have on business costs and hence output/freight generated. It would not be safe to assume that the reduction in cargo ATMs at the London airports necessarily translates to lost shipment value in its entirety.

23 May 2013

Appendix A

				Total Airport	Total City	Total Country
Heathrow	Amman	1				
	Amsterdam	1				
	Amsterdam	1	onwards to Sharjah and Singapore			
	Brussels	1				
	Copenhagen	1				
	Copenhagen	1	onwards to Sharjah and Singapore			
	Dubai	1				
	Frankfurt	1				
	Leipzig	1				
	Lisbon	1				
	Milan	1				
	Milan	2	onwards to Hong Kong			
	Paris	1	onwards to Delhi and Hong Kong			
	Seoul	2		16	49	71
Stansted	Amsterdam	1	originates in Bogota, Puerto Rico			
	Amsterdam	2	originates in Miami, Buenos Aires, Bogota and Puerto Rico			
	Cologne	1	onwards to Madrid and Johnannesburg			
	Cologne	1	onwards to Tbilisi			
	Cologne	1	onwards to Tbilisi and Delhi			
	Dammam	1	originates in Chicago and Houston, onwards to Dubai and Shanghai			
	Dubai	1	onwards to Hong Kong			
	Frankfurt	1	originates in Chicago and Atlanta, onwards to Shanghai			
	Frankfurt	2				
	Frankfurt	1	onwards to Chicago			
	Frankfurt	1	onwards to Hong Kong			
	Frankfurt	2	originates in Seoul and Moscow			
	Frankfurt	1	originates in Atlanta, onwards to Delhi and Hong Kong			

	Frankfurt	2	originates in Moscow, onwards to Seoul			
	Luxembourg	2	originates in Hanoi and Hong Kong			
	Zaragoza	1	onwards to Bahrain and Hong Kong	21	49	71
London Luton	Frankfurt	3				
	Istanbul	1				
	Istanbul	2	originates in Paris			
	Istanbul	2	originates in Cologne			
	Milan	4		12	49	71
Manchester	Amsterdam	1	onwards to Dubai and Hong Kong			
	Brussels	1	onwards to Dubai and Hong Kong			
	Dubai	1	originates in Amsterdam, onwards to Hong Kong			
	Frankfurt	2	originates in Detroit and Dallas			
	Frankfurt	1	onwards to Dubai and Hong Kong			
	Frankfurt	1	originates in Toronto and Houston			
	Milan	1	onwards to Hong Kong	8	8	71
East Midlands	Frankfurt	1				
	Keflavik	2	originates in Liege			
	Keflavik	2				
	Liege	2	originates in Keflavik			
	Paris	1		8	8	71
Prestwick	Los Angeles	1	originates in Luxembourg, onwards to Seattle			
	Luxembourg	1	originates in New York and Houston			
	Luxembourg	1	orginates in Los Angeles and Seattle			
	Paris	2	originates in Chicago			
	Seattle	1	orginates in Luxembourg, onwards to Calgary	6	6	71
Amsterdam	Abu Dhabi	4				
	Abu Dhabi	1	onwards to Taipei			
	Almaty	2	onwards to Hong Kong, Delhi, Sharjah			
	Bahrain	1	onwards to Mongolia, Hong Kong, Chennai			
	Baku	2	onwards to Kuala Lumpur			

Bangalore	1	onwards to Singapore
Beijing	7	
Beirut	2	
Budapest	2	onwards to Moscow
Chengdu	4	
Chennai	1	originates Nairobi, onwards to Singapore
Chennai	1	originates in Chicago and Atlanta, onwards to Singapore
Chicago	2	originates in Doha
Chicago	7	
Chongqing	2	onwards to Shanghai
Copenhagen	1	originates in Nairobi, onwards to Sharjah and Singapore
Copenhagen	2	onwards to Sharjah and Singapore
Curitiba (Br)	1	onwards to Sao Paulo
Dacca	1	originates in Nairobi, onwards to Singapore
Doha	1	originates in Chicago
Doha	3	
Dubai	2	
Dubai	1	originates in Eldoret and Nairobi
Dubai	1	originates in Nairobi
Dubain	1	originates in Manchester, onwards to Hong Kong
Entebbe	1	onwards to Nairobi
Frankfurt	1	originates in Hong Kong
Frankfurt	1	onwards to Mumbai and Hong Kong
Gothenburg	3	onwards to Dubai
Guangzhou	5	
Harare	3	onwards to Nairobi
Heathroiw	1	
Hong Kong	7	
Houston	7	

Jeddah	2		
Johannesburg	1	onwards to Dar-Es-Salaam and Nairobi	
Khartoum	2	onwards to Nairobi	
Kigali	1	onwards to Nairobi	
Kuala Lumpur	1		
Los Angeles	4		
Luxembourg	1	originates in Libreville, Brazzaville, Nairobi	
Manchester	1	onwards to Dubai and Hong Kong	
Mexico City	7		
Miami	2	onwards to Buenos Aires, Bogota, Puerto Rico and Stansted	
Miami	1	onwards to Buenos Aires, Quito and Guayaquil	
Miami	2	onwards to Santiago, Quito, Bogota and Puerto Rico	
Miami	2	onwards to Santiago, Quitoand Guayaquil	
Milan	3	originates in Tokyo	
Milan	2	onwards to Moscow	
Milan	4	onwards to Tokyo	
Mongolia	2	onwards to Hong Kong and Chennai	
Moscow	2		
Moscow	2	onwards to Shanghai	
Nairobi	1		
New York	3	orginates in Bahrain	
New York	1	originates in Bahrain	
New York	7		
Paris	1	onwards to Mumbai and Hong Kong	
Puerto Rico	1	onwards to Bogota	
Puerto Rico	2	onwards to Quito	
Riyadh	1		
Riyadh	2	onwards to Sharjah, Singapore and Kuala Lumpur	

	Santiago	1				
	Sao Paulo	2	onwards to Buenos Aires and Santiago			
	Sao Paulo	1	onwards to Curitiba and Santiago			
	Seattle	1				
	Seoul	7				
	Shanghai	21				
	Sharjah	1	originates in Heathrow, onwards to Singapore			
	Sharjah	2	onwards to Guangzhou			
	Sharjah	1	onwards to Muscat and Hong Kong			
	Stockholm	2	originates in Seoul			
	Stockholm	4	onwards to Seoul			
	Taipei	1				
	Tel Aviv	1				
	Tenerife	1	onwards to Sao Paulo, Quito and Bogota			
	Tenerife	3	onwards to Sao Paulo, Quito and Guayaquil			
	Tianjin	15	onwards to Shanghai			
	Tokyo	1	originates in Frankfurt Hahn			
	Tokyo	5				
	Toronto	4				
	Tripoli	1				
	Vienna	3	onwards to Shanghai	221	221	221
Brussels	Amman	1	onwards to Jeddah			
	Chennai	1	originates in Los Angeles and Dallas, onwards to Singapore			
	Dammam	1				
	Dubai	3	originates in New York			
	Dubai	1	originates in Frankfurt, onwards to Hong Kong			
	Dubai	1	originates in Manchester, onwards to Hong Kong			
	Heathrow	1				
	Istanbul	1	originates in Jeddah			
	Kolkata	1	originates in Los Angeles, onwards to Singapore			
	Milan	2	originates in Riyadh			

	Milan	1	originates in Jeddah			
	Mumbai	1	orginates in Los Angeles and Chicago, onwards to Singapore			
	New Guinea	1	onwards to Seoul			
	New York	1	originates in Jeddah			
	New York	1	originates in Jeddah, onwards to Houston			
	New York	6	originates in Dubai			
	Riyadh	1				
	Riyadh	1	onwards to Jeddah			
	Seoul	1	orginates in New York			
	Seoul	2	originates in New York			
	Sharjah	2	originates in Dallas, onwards to Singapore			
	Sharjah	1	originates in Chicago and Dallas, onwards to Singapore			
	Taipei	1				
	Tianjin	1	onwards to Seoul			
	Vienna	2	originates in Riyadh	36	36	118
Liege	Accra	2	onwards to Lagos and Addis Ababa			
	Addis Ababa	5				
	Bahrain	11	originates in New York			
	Bucharest	1	onwards to Tel Aviv			
	Dubai	12	onwards to Hong Kong			
	East Midlands	4	onwards to Keflavik			
	Entebbe	1				
	Istanbul	5				
	Keflavik	4				
	Keflavik	1	onwards to New York			
	Lagos	2	onwards to Addis Ababa			
	Lagos	1	onwards to Ougadougou			
	Lagos	1	onwards to Port Harcourt			

	Lome	2				
	Luxembourg	1	onwards to Congo, Addis Ababa			
	New York	1	originates in Tel Aviv			
	New York	2	originates in Tel Aviv			
	New York	5				
	Ougadougou	1	onwards to Congo			
	Shanghai	1				
	Shanghai	2				
	Siauliai Lithuania	1				
	Singapore	1				
	Tel Aviv	3	originates in New York			
	Tel Aviv	1	originates in Chicago			
	Tel Aviv	6				
	Vienna	5		82	82	118
Luxembourg	Abidjan	1	onwards to Accra			
	Abu Dhabi	1	onwards to Taipei			
	Almaty	1	onwards to Hong Kong			
	Atlanta	1				
	Atlanta	1	onwards to Chicago			
	Atlanta	2	originates in Doha, onwards to Houston			
	Baku	1	onwards to Almaty and Shanghai			
	Baku	1	onwards to Hong Kong			
	Baku	4	onwards to Shanghai			
	Baku	1	onwards to Singapore and Hong Kong			
	Baku	1	onwards to Singapore and Kuala Lumpur			
	Baku	2	onwards to Taipei and Bangkok			
	Beijing	1	onwards to Xiamen			
	Beirut	1	onwards to Amman and Hong Kong			

Beirut	1	onwards to Amman and Istanbul
Chicago	1	onwards to Atlanta
Chicago	1	onwards to Los Angeles
Congo	1	originates in Liege, onwards to Addis Ababa
Dallas	1	
Dammam	1	onwards to Saigon and Hong Kong
Doha	1	onwards to Hanoi and Hong Kong
Doha	1	onwards to Singapore and Kuala Lumpur
Doha	1	originates in Houston
Doha	1	originates in Chicago
Dubai	1	onwards to Bangkok and Hong Kong
Dubai	1	onwards to Hong Kong
Frankfurt Hahn	3	originates in Shanghai
Indianapolis	1	onwards to Chicago
Indianapolis	1	onwards to Los Angeles, Calgary
Johannesburg	3	
Komatsu	2	onwards to Seoul
Kuwait	2	onwards to Hanoi and Hong Kong
Lagos	1	onwards to Port Harcourt and Kinshasa
Libreville	1	onwards to Brazzaville
Libreville	1	onwards to Kinshasa
Los Angeles	1	onwards to Seattle
Los Angeles	1	
Mexico City	1	
Mexico City	1	onwards to Guadalajara
Miami	2	onwards to Houston
Milan	1	onwards to New York and Chicago
Milan	4	

	Ndjamena	1	onwards to Lagos			
	New York	1	originates in Tel Aviv			
	New York	1	orginates in Tel Aviv, onwards to Chicago			
	New York	1	onwards to Atlanta			
	New York	1	onwards to Houston			
	New York	1	onwards to Mexico City and Guadalajara			
	Prague	2	originates in Chengdu			
	Prestwick	1	onwards to Los Angeles and Seattle			
	Prestwick	1	onwards to Seattle and Calgary			
	Riyadh	1	onwards to Dammam and Hong Kong			
	Sao Paulo	1				
	Sao Paulo	2	onwards to Curitiba			
	Sao Paulo	1	onwards to Manaus			
	Seoul	1				
	Sharjah	1	onwards to Karachi			
	Singapore	1	onwards to Kuala Lumpur			
	Taipei	2				
	Tbilisi	2	onwards to Baku and Shanghai			
	Yerevan	1		80	80	80
Paris	Beirut	1				
	Cairo	1	onwards to Reunion			
	Chicago	5				
	Cologne	2	onwards to Istanbul			
	Delhi	1	originates in Heathrow, onwards to Hong Kong			
	Djibouti	1	onwards to Reunion			
	Hannover	4				

	Heathrow	1				
	Istanbul	1				
	London Luton	2	onwards to Istanbul			
	Mexico City	6				
	Milan	1	onwards to Delhi and Hong Kong			
	Mumbai	2	onwards to Hong Kong			
	Mumbai	1	originates in Amsterdam, onwards to Hong Kong			
	New York	1	onwards to Chicago			
	Niamey	1	onwards to Ouagadougou and Bamako			
	Njamena	1	onwards to Bangui, Brazzavile and Port Harcourt			
	Porto	1	onwards to Mexico City			
	Seoul	2				
	Shanghai	2	originates in Copenhagen			
	Shanghai	2				
	Tokyo	2		41	41	41
Cologne	Basle	4				
	Berlin	5				
	Bucharest	4				
	Bucharest	2				
	Istanbul	2	originates in Paris			
	Istanbul	2				
	Katowice	4				
	Keflavik	5				
	Ljubljana	4				
	Ljubljana	1	onwards to Zagreb			
	London Luton	2	originates in Istanbul			
	London Luton	2	onwards to Istanbul			
	Madrid	1	originates in Stansted			
	Prague	5				
	Sofia	1				
	Tblisi	1	originates in Stansted			

	Tblisi	1	originates in Stansted, onwards to Delhi			
	Tel Aviv	12				
	Zagreb	4		62	62	304
Frankfurt Hahn	Almaty	1	originates in New York			
	Almaty	6	originates in New York, onwards to Shanghai			
	Amsterdam	1	onwards to Tokyo			
	Amsterdam	1	originates in Tokyo			
	Atyrau	1	onwards to Almaty			
	Baku	3				
	Beijing	3				
	Chatearoux	1	onwards to Kabul			
	Doha	2				
	Johannesburg	2				
	Milan	1	onwards to Tokyo			
	Toronto	1	onwards to Mexico City			
	Yerevan	1		24	242	304
Frankfurt	Abu Dhabi	5				
	Almaty	1				
	Almaty	1	onwards to Guangzhou			
	Almaty	1	onwards to Hong Kong			
	Almaty	2	onwards to Shanghai			
	Amman	2				
	Amsterdam	1	originates in Hong Kong and Chennai			
	Atlanta	4				
	Baku	1	onwards to Bangkok and Kuala Lumpur			
	Baku	2	onwards to Kuala Lumpur			
	Bangalore	3	onwards to Chennai			
	Bangalore	1	onwards to Hyderabad and Guangzhou			
	Bangkok	2				
	Beijing	3	onwards to Shanghai			
	Brussels	1	onwards to Dubai and Hong Kong			

Cairo		3	
Chicago		7	
Chicago		1	onwards to Los Angeles
Chicago		4	onwards to Mexico City
Chicago		2	onwards to Mexico City and Guadaljara
Chicago		1	originates in Stansted
Coventry		10	
Dakar		3	originates in Dubai, onwards to Sao Paulo
Dammam		2	onwards to Sharjah and Hong Kong
Delhi		4	onwards to Singapore and Bangkok
Delhi		1	originates in Atlanta and Stansted, onwards to Hong Kong
Detroit		2	
Doha		1	
Dubai		1	originates in Lagos and Accra
Dubai		4	originates in Sao Paulo and Dakar
Dubai		3	
Dubai		1	originates in Dusseldorf
Dubai		1	originates in Manchester, onwards to Hong Kong
East Midlands		1	
Heathrow		1	
Helsinki		1	
Hong Kong		3	
Hong Kong		1	originates in Stansted
Istanbul		6	
Istanbul		1	onwards to Tel Aviv
Jeddah		1	onwards to Sharjah, Hyderabad and Guangzhou
Kabul		1	
Krasnojarsk		1	
Krasnojarsk		6	onwards to Beijing and Seoul
Krasnojarsk		1	onwards to Seoul and Shanghai
Krasnojarsk	y		onwards to Shanghai

Krasnojarsk	7	onwards to Tokyo and Osaka
London Luton	3	
Madrid	4	
Malta	1	
Milan	1	originates in Hong Kong and Dubai
Milan	1	onwards to Dubai and Hong Kong
Milan	1	onwards to Hong Kong
Moscow	10	
Moscow	2	onwards to Tokyo
Moscow	1	onwards to Tokyo and Seoul
Mumbai	1	
Mumbai	1	onwards to Chennai
Mumbai	3	onwards to Hong Kong
Mumbai	1	onwards to Hyderabad
Mumbai	1	originates in Amsterdam, onwards to Hong Kong
Nairobi	5	onwards to Johannesburg
New York	5	
Riyadh	3	
Riyadh	1	onwards to Dammam
Riyadh	1	onwards to Sharjah and Hong Kong
Sao Paulo	3	
Sao Paulo	1	onwards to Curitiba
Sao Paulo	1	onwards to Curitiba, Quito and Puerto Rico
Sao Paulo	2	onwards to Manaus, Quito and Puerto Rico
Sao Paulo	2	onwards to Montevideo and Buenos Aires
Seoul	1	originates in Vienna
Seoul	2	originates in St Petersburg
Seoul	12	

	Seoul	2	originates in Atlanta and Stansted			
	Seoul	1	originates in Moscow and Vienna			
	Shanghai	1	originates in Chicago, Atlanta and Stansted			
	Shanghai	18				
	Sharjah	2	onwards to Kolkata and Hong Kong			
	Stockholm	1	onwards to Dubai and Hong Kong			
	Stockholm	4	onwards to Seoul			
	Taipei	3				
	Tel Aviv	3	onwards to Istanbul			
	Toronto	1	onwards to Houston	218	242	304
Milan	Abu Dhabi	2				
	Almaty	1	onwards to Osaka and Hong Kong			
	Baku	1				
	Dammam	1				
	Delhi	1	originates in Paris, onwards to Hong Kong			
	Doha	2				
	Dubai	2	onwards toHong Kong			
	Dubai	1	originates in Frankfurt, onwards to Hong Kong			
	Heathrow	5				
	Hong Kong	1	originates in Frankfurt			
	Hong Kong	2	originates in Heathrow			
	Hong Kong	1	originates in Manchester			
	Istanbul	1				
	Istanbul	2	originates in Lagos			
	Istanbul	1	orginates in Tirana			
	Jeddah	1				
	Luxembourg	1	originates in Chicago and Los Angeles			
	Luxembourg	4				
	Luxembourg	1	orginates in Chicago and New York			
	Madrid	1				
	Moscow	2	originates in Amsterdam			

	New Guinea	1	onwards to Seoul			
	Osaka	1	onwards to Hong Kong			
	Riyadh	1				
	Sao Paulo	1				
	Seoul	1	originates in Uzbekistan			
	Seoul	9				
	Shanghai	4				
	Tokyo	4	originates in Amsterdam			
	Tokyo	1	originates in Frankfurt Hahn	57	57	57
Vienna	Amman	1				
	Copenhagen	2	orginates Seoul			
	Frankfurt	1	orginates Seoul			
	Istanbul	2				
	Kiev	5				
	Liege	5				
	Milan	3	orginates Seoul			
	Moscow	2	orginates Seoul and onwards to Gothenburg or Frankfurt			
	Oslo	3	orginates Seoul			
	Oslo	6				
	Riyadh	2				
	Seoul	1	via Frankfurt			
	Seoul	3	via Gothenburg			
	Seoul	1	via Tel Aviv			
	Seoul	4	via Copenhagen			
	Seoul	1	originates Moscow			
	Shanghai	3	originates Amsterdam			
	St Petersburg	1	orginates Seoul and onwards to Gothenburg			
	Tel Aviv	1	orginates Seoul			
	Timosoara	5		52	52	52

APPENDIX C: INDEX OF AZIMUTH PARAGRAPH REFERENCES IN YORK AVIATION NOVEMBER 2017 REPORT

York Aviation (YAL) Reference and Para	Azimuth Old Para	Azimuth New Para	Implications / Summary of Change
2.3 – "Although Azimuth state at paragraph 1.2.1 of Volume 1 "*RiverOak, who specialise in identifying market opportunities, has identified the substantial need for additional and specialised airport capacity for dedicated freighters in the southeast of England*", we are unaware of any other research upon which RSP rely. All other documents produced in support of the prospective DCO appear to rely on the work of Azimuth".	Paragraph 1.2.1 of Volume I in section "**RiverOak's vision for Manston Airport**"	Para 1.2.1 of Vol I in section "**RiverOak's vision for Manston Airport**"	Re-worded *"RiverOak, whose directors specialise in……………"*
2.10 – "Furthermore, the reference at paragraph 5.1.4 to concern expressed in the Aviation Policy Framework regarding the implications of capacity shortfalls on the range of destinations served does not, as Azimuth infer, indicate a need for additional aircraft movements by dedicated freighter aircraft as these would require a concentration of freight flows to a specific destinations to fill a single aircraft at a time. Rather, the Aviation Policy Framework refers to the need for a wide range of global destinations being available at the UK's national hub airport, offering	Paragraph 5.1.4 of Volume I in section "**Political Setting**"	Para 2.3.8 in Vol I in section "**Political Setting**"	Original report made reference to Aviation Policy Framework citing the circumstances where no additional airport capacity was provided. The updated report now refers to a quotation from the Airports NPS, which still relates to the circumstances in the absence of any additional capacity at the London airports.

York Aviation (YAL) Reference and Para	Azimuth Old Para	Azimuth New Para	Implications / Summary of Change
passenger and bellyhold capacity so as to maximise the choice and convenience for both passengers and shippers of airfreight. It is this variety of destinations and, importantly, the high frequencies of service that lead the market to favour a bellyhold hub and spoke system so that freight can reach its end destination in the most efficient and cost effective way possible.”			
2.18 – “In this paper for TfL, we estimated the excess air freight that could not be accommodated in bellyhold capacity on passenger aircraft under different scenarios of additional capacity at the London airports and converted that excess to an equivalent number of freighter movements. The 54,000 potential additional freighter movements that Azimuth (and Northpoint) cite at paragraph 3.4.5 are the additional freight carrying capacity required in the event of there being no further runway capacity at any of the London airports (a severely constrained scenario) that is simply no longer realistic as we have set out above. Azimuth’s (and Northpoint’s) use of	Paragraph 3.4.5 of Volume I in section “**The need for air freight capacity in the South East**”	The point discussing TfL forecasts predicting that the South East will be short of capacity for around 54,000 air freight movements is made twice in the new report: Paragraph 4.2.8 in section “**Freight-focussed findings**”; Paragraph 5.1.8 in section “**Channel Crossings and Trucking**”.	Point repeated in two sections.

York Aviation (YAL) Reference and Para	Azimuth Old Para	Azimuth New Para	Implications / Summary of Change
this figure as a potential market for Manston is misleading.”			
2.19 – “The note then goes on to set out how this requirement for additional freight capacity might be met and the economic consequences. In the first instance, we noted that around 14,000 additional freighter movements could be accommodated in the London system if no capacity expansion takes place, and this included the use of additional available freighter slots at Stansted. Azimuth appear to have taken our inclusion of Manston, as an example of a smaller airport in the South East that could accommodate some movements, as an indication that it could play a substantial role, wrongly stating in the Executive Summary and at paragraph 3.4.5 that we said that Manston was expected to handle 14,000 freighter movements. Manston was given simply as an example of an airport with freighter activity at the time of writing (2013) with the potential to accommodate some additional movements (as we set out in Section 4 of this report, the	Paragraph 3.4.5 of Volume I in section “**The need for air freight capacity in the South East**”	Azimuth continue to claim that our work for TfL stated that Manston could accommodate 14,000 displace freighter movements in the **Executive Summary** to Vol I. There are numerous other references to the 14,000 movements, including at paragraph 3.1.3 of Vol III where Azimuth claims that Manston is the only airport that could accommodate these movements.	The updated Azimuth Reports continue to misrepresent the implications of our work for TfL.

York Aviation (YAL) Reference and Para	Azimuth Old Para	Azimuth New Para	Implications / Summary of Change
capability of Manston Airport is 21,000 annual cargo aircraft movements before allowing for any night operations)."			
2.23 – "Azimuth, at paragraph 3.3.2, incorrectly characterises our note to TfL as expressing a concern about the amount of trucking to Europe. Significantly, the last part of paragraph 9 is omitted by Azimuth. When looked at in its entirety, it is evident that we were noting that trucking is an inevitable part of the market, for reasons which we explain later in this section: [quote]"	Paragraph 3.3.2 of Volume I in section "**The UK's competitive position**"	Paragraph 4.3.4 in section "**The UK's competitive position**"	Reference corrected from TfL to York Aviation. Quotation still not given in its entirety and continues to be misconstrued.
2.27 – "Azimuth's interpretation of our work for FTA appears to erroneously assume that excess demand in the London system will need to be met by additional freighter movements from an airport in the vicinity of London. For instance, at para 4.2.3, they state that "Even so and as York Aviation figures show, there will be a shortfall of slots for dedicated freighters, likely to be in the region of 45,000 by 2050".	Paragraph 4.2.3 of Volume I in section "**London Heathrow Airport**"	Paragraph 5.2.3 in section "**London Heathrow Airport**"	No change
2.38 – "At Para 4.0.2, Azimuth suggest the reasons why cargo airlines choose airports. In reality,	Paragraph 4.0.2 of Volume I in section "**Airfreight Capacity at UK Airports**"	Paragraph 8.0.2 of Vol I in section "Potential opportunities for Manston Airport"	No change

York Aviation (YAL) Reference and Para	Azimuth Old Para	Azimuth New Para	Implications / Summary of Change
Manston does not fulfil a number of these key criteria meaning that, even in the most favourable circumstances, it can never be more than a niche player in the market…”			
Footnote 25 (on page 20) – “Azimuth Vol 1 paragraph 7.1.6 quotes from a 2005 MORI survey that people were not impacted by night flights but this would reflect that there were no scheduled night flights when the airport was operational. Local resident support for re-opening (paragraph 7.1.1) needs to be seen in this context.”	Paragraph 7.1.6 of Volume 1 in section “**Support for Manston Airport**” Paragraph 7.1.1 of Volume 1 in section “**Support for Manston Airport**”	Both points removed.	Both points removed.
2.39 – “A key consideration is Manston’s geographic position substantially away from the economic spine of the UK and with very limited local demand. It is remote from most markets with a journey time to the M25 of nearly 1 hour and accessibility beyond would be subject to the general levels of traffic congestion in the London area. Azimuths’s suggestion (paragraph 1.2.2) that Manston might effectively serve as a 4th runway for Heathrow for air cargo flights is merely fanciful given the journey time of 1¾ hours, which is	Paragraph 1.2.2 of Volume 1 in section “**RiverOak’s vision for Manston Airport**”	Paragraph 1.2.2 in section “**RiverOak’s vision for Manston Airport**”	No change

York Aviation (YAL) Reference and Para	Azimuth Old Para	Azimuth New Para	Implications / Summary of Change
little shorter than the time from Heathrow to East Midlands Airport with an already well developed infrastructure for handling air freight and more likely to fulfil such a role in relation to freight overspill from Heathrow that is time critical or of such a special nature as to warrant the use of pure freighter aircraft."			
2.40 – "Many of the other points raised by Azimuth regarding security, e-commerce and just-in-time delivery are all factors relating to the overall efficiency of the industry. If anything, what the analysis presented by Azimuth demonstrates is the importance of developing efficient freight networks serving the whole of the UK rather than the need for a re-opened freight focussed airport in the South East of England. Manston could only recapture economic benefits from cargo being trucked to the continent, as asserted at paragraph 4.8.4, to the extent that it provides a more economically efficient solution…"	Paragraph 4.8.4 of Volume I in section "**Other South East UK airfields**"	Points relating to Operation Stack etc. are made in Paragraphs 6.4.11 to 6.4.12 of Vol I in section "**Air freight trucking**"; Paragraph 6.4.13 again makes the point that by flying freight from Manston Airport, negating the need to truck to and from European airports for some types of air transportation, should help to ease congestion in the area…	Redrafted text but claims about Manston's role in relation to intercepting trucking to Europe retained in new text.

York Aviation (YAL) Reference and Para	Azimuth Old Para	Azimuth New Para	Implications / Summary of Change
2.41 – "One of the key reasons that the UK aviation sector is so productive, as cited by Azimuth at paragraph 5.2.1, is that it allows the market to work. Inefficient and unnecessary actors in the market are allowed to fail…"	Paragraph 5.2.1 of Volume 1 in section "**The Potential Effect of BREXIT on UK Aviation**"	Paragraph 6.2.1 in section "**The Potential Effect of BREXIT on UK Aviation**"	Final sentence "As such, it seems counter-productive to allow a potentially viable airport such as Manston to be used for housing" has been removed.
2.42 – "Azimuth asserts, paragraph 6.2.2, that the perceived lack of investment in Manston by the previous owners was an impediment to freight growth."	Paragraph 6.2.2 of Volume I in sub-section "Previous Operations"	Paragraph 7.2.2 of Vol I in sub-section "**Previous operations**"	Identical, although wording of last sentence changed slightly.
2.44 – "Volume II of Azimuth's work begins with an assessment of different forecasting approaches for cargo, noting that forecasting of cargo is not as well developed as that for passenger activity. We agree that air freight forecasting is difficult and that there is a lack of hard data. However, we do not agree with Azimuth's assertion that quantitative methods are, therefore, not suitable and that qualitative methods are more appropriate. The evidence cited by Azimuth at Table 3 does not support this conclusion and suggests that causal methods (regression analysis) remain the most appropriate for	Table 3 of Volume II titled "**Attributes of Aviation Forecasting Techniques**"	Table 2 of Vol II, titled "**Attributes of Aviation Forecasting Techniques**"	No change

York Aviation (YAL) Reference and Para	Azimuth Old Para	Azimuth New Para	Implications / Summary of Change
forecasting demand for cargo and freighters.)			
2.46 - "As well as reviewing forecasting methodologies, Azimuth sets out some air freight growth forecasts produced by others. At paragraph 3.6.1, Azimuth cite the DfT's assumption for growth in freighter movements in its 2013 UK Aviation Forecasts at 0.4% p.a"	Paragraph 3.6.1 of Volume 2 in section "**Department for Transport National Level Forecasts**"	Paragraph 2.6.1 in section "**Department for Transport National Level Forecasts**"	No change. However, the DfT 2013 UK Aviation Forecasts have been superseded by the DfT 2017 UK Aviation Forecasts that now assume no growth in freighter aircraft movements.
2.47 – "Given the existence of a definitive 'official' UK forecast for freighter movements over the period to 2050, it is not clear why Azimuth rely on global forecasts for air freight produced by the manufacturers Boeing and Airbus for the purpose of selling aircraft (paragraph 2.1.10) as a basis for the longer term projections of freighter movements at Manston in their Volume III (paragraph 2.3.2)."	Paragraph 2.1.10 of Volume III in sub-section "**Air Freight Forecasting Method**" Paragraph 2.3.2 of Volume III in sub-section "**Long-term Freight Forecasting Model**"	Paragraph 2.1.11 of Vol III in sub-section "**Air Freight Forecasting Method**" Paragraph 2.3.2 in sub-section "**Long-term Freight Forecasting Model**"	No change
2.48 – "Taken together, these reports point to a declining market share for freighter aircraft in mature markets such as the UK, where there is a good supply of bellyhold capacity. It is, hence, not reasonable to use the Boeing and Airbus growth rates as a basis for projecting future growth in movements by pure	Paragraph 2.3.2 of Volume III of sub-section "**Long-term Freight Forecasting Model**"	Paragraph 2.3.2 of Vol III in sub-section "**Long-term Freight Forecasting Model**"	No change

York Aviation (YAL) Reference and Para	Azimuth Old Para	Azimuth New Para	Implications / Summary of Change
freighter aircraft to and from the UK, particularly given the existence of DfT projections for such movements. Rather than being conservative, as suggested at paragraph 2.3.2 in Volume III, the use of a 4% per annum growth rate for years 10 to 20 at Manston is highly optimistic, and is certainly not supported by the DfT's analysis of the UK market."			
2.49 – "Having rejected the recognised methodologies for forecasting freight demand at an airport, Azimuth rely on interviews with 24 individuals and/or organisations as set out in Table 4 of their report. To a large extent, these are people with past connections with Manston and who may not have a totally unbiased view on the desirability of it re-opening. It is notable that few cargo airlines or large scale air freight operators were interviewed, rather the list is dominated by local interested parties and logistics firms, not all of which are still in business. In some cases, throughout the remainder of Volume II, individuals are referred to who are not listed in Table 4 and,	Table 4 of Volume II in sub-section "**Interview data collection**" Paragraph 4.3.1 of Volume II in sub-section "**Semi-structured Interview Schedule Design**"	Table 3 in sub-section "Interview data collection" Paragraph 3.3.1 of Volume II in sub-section "**Semi-structured Interview Schedule Design**"	No change

York Aviation (YAL) Reference and Para	Azimuth Old Para	Azimuth New Para	Implications / Summary of Change
in other cases, individuals or organisations are referred to in different terms to those listed in the table. This does not suggest a very robust or rigorous approach to setting out the potential for Manston. Although the framework of questions is set out at paragraph 4.3.1, we are unable to identify any questions that would enable an assessment to be made of future passenger or freight volumes that would be likely to use Manston and which could be used as the basis for any forecast of future usage.”			
2.51 “This analysis is generic and of no direct relevance to the potential for Manston. In particular, no linkage is drawn between the commodities which typically use air freight set out at paragraph 5.1.2 and the economic sectors active in Kent. Significantly, at paragraph 5.1.5, Azimuth cite a respondent that made clear that “tendered” prices determine how air freight moves. This is a powerful reason why bellyhold will in most instances win over pure freighter operations. Issues of price for pure freighter operations are reinforced at	Paragraph 5.1.2 of Volume II in sub-section “**Findings by Category of Interview Question**” Paragraph 5.1.5 of Volume II in sub-section “**Findings by Category of Interview Question**” Paragraph 5.1.10 of Volume II in sub-section “**Findings by Category of Interview Question**”	Paragraph 4.1.2 of Volume II in sub-section “**Findings by Category of Interview Question**” Paragraph 4.1.5 of Volume II in sub-section “**Findings by Category of Interview Question**” Paragraph 4.1.10 of Volume II in sub-section “**Findings by Category of Interview Question**”	No change

York Aviation (YAL) Reference and Para	Azimuth Old Para	Azimuth New Para	Implications / Summary of Change
paragraph 5.1.10, particularly in relation to the risks associated with higher fuel prices.”			
2.52 - “There are then a number of comments regarding the current difficulties of operating at Heathrow at paragraph 5.1.6ff.”	Paragraph 5.1.6ff of Volume II in sub-section “**Findings by Category of Interview Question**”	Paragraph 4.1.6ff of Volume II in sub-section “**Findings by Category of Interview Question**”	No change
2.54 – “Again, paragraph 5.1.15 highlights the dominance of bellyhold freight. Whilst noting that the A380 aircraft has more limited space for bellyhold cargo than B747s at paragraph 5.1.14, Azimuth neglect to point out that other new aircraft, such as B787 and A350 aircraft, do not suffer from similar reductions in space and capacity and continue to offer substantial bellyhold opportunities and capacity.”	Paragraph 5.1.15 of Volume II in sub-section “**Findings by Category of Interview Question**” Paragraph 5.1.14 of Volume 2 in sub-section “**Findings by Category of Interview Question**”	Paragraph 4.1.15 of sub-section “**Findings by Category of Interview Question**” Paragraph 4.1.14 of sub-section “**Findings by Category of Interview Question**”	No change
2.55 – “The response cited at paragraph 5.1.19 makes clear that the most important factor in considering freighter operations is “cost, speed and access to road networks”, which is not a condition which Manston can meet for the majority of the UK. The local transport firms (paragraph 5.1.21) clearly saw an advantage for them in Manston re-opening but it is far	Paragraph 5.1.19 of Volume II in sub-section “**Findings by Category of Interview Question**” Paragraph 5.1.21 of Volume II in sub-section “**Findings by Category of Interview Question**” Paragraph 5.1.20 of Volume II in sub-section “**Findings by Category of Interview Question**”	Paragraph 4.1.19 of Volume II in sub-section “**Findings by Category of Interview Question**” Paragraph 4.1.21 of Volume II in sub-section “**Findings by Category of Interview Question**” Paragraph 4.1.20 of Volume II in sub-section “**Findings by Category of Interview Question**”	No change

York Aviation (YAL) Reference and Para	Azimuth Old Para	Azimuth New Para	Implications / Summary of Change
less clear that this was reflected by the broader industry. Significantly, paragraph 5.1.20 does not address the operational reasons why major freight forwarders seek to locate close to Heathrow, Stansted or East Midlands, except possibly for their city centre sales offices.”			
2.56 – “The response quoted at paragraph 5.1.23 makes clear that for Manston to be an attractive option to freighter operations, it would need to offer night operations.”	Paragraph 5.1.23 of Volume II in sub-section “**Findings by Category of Interview Question**”	Paragraph 4.1.23 of Volume II in sub-section “**Findings by Category of Interview Question**”	No change
2.58 – “The one airline interviewed made clear (paragraph 5.2.3) that “success at Manston depended upon identifying a niche market and becoming known for excellence. In particular, suggestions included a perishables centre, handling of live animals, easy access for charter flights, and handling cargo that is not necessarily straightforward”. We would have expected the remainder of the report to concentrate on quantifying the size of this niche market, including any Brexit implications for exports (paragraph 5.2.1).”	Paragraph 5.2.3 of Volume II in sub-section “**Freight-Focussed Findings**” Paragraph 5.2.1 of Volume II in sub-section “**Freight-Focussed Findings**”	Paragraph 4.2.3 of Volume II in sub-section “**Freight-Focussed Findings**” Paragraph 4.2.1 of Volume II in sub-section “**Freight-Focussed Findings**”	No change

York Aviation (YAL) Reference and Para	Azimuth Old Para	Azimuth New Para	Implications / Summary of Change
2.59 – “The spurious suggestion that freight might be “banned” from Heathrow (paragraph 5.2.6) and Manston might benefit is clearly nonsense in the context of the Government’s support for a third runway to provide capacity for freight in the bellyholds of passenger aircraft as much as for passengers.”	Paragraph 5.2.6 of Volume II in sub-section “**Freight-Focussed Findings**”	Paragraph 4.2.6 of Volume II in sub-section “**Freight-Focussed Findings**”	No change despite the clear statement in the Airports NPS that R3 at Heathrow is intended to double the freight capacity of Heathrow.
2.60 – “Whilst the suggestion from Coyne Airways about the potential for Manston to offer fuel cost savings when flying south from the UK (paragraph 5.2.11) is interesting, it appears not to take any account of the locations where freight is generated in the UK or where it is consolidated into viable loads.”	Paragraph 5.2.11 of Volume II in sub-section “**Freight-Focussed Findings**”	Paragraph 4.2.11 of Volume II in sub-section “**Freight-Focussed Findings**”	No change
2.61 – “Azimuth also claim that the bellyhold model is broken and that there is about to be a shift back to pure freighter operations at paragraph 5.2.25 but this is pure speculation and at odds with other industry commentators (see Airbus freighter forecasts which project an increasing share of bellyhold globally) and the UK Government’s view as expressed by the Department for Transport.”	Paragraph 5.2.25 of Volume II in sub-section “**Freight-Focussed Findings**”	Paragraph 4.2.25 of Volume II in sub-section “**Freight-Focussed Findings**”	No change

York Aviation (YAL) Reference and Para	Azimuth Old Para	Azimuth New Para	Implications / Summary of Change
2.62 – "Whilst paragraph 5.2.24 says there was underinvestment in facilities by the previous owners, the quotation from Finlays at paragraph 5.2.26 makes clear that Manston previously offered a good level of service. Hence, there is little evidence to suggest that underinvestment was any impediment to Manston attaining its natural share of the market in the past. Although Finlays have now relocated their operation back to Stansted, we would accept that they might choose to return to Manston with a similar number of movements as previously if the facilities were reinstated and provided the cost of operating was competitive compared to Stansted. There may also be scope for some humanitarian and military flights (paragraph 5.2.48) but these will be small in number and not the basis for a viable operation of the Airport."	Paragraph 5.2.24 of Volume II in sub-section "**Freight-Focussed Findings**" Paragraph 5.2.26 of Volume II in sub-section "**Freight-Focussed Findings**" Paragraph 5.2.48 of Volume II in sub-section "**Freight-Focussed Findings**"	Paragraph 4.2.24 of Volume II in sub-section "**Freight-Focussed Findings**" Paragraph 4.2.26 of Volume II in sub-section "**Freight-Focussed Findings**" Paragraph 4.2.49 of Volume II in sub-section "**Freight-Focussed Findings**"	No change
2.63 – "At paragraph 5.2.45, Fedex's criteria for an airport to be attractive to an integrator are set out and these seems to describe the characteristics of their main UK base	Paragraph 5.2.45 of Volume II in sub-section "**Freight-Focussed Findings**"	Paragraph 4.2.46 of sub-section "**Freight-Focussed Findings**"	No change No change

York Aviation (YAL) Reference and Para	Azimuth Old Para	Azimuth New Para	Implications / Summary of Change
at Stansted. There is then a discussion about some of the problems DHL perceive at Heathrow but, of course, DHL's principal UK operation is focussed at East Midlands where they have an extensive operation. From our work with the integrators and with the Freight Transport Association, we know that Manston is too peripheral for integrator operations serving the UK. Integrators have a strong preference for locations more centrally located in the UK with good road access to all of the major markets. The availability of land for warehouses (paragraph 6.2.6) is far less important than a location central to the market and the availability of good road access, neither of which are characteristics of Manston. This would apply equally to the suggestion that Amazon might locate there or that the Airport could become a base for drone operations (6.3.24-27)."	Paragraph 6.2.6 of Volume II in sub-section "**Market Opportunities for Manston Airport**" Paragraphs 6.3.24-27 of Volume II in sub-section "**External Environment Scenarios**"	Paragraph 5.2.6 of Volume II in sub-section "**Market Opportunities for Manston Airport**" Paragraphs 5.3.24-27 of Volume II in sub-section "**External Environment Scenarios**"	Removed explicit quote from Atlas Air indicating support for Manston Airport, replaced by comment on discussions with Atlas Air. The position regarding Atlas Air's support needs to be clarified.
2.67 – "Again, there is reliance on our work for TfL and the FTA (paragraph 6.1.8) to justify the conclusions reached. As stated	Paragraph 6.1.8 of Volume II in sub-section "**Attracting Air Freight to Manston Airport**"	Paragraphs 5.1.8 of Volume II in sub-section "**Attracting Air Freight to Manston Airport**"	No change

York Aviation (YAL) Reference and Para	Azimuth Old Para	Azimuth New Para	Implications / Summary of Change
above this work does not support RSP's case."			
2.69 – "At paragraph 6.3.1, Azimuth set out 9 potential scenario drivers for Manston. However, it is not clear how these scenario drivers have been taken forward to the forecasts set out in Volume III, which do not set different potential scenarios for growth…"	Paragraph 6.3.1 of Volume II in sub-section "**External environmental scenarios**"	Paragraphs 5.3.1 in Volume II in sub-section "**External environmental scenarios**"	No change
2.70 – "Section 7 sets out the conclusions from Volume II. According to Azimuth (paragraph 7.1.1), the key issues that are seen to favour Manston are…"	Paragraph 7.1.1 of Volume II in sub-section "**Recommendations**"	Paragraph 6.1.2 of Volume II in sub-section "**Recommendation**"	No change but prefaced now by paragraph 6.1.1 which states *"It is recommended that the airport operator incorporate the opportunities shown below into their future development and marketing plans".* This suggests strongly that there is less certainty about the deliverability of the opportunities at Manston than is implied by <u>all</u> of these opportunities being included within the RSP forecasts for Manston.
2.71 – "Based on their analysis, Azimuth then set out (at paragraph 7.1.2), the markets which it believes that Manston could attract"	Paragraph 7.1.2 of Volume II in sub-section "**Recommendations**"	Paragraph 6.1.3 of Volume II in sub-section "**Recommendation**"	No change
2.73 – "The key conclusion drawn by Azimuth is that "This report demonstrates the potential demand	Paragraph 7.0.1 of Volume II in sub-section "**Conclusions**"	Paragraph 6.0.1 of Volume II in sub-section "**Conclusions**"	No change

York Aviation (YAL) Reference and Para	Azimuth Old Para	Azimuth New Para	Implications / Summary of Change
for Manston Airport, indicating its viability and clearly showing that Manston Airport is a valuable local, regional and national asset, providing airport infrastructure badly needed by the UK." (Paragraph 7.0.1)"			
2.76 – "The forecasts set out in Volume III draw extensively on the analysis in Volumes I and II. Although stated to be derived on a 'bottom up' basis (Executive Summary Page 1) and claimed to be more conservative than top down, econometrically driven, projections, reliance is still placed, at paragraph 1.1.1…"	Paragraph 1.1.1 of Volume III in sub-section "**Background**"	Paragraph 1.1.1 in sub-section "**Background**"	Minor rewording of language. No substantive change to continued reliance on York Aviation work despite the reliance on this work having been refuted.
2.77 – "Paragraph 2.1.2 again suggests that the literature review undertaken showed that "a qualitative approach was the most appropriate method through which to gather data on the potential demand for an individual airport". Whilst we agree that freight forecasting is difficult, as Azimuth themselves note, at paragraph 2.1.4, qualitative forecasts still need to be based on "market data" and, at paragraph 2.1.6, Azimuth go on	Paragraph 2.1.2 of Volume III in sub-section "**Air Freight Forecasting Method"** Paragraph 2.1.4 of Volume III in sub-section "**Air Freight Forecasting Method**" Paragraph 2.1.6 of Volume III in sub-section "**Air Freight Forecasting Method**"	Paragraph 2.1.2 of Volume III in sub-section "**Air Freight Forecasting Method**" Paragraph 2.1.4 of Volume III in sub-section "**Air Freight Forecasting Method**" Paragraph 2.1.7 of Volume III in sub-section "**Air Freight Forecasting Method**"	No change

York Aviation (YAL) Reference and Para	Azimuth Old Para	Azimuth New Para	Implications / Summary of Change
to refer to the anecdotal information collected in the interviews as primary market data.”			
2.80 – “Azimuth place reliance on both the overspill argument (paragraph 2.2.2) and that there will be a reversal away from the existing preference for bellyhold for most types of air freight, despite the overwhelming evidence that this is likely to remain the case in future due to the lower freight rates available…”	Paragraph 2.2.2 of Volume III in sub-section “**Short and Medium Term Freight Forecasting Model**”	Paragraph 2.2.2 of Volume III in sub-section “Short and Medium Term Freight Forecasting Model”	No change
2.82 – “At paragraphs 2.2.6 and 2.2.7, Azimuth set out the methodology they have used for deriving freight movements and tonnage for Manston. In essence, these movement forecasts are entirely based on claimed confidential discussions with airlines, airports and others involved in the industry, which are then converted to freight tonnage based on the capacity of each aircraft and assumed load factors. These discussions would appear to be different from the list of interviewees reported in Volume II, which included only 1 airline	Paragraph 2.2.6 of Volume III in sub-section “**Short and Medium Term Freight Forecasting Model**” Paragraph 2.2.7 of Volume III in sub-section “**Short and Medium Term Freight Forecasting Model**” Paragraph 2.2.9 of Volume III in sub-section “**Short and Medium Term Freight Forecasting Model**”	Paragraph 2.2.6 of Volume III in sub-section “**Short and Medium Term Freight Forecasting Model**” Paragraph 2.2.7 of Volume III in sub-section “**Short and Medium Term Freight Forecasting Model**” Paragraph 2.2.9 of Volume III in sub-section “**Short and Medium Term Freight Forecasting Model**”	No change

York Aviation (YAL) Reference and Para	Azimuth Old Para	Azimuth New Para	Implications / Summary of Change
(unlikely itself to relocate its single European operation to Manston) and no other airports. Although it is claimed (paragraph 2.2.9) that switching costs have been taken into account, there is no explanation as to how these costs have been factored into the assessment of what operations Manston might attract.”			
2.83 – “A vague list of potential operations is set out at paragraph 3.2.3, albeit with specific assumptions then stated about the loadings on each…” [Also mentioned in YAL para 2.85]	Paragraph 3.2.3 of Volume III in sub-section “**Freight Forecast by Tonnage**”	Paragraph 3.2.3 of Volume III in sub-section “**Freight Forecast by Tonnage**”	Acknowledgement that some return legs can be empty has been added. In some cases, global growth rates from IATA have been added but these are not relevant to assessing the potential for such operations at Manston.
2.88 – “Although not the main focus of this summary report, we note that the passenger forecasts, set out by Azimuth in Section 2.4”	Title for sub-section 2.4 in Volume III “**Passenger forecasting method**”	Title for sub-section 2.4 in Volume III “**Passenger forecasting method**”	No change
2.91 – “In overall terms, the forecasts presented by Azimuth at Table 1 of Volume III are simply not credible and do not provide a robust basis for promoting a DCO.”	Table 1 in Volume III “**Summary 20 year freight and passenger forecast”**	Table 1 in Volume III “**Summary 20 year freight and passenger forecast”**	Table unchanged. Paragraph below has now removed “*Nonetheless, the forecast shows the airport exceeding the Nationally Significant Infrastructure Project (NSIP) criteria for 10,000 freight movements by Year 6*”.
Footnote 52 [from YAL Para 4.9] – “We are unclear why 19 Code E	Table 2 in Volume III “**Freighter Movements by Year by ICAO**	Table 2 in Volume III “**Freighter Movements by Year by ICAO**	Code F column has been removed. Code D movements have

York Aviation (YAL) Reference and Para	Azimuth Old Para	Azimuth New Para	Implications / Summary of Change
stands are proposed given that the fleet mix at 2039 shows 85% of aircraft (at 17,171 annual cargo aircraft movements) being by aircraft smaller than Code E dimensions."	**Design Code"** in sub-section "**Freight Forecasts by Movements**"	**Design Code"** in sub-section "**Freight Forecasts by Movements**"	significantly decreased whilst Code E movements have significantly increased. The reasons for this is unexplained and this is inconsistent given that the total tonnages and tonnage assumptions per movement have not changed. This cannot be correct.
5.4 – "Azimuth spend some time considering the appropriate employment density on which to base an assessment of direct employment. They ultimately conclude that East Midlands Airport provides an appropriate comparator (see paragraph 4.1.4 of Volume IV)…"	Paragraph 4.1.4 of Volume IV in sub-section "**Macro Level Forecasts**"	Paragraph 4.2.1 of Volume IV in sub-section "**Comparator airport figures**"	Similar points but different wording, and a clarification over the calculation has been added.
5.8 – "In examining the employment projections presented (Section 5.1 of Volume IV), it appears that no allowance has been made for either productivity growth or returns to scale over time and as the Airport grows.	Section 5.1 of Volume IV titled "**Forecast Job Creation Resulting from Operations at Manston Airport**"	Section 5.1 of Volume IV is titled "**Forecast Job Creation Resulting from Operations at Manston Airport**"	No change here but some allowance has been made for productivity effects as set out in Volume IV at paragraph 4.3.3. Other points regarding the inappropriate employment density have not been addressed.
5.10 – "Section 7 of Volume IV discusses other socio-economic impacts. In particular, it talks about contributions to GDP. Para 7.1.1 describes GDP as "a monetary measure of the state of a Region's or a Country's economy"	Paragraph 7.1.1 of Volume IV in sub-section "**Gross Domestic Product**"	Paragraph 8.1.1 of Volume IV in sub-section "**Gross Domestic Product**"	Same error repeated. Definitions for acronyms are added.

York Aviation (YAL) Reference and Para	Azimuth Old Para	Azimuth New Para	Implications / Summary of Change
5.11 – “The comments in Paragraph 7.1.7 describing how Manston could contribute significantly to Thanet’s Economic Growth Strategy aspirations in terms of GVA per job and per capita are, in reality, unsupported.”	Paragraph 7.1.7 of Volume IV in sub-section “**Gross Domestic Product**”	Paragraph 8.1.7 of Volume IV in sub-section “**Gross Domestic Product**”	No change

APPENDIX D: YORK AVIATION FEBURARY 2018 NOTE

York Aviation

Manston Airport

RSP Consultation January 2018 – Further Comments on Azimuth Report *"Manston Airport – A Regional and National Asset"*

1. In this note we comment on the revised material presented in the 4 volumes of the Azimuth Report. However, much of this report remains unchanged and the significant shortcomings identified in our earlier report[1] have largely not been addressed and, where new material has been added, this fails to correct the previous misinterpretations.

2. Ultimately, Azimuth still seek to rely on our work for the Freight Transport Association and for Transport for London to justify their freighter aircraft movement forecasts despite our having made clear in our earlier report that this work cannot be interpreted in the way that Azimuth seek to do.

3. In this note, we address the new points made by Azimuth in each of the 4 volumes in turn.

Azimuth Report Volume I – Demand in the South East of the UK

Section 2 – UK Airport Capacity

4. As we pointed out at paragraphs 2.8 to 2.11 of our earlier report, almost all of the evidence presented by Azimuth to highlight the need for more airport capacity in the South East of England relates to the need for more airport capacity to meet growing passenger demand for flights to a wide range of global destinations fed by hub connecting services at Heathrow. These passenger flights also provide significant bellyhold freight capacity. Indeed, the recent non-statutory consultation material published by Heathrow Airport makes clear that, overall, the new passenger services and additional capacity made possible by the third runway will result in a doubling of freight capacity at the Airport[2].

5. The reference, at paragraph 2.1.2 of the Azimuth Report, to the Secretary of State for Transport's introduction to the new UK Aviation Forecasts in October 2017, stating that the runways at the London airports will be full at an earlier date than previously thought, needs to be seen in this context. It is clear that the reason that runway capacity is filling up more quickly than previously thought is due to growth in passenger aircraft as the actual decline in pure freighter flights is highlighted in the document at Figure 4.5[3] reproduced below.

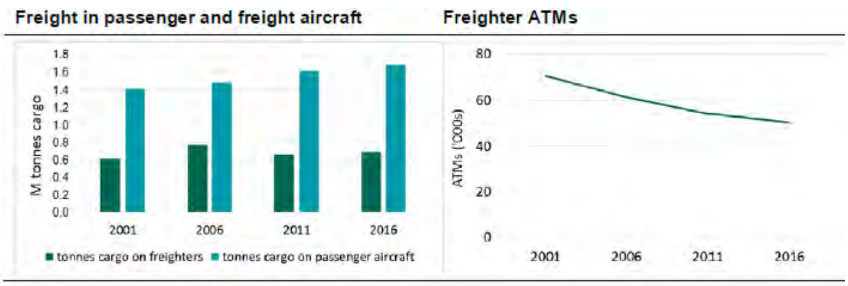


Figure 4.5 Historic freight carried at all modelled airports

[1] "Summary Report analysing use of York Aviation material by RiverOak Strategic Partners and Assessment of Capability of Manston Airport" submitted to PINS and made available on the Stone Hill Park website in November 2017.
[2] The Case for Heathrow Expansion, Heathrow Airport Ltd, January 2018.
[3] UK Aviation Forecasts, Department for Transport, October 2017, corrected version issued 25th January 2018 as a result to discrepancies in the use of CAA Statistics data in the original report brought to the DfT's attention by York Aviation.

6. These forecasts do not support the need for more capacity for pure freighter aircraft. Reference, at paragraph 4.0.1 of the Azimuth report, to the difference between the constrained and unconstrained passenger forecasts are simply irrelevant to the requirement for capacity for freighter aircraft and, in practice, the constrained forecast represents an unrealistic situation of no further capacity expansion at any of the UK airports over the period to 2050. The Department for Transport's (DfT) long term assumption is that there will be no growth in pure freighter aircraft movements across all UK airports as we highlighted at paragraph 3.26 of our previous report and this is the relevant context for considering whether there is a 'need' for Manston. Azimuth are simply wrong when they say that the DfT's assessment of the extent to which runway capacity is full *"may not reflect the need for freighter aircraft going forward"* as it is clear from Table 68 of the UK Aviation Forecasts report that freighter ATMs are included within the assessment

7. Hence, Azimuth's inference from this information that there is a strong economic case for more freighter airport capacity in the South East of England is simply not correct and the evidence regarding the economic benefits of additional passenger aircraft capacity has been misapplied.

Section 3 – Air Freight Capacity

8. Additional references have been added, at paragraphs 3.15 and 3.16 of the Azimuth report, to the prospects for growth in demand for pure freighter operations globally. However, this is not relevant to the prospects for Manston as more specific information is available of the actual trends and requirements in the UK market, where there are high levels of bellyhold capacity available at a high frequency of service negating the need for substantial additional freighter markets. The UK market for freighter aircraft is analysed in detail in Section 3 of our November 2017 report. The fact that freighters carry a lower proportion of cargo to/from the UK than the global average (Azimuth paragraph 3.2.1) is a reflection of the strong global position of the UK in terms of the provision of long haul scheduled services offering passenger and freight capacity. There is simply no need for additional freighter operations given the high quality offer made available on passenger aircraft. These flights offer more than sufficient competition to ensure that shippers are not disadvantaged, with the costs of bellyhold being lower than pure freighter tariffs in any event.

9. Nor does the additional information about short term shortage of freight capacity in the run-up to Christmas 2017, consequential increases in freight rates across Europe and congestion in and around the cargo centre at Heathrow (para 3.1.8), demonstrate a requirement for additional pure freighter operations. What this additional information evidences is the shortage of bellyhold capacity, otherwise, if pure freighter operations were an economic solution for shippers, additional ad hoc flights would have been operated to Stansted or East Midlands to cover the shortfall, both airports having spare capacity for additional freighter movements. The fact that such extra flights were not operated is clear evidence that even at higher freight rates, additional freighter operations were not economic. The position is further evidenced by the reference at paragraph 3.2.5 to a 10% increase in cargo handled at Heathrow in 2017. Heathrow's current consultation on its expansion makes clear an intention to resolve congestion issues in and around the cargo centre, improving facilities and access to accommodate 100% growth in cargo throughput[4].

10. As noted earlier, this section of the Azimuth report continues to place inappropriate reliance on our earlier work for Transport for London and the Freight Transport Association. As we made clear at paragraphs 2.17 to 2.28 of our earlier report, this work cannot be interpreted in the way Azimuth seek to do. It is simply wrong to state, as Azimuth do at paragraph 3.4.6 of their report that we identified *"that an operational Manston Airport is the only viable option"*. This serious misrepresentation of our 2015 report for the Freight Transport Association, which did no more than mention that Manston had handled some freighter traffic prior to its closure, has not been corrected.

[4] Our Emerging Plans, Heathrow Airport Ltd, January 2018.

Section 4 – Air Freight Capacity in the UK

11. Section 4.1 of the Azimuth report relating to Stansted Airport has been extensively revised, noting that the Airport no longer intends to seek an increase in its annual movement limits but neglects to mention the fact that movements are reserved for freighter aircraft under the 2008 planning permission under condition ATM1: *"a limit on the number of occasions on which aircraft may take-off or land at Stansted Airport of 264,000 ATMs (Air Transport Movements) during any 12 calendar month period, of which no more than 243,500 shall be PATMs (Passenger Air Transport Movements) and no more than 20,500 shall be CATMs (Cargo Air Transport Movements)."* Of the 20,500 movements reserved for freighter aircraft, only 11,600 were used in 2016 meaning that there were almost 10,000 freighter aircraft movements of spare capacity at that airport alone. Indeed, the inference that Stansted will seek to displace freighter activity, at paragraph 4.1.5 of the Azimuth report, is simply not borne out by the facts. Attaining the planned 43 mppa with 243,500 PATMs would require an average number of passengers per aircraft of c.176, up from c.161 in 2017, which is a realistic target given that the new generation of Ryanair aircraft (Boeing 737 max) will provide increase in seat capacity by 9 passengers on each aircraft before any allowance is made for Stansted's growing portfolio of long haul services. The Stansted Airport Sustainable Development Plan 2015 makes clear that Stansted intends to increase pure freighter activity and expressly states the potential to increase from 230,000 tonnes to 400,000 tonnes of freight on dedicated aircraft[5].

Section 5.3 – E-commerce

12. A section has been added to the Azimuth report regarding growth in e-commerce and the effect on demand for air freight. However, of itself, this tells us nothing about the requirement for more pure freighter aircraft and may simply reflect growing demand for bellyhold capacity at economic freight rates.

Section 6 – Manston Airport

13. Section 6.1 of the Azimuth report adds substantial text about the history of Manston Airport, expanding on the original assertions that the failure of the Airport can be attributed by the failure of the previous owners to invest in facilities. As we noted at paragraph 2.62 of our earlier report, users of Manston previously appeared happy with the standard of service offered so there is no evidence that lack of investment was an impediment to growth, rather it was an absence of a market. Furthermore, investment in freight facilities at Stansted and East Midlands Airports was in response to clear demand from particular operators (e.g. DHL's own facility at East Midlands) rather than speculatively ahead of proven demand. Despite investment in cargo facilities, Doncaster Sheffield Airport attracted only 688 air freighter movements in 2016.

14. Reference has been added, at paragraph 6.2.3 of the Azimuth report, to our 2011 report on the Economic Impact of Night Flying Report for Manston where we noted that Manston stood to benefit from the levels of air freight growth being projected by Boeing and Airbus. It is important to recognise that these remarks were made in the context of a Government policy position which did not support the provision of any additional capacity across the London airports and whilst Manston was still operational in the market. This is not the situation today. Furthermore, at the time that this report was written, it was assumed that the decline observed in pure freighter movements to/from the UK could be attributed to the recession and that there would be an upturn in such movements with economic recovery. Clearly, we now have evidence that this has not been the case and there has been a structural change in the industry notwithstanding the availability of spare capacity for freighters at airports such as Stansted and East Midlands.

[5] Stansted Airport, Sustainable Development Plan 2015, Summary page 9.

Section 7 – Future Potential Opportunities for Manston

15. Whilst noting the responses to RSP's initial Summer 2017 consultation (paragraph 7.1.6 of the Azimuth report), it is important to note that this consultation does not represent a systematic or unbiased sample, particularly given the shortcomings in the case presented. As in the original Azimuth report, the findings of an earlier comprehensive resident survey conducted by MORI are referenced (paragraph 7.1.7). Azimuth seek to construe this as being supportive of growth on the basis that residents say they were little affected by noise from airport operations, including at night. Of course, at that time, the Airport was operating under the restrictions of a Section 106 Agreement which did not allow operations at night (other than for emergencies). Hence, it is hardly surprising that residents report that they were little disturbed by operations at night. However, when the MORI report is examined more fully, it is evident over half of the residents were concerned that expanded operations would give rise to negative impacts from night operations (page 5 of the MORI report[6]). This needs to be seen in the context of the substantial number of night movements being projected by RSP, as we discuss later in this note.

16. A new Section 7.5 has been added on slot restrictions at Amsterdam, presumably to counter our questioning of why Coyne Airways would relocate from Amsterdam to Manston in our earlier report. This sub-section neglects to mention that Schiphol Group is extending the runway at nearby Lelystad to accommodate overspill traffic[7], primarily for leisure flights so as to free up slots for 'Mainport' related activity at Schiphol which would include cargo services. Indeed, Schiphol Group is also investing in improving its cargo handling facilities[8] so, notwithstanding the application of the 80% 'use it or lose it' rule[9] in the short term which could impact disproportionately on cargo operators to the extent that they do not use all of their allocated slots, Schiphol has put in place plans to address the forthcoming capacity constraint through enabling Lelystad to act as a reliever airport, albeit that Airport will not be available until 2019. There are also ongoing discussions regarding the long term future of the existing movement limit[10]. In any event, the existence of a potential constraint does not automatically make Manston a preferred alternative as Brexit is likely to make the airport an unattractive alternative for cargo airlines seeking to serve the EU market more broadly. Other available airport capacity in continental Europe, including that at Lelystad, is more likely to be a first choice for any operations displaced from Schiphol.

Azimuth Report Volume II – A Qualitative Study of Potential Demand

Section 3 – Review of Air Freight Forecasting Literature

17. At paragraph 3.6.4, Azimuth have added a reference to the DfT 2017 UK Aviation Forecasts but seek to dismiss the projected no growth in freighter aircraft movements as merely an assumption (see Volume III, paragraph 2.1.14), referring to the historic tonnage growth percentages cited by the DfT. Unfortunately, Azimuth do not appear to have realised to what the percentage growth figures refer. The 5% growth referred to by DfT[11] is total growth in cargo carried across freighter and passenger aircraft combined over the period 2011 to 2016. When mail is included, tonnage growth over the 5 years has been only 3.2%, and there has be negative growth in combined tonnage on freighter aircraft of -2.2%[12]. In contrast, the combined tonnage of freight and mail carried on passenger aircraft grew by 1.1% over the period. Unfortunately, Azimuth's misunderstanding of the DfT data has been carried through to the forecasts in Vol III, which cover both freight and mail operations projected for Manston.

[6] http://hbm2015.com/wp-content/uploads/2016/08/2005-04-S106-Consultation-MORI-results.pdf
[7] https://www.lelystadairport.nl/en/future
[8] http://www.annualreportschiphol.com/results/our-results/competitive-marketplace
[9] EU Slot Allocation Regulation 95/93 as amended.
[10] https://theloadstar.co.uk/schiphol-artificially-restricting-airport-cargo-capacity-illegal-slot-rules/
[11] In the amended version of UK Aviation Forecasts 2017.
[12] CAA Airport Statistics, adjusted for Belfast International data as advised by DfT.

Azimuth Report Volume III – The Forecast

Section 2 – Review of Air Freight Forecasting Literature

18. At paragraph 2.1.6, Azimuth refer to a peer review of the forecasting methodology by Loughborough University but this peer review has not been published as would be normal best practice. We have set out at length in our previous report (paragraphs 2.76 to 2.87) the flaws in the approach adopted. These criticisms have not been addressed. In our view, the forecasts are purely aspirational and not grounded in the evidence. As such, they are highly likely to have been infected by optimism bias within the RSP team.

19. At paragraph 2.1.10, Azimuth cite recent growth in freight tonnage from an IATA bulletin and capacity growth but, again, these are combined freighter and bellyhold figures and fail to take account that load factors remain low in Europe at 46.4% over the 12 months as reported by IATA[13]. This suggests that there is substantial potential to increase cargo tonnage flown without the need to increase aircraft movements, notwithstanding the comments at paragraph 2.3.5 of the Azimuth report that there may be instances where volume is a better measure of how full an aircraft may be rather than weight, an issue which is likely to relate to special consignments rather than the majority of high value, low volume goods carried as air freight. Azimuth continue to rely inappropriately on combined cargo tonnage figures and projections as a proxy for expected growth in cargo aircraft movements. As made clear in our earlier report (paragraphs 2.47 to 2.48), the use of such data is not appropriate for considering the prospects for Manston.

20. At paragraph 2.1.13, Azimuth cites CAA Airport Statistics for cargo growth for 2016, seeking to suggest some reversal of past trends away from freighter aircraft movements. Paragraph 2.3.6 also cites short term tonnage increases on freighter aircraft to infer a longer trend. There is danger in relying on single year figures but the data for 2017 show cargo tonnage across the London airports growing by 9.8%, in line with the UK average, but that carried on freighter aircraft growing by only 7% with a 5.5% fall in cargo aircraft movements in the London area. This tends to confirm the long term trend towards the increasing use of bellyhold capacity on the wide global network served from the main London airports.

21. Most significantly, in the light of this misinterpretation of short term trends, Azimuth compound the error by taking the 4%[14] figure for growth in cargo tonnage on freighter aircraft over a 5 year period, cited in the original DfT Aviation Forecasts 2017[15] , and use this as a justification for continuing to use the Boeing/Airbus forecast of 4% per annum growth in global freight tonne kilometres as the basis of forecasting freighter movements at Manston for years 10 to 20 of the forecast. Leaving aside the questionable validity of using a freight tonnage forecast as the basis for forecasting freighter aircraft movements, this is mathematically wrong and the average annual growth rate in cargo tonnage on pure freighter aircraft is no more than 1% per annum based on the updated DfT growth of 5% in cargo tonnage (see paragraph 17 above). On this basis, the updated Azimuth report presents identical forecasts as previously, although how clearly based on an error in the growth rate applied. Even if the short term 'bottom up' forecasts were correct, which we dispute (see paragraphs 2.80 to 2.85 of our earlier report), the eventual forecast at year 20 should be no greater than 12,789 freighter movement rather than 17,171 movements.

Section 3 – Manston Airport Freight Forecast

22. The updated Azimuth report has provided no further substantiation of the short term forecasts, nor of the forecast fleet mix, so undermining the weight which can be attached to the reliance on the short term forecasts.

[13] IATA Air Freight Analysis, November 2017, page 4.

[14] Now revised to 5%.

[15] Paragraph 4.4.

23. Despite the lack of the required explanation of the derivation and make up of the forecasts in the Azimuth report, some further detail is now provided in the noise section of the updated PEIR, which sets out the details of the freight movement forecasts by airline and aircraft type (Appendix 12.3). This information is set out in a table appended to this note and we have added the relevant QC count information to illustrate some of the issues arising from the fleet mix. Significantly, the fleet mix assessed for noise is not the same as contained in Azimuth Vol III. The inconsistencies are unexplained and give rise to further doubt as to the robustness of the forecast and whether it is deliverable:

	Azimuth	**PEIR App 12.3**
Code C	43%	41%
Code D	42%	17%
Code E	13%	37%
Code F	2%	6%

24. When examined in detail, the projections underlying the whole application lack realism for the following reasons:

- ✈ Amazon - this is suggested as a B777-300ER freighter but there is no freighter variant of this aircraft; the only B777 freighters being -200 variants. Other airlines are also shown as using this type and it accounts for 26% of all freighter movements shown.

  In any event, it is not clear why Amazon would operate 5 flights a day from the US to Manston as the goods which Amazon sells in the UK are not, in the main US manufactured. This seems to confuse the claimed potential (Azimuth Vol II, section 6.3), which we dispute, for an Amazon distribution hub at Manston to serve the UK with long haul freight operations.

- ✈ Cargolux - this assumes reinstatement of the previous Cargolux flower operation which has relocated to Stansted.

- ✈ Fedex/DHL- the aircraft types shown appear to indicate a DHL operation (e.g. A330-343 aircraft, which are only operated by DHL). The integrator operation is expected to account for 22.8 movements per day or 46% of the total. Based on our knowledge of the integrator market, this is completely unrealistic as Manston is quite simply in the wrong location to serve as an integrator hub in the UK. It would also require a substantial night operation, for example at DHL's main UK base at East Midlands Airport has some 63% of freighter aircraft movements operating within the night period.

  Overall, the number of movements shown in the PEIR would imply around 8,322 annual movements by the integrator. This is around 43% of the total number of freighter movements at EMA in 2016 or around 2/3 of the current DHL operation. This is hardly realistic as it would imply Manston would be a major integrator hub, duplicating the EMA operation. It is also important to note that freight tonnage continues to grow at EMA but the number of freighter movements have not systematically grown over the last decade.

- ✈ Pakistan Airlines - the airline no longer operate pure freighter aircraft.
- ✈ Postal - the B737 operation presupposes the development of a mail hub. Royal Mail have pared back on flying even at their main hub at EMA so it is unclear why a dedicated B737 operation would be operated from Manston.
- ✈ Russian - the types indicated have QC counts of 8 and 2 respectively on arrival and 16 on departure, with some movements shown as operating at night, in contravention of the proposed Noise Mitigation Plan banning such aircraft at night.
- ✈ TAAG Angola – the airline does not operate B747 freighters, which is the type shown, and, in any event, their operations by most aircraft types are banned from European airspace on safety grounds.

25. These basic errors reinforce the doubts expressed in our earlier report about the realism of the short term freighter movement forecasts.

Implications for Night Operations and Night Noise

26. The Noise Mitigation Plan sets out a Night Quota period from 2300-0600 and a Shoulder period from 0600-0700. The quotas proposed for each of these periods are 4,000 QC points and 2,000 QC points per annum respectively. These QC budgets can be compared to other airports where such quotas are in place:

- ✈ Luton 3,500 from 2330-0600 and 7,000 from 0600-0700
- ✈ Heathrow (from Nov 18) 5,150 from 2330-0600
- ✈ Gatwick (from Nov 18) 6,935
- ✈ Stansted (from Nov 18) 7,960

27. The proposed night noise quota of 4,000 QC points is higher than the night quota for Luton Airport and not significantly lower than that for Heathrow. Local residents will be subject to a substantial amount of noise during the sensitive night period.

28. The fleet mix information provided in Section 12 of the update PEIR shows an average of 7.1 aircraft movements per night[16] for the 7 hour night quota period. Based on the aircraft types shown and the relevant QC points, this would amount to 3,222 annual QC points, within the 4,000 quota proposed. The proposed quota would allow up to around 9 aircraft movements per night on average, assuming the same aircraft mix, equivalent to around 3,217 annual aircraft movements. It follows, therefore, that the 2,000 quota for the shoulder hour 0600-0700 would allow 4-5 aircraft movements a day. In total, the extended 8 hour night period quotas would allow 4,826 annual aircraft movements on the basis of the fleet mix shown. This could be higher if quieter aircraft were operated over time.

29. However, a key issue is the realism of the projected day/night split. The RSP/Azimuth projections indicate only 14% of freighter aircraft movements being at night whereas, at EMA, some 63% of freighter movements operate at night. Given the dominance of integrator operations within the total RSP/Azimuth forecast, this would suggest a far greater reliance on night movements than shown. Correcting the day/night balance just for the integrator operation would imply at least 14.4 aircraft movements per night on average for the integrators, rather than the 4 movements shown for these airlines in the detailed fleet forecast. Accommodating these additional movements would breach the night noise quota constraint by c.1,000 a year. In other words, either the noise quota will need to be increased or the forecast will need to be constrained to reflect that these movements are unlikely to operate.

[16] The number will clearly vary day by day in practice.

30. Indeed, the proposed night movement constraint reinforces the view that the establishment of an integrator hub at Manston is simply not credible. If an integrator hub cannot be established this would reduce the movement forecasts by 46%. At Year 10, this would mean no more than 6,425 freighter aircraft movements, even if the remainder of the forecast were correct. If this were to be grown for the longer term using the DfT's historic freight tonnage figures (see paragraph 21 above), the freighter movement forecast at Year 20 would not exceed 7,000 movements, below the threshold for a DCO.

Capability of the Airport

31. We made the point in our earlier report (paragraph 2.93) that we would have expected a clear explanation of how the forecasts for aircraft movements translated into the requirements for infrastructure. This explanation has still not been provided.

32. Prima facie, on the same basis as we assessed the 'capability' of the existing infrastructure at Manston (paragraphs 4.5 and 4.6 of our earlier report), the infrastructure proposed by RSP could have a capability of over 100,000 freighter aircraft movements a year, taking into account the night movement quotas and the passenger operations. This is clearly excessive but not explanation or justification for the scale of the facilities has been provided by RSP.

Azimuth Report Volume IV – The Economic and Social Impacts of Airport Operations

Section 3 – Forecasting the Socio-Economic Impact of Airports

33. Despite the substantial errors in the assessment of socio-economic impacts identified in Section 5 of our earlier report, Azimuth have made no attempt to correct these errors and the economic impact assessment remains as in the original Summer 2017 consultation documents.

34. At Section 3.4, further reference has been added to our 2004 study into the socio-economic impact of airports for the Airports Council International Europe. We had already pointed out to Azimuth in direct correspondence[17] that it was inappropriate to rely on 2004 data as representative of the position in 2017, not least because of increasing efficiency of passenger and cargo handling. Furthermore, as is made clear in Figure 6.5 of our 2004 report[18], the employment densities can vary quite widely across airports dependent on their characteristics so the use of averages is entirely inappropriate for any specific airport. The on-site employment estimates set out at paragraph 5.12 of our earlier report are the correct basis for assessing the employment impact of Manston as these are based on recent experience of specific UK airports, where detailed analysis of the impact has been carried out in recent years, rather than on the generic Europe-wide ratios that Azimuth seek to apply. We have not factored any extraordinary assumptions regarding future automation or productivity growth into our estimates (Azimuth paragraphs 3.46-3.47) so these are conservatively based on average rates of productivity growth as airports grow.

Section 4 – Employment Forecasts for Manston Airport

35. For the reasons explained in our earlier report, the methodology used by Azimuth for deriving indirect, induced and catalytic impacts remains flawed.

36. A new section 4.3 has been added on the location of employment, referring to work by Oxford Economics (OE) for London Luton Airport[19]. This is used by Azimuth to justify the assertion that all on-site employment will be taken by local residents. Unfortunately, Azimuth have not realised that the way in which the employment estimates were derived by OE, using Government business statistics, only measures employment by place of employment and does not reflect the place of residence of those employees so cannot be taken as a reflection of the extent to which jobs at Manston might be taken up by local residents from Thanet.

[17] E-mail of 6th October 2017.

[18] The social and Economic Impact of Airports in Europe, York Aviation for ACI EUROPE 2004

[19] The Economic Impact of London Luton Airport, Oxford Economics, November 2015.

Section 5 – Training and Education

37. New sections have been added in relation to support from East Kent College and Canterbury Christ Church University expressing support for activities that would generate jobs in East Kent. This is not specific to the RSP proposals but would also apply to employment generated through Stone Hill Park's proposals. The future of the Museums would, of course, be enhanced by Stone Hill Park's specific proposals for new facilities and a heritage aviation airport within its proposals. The prospects for a Manston Training Facility are speculative and depend, ultimately, on whether the proposals for the use of the Airport were realised in practice.

Section 6 - Tourism

38. Section 6 is a new section on tourism which is entirely aspirational, with precedents being drawn from the experience of Southend (Azimuth paragraphs 6.4.2 to 6.4.8) following expansion of passenger flights at the Airport. However, the evidence presented is circumstantial and compares tourism expenditure in the Southend area during the recession with more recent (2015) data. It does not directly relate the growth in tourism expenditure of visitors to any data on the extent to which the Airport was a factor in this increase. As is made clear in the reference to Bournemouth Airport (Azimuth paragraph 6.4.14), the ability to use an airport to leverage additional tourist visitors is dependent on the destinations offered, with Germany, Scandinavia and the Netherlands particularly highlighted as places where there is a greater propensity to visit the UK on holiday, although it must be noted that these countries tend to prefer ferry travel and the use of their own car transport more generally over the use of air services.

39. Ultimately, the extent to which Manston might act as a catalyst to inbound tourism depends on the likely route network. The fleet mix forecast (PEIR Appendix 12.3) shows Ryanair as operating 76% of all passenger flights, with the remainder, other than the assumed return of the KLM service, expected to be largely ad hoc charter. Taking an example of the route network which Ryanair might operate from a similar scale of base at Leeds Bradford where the airline handles around 1 million passengers a year similar to the Azimuth projection for Manston, the airline serves the following destinations[20]:

Alicante	Las Palmas
Bratislava	Malaga
Corfu	Malta
Chania	Murcia
Dublin	Palma
Faro	Pisa
Fuerteventura	Riga
Gdansk	Tenerife
Gerona	Venice
Ibiza	Vilnius
Krakow	Warsaw
Limoges	Wroclaw
Lanzarote	

40. The majority of flights (over 59% in the summer tourist season) are to typical outbound leisure destinations and such destinations would, in all likelihood, be those operated initially particularly if our assessment (see paragraph 2.88 of our earlier report) that Azimuth's passenger forecasts are substantially overstated by reference to the level of demand in the Manston catchment area. Overall, it is hard to see how Manston would support a portfolio of routes likely to contribute significantly to inbound tourism nor to greatly assist St Augustine's Divine Retreat Centre (Azimuth paragraph 6.5.2) in marketing its activities, not least as its principal marketing focus appears to be to UK residents.[21]

[20] Based on OAG data for February and July 2018.
[21] http://divineuk.org/about-us/ramsgate/ The organisation operates another retreat centre in Darlington.

41. The suggestion that Manston might support services from China (Azimuth paragraph 6.5.4) lacks any foundation; such services do not form part of the forecasts, passenger aircraft stands and the passenger terminal would not be appropriately sized to handle flights to/from China and only Heathrow and Manchester Airports in the UK manage to sustain regular flights from China at 78mppa and 28mppa respectively. The Manston catchment area would simply not be sufficient to sustain such services and it is not credible that an airport in the 1-2 mppa range (or smaller) would support regular flights to/from China.

42. Overall, the additional material added in relation to the value of tourism does not demonstrate any linkage between the re-opening of Manston Airport and the actual potential impact on tourism in Thanet and Kent.

43. The other comments made by Azimuth about the lack of impact of airport operations on the value of tourism in Southend, Bournemouth and the Southampton area (Azimuth paragraphs 6.4.7, 6.4.14) have to be seen in the context that these airports do not have flight paths over a major tourist area as would clearly be the case with Manston in relation to Ramsgate. In the case of Manston, any negative implications might be expected to be more significant.

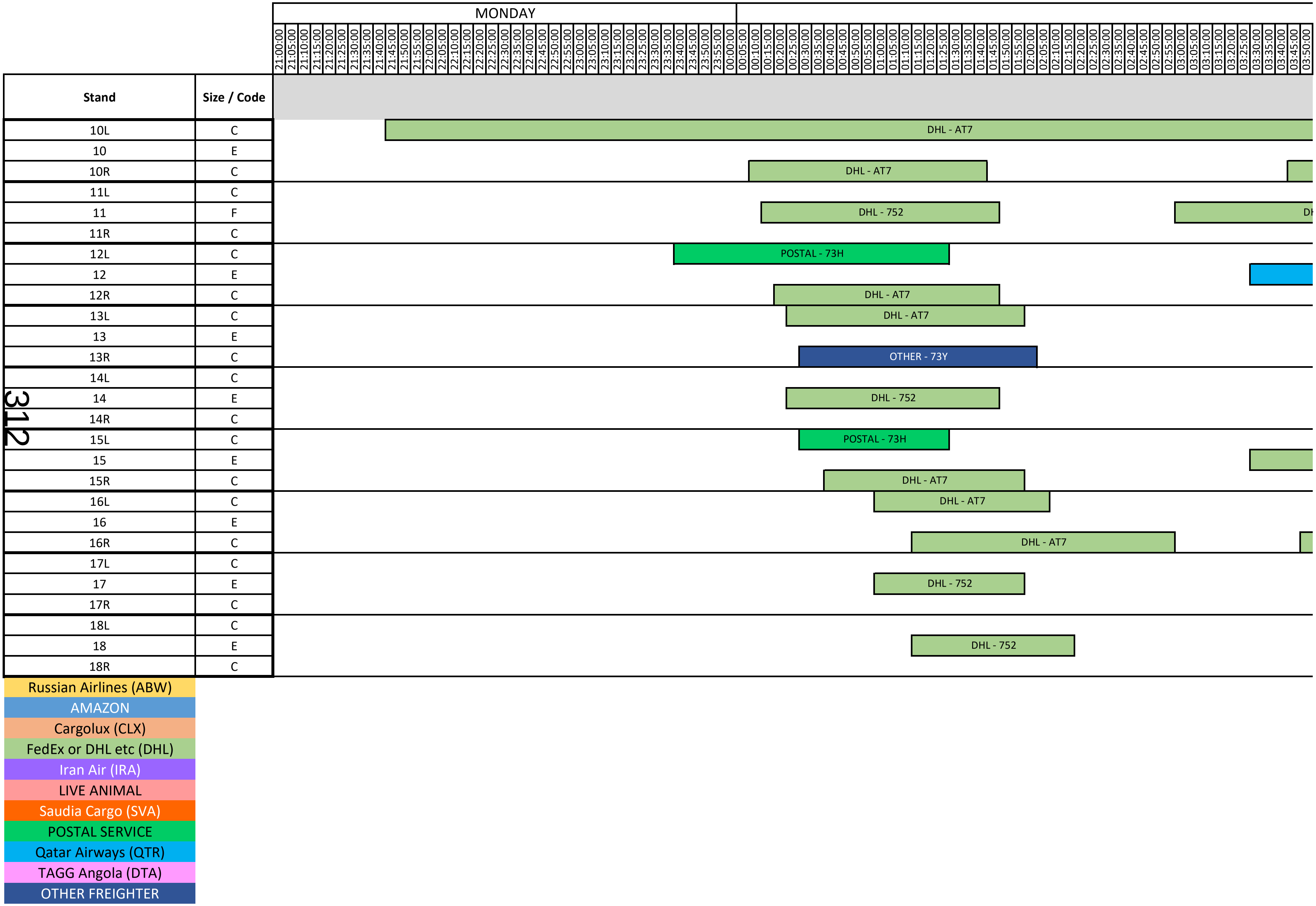
8th February 2018

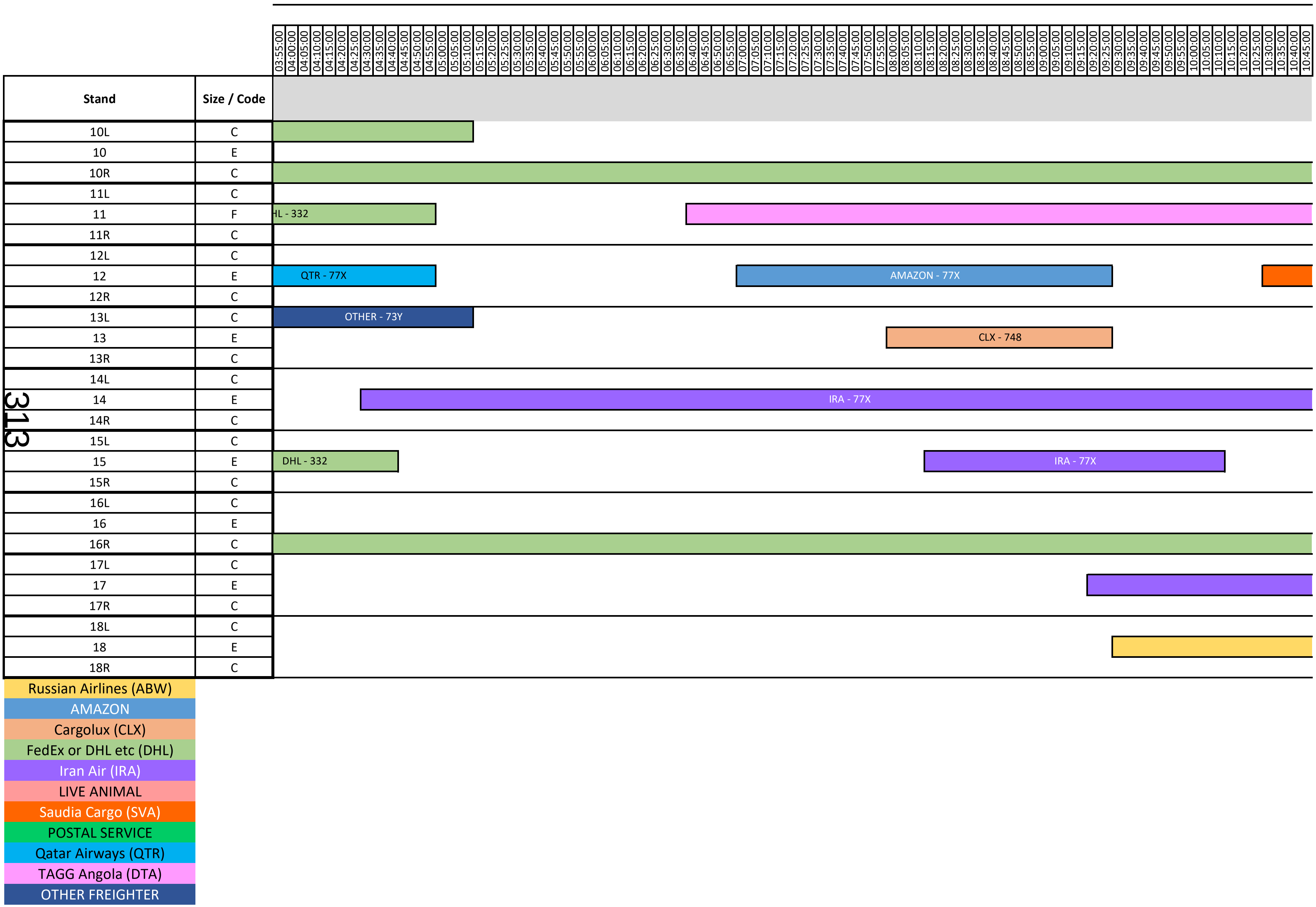
Appendix 12.3 Fleet Mix, QC points and Aircraft Categories

Airline	Type	Av Movements Day	Av Movements Night	QC A	QC D	Av QC	Total QC	Code
Amazon (US)	B777-300ER	4.6	0.5	1	2	1.5	0.75	E
Cargolux (Africa/Nairobi	B748	1.1	0.1	1	2	1.5	0.15	F
Fedex/DHL	B752	4.1	1.4	0.25	0.5	0.375	0.525	D
Fedex/DHL	A332	4.1	1.4	0.5	1	0.75	1.05	E
Fedex/DHL Feeders	ATR72	10.6	1.2	0.25	0.25	0.25	0.3	B
Fish and crabs (Dubai)	B777-300ER	0.4	0	1	2	1.5	0	E
Iran Air	B777-300ER	4.2	0	1	2	1.5	0	E
Live Animals	B777-300ER	0.4	0	1	2	1.5	0	E
Middle E (Egypt/Saudi	B777-300ER	0.9	0.1	1	2	1.5	0.15	E
PIA	B777-300ER	0.2	0	1	2	1.5	0	E
Post	B737-800	1.1	1.1	0.5	1	0.75	0.825	C
Qatar	B777-300ER	1.6	0	1	2	1.5	0	E
Russian	IL76	2.3	0.3	8	16	12	3.6	D
Russian	AN124	0.8	0.1	2	16	9	0.9	F
TAAG Angola	B748	0.7	0.1	1	2	1.5	0.15	F
Other	B737-300	5.7	0.6	1	0.5	0.75	0.45	C
Military	C17	0	0.1	0.5	2	1.25	0.125	D
Military	C130	0	0.1	0.5	2	1.25	0.125	D
Humanitarian	B748	0.1	0	1	2	1.5	0	F
KLM	F70	4	0	0	0.25	0.125	0	C
Charter	A320	1	0	0.25	1	0.625	0	C
Blue Air	B737-800	1.3	0	0.2	1	0.6	0	C
Cruise Flights	B757-300	0.8	0	0.25	1	0.625	0	D
Ryanair	B737-800	21.9	0	0.5	1	0.75	0	C
Total Freight		**42.9**	**7.1**				**9.1**	
Total		**71.9**	**7.1**				**9.1**	

APPENDIX E: INDICATIVE STAND ALLOCATION OF RSP/AZIMUTH AIRCRAFT MOVEMENT PROECTIONS BASED ON A RATIONAL TIMETABLE OF OPERATIONS

STAND ALLOCATION CHART FOR RSP FORECAST SCHEDULE BASED ON RATIONAL DAY NIGHT SPLIT

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AMAZON - 77X
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CLX - 748
IRA - 77X
DHL - 332
IRA - 77X
Russian Airlines (ABW)
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Cargolux (CLX)
FedEx or DHL etc (DHL)
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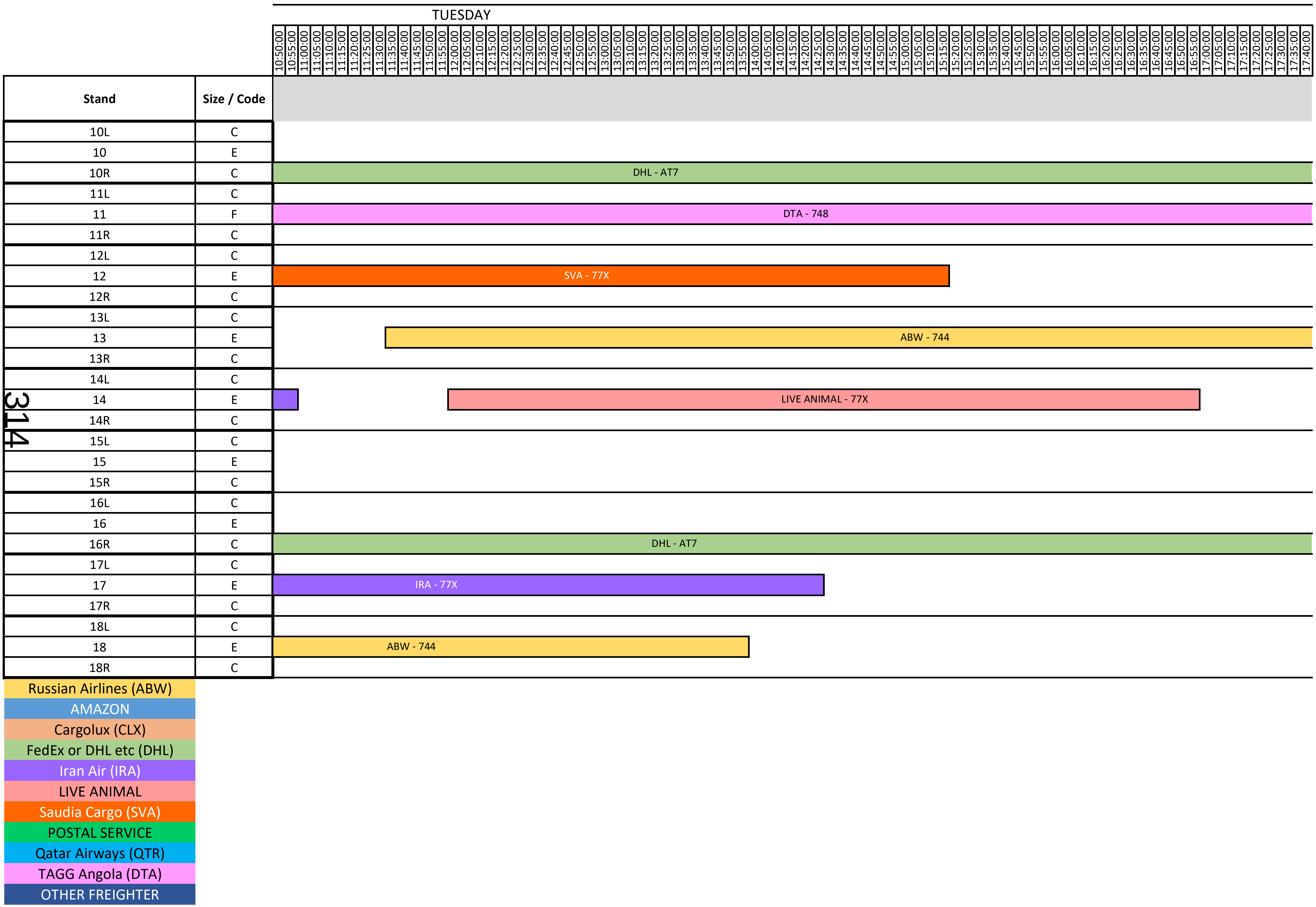
Saudia Cargo (SVA)
POSTAL SERVICE
Qatar Airways (QTR)
TAGG Angola (DTA)
OTHER FREIGHTER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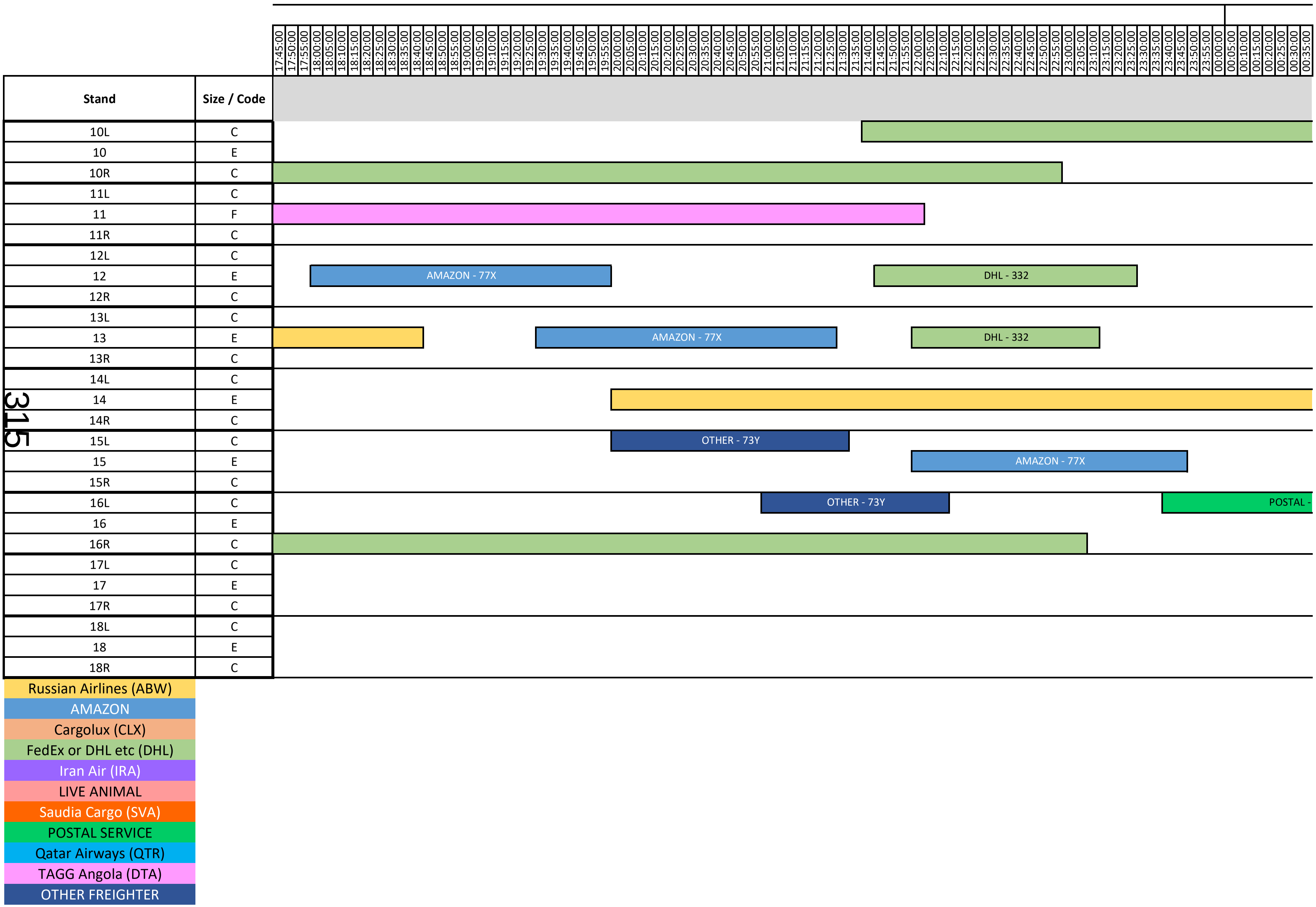
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Stand	Size / Code	
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11R	C	
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12R	C	
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14L	C	
14	E	ABW - 744 (DEPARTS 18:45 WEDS)
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Russian Airlines (ABW)
AMAZON
Cargolux (CLX)
FedEx or DHL etc (DHL)
Iran Air (IRA)
LIVE ANIMAL
Saudia Cargo (SVA)
POSTAL SERVICE
Qatar Airways (QTR)
TAGG Angola (DTA)
OTHER FREIGHTER

York Aviation

Manston Airport

Supplementary Submission following Hearings into Compulsory Acquisition and Need held on 20th and 21st March 2019

1. This note expands on points made on behalf of SHP during the Hearings held on 20th and 21st March 2019 in the light of the very limited time afforded to SHP to present its case and test the case made on behalf of the Applicant. This note provides further evidence to assist the Examining Authority in considering the Need case presented by RSP and whether there is a compelling case in the public interest. This submission should be read alongside the Summary of Oral Evidence submitted by SHP.

Correct Interpretation of YAL's work for TfL and the FTA

2. In their comments on Written Representations (Deadline 4) and at the Need Hearing, RSP persisted in relying heavily on quotations from our work in 2013 and 2015 for TfL and for TfL and the FTA respectively. This is despite being told repeatedly that, when read in their entirety, neither of these two notes/reports supported the interpretation being made of them by RSP and its advisers in relation to the asserted need for a freight focussed airport in the South East of England.

3. At the outset, we would reiterate that we do not resile from either of these pieces of work and, as stated to RSP in 2016, the report for TfL and the FTA is in the public domain and, therefore, could be cited by them. The same is not true of the note for TfL, which was an initial informal briefing note intended for the client's internal use only. We have made clear to RSP since 2017 (see correspondence submitted as Appendix B to our comments on RSP's Responses to the ExA's first set of questions) that their interpretation of these two notes/reports was in error. We understand that TfL and the FTA similarly confirmed that the 2015 Report was in the public domain and that they had relied on the contents of the report in submissions to the Airports Commission and Government. However, it is our understanding that neither body has expressed any direct view on the use made by RSP of the note and report, contrary to the inference made by RSP at 4.18.3 of its commentary on Written Representations. RSP did not check directly with us whether its interpretation of our work was correct nor has it addressed the criticisms made of its interpretation in both our 2017 and 2019 reports.

4. To summarise the meaning of these documents:

TfL Note

5. This was an informal briefing note prepared by York Aviation for TfL relatively early in the process of the Airports Commission's work. It considered three scenarios, Max Use (i.e. no additional runway capacity at any of the London airports), 2x2x2 (i.e. additional runways at Gatwick and Stansted) or a New 4 Runway Hub (with the closure of Heathrow). It did not consider the Government's adopted strategy of the development of a new runway at Heathrow.

6. It is important to note that the market was considered in the first instance in terms of tonnage capacity expected to provided in the bellyhold of passenger aircraft as the primary requirement, with the need for additional capacity for air freight being expressed as a residual. The reference in the note to 14,000 freighter movements that might still use an airport, such as Manston, in the vicinity of London in the 'Max Use' case was a reference to the then existing 14,000 freighter movements operated at the London airports, which might need to be displaced by 2050 if no additional capacity was provided at any of the main London airports. To reiterate comments made in our 2017 and 2019 Reports, Manston was only referenced on the basis that it was, at the time, an airport handling a number of freighter movements and the context of the 'Max Use' scenario only, i.e. a heavily constrained case.

7. Table 4 presents the potential excess cargo tonnage, after considering bellyhold capacity, as 'freighter tonnage required' and converts this to an indicative number of freighters so as to consider whether, prima facie, there would be runway capacity available to accommodate additional freighter movements under each of the scenarios, to the extent there was any shortage of bellyhold capacity by 2050. Para. 24 makes clear that the only in the case of no new capacity being provided (Max Use) would there be an effective shortfall in capacity:

   "We estimate that the number of freighters required to accommodate projected air freight demand would rise from 14,000 in 2012 to around 41,000 in the New Hub case, 47,000 in the 2+2+2 case and 68,000 in the Max Use case. In both the New Hub case and 2+2+2 case, we estimate there will be sufficient runway capacity available to accommodate these movements at 2050, at the New Hub and/or Stansted respectively."

8. It is important to note that the number of international passenger ATMs expected to be provided with a 3rd runway at Heathrow lies between the 2x2x2 and New 4 Runway Hub cases. Given increasing tonnage capacities on new generation passenger aircraft coupled with an emphasis on maximising global connectivity from the new capacity at Heathrow, as set out in the Airports NPS paras 3.18 and 3.19, this means that the bellyhold capability from the new runway at Heathrow is likely to exceed that which we assumed in the case of the two expansion scenarios considered in our 2013 note. The effect of this will be to reduce further any residual element of air freight capacity required over and above bellyhold capacity to be provided. Furthermore, in the circumstances of a 3rd runway at Heathrow and in the light of the available capacity at Stansted (see below), we expect any required freighter movements to continue to operate from the existing airports.

9. Importantly, the note then goes no to explain how any shortfall in capacity would be met, noting in the first instance the clear opportunity for more freight to be handled at the main regional airports such as Manchester and Birmingham alongside East Midlands, citing in particular the benefits of reducing the amount of freight trucked from the regions for carriage from Heathrow (para. 26 of the note). Only in the case of no additional capacity being provided (Max Use) was it considered likely that more freight would need to be trucked to Europe. It is evident, nonetheless, that our note considered that the consequence of any constraint on capacity at the main London airports would be more trucking of freight to find cost efficient bellyhold capacity elsewhere rather than identifying a need for a dedicated freighter airport.

10. The note concludes, at para 29, that *"In the latter two cases, our assessment is that, across both bellyhold capacity and pure freighter activity, there would be sufficient capacity to meet expected demand for air freight to and from the UK"*, going on to conclude that "*The key difference between these two scenarios* (2x2x2 and New 4 Runway Hub) *would be in terms of the efficiencies and economies of scale gained by the industry arising from the concentration of freight activity at a single hub. In both cases, the overall volume of air freight to and from the UK is expected to be broadly the same, although the actual freight carried including transit freight would be higher in the hub case. However, under the new hub scenario, savings from greater efficiency may be passed onto users, so reducing shipping costs and facilitating trade leading to higher freight volumes"* (para. 30). These efficiency benefits will be delivered by facilitating further growth in cargo capacity at Heathrow with a 3rd runway exploiting the existing synergies of consolidation already present around Heathrow.

Report for TfL and the FTA

11. Our work for TfL and the FTA in 2015 adopted the same approach but was based on updated information from the Airports Commission as well as an updated assessment of the underlying growth of the air cargo market as a whole. Again, the excess tonnage expected at 2050 under each of the capacity scenarios under consideration by the Airports Commission was set out. This was again presented in terms of freighter movement equivalents on Page 19.

12. It is significant that the estimated cargo capability at Heathrow assumed in 2050 was 2.6 million tonnes a year with a third runway whereas, given increased bellyhold capacities on newer generation aircraft, the estimated tonnage capacity at Heathrow is now expected to exceed 3 million tonnes a year. This alone wipes out any excess demand that would need to be accommodated in dedicated freighter aircraft.

13. In any event, it is made clear that the actual requirement for dedicated freighter aircraft is limited and, over and above existing operations, a residual to the extent that bellyhold capacity is insufficient:

"For the purposes of this analysis, we have assumed that freighter aircraft primarily act as a means to supplement bellyhold capacity where insufficient bellyhold capacity is available. This is simplification as there are items that cannot be transported on passenger aircraft or for which freighter transport is preferable and destinations that are not served by passenger aircraft. Consequently, we have further assumed that a residual number of freighter movements will still be accommodated in London in capacity constrained scenarios at 2050, i.e. all scenarios other than the 4 Runway Hub" (Page 20).

14. We then go on, on Pages 22ff titled *"How will the Freight Industry React"*, to explain how the excess tonnage would be accommodated in practice, i.e. not through additional movements by dedicated freight aircraft:

"The options in relation to the excess demand that cannot be satisfied within the London system are subtly different. Again, some companies may simply choose to step back from the London market, either withdrawing or choosing not to seek to expand with demand. This may be particularly true for major global companies with the ability to shift the emphasis of their activity. However, this will ultimately leave unsatisfied demand in and around London and potentially market space for others to step in and seek to serve the market via a different business model. This is most likely to involve trucking freight from London to other airports either in the UK or on the continent that have the necessary capacity and/or long haul passenger networks to support the required levels of demand. This will, however, come at a cost in terms of both additional trucking costs and a loss of utility to users as these avenues will need more time to ship freight, which in an industry where speed is an essential feature is clearly potentially damaging. Again, there is also the potential for increased service failures and delays via this route."

15. We go on to set out a Gravity Model to examine how any excess demand would be expected to be handled (Appendix C to our comments on RSP's Written Answers) and the cost and time implications of the need for additional trucking. However, to the extent that air freight from the regions simply reverts to using available capacity in the regions, these costs will have been overstated and cost/time to shippers in this case could actually be reduced. Ultimately, any loss of utility/consumer benefit arising from increased costs/time for shippers has to be set against the increased costs implied by the use of more expensive dedicated freighter aircraft and the costs of establishing and operating an airport capable of handling such aircraft. Given our understanding of the cost of trucking compared to the costs involved in the operation of dedicated freighter aircraft, we would expect trucking to remain the most economically beneficial solution. Furthermore, when the increased bellyhold tonnage now expected to be available at Heathrow is taken into account, the issue simply disappears.

16. As made clear during the Hearing on Need, the demand and capacity assessments set out in Section 3 of our 2017 Report and Section 4 of our 2019 Report are an updating of the analysis carried out in 2015 for TfL and the FTA using the most up to date data. Hence, this analysis reflects the correct interpretation of our earlier work in the context of the current market situation and known airport plans for capacity expansion.

17. Correctly interpreted, our previous work explains how, to the extent that any shortfall in capacity exists, the need is likely to be met, i.e. through use of bellyhold capacity at regional airports and, to some degree, an increase in trucking to European hubs to avail of cost effective consolidation of freight loads to a wide range of global destinations. Operation of dedicated freighters on a limited range of routes would simply not provide a viable option for any freight displaced from Heathrow.

Role of Trucking

18. During the Hearing, the Applicant cited unevidenced figures for the number of cross-Channel trucks carrying airfreight. The Applicant also noted that a high proportion of these operated on airline flight numbers. It is important to note that such movements are part of the system of whereby airlines truck freight to and from their hubs to connect to bellyhold operations. By way of example, on 27th March 2019, the Official Airline Guide database (OAG) records a total of 635 truck movements on airline flight numbers to and from airports in the UK (evidence can be provided if required). Of these, 215 truck movements were scheduled from Heathrow, of which 65% were to UK domestic airports suggesting strongly that the primary purpose was the distribution of bellyhold imports. 197 truck movements were scheduled into Heathrow, of which 51% were from UK domestic points for consolidation of goods for onward transport. It is notable that trucking from Europe into Heathrow figures more strongly than trucking from Heathrow, suggesting that the primary purpose is to feed goods into the Heathrow hub for onward transport in the bellyhold of passenger aircraft. Similarly, to/from the UK regions, there were 10 trucks scheduled outbound to Europe but 51 trucks scheduled inbound indicating again a focus on imports. Excluding international trucking to the Republic of Ireland, there are of the order of 180 trucks a day operated across the Channel on airline flight numbers. This equates to of the order of 63,000 trucks a year (assuming not all trucks operate on 365 days a year). These truck movements would not be divertable to Manston as they are strictly related to the cargo hub at Heathrow and equivalent hubs in Europe. We would expect a similar number of truck movements connected with integrator operations also related to their patterns of hub and spoke operations but data is not systematically available.

19. Ultimately, the reason that trucking is common place within the general and integrator sectors relates to the price of aviation fuel, which changed the economic paradigm in terms of the optimum balance between use of dedicated freighters and trucking for part of the journey combined with the use of more economic bellyhold capacity. Since 2000, the price of aviation fuel has risen by 123% (https://www.spglobal.com/platts/en/oil/refined-products/jetfuel). This has impacted on the decision as to the balance between time and cost for shippers. This increase in the cost of air freight, and dedicated freighter operations in particular, is the primary reason why consideration of air freight trends prior to 2000 (which Northpoint seek to do (para. 8) in their report submitted at Deadline 4) is no longer relevant and slowdown in growth in air freight tonnage reflects a shift in the balance towards trucking and even towards shipping for some goods that might previously have used aviation. This is relevant to consideration of the appropriate rates of market growth to assume, as we discuss later in this note.

20. Understanding the economic drivers for shippers and the relationship to consolidation of loads at hub airports for bellyhold and general air cargo, and the hub network structures of the integrators, is vital to assessing the extent to which Manston could plausibly intercept or 'clawback' any part of the air freight currently being trucked across the Channel. In our assessment, the economics of dedicated freighter operations compared to the relative cost of trucking makes the interception of anything other than a small number of special loads highly unlikely. As Mr Cain said in oral evidence, shippers will trade off time and cost but as costs have risen, the balance has shifted and this, in large part, explains why bellyhold capacity is now clearly favoured for the majority of commodities. This would include fresh fish as cited by Dr Dixon in oral evidence (see Case Study on Page 16 of the Steer Report for Airlines UK referred to in our comments on the Applicant's responses to question ND.1.17 (http://airlinesuk.org/wp-content/uploads/2018/10/Assessment-of-the-value-of-air-freight-services-to-the-UK-economy-Final-Report-v22-Oct-2018-b-SENT.pdf). The global change in the price of aviation fuel is a key reason why bellyhold capacity is preferred and why use of dedicated freighters is declining in relative terms, particularly where there is good availability of bellyhold capacity, as is the case in the UK.

21. Furthermore, in the highly unlikely event that some airlines engaged in trucking of freight between hubs considered the use of Manston for dedicated freighter movements as a viable alternative option, this would imply a totally different fleet mix to that assessed in the ES (Appendix 3.3). We discuss issues related to the fleet mix further below.

The Validity of Azimuth's 'Forecasts'

22. In oral evidence, Dr Dixon conceded that the Azimuth Report, which she prepared, was not really a forecast of what would happen but an assessment of the 'potential' need for a dedicated freight airport in the South East of England. She confirmed that she had taken no account of the viability of operating the services for the airlines or the viability of the operation of the Airport (despite the Azimuth Report being referenced as setting out the viability of and the Business Plan for the development in the ES, Planning Statement and Statement of Reasons - see para 2.5 of York Aviation 2019 Report).

23. At para. 2.2.10 of Vol III of the Azimuth Report, a number of key considerations are set out which would impact on the decisions of airlines as to whether to use Manston:

- *"The cost of physical relocation*
- *Cancellation of long-term contracts*
- *Loss of economies of scale, although if an entire operation is switched, economies of scale would be gained at the new airport*
- *Market effects such as marketing new routes and a potential loss of custom in the early years following the switch*
- *Network effects lost by switching to a smaller airport*
- *Capacity constraints at other airports, particularly in slot allocations*
- *Sunk costs such as an airline's investment in the airport from which they are switching"*

24. Although the report claims that these factors have been taken into account in the 'forecasts', it is now clear from answers given in oral evidence that this was not the case and that Dr Dixon simply assumed that the costs would be "*neutral*". We take this to mean that her underpinning assumption was that the costs for an airline of operating from Manston would be the same as from other airports and/or that the costs to shippers for a tonne of air cargo would be the same to/from Manston as from alternatives, including bellyhold options. Without proper consideration of switching costs, the charges to be levied at Manston and the relative price of dedicated freighter operations v. bellyhold for the shipper, the so-called 'forecasts' can have no validity as they do not reflect market realities.

25. Furthermore, as pointed out in our comments on the Written Answer to question FD.1.15, whilst it is claimed that RSP's Business Model is based on being able to offer airport users competitive terms, this is clearly not the case. As we know from the Business Model spreadsheet submitted at Deadline 3, the Applicant plans to charge airlines around four times the equivalent cost at East Midlands Airport and without any countervailing incentives (see separate papers prepared by Altitude Aviation Advisory). Hence, it is clear that, leaving aside its other manifest shortcomings, the Azimuth Report has not assessed the actual position proposed by RSP of charging a significant premium over other airports for dedicated freighter operations, which are already significantly more expensive than bellyhold alternatives.

26. The consequence of this is that on any reasonable assessment of the costs of using Manston and the costs to the shipper of using dedicated freighter aircraft, when coupled with the costs of switching and other costs identified by Azimuth, the share of the market that Manston might hope to attract will be severely reduced below the 'neutral' assessment made by Azimuth. We have set out our view of the maximum potential in Section 4 of our 2019 Report. At the price RSP propose to charge, demand would be significantly lower and the revenues that they assume within the Business Model not attainable. We have already set out in Section 7 of our 2019 Report, the more likely financial position at competitive airport charges and, even then, this was based on the full Azimuth 'forecast' being attained, which is unlikely for the other reasons cited above. Either way, proper analysis strongly suggests that there is no prospect of the proposed investment in the development of a dedicated freight airport at Manston being viable even on the basis of the latest estimate of upfront construction costs, which we now understand from the oral evidence of George Yerrall are likely to be underestimated at this point in time.

27. Put simply, the oral evidence given by Azimuth Associates confirmed that the Report upon which the entirety of the Need Case for the development relies has no realistic foundation as a basis for predicting the extent to which Manston might actually be used.

Northpoint Report

28. The Northpoint Report submitted by the Applicant at Deadline 4 is a clear attempt by the Applicant to produce a post event corroboration of the Azimuth forecasts that are used to underpin the entirely of their case for the development. This attempt at a putting a 'sticking plaster' over the flaws in the Azimuth must also be dismissed as it self-confessedly has not yet taken into account the key variables which should inform a robust prediction of the actual potential usage of Manston as set out at para. 67 of the Report, namely the model (it):

- *"it does not use differential rates for bellyhold, express and ordinary freight ‐ although the analysis is a level of aggregation where this is not a fundamental determining issue;*
- *it does not examine aircraft movements ‐ we regard this primarily a function of tonnage volumes and airport location and runway length*
- *it does not look at the scope for migrating between type of carrier (e.g. bellyhold to freighter) and therefore between airports pairs; and*
- *it does not examine the impact of price because it is primarily interested in the issue of capacity."*

29. These factors are precisely the reasons why Manston would struggle to penetrate the market to any material extent. It is stated at para. 68. that these factors are taken into account in a more detailed model that is being developed/used to inform the funding process. However, this more detailed model has not been provided to the Examination and would need to be carefully scrutinised once produced.

30. As already pointed out, the thesis underpinning the Northpoint Report that somehow considering the performance of the airfreight market over the last decade is not relevant and that trends from the 1990s need to be included is exposed as flawed when the effect of fuel price rises since 2000 is taken into account.

31. Nor are the benchmark comparisons in terms of cargo tonnage growth set out at para 10, particularly persuasive. The only airport where there appears to be a major jump in tonnage compared to the UK as a whole is Paris and (as set out on page 21 of the Steer 2018 Report for AirlinesUK) data for Paris before 2014 was measured differently so the jump in tonnage shown is not a real jump but the result of changes in data collection. This would have to be corrected for if any comparisons are to be made. The outperformance at Frankfurt is more down to the consolidation in the sector and the use of Germany and the Low Countries as distribution hubs for Europe. However, since 2000, the performance of Frankfurt is not significantly different from the performance at the total UK level and, in any event, a shift from Heathrow to the regions is no bad thing in the context of the proportion of freight with regional origins that has historically been trucked to London. All in all, this pattern is simply reflective of the market working to reduce unnecessary road journeys within the UK.

32. We have already referred in our comments on the Applicant's Written Answers (ND.1.18, ND.1.13, ND.1.18, ND.1.20) on the capacities available at the other airports and will comment further below on specific points made by the Applicant in oral evidence regarding Stansted. Suffice it to say that Northpoint continue to understate the tonnage capabilities of these other airports in paras. 16 to 32.

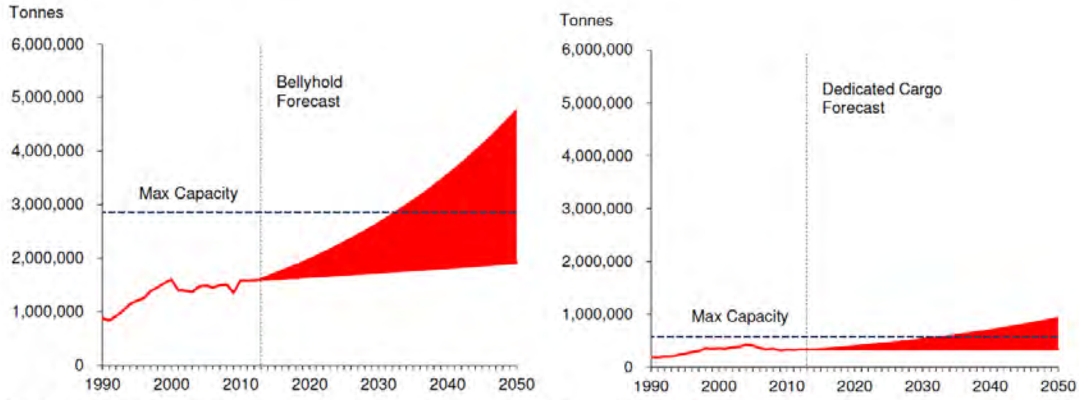
33. In terms of overall freight tonnage to and from the UK, notwithstanding our comments about the inherent invalidity of considering trends back to 1990, the actual freight tonnages projected for the UK and for the South East by Northpoint are not substantially different at 2040 from our own GDP based estimates (see Figures 4.7 and 4.8 of our 2019 Report) as far as the base case of 2.35% per annum growth is concerned (Table above para. 63). However, there is no foundation for the use of any higher underlying rate of growth in cargo tonnage.

34. The work used by Northpoint to corroborate its analysis is work carried out by Ramboll and Oxford Economics in 2014 (http://content.tfl.gov.uk/impacts-of-a-new-hub-airport-on-air-freight-industry.pdf). We note that the quotations from this work by Northpoint are selective and use graphs relating to the UK and London inconsistently. When read properly, this report explains precisely why fewer dedicated freighters are needed at London due to bellyhold capacity. This report also explains why the growth rate in cargo tonnage flown has slowed from the long term trend. Northpoint use Figures 3.7 and 3.8 from this report relating to the expected growth across the UK as a whole when the relevant ones for the South East are Figures 3.5 and 3.6, reproduced overleaf. The charts used by Northpoint illustrate the greater need for dedicated freighters in the rest of the UK on the basis of limited bellyhold growth other than at the London hub. The correct charts for the London airports show very limited need for dedicated freighter operations given bellyhold capacity expected to be available.

35. This report goes onto predict the extent of any shortage of freighter ATMS at the lower and upper bounds of the forecasts against DfT's capacity constrained forecasts. It shows that the maximum shortage of dedicated freighter capacity at 2040 is 4,000 movements (Table 4.3 reproduced overleaf) on the upper bound forecast. The big shortfall is in bellyhold ATMs. At the lower bound cargo forecast, there is no shortfall and spare capacity for 2,000 dedicated freighter movements (Table 4.2). This analysis confirms our assessment of the position, i.e. that there is limited, if any, need for additional capacity for dedicated freighter ATMs, even viewed from the position as at 2014.

There is a marked difference in the range of growth of dedicated cargo for London Area Airports, as compared to the UK-wide growth rate. This is likely due to the high number of passenger flights originating in London compared to the rest of the UK, which allows for more bellyhold cargo growth as opposed to dedicated cargo growth. As mentioned in Section 2.2, one of the reasons for the much slower growth rate of cargo after 2000 is likely the steep rise in the price of aviation fuel. The fan charts below (charts 3.5 to 3.8) show the range of Oxford Economics trend forecasts for the UK and London area airports[25]. The upper range of the forecast implies that after 2033, the higher range of cargo growth forecasts cannot even be met with a new hub airport. Therefore, the Oxford Economics upper bound forecast has been capped at the line shown in the charts at the capacity that can be built.

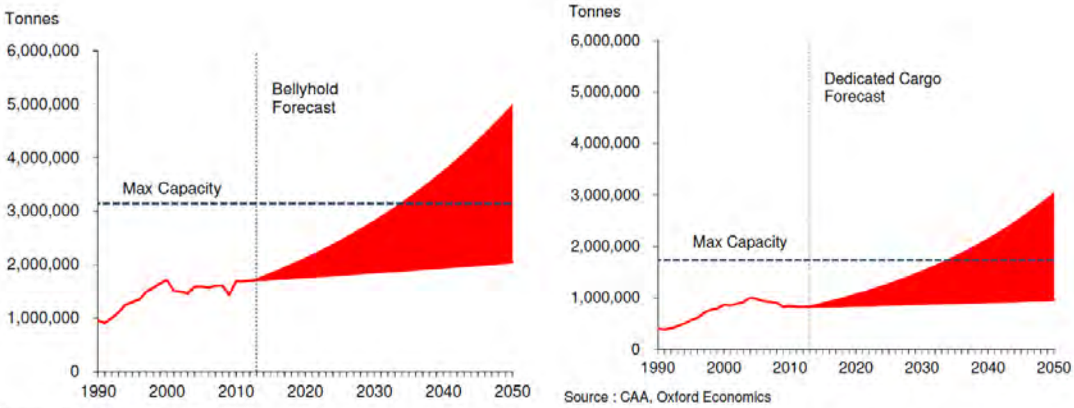
Charts 3.5 and 3.6: Actual and Forecast London Trend Bellyhold and Dedicated Freight Growth from 1990-2050



Source : CAA, Oxford Economics

Source : CAA, Oxford Economics

Charts 3.7 and 3.8: Actual and Forecast UK Trend Bellyhold and Dedicated Freight Growth from 1990-2050



Source : CAA, Oxford Economics

Source : CAA, Oxford Economics

[25] Note that the Upper Bound ATM forecast has been capped from 2030 in order to match the ATM supply that could be delivered, using Atkins data.

Table 4.2: Predicted Annual Volumes of Constrained Air Cargo Using OE Lower Bound Trend Forecasts

Year	LAA Constrained Cargo (Thousand ATMs)	Belly Hold Cargo (000 ATMs)	Dedicated Cargo (000 ATMs)	Belly Hold Cargo (Kgs)	Dedicated Cargo (Kgs)
2020	-123	-122	-2	-199,007,217	-41,551,049
2030	-220	-217	-3	-354,390,025	-72,674,570
2040	-174	-172	-2	-281,370,352	-56,671,816
2050	-111	-110	-1	-179,940,132	-35,596,283

Source: DfT, Oxford Economics.

Table 4.3: Predicted Annual Volumes and Value of Constrained Air Cargo Using OE Upper Bound Trend Forecasts

Year	LAA Constrained Cargo (000 ATMs)	Belly Hold Cargo (000 ATMs)	Dedicated Cargo (000 ATMs)	Belly Hold Cargo (Kgs)	Dedicated Cargo (Kgs)	Projected Cargo Value (£/kg)	Belly Hold Cargo Value (£ m)	Dedicated Cargo Value (£m)	Total Cargo Value (£m)
2020	96	95	1	154,672,622	32,294,355	£110	£16,970	£3,543	£20,513
2030	70	69	1	112,960,704	23,164,790	£148	£16,679	£3,420	£20,099
2040	295	291	4	476,166,397	95,906,389	£199	£94,620	£19,058	£113,678
2050	522	515	7	842,454,190	166,656,750	£267	£225,297	£44,569	£269,866

Source: DfT, Oxford Economics.

36. The Northpoint Report then presents a simple spreadsheet model showing the tonnages that Manston might attain under a number of different scenarios. These scenarios are driven by:

- Different growth rate assumptions
- Different assumed capacities at the other airports
- Different assumptions about Manston's ability to clawback an element of the tonnage being trucked across the Channel

No probability is assigned to the achievability of any of these underpinning assumptions and results are simply presented in terms of whether the outcomes are higher or lower than Azimuth's forecasts. We would note that this is a tonnage spill model and does not, as pointed out above, consider how this tonnage would then travel. It is just assumed that in all cases it would choose a dedicated freighter service from Manston regardless of cost.

37. First of all, accepting at face value Northpoint's assertion that import/export tonnage leaked to European airports would amount to 1 million tonnes a year by 2050, the assumed claw back of this leakage is 25% in the base case (almost 20% in the first year of opening 2022 based on current leakage of 500,000 tonnes), 40% in the high case and 60% in the stepped up clawback case. For the reasons set out in paras. 18 to 20 above, this is patently absurd given the reasons for the trucking activity in the first place.

38. If you strip out the assumed clawback, 17 of the 24 Northpoint scenarios show negative demand for Manston at 2040 (with demand significantly less than Azimuth project in earlier years). The only remaining scenarios in which there would be any demand for Manston are those relying on unrealistically high market growth rates in cargo tonnage deriving from the analysis back to 1990 of 2.7% CAGR[1] and 3.0% CAGR and then only in the circumstances where the capacities attainable at the other airports have been understated in aggregate. Overall, the model provides no corroboration of there being material demand for Manston as a dedicated air freight airport. Rather the analysis contained in the report tends to confirm the reasons why the Airport could not succeed.

Night Flying and the Integrators

39. We set out in our commentary on RSP's Written Answers to Questions evidence as to the dependence of conventional integrators on night flights. Hence, leaving aside the locational reasons why Manston would not be a suitable base for an integrator, the proposed night scheduling ban effectively removes any prospect of such operations, a point effectively conceded by the Applicant when it says that an integrator base is not proposed for Manston (Written Answer to ND.1.16).

40. We are now asked to believe that the Azimuth did not mean conventional integrator operations when including them in the 'forecast' as set out at para. 3.2.3 of Vol III of the Azimuth Report, despite DHL/Fedex being specifically identified as the operators of these flights at Appendix 3.3. of the ES, which we were told in oral evidence was based on the Azimuth projections. We are now asked to believe that what was meant was a new form of integrator – Amazon or Alibaba- Cainiao - operating these flights. This is despite Amazon being separately identified in Appendix 3.3. of the ES in addition to the conventional integrator operations.

[1] Compound annual growth rate.

41. The Northpoint Report is used by RSP in an attempt to support this change of emphasis to 'New' integrators and the e-commerce model as the basis of justification for 48% of the aircraft movements claimed for Manston at Year 20 (more in the earlier years). This is no more than speculation as the extent to which the e-commerce operators will seek to operate their own aircraft within the European market and the nature of those operations is largely unknown. We set out below our understanding of the current operations.

Amazon

42. Amazon has set up its own airline operating within the USA so as to control its own supply chain rather than relying on the existing integrators. In essence, it is developing its own sorting facilities and replicating the type of hub and spoke systems used by the existing integrators. It is operating its own aircraft largely for the purpose of distributing goods between its main distribution centres, with onward transport to the customer locally by road (https://aircargoworld.com/allposts/amazon-to-move-prime-air-cargo-hub-to-cincinnati/). It is our understanding that the pattern of flying in terms of day/night operations follows closely that of a conventional integrator, positioning product between distribution centres overnight so as to be ready for delivery next day.

43. Amazon has an embryonic operation in the UK with a leased Boeing 737 freighter operating to East Midlands Airport (https://www.ch-aviation.com/portal/news/63035-amazon-air-boosts-fleet-to-32-b767s-eyes-more). Amazon is opening a 500,000 sq.ft. warehouse and sorting centre immediately adjacent to East Midlands Airport in April 2019 (https://www.leicestermercury.co.uk/news/business/east-midlands-gateway-amazon-nestle-1444182). This would strongly suggest that Amazon is likely to follow the lead of DHL and UPS and establish East Midlands as its UK air hub. Indeed, the two flights currently operated to Milan and Madrid appear to be joint operations with DHL. Like many DHL operations, these rely in part on night flights (based on Flight Radar data), with the departure to Milan at 06.00 and the arrival from Madrid at 02.40. This reinforces our view that, as operations to the UK expand, they would be expected to follow a similar pattern over the day as the conventional integrator operations at East Midlands.

Alibaba-Cainiao

44. Alibaba has committed to establishing its main European hub at Liege Airport (https://www.retaildetail.eu/en/news/general/li%C3%A8ge-officially-becomes-alibabas-first-european-hub). It is not yet clear whether it intends to commence direct operations or to contract with existing airlines at the Airport such as ASL Airlines, which operates for TNT/Fedex with its major hub at Liege and also provides the current Amazon service from East Midlands. Again, it seems most likely that any Alibaba operation in Europe will also mirror pre-existing patterns of integrator operation, using its main base as Liege, for the same reason as Amazon.

45. Overall, we see no reason to assume that the choice of airports for the 'new' integrators would be based on different criteria to the existing integrators nor that they would be any less dependent on night operations. Hence, given the proposed night scheduling ban, the establishment of a 'New' integrator base at Manston with 2 aircraft in Year 2 and 4 aircraft in Year 4 is simply not credible.

Consequences for the Environmental Assessment

46. Mr Hilton of Wood stated in oral evidence that environmental assessment relied on Appendix 3.3 of the ES and that it was derived based on the Azimuth 'forecasts'. However, as we have pointed out in Table 3.1 of our 2019 Report, there are inconsistencies in the proportions of aircraft in each ICAO category between Appendix 3.3 and other parts of the ES, and between the ES and the Azimuth Report. Dr Dixon said she was not responsible for producing Appendix 3.3 and Mr Hilton did not seem to know who was responsible either.

47. In the context that the information in Appendix 3.3 is claimed to be the basis upon which all of the environmental assessments have been carried out, it is important to note that Mr Hilton told the hearing that the assessments were based not only on the aircraft types named in Appendix 3.3 but also on the specific aircraft and engine types operated by the named airlines. Hence, to the extent that these airlines would not or could not operate to Manston (see para 3.10 of our 2019 Report), particularly once the impact of the night scheduling ban is taken into account, this invalidates the specific environmental assessments made. The particular example referred to in oral evidence is the assumption that the ATR-72 turbo-prop aircraft would account for around 25% of all freighter aircraft movements, specifically operating for DHL or Fedex. The 'New' integrator, Amazon, is currently using Boeing B737 jet aircraft for its European operations so, even if it was right that DHL or Fedex would be substituted by Amazon or similar, it could not be relied on that these airlines would use so many turbo-prop aircraft. This means that the ES can no longer be deemed to have assessed the worst or most likely case effects, even if that was ever the case.

48. Appendix 3.3 does not include any General Aviation movements, yet the Noise Mitigation Plan suggests that there could be up to 38,000 such movements a year or 104 a day on average. Elsewhere (para. 12.7.39), the ES states that 16 such movements a day have been included in the assessment. This is clearly inconsistent with the worst case for noise that would be permitted under the Noise Mitigation Plan.

49. As pointed out at the Noise Hearing, a further consequence of the night scheduling ban is to condense all of the aircraft operations into the day-time period. The response given by Mr Hilton that movements that were otherwise assumed to operate in the night (14% of total movements) would simply switch to the 06.00-07.00 hour, and so still be within the 8-hour night noise assessment period, lacks credibility. Faced with a night scheduling ban, the airlines would need to reprogramme their operations in their entirety to fit within a curfew and, to the extent that hypothetically they would still operate to Manston, this would result in proportionately more movements in the 16-hour day period used for daytime noise assessment, resulting in an increase in contour area over that assessed and an increase in the areas eligible for compensation. The veracity of this can only be tested further when RSP produces the more detailed analysis of the profile of flights over the day related to the infrastructure requirements as promised at the Compulsory Acquisition Hearing.

50. We note also that the effect of the night scheduling ban will also impact on the data used in the Transport Assessment as set out in Appendix E to the TA. First of all, Table 1.1 shows freight related truck movements evenly distributed over the day. However, if, as we are now told, more than half of the movements at the Airport are going to be associated with a 'New' e-commerce integrator, it would be reasonable to expect that truck movements would be bunched around the arrival of these aircraft to ensure speed of delivery to the customer. On the basis of the suggested bunching of flights into the 06.00-07.00 hour, this would result in a significant number of trucks on the highway network in the 08.00-09.00 period to ensure deliveries of goods. Equally, for outbound flights before the night curfew, it would be expected that goods would need to be at the Airport 2-3 hours ahead of the last flight (23.00) so this too would require more movements in the day time. It would appear unlikely, therefore, that the TA has assessed the true impact on the highway network including in the morning and evening peak periods.

Policy Tests

51. It was suggested by RSP that there is an overriding policy presumption in favour of more capacity for air freight stemming from the priority placed in this within the Airports NPS and more recent Aviation 2050 Green Paper and that there was an automatic presumption in favour of all airports making best use of existing runways.

52. As stated in our comments on the Applicant's Written Answers (ND.1.2 and ND.1.4), the Government makes clear that the principal means envisaged to ensure that the UK has sufficient air freight capacity is through the provision of a 3rd runway at Heathrow delivering, mainly, more bellyhold capacity. Growth at Stansted and East Midlands in also anticipated. The Government does not go onto identify any further anticipated shortfall in capacity for air freight that needs to be addressed before 2050.

53. In terms of the 'Best Use' policy, it is clear, as we set out at paras. 2.16 and 2.17 of our 2019 Report, that there is no automatic presumption that best use should be made of all runways as policy is clear that each case has to be tested on its merits, including whether there is a demonstrable need and benefits from the proposed use sufficient to outweigh any environmental or other negative impacts. The lack of a coherent Need Case for Manston strongly suggests that there is no presumption in favour of making best or other use of the runway in this instance.

Capacity Available at Stansted

54. We set out the position in relation to the consented capacity at Stansted in our comments on the Applicant's Written Answer to ND.1.18. In oral evidence, there appeared to be some confusion regarding the attitude of MAG (the Airport's owners) to cargo growth there.

55. The Aviation Forecasts underpinning the recent Stansted Planning Application to lift the cap on passengers are set out in Volume 4 of the ES (https://publicaccess.uttlesford.gov.uk/online-applications/files/2C9A5D09B9434B571771AF326D87A423/pdf/UTT_18_0460_FUL-ES_VOLUME_1_-_CHAPTER_4_AVIATION_FORECAST-2634298.pdf). The cargo forecasts to 2028 are set out at para. 4.59. These show the anticipated tonnage to grow to 376,000 tonnes a year by 2028, not far short of our assumed capacity of 400,000 tonnes by 2040, suggesting that we may have understated the true capacity available at Stansted over the longer term. Indeed, the forecasts show slightly more cargo in the with development case than without development (Stansted Planning Statement, para. 6.28).

56. The Stansted Airport cargo forecasts assume 16,000 cargo ATMs a year and an increasing proportion of bellyhold capacity as long haul airlines, such as Emirates expand operations at the airport. We would expect the cargo capacity of Stansted to continue to increase beyond 2028 up to the envisaged capacity of 400,000 tonnes a year as more long haul services commence at the Airport, displacing more marginal short haul routes. The claims by RSP's experts that cargo capacity at Stansted is constrained is without foundation.

Capability of the Proposed Infrastructure

57. We now set out some observations on the capability of the existing and proposed infrastructure that we were prevented, by time constraints, from making at the Compulsory Acquisition hearing.

58. As Mr Rhodes of Quod for SHP made clear, the site has an established lawful use as an airport. Having examined the site in detail and spoken with those who previously managed operations on the ground, it is clear that the facilities, if reinstated, would have a capability of handling of the order of 21,000 freighter aircraft movements a year as set out in Section 4 of our 2017 Report. This assessment is consistent with the basis upon which RSP has calculated a theoretical capability of over 83,000 freighter aircraft movements a year from its proposed infrastructure.

59. Whilst the basis of this theoretical 'capability' assessment is set out by RSP in various documents, it has provided no explanation of how it has assessed that 19 freighter aircraft stands, all of the maximum Code E size, are required to handle the projected 17,170 annual freighter aircraft movements, which is equivalent to 23.5 freighter aircraft (half the number of aircraft movements) being handled each day on average, i.e. most stands would only be used once each day, suggesting an even heavier bunching of movements with consequential implications for vehicular traffic bunching on the highway network. Indeed, the concept that vehicle activity associated with air freight will be spread over the day, as set out in Appendix E to the TA, is inconsistent with the implied need for virtually all freighter aircraft to occupy stands simultaneously. Furthermore, many of the movements in the fleet mix assessed in the ES are shown to be using much smaller aircraft (such as the ATR72 turboprop) for which each Code E stand could easily accommodate two aircraft at a time, reducing the number of Code E stands required in total.

60. Overall, the proposed scale of infrastructure provision is completely inconsistent with claimed cost efficiency of the development (as required by the Airports NPS) nor likely to facilitate RSP being able to offer operators competitive terms as claimed by them, given the scale and cost of the infrastructure it proposes to provide and the consequent implications for the level of charges that it would have to levy to cover the costs of investment as set out in Section 7 of our 2019 Report. In effect, the Business Model spreadsheet corroborates the intention to charge at this level.

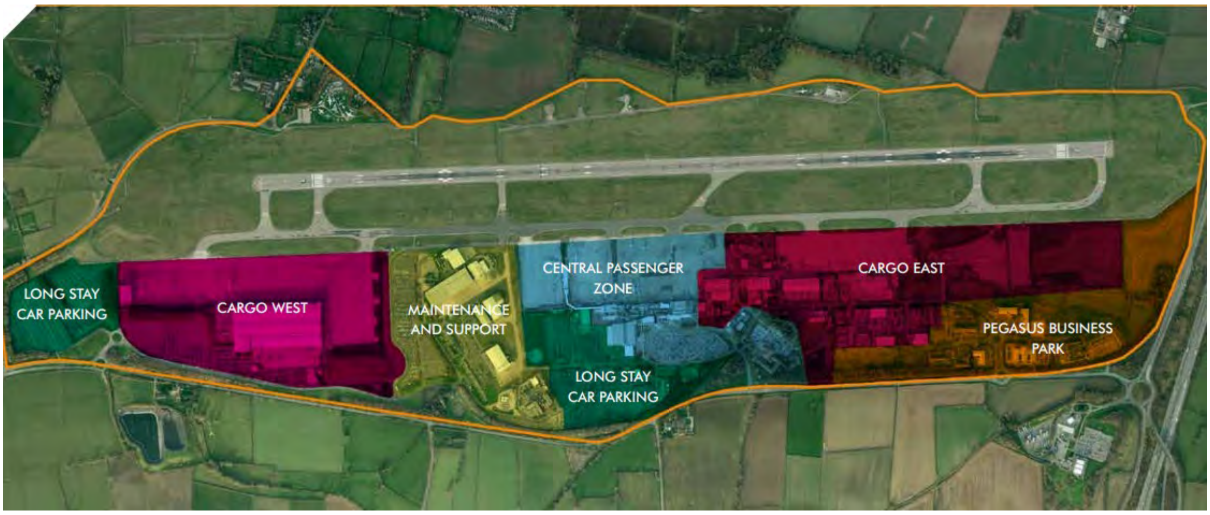
61. At the very least, the ExA needs to investigate further the requirement for the scale of infrastructure proposed to ensure that it is not excessive, particularly in relation to the compulsory acquisition of land. To assist, we have set out a detailed assessment, missing from the Applicant's documents, of the infrastructure required to support RSP's projected freighter airline operations at the times they would want to fly (which must necessarily include an allowance for night operations without which the airlines will be unlikely to operate or base aircraft so reducing the required infrastructure still further). Indeed, the concept that vehicle activity associated with air freight will be spread over the day, as set out in Appendix E to the TA, is inconsistent with the implied need for virtually all freighter aircraft to occupy stands simultaneously. We have explained the basis of our assumptions at paras 3.43 and 3.44 of our 2019 Update Report, with a fuller explanation of the infrastructure required at Section 6. This shows that, even allowing for resilience and flight delays using normal industry standards, the required infrastructure would be less than half of that proposed by RSP – 10 stands and 1/3 of the cargo sheds assuming efficient automated operations as stated by RSP - even if its projections of usage were attainable.

62. The scale of infrastructure proposed on the airfield is simply unjustified.

Airport Related Business Parks

63. There is then the matter of the Northern Grass. RSP's recent comments on the Written Representations suggest that is it confused itself as to its own proposals. The developable area of the Northern Grass, after allowing for the area around the radar and the museum zone is of the order of 83.5 acres, broadly equivalent to the area of the Pegasus Business Park at East Midlands Airport at 70 acres. The 26 acres referred to by RSP in its recent submission (para. 2.9.17) in response to SHP's Written Representation appears to be the footprint of the buildings proposed, which is not, of course, the same thing as the area available for development.

64. We recognise that MAGProperty cite 218 acres of business property space as being available at EMA (https://www.eastmidlandsairport.com/about-us/business/) as referred to in RSP's comments on Written Representations (para. 2.9.16). It is not entirely clear to us which areas are included within this 218 acres, which may include airside as well as landside development zones. Further information on the development zones at EMA was included in our comments on RSP's Written Answer ND.1.15, with its development plan included and reproduced below.



65. Key metrics for the overall plan are:

- *The entire airport covers an area of approximately 900 acres;*
- *Total area of development (coloured areas) approximately 460 acres;*
- *Much of the development area comprises passenger facilities, airside cargo facilities and passenger car parking*
- *Area designated as the landside 'Pegasus Business Park' (commercial development) totals 70 acres, of which 28 acres has been developed[2];*
- *60% of Orange hatched area has yet to be developed for any uses despite the tonnage throughput attained by EMA.*

66. This plan makes it evident that the total business development area cited for the EMA site is in no way equivalent to the Northern Grass with the more relevant direct comparison being with the 70 acres of landside 'Pegasus' business park at East Midlands and the proposed Manston Northern Grass development zone of 83.5 acres, at least on the basis of RSP's original proposals for B1/B8 development for businesses seeking an airport location as both of these zones are entirely landside areas with no direct airfield access.

67. However, the revised NSIP Justification Statement states that it is now intended that the uses on the Northern Grass be limited strictly to those which are 'airport related', presumably to be consistent with the 2006 Local Plan policy which requires the whole of the site, including the Northern Grass, to be used for airside uses. 'Airport related' is normally taken to be those uses required to directly support the operation of an airport, and this would exclude more general business park uses which would simply prefer a location on or adjacent to an airport that formed the basis for the Application. Such a general business park appears to be no longer what is proposed for Manston, particularly given the limitation to airport related uses now contained in the draft DCO, and, indeed, would not constitute Associated Development to the NSIP even if it was.

68. The list of 'airport related' facilities provided as part of the revised NSIP Justification comprises mainly operational facilities, such as crew report offices, offices for Border Force, airside transport offices which would need to be located with direct airside access, i.e. not on the Northern Grass as crossing Manston Road would be unacceptable (See Section 6 of our 2019 Report). Other uses proposed include facilities related to the ground transportation of passengers, which would not be compliant with the local plan policy. In any event, these facilities would be very small in scale using only a fraction of the site and not directly related to the NSIP facilities themselves so as to constitute Associated Development.

[2] This is developed area not building footprint.

69. The proposed restriction of uses to those strictly airport related is significant as the evidence from East Midlands (see our comments RSP's Written Answer to question CA.1.4) is that there is little or no requirement for landside airport related accommodation adjacent to the UK's main air freight hub and EMA is actively seeking to relax the usage constraint on such buildings to non-aviation related uses. Pegasus Business Park is, in practice, a general business park attracting businesses seeking a central location within the East Midlands, close to the M1. Even so, the full 70 acre site area has not yet been developed out, with currently only around 28 acres containing any buildings, car parks or road infrastructure at all.

70. In the absence of the promised (Deadline 3) benchmarking of land areas required for Associated Development, during the Compulsory Acquisition Hearing, the Applicant referenced other airport business parks with airport associated development. Two of those examples were Newquay Aerohub and Prestwick Aerospace Enterprise Zone. As is described below, neither of these examples supports the Applicant's case for the area of development land proposed for the Northern Grass area on the basis of airport related uses.

71. Newquay Airport Aerohub is an Enterprise Zone of that includes both airside development land (231 acres), a landside business park covering 87 acres of land and a further 45 acres of land defined as economic zones related, inter alia, to passenger terminal operations (https://www.aerohub.co.uk/our-offer/development-opportunity). In relation to the landside business park, which is the relevant comparison to the Northern Grass, *"53.5 acres are now serviced and build-ready"* amounting to 115,000 square metres of floor space, and is described by the EZ as being *"Open to businesses from all sectors"* with the caveat that they give priority to aerospace and aerospace supply chain companies (https://www.aerohub.co.uk/business-park/the-development). However, it understood that only 2 businesses currently occupy space within the landside development and that neither of them are 'airport related' businesses or even aero sector related, with one being a manufacturer or prefabricated houses. As the Aerohub was established in 2012, with business park plots serviced and available for development in 2015, it is clear there is very little demand currently for this type of development. There is also limited take up of the airside development area but this is not relevant to the Northern Grass comparison.

72. Prestwick Aerospace is another Enterprise Zone established in 2011 covering 34 acres which includes existing airside and landside developments (hangars, warehouses and offices) plus a number of as yet undeveloped plots. Most of the current occupants are aerospace sector companies, such as BAE Systems and Spirit Aerosystems, but these companies are not airport related nor making extensive use of the airport as parts and supplies are trucked in rather than needed access to the runway[3].

73. It would appear that the benchmark examples being relied on by RSP are general business parks that happen to be located on land holdings adjacent to operational airports. Even on this basis, the take up of these sites does not suggest that a general landside business park site of the scale of the Northern Grass could be justified.

74. Given the requirement for the development to be strictly related to the NSIP Project and with the restriction to strictly airport related uses, as defined in the Amended NSIP Justification Statement, the requirement for land for landside development is even more limited. Such uses as might locate on the Northern Grass are likely to be confined to passenger related car parking and surface transport related activities, which would occupy only a small part of the area at the throughput proposed.

27th March 2019

[3] York Aviation has done a number of studies in relation to Prestwick Airport for Scottish Enterprise and are familiar with the site but the reports remain commercially confidential.

York Aviation

Manston Airport NSIP

Comments on Applicant's Deadline 3 Responses to Questions from the Examining Authority

Introduction

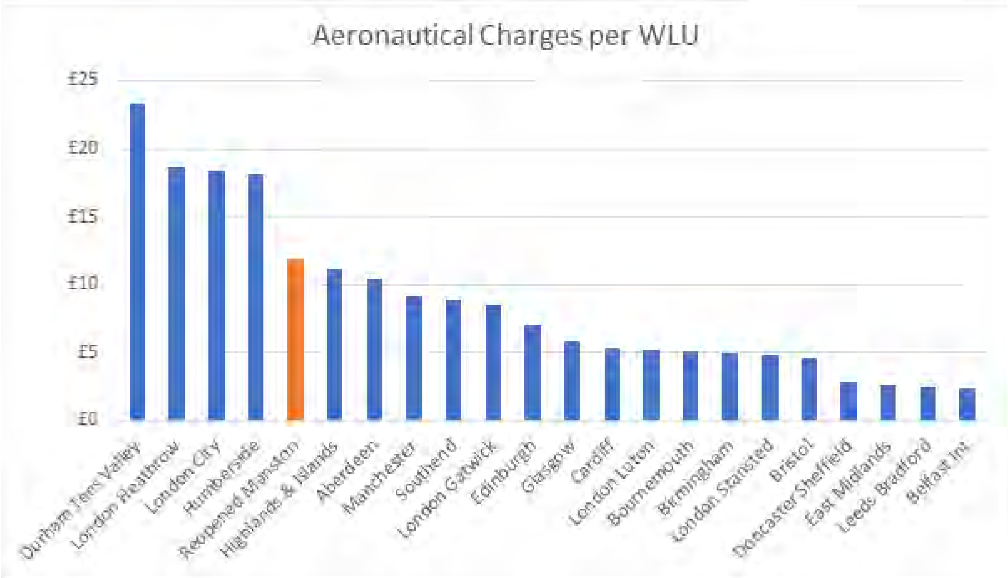
As with other submissions made by the Applicant, we note that the answers given are in places inconsistent and contradictory and this serves to undermine their credibility and to cast further doubt upon the overall robustness of the need case. Many of the responses simply repeat material already submitted and do not provide the further requested clarification nor, in some cases, respond to the question put.

We comment here on points of relevance to the need case and the forecasts of usage for the development that underpin the entire NSIP Justification, including the assessment of socio-economic impacts. We have referenced our answers to the ExA's question number but do not repeat in full the question and answer given. We cross refer as required to the York Aviation 2017 Report and the 2019 Update Report as required where points have already been addressed in our evidence. Where we have nothing to add to our previous analysis, we do not comment on the specific question and answer.

AQ.1.19	The question posed seeks justification for the assessed capability of the proposed cargo and passenger stands and questions whether the impacts of this level of usage have been assessed in the ES. It is clear that the claimed capability has not been assessed in the ES and the Applicant now proposes that there should be aircraft movement limits within the Noise Mitigation Plan. However, this would not be binding and could be varied by the Applicant when reviewed. The answer cross refers to calculations at OP.1.11, which provides no further insight into how the quantum of infrastructure has been justified. However, the more pertinent question is why, if this is the capability of the infrastructure, the totality of this infrastructure is required to handle the number of aircraft movements which are now proposed as the cap on activity. We address this at Section 6 of our 2019 Update Report and demonstrate that, even allowing for airlines operating at the times they prefer and for robustness and resilience, the maximum amount of development required would be around half of that applied for.
CA.1.4	We note that all of the Northern Grass area has been redefined as being for airport related works (Works 15-17). However, there remains no justification for why the totality of this area is required for airport related uses. The additional benchmarking of the requirements for such airport related uses from the Applicant, that was promised by Deadline 3, and as part of the updated NSIP Justification Statement has not been provided. To assist the ExA further in understanding the limited requirement for such non-airside airport related development, we would refer the ExA to a recent report prepared for East Midlands Airport in relation to a proposed change of use of a building formerly used for cargo activities from airport related to non-airport related uses. This report (attached as **Appendix A**) makes clear that there is no longer demand for

	airport-related landside accommodation even at the UK's main air freight hub. This would strongly suggest the same would be true at Manston.
CA.1.14	The response does not address the question adequately. Whilst members of the advisory team, (e.g. Viscount Aviation) may have experience of airport management and operations, the Applicant itself has no track record of successful airport operation and development in the UK. The only UK airport operated directly by the Applicant or its principals was Manston and its owner at the time, Wiggins Group (for whom Tony Freudmann was employed), and its successors all failed to secure a viable airport operation.
CA.1.15	The Application Documents are predicated on the Airport's first year of operation being 2020. This is highly unlikely to be achievable. As we discuss later (F.1.6), the amount of capital expenditure now cited as required to enable the Airport to be operational strongly suggests that opening in 2020 would not be physically achievable given the expected timeframe for a DCO decision. In any event, it is highly unlikely that the required airspace changes could be completed in time to allow the Airport to become operational before 2022 at the earliest. This would significantly narrow the gap between the time when the Airport might become operational and the delivery of additional runway capacity at Heathrow to facilitate cargo capacity growth there. The CAA's response to Question Ns.1.24 makes clear that it would normally likely to take at least 60-70 weeks from the initiation of the airspace change process to flight path options being defined. There then follows a CAA decision making process of at least 8 weeks. We note that the process was initiated on 14th January 2019, meaning that the earliest that the required airspace could be in place would theoretically be mid-2020, assuming no delays to the process as set out in the CAA document CAP1616, which outlines the process for delivering an airspace change. Heathrow has recently consulted on its design envelopes for achieving independent parallel approaches to its existing runways ahead of Runway 3. This consultation has just closed and Heathrow Airport expects to be able to consult on design options in 2020 and to submit its final options to the CAA in 2021 for approval, with implementation being in 2022 - https://afo.heathrowconsultation.com/wp-content/uploads/sites/4/2019/01/3625-HRW-2R-AIR-CON-1-3.1-3R-Consultation-Booklet-Update-1-AW-LR-pages.pdf. This would suggest that flightpath implementation in 2022 is the earliest possible date given the consultation requirements of the CAP1616 process, but we note that RSP has not yet commenced any of the consultation required regarding Design Principles or Design Envelopes that would be required ahead of the definition of the options and submission for approval. Furthermore, the Statement of Need, as published on the CAA Airspace Change website - https://airspacechange.caa.co.uk/PublicProposalArea?pID=112 links the change to the FASI S programme, which is a major airspace redesign exercise covering the whole of the South East of England, including inter alia the redesign of airspace required to facilitate the 3rd runway at Heathrow. It is our understanding that, because of the complex interactions between flightpaths serving all of the airports in the South East, consultation on flight path options across the full range of airports is planned to be concurrent to ensure that all of the interfaces are correctly identified. This is planned for 2022, with implementation of the new airspace arrangements in the period 2024-2026. It is entirely possible that new flightpaths for Manston could not be in place until this later date.
E.1.2	The Applicant's response to Question E.1.2 states that the information provided at Tables 3.7 and 3.8 of the ES represent the worst case for environmental assessment. However, as made clear in Table 3.1 of the York Aviation 2019 Update Report, the information in these tables does not match other information regarding the mix of aircraft types expected set out elsewhere in the Application Documentation. In particular, Appendix 3.3. of the ES, which purports to set out the forecasts used as the basis of the environmental assessment, shows a higher proportion of Code E aircraft in the fleet mix than the data in Tables 3.7 and 3.8, which would have the effect of increasing some aspects of the environmental impact. The ExA cannot be certain, therefore, that the worst case impacts have been consistently assessed.
E.1.3	We note that when considering the capability of the infrastructure proposed by RSP, we did not consider the capability provided by 3 tear down aircraft stands. In the absence of any clear justification for the provision of 3 full aircraft stands for such purposes, the provision of these

	stands simply adds to the overall degree to which there is over-provision of infrastructure even in the highly unlikely event of RSP's 'forecasts' being achievable.
F.1.5	The Applicant has appended a summary table of income and expenditure which it claims is the Business Model underpinning the whole investment of over £300m. For the reasons well explained in the 2019 Report from Altitude Aviation Advisory, this level of information will be wholly inadequate for any investor to contemplate investment in an airport, let alone such a high risk enterprise as the re-opening of Manston Airport. This cannot be considered as a Business Model without substantial further detail of the costs and revenues by specific line item (landing fees, passenger charges, freight throughput charges, handling charges, fuel income, commercial passenger income, rentals, car parking etc) and without detailed explanation and justification for the assumptions used line by line. This has not been provided by the Applicant. Based on the information provided by the Applicant, Aeronautical Revenues per Workload Unit (WLU) are projected as £17.27 in Year 1 falling to £11.29 in Year 20. This means that on average the expected aeronautical charges per WLU are around £12 over the period. This would imply a charge per passenger of around £12, which is much too high for a Ryanair/low fares airline dominated airport, or revenue per tonne of cargo of around £120. This is over 2.5 times higher than the airport is previously achieved when operational. To the extent that the effect of low fare airlines is to reduce the contribution of passenger revenues overall, then charges for cargo operations will be higher and are more likely to be around the £180 per tonne mark assumed for Year 1 before passenger operations are assumed to commence. This would be approaching 4 times what Manston previously earned per tonne of cargo. It is also worth comparing these charges to those observed elsewhere at UK airports using the UK Airports Performance Indicators 2016/17 produced by Leigh Fisher. This suggests that Manston would have amongst the highest aeronautical charges in the UK, substantially above a wide range of major and established UK airports. We note particularly that charges would be 4.5 times higher than what RSP consider to be the nearest comparator, East Midlands. It is important to note that aeronautical income per WLU figures are distorted at very small airports, such as Durham Tees Valley and Humberside, which have limited commercial passenger and freight operations but more substantial general aviation activities, including in the latter case helicopter operations serving the North Sea gas rigs. In both cases, the main airline operator carrying passengers is KLM, which will be willing to pay substantially higher airport charges than a low cost airline as many of the passengers will be transferring globally at Amsterdam and paying relatively higher fares to the airline overall. The only other airports which are projected to have higher charges than RSP propose for Manston are Heathrow and London City. This illustrates the extent to which the income assumed by RSP is unreasonable as Manston could not be expected to command the level of charges levied at the UK's main hub airport or at London City Airport, with its unique position serving the City and Canary Wharf.



As we made clear at para. 7.36 of our 2019 Update Report, charges at this level would make Manston totally uncompetitive, with the obvious implication that it would struggle to attract any users at all. Given the expected mix of traffic, it will need to charge at the levels seen at Stansted, Doncaster Sheffield and East Midlands to have any hope of attracting cargo operators and low cost airlines. Charges at this level would certainly not factor in any compensation to the airlines for switching costs or other cost factors identified by Azimuth as we discuss at para. 3.27 of our 2017 Report.

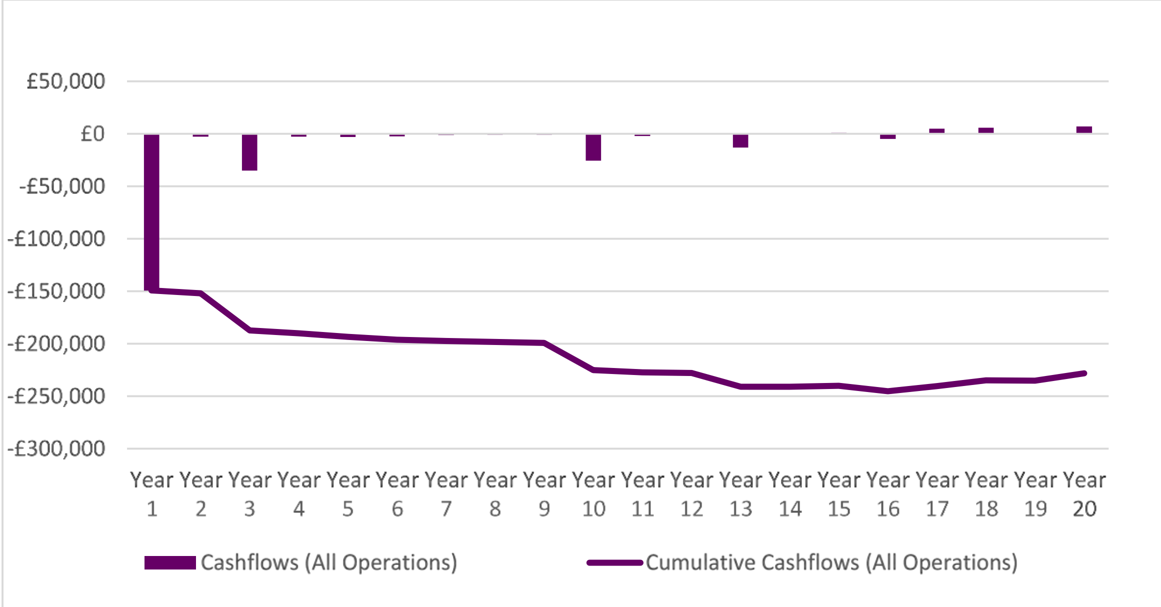
Total Revenue per Workload Unit is forecast as £27.39 in Year 1 falling to £18.82 in Year 20. This can be compared to East Midlands Airport, which is a highly successful air freight hub with passenger operations by mainly low cost airlines, which earned total revenue per WLU of £6.82 in 2016/7, the latest year for which data is available in the *Leigh Fisher Airport Performance Indicators*. The revenues assumed to be attainable in the 'Business Model' submitted by the Applicant are wholly unrealistic for a largely cargo/low cost airline operation. We would note that Aeronautical Revenue comparisons generally are more robust as the total revenues per WLU recorded for smaller airports can be heavily impacted by the extent to which broader property revenues may be included so creating a false picture of true airport related earnings.

It is unclear how the remaining revenue streams have been divided between 'Commercial Net Income' and 'Other Income' in terms of revenue from passengers and revenue derived from letting property on the Northern Grass.

Please note that there was an error in the definition of a Workload Unit given at reference 140 of our 2019 Update Report which should have read that 1 million Workload Units (WLU) comprises 1 million passengers or 100,000 tonnes of cargo per annum. The use of WLUs within our report was correct.

F.1.6 We note that the Applicant has now provided an updated assessment of the capex requirements to bring the Airport back into use. Although a more detailed schedule of areas is now provided, this remains inadequate to understand the costs involved in individual elements of the project. Nonetheless, it is significant that the Applicant now acknowledges that the cost involved in bringing the Airport back into use and for

	the initial two phases of capital investment are substantially greater than originally stated. The Phase 1 costs have risen from £100m to £186m and the Phase 2 costs from £45m to £69m, i.e. early years expenditure has increase from £145m to £255m. Excluding the £80m we originally assumed for the cost of developing the Northern Grass in line with the phased programme now presented, the net costs for the airport related development south of the road is expected to be incurred as follows: • Years 0/1 £144m • Years 3/4 £31m • Years 9/10 £25.2m • Year 13 £12.8m • Year 16 £6.4m • Year 19 £6.4m Of course, if the uses proposed for the Northern Grass are now assumed to be strictly airport-related, these uses would not be expected to generate significant commercial property income and so the net effect of allowing for the investment required to open up the Northern Grass is likely to materially worsen the financial position compared to more general business park uses which might have provided some element of cross subsidy to airport operations. Overall, the increased upfront costs have significant implications for the cumulative cashflow based on more realistic revenue assumptions as set out in Section 7 of our 2019 Update Report, even assuming RSP's demand 'forecasts' could be realised. We have updated **Figure 7.2** from

	our 2019 Update Report. This shows that on a cumulative cash flow basis, the amount of funding required from debt and equity is likely to reach £250m in around Year 16 before there is any possibility for debt to start to be repaid. It is important to note that interest charges are excluded from this analysis. **Figure 7.2: Scenario 1: RSP Proposals Cumulative Cashflows for Manston Airport (£ million)**  Source: York Aviation As with our previous assessment, we cannot calculate an IRR (internal rate of return) for the first 20 years of the project so our assessment remains that it is highly unlikely that rational investors could be persuaded to invest in the project.
F.1.15	As we noted in our 2019 Update Report (para. 7.4), RSP has committed to adhering to the principles set out in the Airports NPS of ensuring that its development is cost efficient and sustainable so as to minimise costs to airlines, passengers and freight users, albeit we recognise that these provisions of the Airports NPS may not be directly applicable other than to consideration of the 3rd runway at Heathrow. They are, nonetheless, highly relevant to the consideration of whether any airlines would actually choose to operate from Manston. The answer given by RSP is that *"The Business Model is predicated on being able to offer airport users competitive terms."* However, as we have demonstrated in Section 7 of our 2019 Update Report and in commenting on the response to Question F.1.5 above, this is far from the case and the anticipated revenues in RSP's Business Model are far in excess of what users would be willing to pay. There are two possible outcomes; either airlines will not operate to Manston and the expected passenger and freight volumes will not materialise, or the revenues earned will be materially less than set out in the submitted Business Model. Either way, the implication is that the development will not be cost efficient or viable and the operation is highly unlikely to be sustainable, as was the case with previous attempts to operate a commercial airport at Manston. Although

	the answer claims that there will be net benefits to users, these benefits have not been set out or quantified anywhere in the Application Documents.
F.1.16	The economic licensing regime referred to in the Airports NPS applies only to Heathrow and Gatwick currently. The application to other airports is subject to market power assessment. Based on our assessment of the likely market for Manston it is not plausible to assume it would attain a position of substantial market power.
F.1.17	It is important to note that the provisions of the Civil Aviation Act 2012 apply principally in relation to the economic licensing of airports with substantial market power. As this will not apply to Manston, the process of seeking an economic licence will not apply. In the response, the Applicant appears to confuse the process of applying for an Aerodrome Licence/EASA Certificate with the separate requirements of the Civil Aviation Act 2012. Schedule 8 of the Civil Aviation Act 2012 makes provision for airports with a turnover of greater than £1 million in two consecutive years to obtain a certificate conferring the status as a Statutory Undertaker. RSP will not be able to apply for such a certificate until they have been operational for 2 years and can demonstrate that the turnover threshold has been exceeded.
ND.1.1	The response to this question claims that the Airports Commission did not consider the potential role that Manston might play as a freight airport. In its response to the ExA's questions, the Civil Aviation Authority helpfully provides the submission made by the previous operator of the Airport to the Airports Commission. It is clear here that the proposition submitted by Manston was for a major freight airport (point b) of the submission, which we note was written by the Aviation Strategy and Policy Consultancy now part of Northpoint and one of RSP's current advisers. In the light of this, it is not credible to suggest that the Airports Commission did not consider Manston other than in terms of a role in meeting passenger demand. It is also disingenuous to say that the Airports Commission's Interim Report and shortlisting did not consider freight as benefits to freight users were extensively discussed throughout the Commission's Interim Report (Section 3) and formed part of the consideration of benefits, albeit these could not be specifically quantified (AC Interim Report, para. 3.100). The inclusion of air freight benefits as part of the Commission's Sift criteria is made clear at para. 3.7 of their *Guidance Document 02: Long Term Capacity Options: Sift Criteria May 2013*. Whilst there may have been further submissions on air freight by TfL on behalf of the Mayor of London (Ramboll/Oxford Economic Report *Impacts on the Air Freight Industry, Customers and Associated Businesses 2013)* later in the process, it is clear that the Airports Commission gave full consideration to the implications for the air freight sector in its shortlisting process. The proposal that Manston could act as a major freight airport to relieve congestion at the other airports was not followed through/rejected by the Airports Commission, which only mentioned Manston as a possible reliever airport for General Aviation (see our 2019 Update Report para. 2.21). RSP have added reference to passenger capacity in square brackets to quotation from Appendix 2 to the Airports Commission's Interim Report. This is not correct and seeks to mislead the reader. The quotation needs to be read in context of proposition submitted by the operator of Manston which put forward a major freight role. The Applicant also makes reference to the recent policy support for all airports making best <u>use</u> of their existing runways alongside the development of a 3rd runway at Heathrow. This policy still requires the case to be made for each specific airport. As we make clear in our 2019 Update Report (paras. 2.16, 2.17), this requires a realistic assessment to be made of the usage of each runway and the benefits deriving from that usage which can be balanced with any environmental harm that might arise. The policy cannot be taken in isolation without considering the extent to which there are net benefits from the level of usage proposed. The policy does not support safeguarding runways in perpetuity against some prospect of future use.

ND.1.2	The Applicant quotes extensively from the recent Aviation Strategy Green Paper in relation to the Government's support for the air freight sector. However, the Applicant fails to make reference to how the Government envisages the need to be met (para. 4.49 of the Green Paper): *"The government supports continued growth of the air freight sector particularly making best use of existing capacity at airports, to continue to facilitate global trade for UK businesses and consumers. It has already taken action by supporting the Northwest Runway scheme at Heathrow, which has been estimated to nearly double the capacity for freight at the airport to 3 million tonnes per year."* At para. 4.47, the Green Paper makes specific mention of *East Midlands and Stansted alongside Heathrow as the principal freight gateways.* It is important to note that the reference here is to *"existing capacity"* rather than existing runways as the means by which the growth of air freight is to be supported. The truth is that there is no specific support in policy for re-opening Manston as an air freight hub. Whilst policy is generally supportive of facilitating air freight, it does not follow that Manston is a solution.
ND.1.3	We note that the answer given here simply refers back to previously submitted Azimuth material. If the ExA had considered this sufficient, we presume that the question would not have been put. It is clear that the Applicant has not given adequate consideration of the alternatives for handling demand for air freight services across the UK.
ND.1.4	The Applicant's response completely fails to mention the clear position of Government that the requirement for more air freight capacity will principally be met by the provision of the new Northwest runway at Heathrow and through greater use of existing facilities, principally at East Midlands and Stansted. The analysis of the contribution of Heathrow at Section 5.2 of Azimuth's Vol I appears to proceed from the assumption that the new capacity will principally be used for low cost airlines offering little bellyhold capacity. This is completely at odds with the Airports NPS, which especially sees the 3rd runway as offering the potential for more global connectivity, including to points not currently served, and a doubling of capacity for air freight. Specifically, the Government sees the 3rd runway at Heathrow as: *"expected to lead to more long haul flights and connections to fast-growing economies, helping to secure the UK's status as a global aviation hub, and enabling it to play a crucial role in the global economy"* (Airports NPS, para. 3.18). It is these flights that will enable Heathrow to double its freight handling capability. Azimuth erroneously adopt a set of criteria for considering alternative airports in terms of their own asserted requirements for a freight focussed airport. The need for a new freight focussed airport is unsubstantiated by evidence, as we make clear in Section 4 of our 2019 Update Report. In our 2017 and 2019 reports, as well as our 2015 Report for TfL and the Freight Transport Association that Azimuth persist in wrongly interpreting, we make clear that the principal alternative likely to be used for any cargo that could not be accommodated at the Heathrow hub is bellyhold capacity at alternative airports.
ND.1.5	Examination of the Air Cargo World article cited by Azimuth at footnote 5 strongly suggests the information provided relates to rates for scheduled and bellyhold cargo in the run-up to Christmas. This is a transient phenomenon associated with the shipment of goods for Christmas. In any event, even if freight rates for bellyhold rise on a temporary basis, this may still be below the equivalent cost of a dedicated freighter operation as we set out at para. 4.7 of our 2019 Update Report. Given the difference in cost of dedicated freighter operations, these would not solve the problem. We note that the article at Footnote 6 makes clear that this problem was not just confined to the UK or Europe but affected routes between the Far East and the US suggesting that the high seasonal freight rates are a global issue rather than specific to the air freight sector in the UK. Increased bellyhold capacity at Heathrow is likely to be an effective means of ameliorating the seasonal issue in terms of freight rates to and from the UK.
ND.1.6	This response seeks to compare the situation at Frankfurt with that at Heathrow in terms of the number of freighter services operated/the proportion of freight handled on dedicated freighter aircraft rather than bellyhold. The proportions for Paris and Amsterdam are also stated. These four airports are the principal hub airports in Europe. The context for the greater number of dedicated freighter aircraft operated to

	these airports is easily explained by the difference in bellyhold capacity offered for sale to non-European points at each of these airports. Based on the Official Airline Guide database (OAG), the tonnage capacity offered in bellyholds of departing passenger aircraft in the week beginning 4th March 2019 was: • Heathrow - 41,275 tonnes • Paris - 25,382 tonnes • Amsterdam - 20,707 tonnes • Frankfurt - 17,122 tonnes The relative share of freight carried in dedicated freighter aircraft is in inverse proportion to the amount of bellyhold capacity available at each of the airports. An important feature of these hub airports is that they have well developed freight forwarding infrastructure concentrated around them given the global connectivity offered by the hubs and the national airlines based there. This consolidation is driven in the first instance by the hub connectivity offered in the bellyhold of passenger aircraft but the existence of the freight forwarding and consolidation centres makes these airports the first choice for dedicated freighters to operate to the extent required to supplement any gaps in the network of bellyhold services available. These conditions are not replicable at other non-hub airports, other than for express freight/integrator operations for which Germany like the UK has specialist airports where such operations are based. Leipzig and Cologne serve as hubs for such operations in the same way as East Midlands serves as the UK main integrator hub. It is notable that, despite handling 44 million passengers a year with major global connections, Munich Airport only handled 3,807 freighters in 2018, despite Bavaria being a major manufacturing economy. This only serves to highlight the special circumstances which make Frankfurt attractive for dedicated freighter operations, notwithstanding its night closure period, and so long as it has available slots. Just as with Heathrow, the attraction of Frankfurt for freighter handling is simply not replicable elsewhere in Germany. There are also important scale factors that apply to the position of Germany in terms of the total air freight market: • the economy is around 30% larger than the UK; • of which manufacturing's share is over 20% compared to 9% in the UK; • the population is around 25% higher than the UK driving imports. Hence, it is unsurprising that the need for air freight capacity is greater to and from Germany than to and from the UK. Furthermore, Germany's central location within Europe means as it acts as a distribution hub for much of Central Europe, well beyond its borders, in a manner that the UK could not hope to replicate. Hence, given the more limited bellyhold capacity available at Frankfurt, the need for more dedicated freighter operations is hardly surprising. The fact that they choose to operate to Frankfurt despite the night closure period is a sign of the power of the hub. When the economic factors are properly considered, alongside recognition of the special characteristics that give rise to demand for cargo services to major national hub airports, the relative performance of Frankfurt and Heathrow is easily explained. The UK is currently adequately

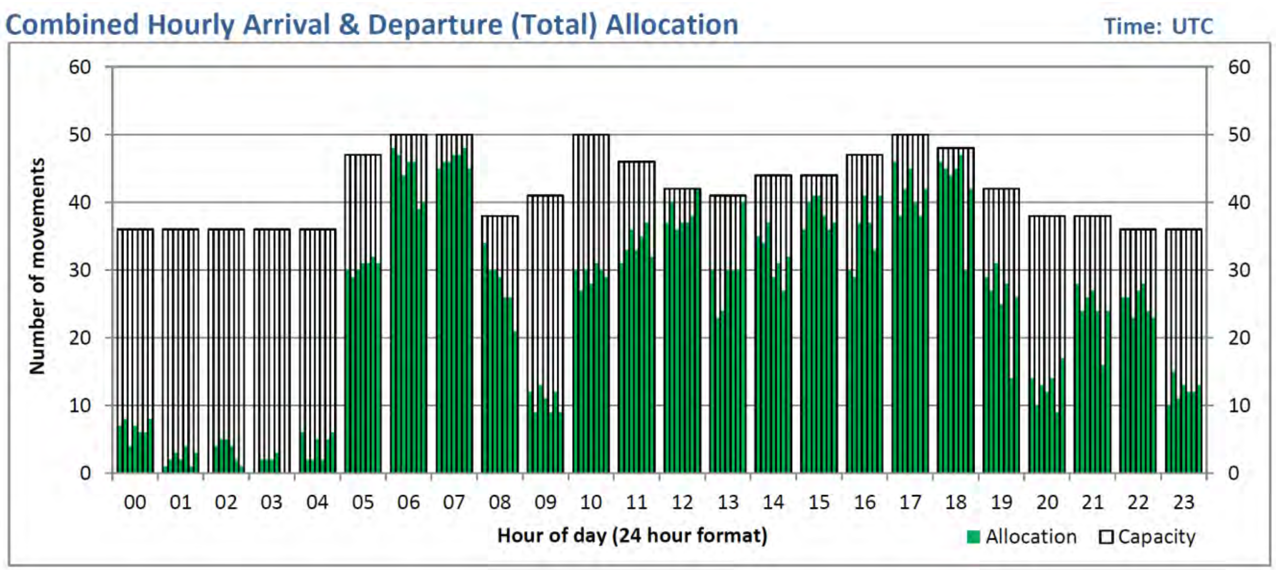
	served by the existing combination of bellyhold capacity and freighter capacity available at Heathrow, East Midlands, Stansted and other existing airports, as shown in Figure 4.7 of our 2019 Update Report. The situation at Frankfurt is simply not a relevant comparator with the key requirement being increased global connectivity at Heathrow, that the 3rd runway will provide, rather than an increase in capacity for dedicated freighter aircraft at a remote location.
ND.1.7	This response continues to rely erroneously on our work for TfL and the FTA. We previously corresponded with Dr Dixon of Azimuth Associates regarding their misinterpretation of this work (see correspondence attached at **Appendix B**). Azimuth's response explains our use of a gravity model approach to look at how any excess demand for air freight capacity might be dispersed in the event of there being a shortage of capacity across the main London airports. What the response fails to recognise is that the expected distribution of any air freight which could not use the London airports (see page 23 of our report for TfL and the FTA attached as **Appendix C**) was based not solely on access times but on the attractiveness of alternatives in terms of bellyhold and freighter capacity available. The share of the main European hubs is, thus, a reflection of the relative strength of their networks including bellyhold capacity, offering capacity at competitive freight rates; a competitive position that Manston would simply not be able to replicate. A dedicated freight airport would be expected to intercept no more than a small fraction of any displaced demand. The response goes on to wrongly ascribe diversion to Europe to lack of facilities at UK regional airports but the real issue is bellyhold capacity on long haul services coupled with the structural focus of the forwarding and consolidation sector adjacent to the main hub airports, including Heathrow. Manston would not address this structural issue, which is, indeed, one of the main reasons why Manston would fail. It should be noted that Heathrow is addressing the congestion in its cargo centre (See para. 4.21 of our 2019 Update Report) and there is no evidence that other UK airports have suffered from equivalent congestion issues such as to impact on their attractiveness.
ND.1.8	We would note that response the perhaps wrongly assumes, as Azimuth does throughout its reports, that air freight using the London airports is necessarily destined for London and the South East only. This table of comparative journey times set out in the response might be relevant for the fresh fruit and flowers market that Manston used to handle and might recapture if the price charged to airlines was low enough but it is not relevant for the bulk of cargo that Manston would need to attract if it were to seek to achieve the share of the UK market asserted by Azimuth. Our analysis, set out in Figures 4.4 and 4.5 of our 2019 Update Report, shows how widely dispersed across the UK the market for air freight is. Our analysis would suggest that only around half of UK air freight is destined for or originates in London and the South East but, despite this, regional airports handle only 23% of freight tonnage. This analysis would point to at least 1/3 of freight using London airports as having an origin or destination elsewhere in the country. Hence, the relevant journey times are not to specific distribution centres serving London (such as Sainsbury's local distribution centres) but to Heathrow where much of the total UK air freight is consolidated into economic loads and to the 'Golden Triangle' for UK distribution in the vicinity of East Midlands and the M1/M6 junction. Manston has no real advantage in the former case and is not an option in the latter. We would suggest that the contour maps provided by the Applicant in the appendices only serve to make this point. This response also contains the extraordinary claim that Stansted does not have a dedicated freight facility. The cargo facilities at Stansted are described at https://www.stanstedairport.com/about-us/cargo/. This states that Stansted has a 'World Cargo Centre' with 55,000m^2 of warehouse and office space. This facility is currently split over two warehouse units, the larger of which has been in operation since before 2000 with the second being added around that time. The second and smaller unit has been recently been extended and it is clear that Stansted has significant space safeguarded adjacent to the cargo facilities and cargo aprons to expand further. Stansted's dedicated cargo

	stands can simultaneously accommodate 4 x A380, 3 x B747-8F, 1 x B747-400F and 1 X B767-300 or up to 15 smaller code C aircraft. The scale of facilities is substantial as illustrated in the satellite picture below. 
ND.1.9	We note the explanation given regarding the difference between express freight or integrator operations and the more general air freight model. There is no evidence that the UK needs a dedicated freight hub for general air freight given the substantial bellyhold capacity available at Heathrow and growing bellyhold capacity at UK regional airports. Any growth in freighter aircraft movements in the UK in recent years is almost entirely within the integrator model.
ND.1.10	It is important to note that the table reproduced in the Azimuth Reports from the DfT's 2017 UK Aviation Forecasts reflects the position on the basis that no additional capacity is provided at any of the London airports. To a large extent, the identified constraints relate to passenger capacity defined in planning conditions. The table takes no account of consented increases in passenger capacity at Stansted, the third runway at Heathrow and any other capacity developments in the pipeline. Hence, this chart is of no relevance to considering the extent to which there would be capacity for more freighter movements across the London airports. Part ii) of the response contains another extraordinary statement that little additional terminal or runway capacity has been added at UK airports for decades. This appears to ignore the development of a second runway at Manchester, Terminal 5 at Heathrow, expansion at Gatwick and Stansted, Luton's expansion to 18 million passengers a year. The response claims that Manston is required because further expansion elsewhere will take time. However, as we have identified in our 2019 Update Report, there is no immediate shortage of air freight

	capacity. Even on the basis of the table referred to at i) of the answer, Stansted Airport would not be expected to be full until 2040 by which time R3 at Heathrow will have been in place for some time.
ND.1.11	The Applicant gives another extraordinary response that most freighter movements do not operate to a timetable and are ad hoc based on demand. This is wrong and misleading. Integrator operations all operate to timetables but these are not usually published in a central database. At Frankfurt, 18,000 of the 28,000 dedicated freighter movements in 2018 operated to a published timetable; of the rest, we would expect a substantial proportion to have been integrator movements also operating to a timetable but not published as such. The published freighter schedule is already in place for much of the next 12 months with over 15,000 movements are already timetabled (see timetable information extracted from OAG at **Appendix D**). The number of scheduled freighter movements in the UK is lower at over 7,000 dedicated freighter movements already scheduled for the next 12 months. It is important to note that the schedule will not be complete for the winter scheduling season (from Nov) at this point in time, so the final total of annual scheduled freighter movements will be greater. In the response, Azimuth Associates wrongly interprets the increase in cargo tonnage between Frankfurt and China as indicating an increase in trade. This is not necessarily so. Similarly, the Manchester study looked at increased cargo export figures from Manchester Airport once Hainan Airlines commenced the operation of a passenger flight offering bellyhold capacity but, whilst exports flown from Manchester to China increased, the total of UK exports fell negating the effect of any increase in exports flown to/from Northwest England. It is also relevant to note the Cathay Pacific example cited in our 2019 Update Report (para 4.19), where a dedicated freighter operation was replaced by bellyhold capacity as a more cost effective operation. The ability to carry bellyhold freight is integral to a route's viability but the overall route economics enable cargo capacity to be sold at a lower rate per tonne than dedicated freighter operations (see 2019 Update Report para. 4.7). The thrust of this response ultimately describes ad hoc freighter operations, which are largely charter operations, which made up around 36% of all freighter movements in the UK in 2017, i.e. c.19,000. Of these, over half are within the UK. This again serves to indicate the small scale of the market from which Manston hopes to attract a share. We have addressed the low probability of Manston attracting operations by Amazon's dedicated freighter fleet in our Update Report at para. 3.10.
ND.1.12	We note that the sample routes used in the freight rate graph do not relate to the UK. Indeed the market where rates show the most volatility is Hong Kong-North America where there is no suggestion that lack of airport capacity drives rates higher. The volatility in the rates on the European markets illustrated is less. Even so, the range of volatility looks to be around 2.5x, less than the 4.5x estimated cost differential of using a dedicated freighter compared to bellyhold capacity. Hence, these examples do not provide evidence that there is a role for dedicated freighters to be operated, even on an ad hoc basis at times of seasonal demand. Any relief role for Manston as asserted is likely to be limited. The Heathrow quotation referenced in the response points to the need for more bellyhold capacity on passenger routes, which R3 will permit, rather than a need for dedicated freighter aircraft.
ND.1.13	Much of the response simply repeats material already contained in the Azimuth Reports. As we have addressed in some detail in both of our reports, Azimuth's interpretation of UK air freight statistics is flawed and betrays a lack of understanding of the market dynamics. The fact that the UK is now experiencing strong air freight tonnage growth suggests that the performance of the sector is less related to congestion and more to underlying economic factors. There has been no shortage of capacity for freighters at airports other than Heathrow, specifically Stansted and EMA so, if anything, any restrictions in freighter growth reflect Heathrow specific issues, rather than a general constraint, which

Manston cannot address any more than the already well established airports. As we have pointed out in response to ND.1.6 above, the reason that a greater proportion of freight is carried in dedicated freighter aircraft at the Frankfurt hub is a result of the substantially lower volume of bellyhold capacity available rather than any constraint on dedicated freighter operations at Heathrow.

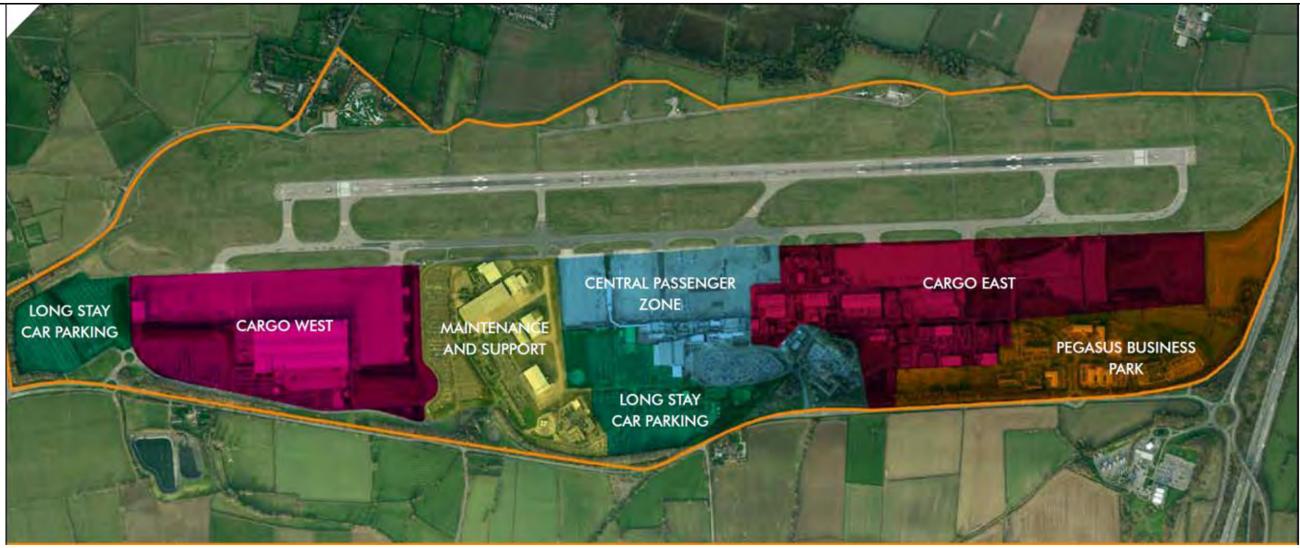
In terms of whether Stansted operates under capacity constraints for cargo aircraft, the Applicant tries to infer from growth in passenger aircraft movements (ATMs) and a fall in cargo ATMs that this can only be due to passenger aircraft crowding out cargo aircraft. First of all, as we have pointed out in response to ND.1.8 above, Stansted operates with dedicated freight aprons and so there is no conflict between the stand occupancy requirements of low cost carriers and those of cargo carriers. The quotation from Schiphol appears entirely irrelevant in this regard. The Applicant wrongly uses the initial raw slot demand at Stansted in the answer to ND.1.18 to suggest that Stansted Airport is more constrained than it actually is. The correct information to use is the pre-season allocation of slots which we illustrate below for Summer 2018 taken from the Airport Coordination Ltd Pre-Season Report https://www.acl-uk.org/wp-content/uploads/2018/03/STN_S18_SOS.pdf.



The graph above shows the actual spare runway capacity to accommodate additional freighter movements at Stansted at the start of the summer season in 2018. As can be seen there is ample spare capacity for additional ad hoc freighter movements to be scheduled if required (the already timetabled operations will be included in the chart).

The response also cites the recent Steer 2018 report for Airlines UK (see para. 4.6, 4.16-4.19 of our 2019 Update Report) in relation to recent airfreight growth to and from the UK compared to faster growth across Europe and, whilst acknowledging that this may be in part due to underlying economic factors, attempts to assert that it is someway due to constraints on dedicated freighter operations at Stansted. The evidence shows this to be simply nonsense.

ND.1.14	The Applicant has appended to this response its correspondence with the Department for Transport. Unsurprisingly, Azimuth Associates repeats its view that the Department's assumption that there will be no growth in dedicated freighter movements to and from the UK is wrong. Contrary to what is inferred in the response, the Department has not promised to produce a forecast of dedicated freighter movements, notwithstanding the current growth in cargo tonnage. What the Department actually said was: *"The Department is currently revaluating air freight policy as part of the developing Aviation Strategy, and you may have seen last July's Call for Evidence and the recent (April 2018) Next Steps response documents which set out some initial options……..We take your suggestion of conducting more detailed modelling of air freight on board and will consider it along with the other suggestions we have received as part of the strategy."* It is evident from the section on the Supporting Freight at paragraphs 4.45 to 4.50 of the Green Paper that the Department has not taken up the suggestion that detailed forecasts of dedicated freighter movements should be produced. Rather as covered in earlier responses, the Department has placed particular emphasis on the role of the existing airports Heathrow, East Midlands and Stansted and stressed the expected doubling of air freight capacity at Heathrow. In the context of the emphasis that the Department is placing overall on ensuring that the UK has sufficient airport capacity in the right places to support the broader economic growth agenda, it is inconceivable that they would not have factored into their analysis of the capacity requirements, as set out in the October *2017 UK Aviation Forecasts*, the need for more dedicated freighter aircraft if they believed it to be a likely requirement. In our discussions with the Department, we are not aware of any intention to produce forecasts of freighter aircraft movements in the near future.
ND.1.15	In this response, the Applicant attempts to assert that capacity for dedicated freighter aircraft at East Midlands Airport (EMA) is somehow constrained by capacity. At 76,000 annual aircraft movements in 2018 according to CAA Airport Statistics, EMA has ample spare runway capacity. A single runway can typically support well over 200,000 aircraft movements a year before significant constraints start to arise. The Airport's 2015 Sustainable Development Plan (https://live-webadmin-media.s3.amazonaws.com/media/2934/ema-sdp-2015-land-use.pdf) identifies land and facilities to support 10 mppa (up from 4.9 mppa) and 1.2 m tonnes of cargo (from 360,000 tonnes). The forecast tonnage is 700,000 tonnes by 2040, which the Applicant appears to have incorrectly construed as a capacity constraint. Land is clearly zoned for expansion in Cargo East and West as illustrated below.

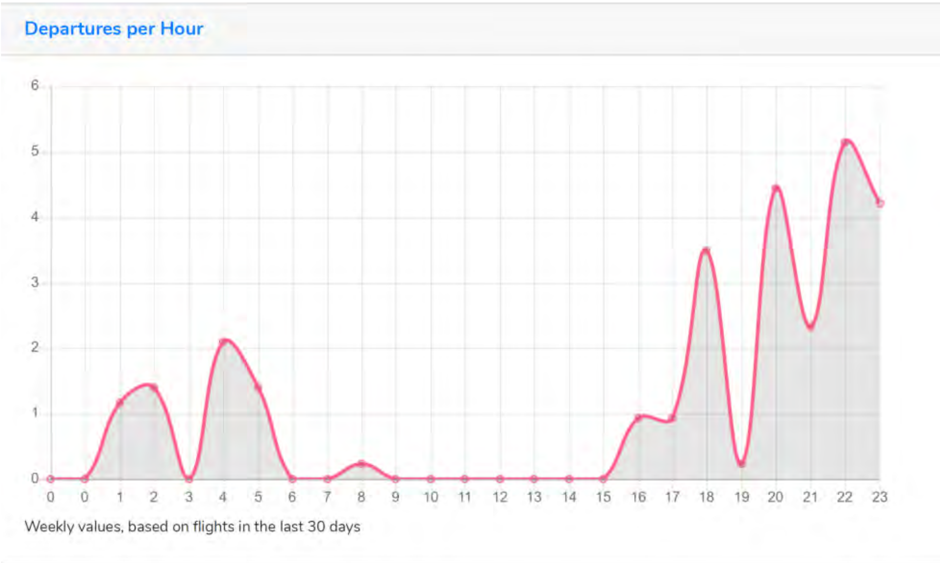


The reason why the EMA plan places emphasis on meeting integrator demand is because this is where there is demand for growth in dedicated cargo services. More general freighter movements could be accommodated if there was demand. Given the position of the Airport next to the East Midlands Gateway logistics park (https://www.slp-emg.com/c/location.php), it is highly unlikely that further expansion of cargo facilities at the Airport would be refused. Specifically, policy EC4 of the North West Leicestershire Local Plan supports growth at the Airport in line with its Master Plan (subject to environmental assessment):

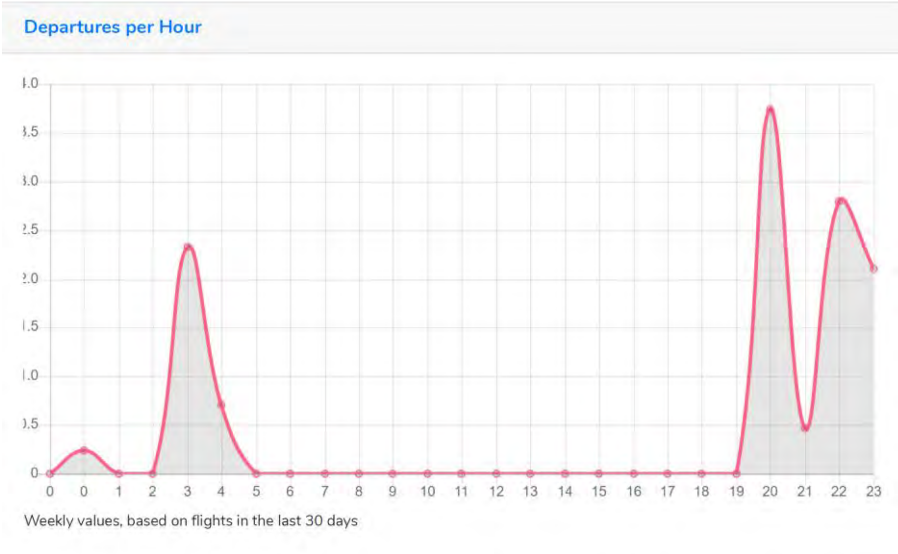
*"**Policy Ec4 – East Midlands Airport***
(1) The growth of East Midlands Airport will be supported provided development that gives rise to a material increase in airport capacity or capability:
(a) Is limited to that necessary to support an airport capable of handling up to 10 million passenger and 1.2 million tonnes of cargo per year; and
(b) Incorporates measures that will reduce the number of local residents affected by noise as a result of the airport's operation, as well as the impact of noise on the wider landscape; and
(c) Incorporates measures to ensure that local air quality satisfies relevant standards; and
(d) Is accompanied by improvements in public transport access to the airport and other measures that will reduce the level of airport-generated road traffic (per passenger); and (e) Will protect and enhance heritage assets within the vicinity of the airport."

In the light of this policy support, it is simply unreasonable to assert that EMA operates under any real or prospective constraint on its air freight operations for the foreseeable future.

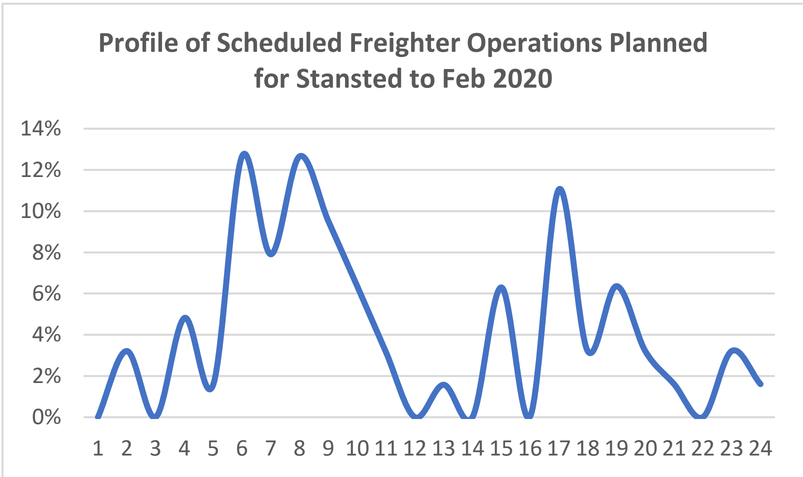
	The Applicant claims that it has taken the potential for EMA to increase from 360,000 tonnes of cargo to 1 million tonnes in its forecasts. It is totally unclear how this scale of growth has been factored in (see Figure 4.7 of our Update Report) as the Applicant's methodology for forecasting freight movements and tonnage is totally opaque.
ND.1.16	In this response, the Applicant claims night flying by integrators due to passenger flights crowding out movements during the day. This is patently untrue as the pattern of operation at EMA shows (see Table 3.2 of our 2019 Update Report). The response goes onto claim that it is not proposed for Manston to have an integrator base, yet the information provided in Appendix 3.3 to the ES shows that 48% of freighter aircraft movements in Year 20 (more in the earlier years) are expected to be operated by the integrators DHL or Fedex, including feeder flights by small aircraft which clearly implies the expectation of an integrator hub operation. At 8,327 integrator movements in Year 20 (as shown in the ES), Manston would be expecting to operate around 60% of the total number of integrator flights at East Midlands. By any measure, this implies some form of base or hub operation. Such an operation would only be possible if the airlines could operate a similar pattern of day/night movements as seen at EMA, as we outline at paras. 3.37-3.44 of our 2019 Update Report. Even if the operation was on a non-based basis, the pattern of day night movements would be very similar as it should be noted that EMA operates partly as a hub but also as a spoke to DHL's main operation at Leipzig. These movements would have to operate with timings based on late evening arrivals from the main hub and early hours' departures. The Applicant should be asked to clarify as a matter of urgency the intentions regarding integrator operations as, if these movements are removed from the forecasts, the number of predicted freighter aircraft movements is below the threshold for an NSIP (see para. 3.46 of our 2019 Update Report)
ND.1.17	The respondent does not actually answer the question posed. The answer deals with trucking of food, which is not an indication of high value air freight potential. As explained in Section 4 of our 2019 Update Report, trucking of freight between hubs is an integral part of the air freight system. The DfT figures referred to by the Applicant are travelling under an airway bill and will meet required delivery times for the high value/low weight model. Such freight is not a separate category of air freight and would normally be considered as part of the general air freight sector - see Steer Report for Airlines UK (http://airlinesuk.org/wp-content/uploads/2018/10/Assessment-of-the-value-of-air-freight-services-to-the-UK-economy-Final-Report-v22-Oct-2018-b-SENT.pdf) para 2.8ff for a description of different types of freight operation. This explains that the role of trucking is integral to general air freight handling (paras. 2.17-2.19) and not necessarily of itself any indication of capacity constraints but is simply a manifestation of how the market works.

ND.1.18	The answer refers to Stansted's previous passenger cap of 35 mppa but fails to recognise that this has been increased to 43 mppa. The response again confuses the DfT's 2017 presentation of the limiting capacity at each airport as being a movement limit not a passenger limit. It is clear from reading the DfT 2017 UK Aviation Forecasts, specifically Tables 63, 64 and Fig 7.4 (as reproduced at Fig 2 of Azimuth Vol I) that the limits reflected, particularly for Stansted, are based on passengers. Table 66 of the DfT UK Aviation Forecasts 2017 shows clearly that Stansted's peak forecast number of ATMs is 212,000 ATMs, i.e. the Airport is not projected to fully use its consented movement capacity of 274,000 ATMs, of which the limit for cargo flights is now 16,000 per annum as per new permission, i.e. 60% growth in cargo flights above current levels. It is simply wrong to assert any form of imminent constraint on the overall number of freighter aircraft movements at Stansted. The concept that MAG is favouring low cost airlines over freight at Stansted is pure speculation and without any foundation. Nor would air traffic control delay freighter operations to favour passenger flights but they would adhere to air traffic flow management slots as issued by Eurocontrol based on filed flight plans. In truth, there is no evidence that freighter operations are restricted at Stansted. Any short term fall in freight tonnage is almost certainly coincidental and related to underlying economic factors. As illustrated in response to ND.1.13, Stansted has recently extended its cargo facilities, which it would not have done so had it intended to force out freighter activity. As we have noted in response to ND.1.13 above, the Applicant uses the Stansted raw demand graph rather than the correct allocation chart. There is currently plenty of spare runway capacity at the times when the freight operators want to fly. We have looked at the times when the airlines currently want to fly (on the basis that there is no evidence that airlines are currently constrained from operating at the times they wish by any current capacity constraint at Stansted). The full details are given in **Appendix E**. Summary graphs are shown below: **Fedex** 

UPS



Scheduled Freighter Operations



It is clear that the integrators operate primarily at night with c.36% of all departures at night and a similar pattern for scheduled freighter operators. In overall terms, we estimate that around 45% of all non integrator freighter aircraft movements at Stansted operate with either an arrival or departure in the night period. If these operators had to move from Stansted due to the effect of night constraints, they would only

	do so to an airport that could provide the flexibility to maintain current schedules, i.e. for Manston to be a candidate it would require to be able to operate a substantial number of night flights, well in excess of the proposed night quota in the Noise Mitigation Plan. The situation at Amsterdam has also been misinterpreted by the Applicant. The 80% use it or lose it rule for slots has been in place under EU Regulation 95/93 for many years. This means that systematic off-schedule operations by any airline may result in some airlines losing their grandfathered slots and, with an airport at its overall annual movement limit, alternatives at a different could not be allocated as would have been the case before the limit was reached. This is not some new rule aimed at cargo carriers specifically but a part of EU law.
ND.1.19	It is interesting to note that the Applicant does not expect the position of most freight at Heathrow being carried bellyhold in long haul passenger aircraft to change once R3 opens. In terms of the balance of slot usage with R3, it is Government policy that the use of R3 should be focussed particularly on securing global connectivity and in ensuring improved regional domestic connectivity through the ringfencing of some slots (see Aviation Strategy Green Paper para. 3.52). On this basis, the Applicant's estimate of 85,000 of new slots being for long haul services is almost certainly conservative but would still represent an increase of c.50% in global connectivity compared to 2018 (c.175,000 long haul flights based on OAG data). The current bellyhold capacity offered for sale at Heathrow on long haul routes is c. 14 tonnes per sector on average (OAG). On this basis, 85,000 additional flights would equate to 1,200,000 tonnes, i.e. taking Heathrow to the 3 million tonnes total. It should be noted that this is a throughput estimate not a formal constraint so the tonnage achieved could be higher. Contrary to assertions made by Azimuth in its reports, newer aircraft types carry more tonnage per flight meaning that the future bellyhold capacity is likely to be greater on average per aircraft than today. Hence, Heathrow might well achieve more than 3 million tonnes of cargo once R3 is operational. We have extracted bellyhold tonnage capacities being offered for sale on average by aircraft type on 28th Feb 2019 to illustrate the high capacity offered by some newer types, in particular the Boeing B787:

Type	**Bellyhold Tonnage**
Airbus A330	11.0
Airbus A340	12.7
Airbus A350	20.0
Airbus A380 Passenger	20.2
Airbus Industrie A330	13.5
Airbus Industrie A350	20.0
Boeing 737 Passenger	5.4
Boeing 747 (Passenger)	15.2
Boeing 757 (Passenger)	7.1
Boeing 767 Passenger	13.9
Boeing 777 Passenger	23.2
Boeing 787	38.2

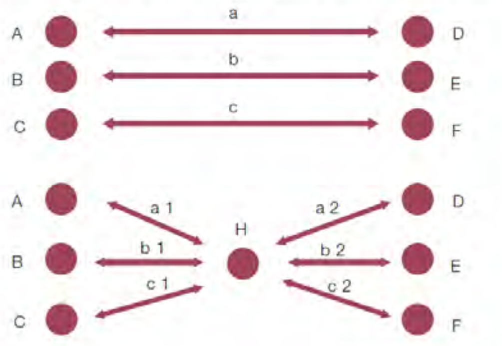
	We would also highlight that the Boeing industry reports, on which Azimuth seek to place substantial reliance throughout their reports, quotes lower (belly) hold capacity growth on passenger aircraft of 6% in their *World Air Cargo Forecast 2018-2037* (Executive Summary page 7) so Azimuth are simply wrong to speculate that the ability to carry bellyhold is reducing not increasing. We would reiterate para. 2.15 of our 2019 Update Report that Heathrow with R3 provides for growth for 31 years.
ND.1.20	This response seems to proceed from the premise that Heathrow could only attain 3 million tonnes of cargo per annum through extensive introduction of freighter flights. As we have demonstrated in response to ND1.19, this is easily deliverable from bellyhold capacity. Once again, the response is littered with speculation about the need to demolish Terminal 4 to provide more cargo aircraft stands, which is without substance. The fact that slots to use R3 may be released incrementally is not an issue as the release will be in line with demand. The Applicant again claims that it has taken account of growth in air freight capacity at Heathrow in its forecasts for Manston. Once again, this is totally opaque in the methodology. Our assessment (see Section 3 of our 2019 Update Report) is that there will be ample spare capacity. The remainder of the response asserts that, notwithstanding growth in capacity at Heathrow and elsewhere, there will be 400,000 tonnes of freight by 2050 which will require a dedicated freighter operation. This appears to be estimated by growing the current tonnage on dedicated freighters at the London airports by c.2% p.a. However, it does not follow that this freight would not be better suited to using the increased belly hold offer from Heathrow with a 3rd runway. As we have pointed out at paras. 4.4 and 4.19 of our 2019 Update Report, there is clear evidence of airlines discontinuing dedicated freighters when increased bellyhold capacity is available. Comparisons between Heathrow and Frankfurt (see ND.1.6) reinforce the point. Freighters, other than integrator operations and a small number of niche ad hoc/charter operations, fill the gap when bellyhold is not available rather than being a distinct market as the Applicant's response appears to suggest.
ND.1.21	We note the team experience cited. There is little here to give confidence that the team could bring Manston to profitable operations.
ND.1.22	Again, this answer appears to assume that freight is necessarily destined for Central London. Whilst this may be true for urgent documents carried by the integrators, is it not the case for the vast bulk of air freight. Otherwise, the Applicant's answer describes well the reasons why EMA is the main UK freight hub.
ND.1.23	We do not dispute that a 'No Deal' Brexit could lead to delays at the border for trucks in the short term until new systems and processes are put in place. However, the bigger issue with a 'No Deal' Brexit is likely to be the overall impact on the economy. Forecasts suggest that the economy could be up to 9.3% smaller than it would otherwise be in the event of 'No Deal' (https://www.bbc.co.uk/news/uk-politics-46366162). There would simply be less demand for freight transport so reducing any market that Manston might avail of. This is likely to be a much more significant factor in terms of the prospects for dedicated freighter operations at Manston than short term issues of customs clearance at the Channel crossings.
ND.1.24	The response that increased security measures could result in increased delays to cargo on passenger aircraft is pure speculation. The assertion is unsubstantiated and runs counter to the thrust of the Aviation Strategy Green Paper (Section 5) whereby the Government has set out a clear intention to improve the passenger experience.
ND.1.25	The advantages of dedicated freighter operations cited by the Applicant come at a cost which few shippers of general cargo are willing to pay. There is always an economic trade-off between time and cost so, for most air freight, the hub and spoke system works well as it does for passengers. Whilst Azimuth quotes *Boeing 2016 World Air Cargo Forecast* as saying 80% of cargo between Asia and Europe used dedicated

	freighters, the latest Boeing 2018 report (referred to earlier) shows this proportion has fallen to 75%. Hence, it is completely wrong for the Applicant to claim that there is not a general trend to a reducing share of cargo carried on dedicated freighter aircraft. The trend is clear and relates to the overall cost effectiveness of transporting goods. Boeing, in its 2018 report, stresses that dedicated freighters tend to concentrate on the main trade routes whilst bellyhold and hubbing provides the global reach. This contrasts with the view of the Applicant that some how dedicated freighters offer more flexibility to get goods from A to B. The response appears to cling to the belief that decline in freighter use is due to the lack of a dedicated freight airport, citing Leipzig and Liege as having few passengers and seeking to dismiss East Midlands and Stansted as freight airports because they handle more passengers than Leipzig and Liege. At 4.9 mppa, East Midlands is still a relatively small airport in passenger terms and remains able to focus largely on freight. It is frankly ludicrous to liken East Midlands Airport to Amsterdam Schiphol, which handled over 71 million passengers and nearly 500,000 ATMs in 2018. Reference again made to the potential for Amazon dedicated freighter operations. It is important to understand the purpose of Amazon's freighter operations in the context of the US market. The operation of their own aircraft is about feeding their distribution centres to keep them stocked with product https://aviationweek.com/commercial-aviation/amazon-air-seen-little-threat-incumbent-package-carriers. The circumstances in the US are very different and distances in the UK much shorter so delivery times can be met from depots in the centre of the country without the same need to fly between distribution centres.
ND.1.26	This answer again seeks to draw comparisons between Stansted, East Midlands and Amsterdam Schiphol Airports. We note that this answer correctly quotes the planning conditions at Stansted which were inaccurately cited earlier in the Applicant's responses. The response also states that constraints at East Midlands will be overcome when the new UPS handling facilities are operational. Whilst these facilities will enable UPS to grow to a scale to match DHL, we are not aware of any evidence that activity at East Midlands has been constrained to date.
ND.1.27	The response continues to assert that the decline in dedicated freighters in the UK is due day and night time slot constraints. This is not borne out by experience at the UK's unconstrained airports albeit this may have been a factor, in part, at Heathrow. However, to the extent that there has been any constraint at Heathrow, this has not manifested itself in growth in dedicated freighter movements elsewhere, despite both Stansted and East Midlands having ample spare capacity. There is no reason why the re-opening of Manston would make any difference to the clear trend. It should be noted that globally Boeing (2018) forecasts growth in freighters operating globally of 70% but 100% growth in freight. This suggests a global decline in the freighter share of the market of at least 17.5% over 20 years (and more if capacity of dedicated freighter aircraft were to increase relative to increase in bellyhold capacity). The decline in freighter operations is likely to be strongest in markets where there is strong growth in bellyhold capacity, as would be the case with a 3rd runway at Heathrow.
ND.1.28	This response again says that the focus of Manston will not be on integrator operations, yet such operations make up 48% of the Year 20 freighter movements (more in the early years) as set out in Appendix 3.3 of the ES. The Applicant appears not to understand its own evidence. The response says that other than the integrators, dedicated freighter operators do not depend on night flying. However, our analysis of non-integrator freighter operations at Stansted (see ND.1. 18) shows around 45% of operations were dependent on a night movement when either arriving or departing. Hence, the ability for airlines to operate a substantial proportion of their flights at night would be essential to Manston being able to attract such operations.

ND.1.30	This response is wrongly dismissive of the work of Aviasolutions for Thanet District Council (see Section 6 of our 2017 Report). The response also refers erroneously to a footnote on page 14 of Avia's 2017 commentary on Local Plan Consultation Responses, whereas the question refers to Aviasolutions earlier 2016 Report. As we point out in our 2017 Report (paras. 6.8 and 6.16), Aviasolutions correctly interprets our report for TfL and the FTA in 2015. Despite having been told in 2017 that they were misconstruing the meaning of the analysis contained in this report (see ND.1.7), the Applicant clings to its erroneous interpretation of our 2015 Report and quotes in this answer a claimed freight capacity shortfall of 2.1 million tonnes without any new runway or capacity across the London airports as the basis for its claim that Aviasolutions got it wrong. Our views and those of Aviasolutions do not diverge as the Applicant claims, they are in essence the same. The Applicant's view is where the error lies. It is important to note in relation to the role of trucking in the market that this is a matter of cost as well as speed. Dedicated freighter services would not address this issue. The Applicant continues with further criticisms of the Aviasolutions analysis and claims that out of date data has been used because Southend Airport is excluded from the analysis. As any experienced aviation consultant would be aware, Southend has not been included in the CAA Departing Passenger survey in the whole period since 1990, albeit it is being surveyed in 2019. Whilst we noted the Aviasolutions work in our 2017 Report, we have conducted our own analysis of the market from first principles. The Applicant asserts that, somehow, the performance of Manston will be different and claims to use more up to date data than used by Aviasolutions. However, this is not so, as much of the analysis set out in the Azimuth Reports relies on data and analysis used by the Airports Commission in 2013-2015 and fails to take into account subsequent developments and decisions. Once again, the answer states that the London system will be full by 2030 but, as pointed out numerous times in our Reports and responses, this relates to the circumstance where a 3rd runway is not built at Heathrow. Given that the question from the ExA relates to the Aviasolutions 2016 Report which did specifically address viability, it is important to note the conclusion of that report: *"7.3.9. Conclusion - The asset would require significant long term investment but would only generate a marginal return on the capital invested. These returns are also predicated on a large number of external variables over which the owner of Manston Airport has limited influence. It is AviaSolutions' view that based on this scenario there is no viable long term prospect of an economically viable airport being established at Manston".*
ND.1.31	This answer largely repeats earlier answers (ND1.18) that MAG has made a strategic choice to favour passengers over freight at Stansted. Nowhere in Section 5.1 of Azimuth Volume I does it quote MAG as saying it prefers passengers over freight, albeit Azimuth construes this to be the case. Paras 2.52, 2.53 of the Stansted Airport Ltd (STAL) Planning Statement (https://www.uttlesford.gov.uk/media/7748/Stansted-Airport-application-planning-statement/pdf/35__Planning_Statement__final_.pdf) for its recent planning application makes clear there are substantial aspirations for cargo growth: *"2.52 Today, Stansted is the third largest air freight centre in the UK, handling around 10% of the UK's air cargo market. In 2017, 260,000 tonnes of freight, worth over £12bn, were handled on c.12,000 dedicated freighter flights. This helps connect local firms, small and medium*

	sized enterprises in Essex and hi-tech companies in Cambridge, to global markets. In addition to dedicated air freight, the flights of DHL, FedEx, UPS and Royal Mail provide London with an express cargo hub for time critical, often overnight, deliveries. *2.53 Long haul services, such as those recently announced to the Middle East and North America, also bring trading benefits through the capacity to carry air freight. Belly-hold cargo is an important factor in maintaining the viability of long haul services, as well as giving local businesses easier access for importing or exporting goods. This new cargo capability will complement the existing 'all freight' services to, for example, Memphis and Qatar."* It is important to note, however, that STAL anticipates that more long haul scheduled services will be the principal means to drive throughput of cargo. We would further note in response to the Applicant's answer that there is no evidence that there was ever a shortage of capacity at Manston nor that its limited operations in the past were due to any shortfall in facilities. The past performance was reflective of market realities, which have not fundamentally changed.
ND.1.32	This response claims there were no facilities for handling outbound export cargo at Manston, which is absolutely incorrect. The response also restates unsupported expectations of cargo services by type of airline. As we note at para. of our 2019 Update Report, several of the airlines listed as operating in Appendix 3.3 to the ES do not have dedicated freighter aircraft in their fleets. To assist the Examining Authority, we have included the fleet lists of these airlines (from ch-aviation) at **Appendix F**. Freighter aircraft are denoted by an (F). We have included Qatar Airlines in the list where it is evident that they do operate a young fleet of freighter aircraft but, for the reasons we outline, they are highly unlikely to operate to Manston. We have addressed the shortcomings of the Business Model at F.1.5.
ND.1.33	This answer again is based on there being a shortage of capacity for dedicated freighter operations across the London airports. As we have demonstrated, this is not so. Elsewhere the response is muddled as, whilst it correctly identifies the potential of import of flowers from Africa, it claims that the UK will be importing of consumer goods from Pakistan and exporting clothing. This does not appear to be rational given the relatively limited clothing manufacture in the UK and limited consumer goods exported from Pakistan. The response is also unclear about China and implies that it would be a market for exports rather than the majority of trade currently being imports. In any event, there is no evidence that these markets or goods would be candidates for using dedicated freighters and would more likely seek bellyhold capacity (the experience at Manchester Airport with Hainan Airlines and Cathay Pacific would rather tend to prove this point.) We do not believe that the majority of these goods would be of such an urgent nature as to justify dedicated freighters, other than the fresh flower market that Manston historically handled.
ND.1.34	This answer continues to proceed on the basis that most air freight is to and from London. For the reasons already explained (see Section 4 of our 2019 Update Report), this is not the case.
ND1.35	It is not clear where the figure of 394 perishables flights per year comes from? The ES data at Appendix 3.3 shows 444 such flights (Cargolux from Africa/Nairobi in Year 20). Once again, there is lack of clarity of the basis upon which the application has actually been assessed, with different figures being quoted in different parts of the documentation.

ND1.36	The answer wrongly cites the proportion of KLM passengers within the total passenger forecast. This does not answer the ExA's question as to what proportion would be hubbing at Amsterdam. The answer given appears to mean that the route is assumed to carry 75,000 passengers per annum and does not grow through the period. This would equate to c.52 passengers per flight on average based on the 1,456 movements shown in Appendix 3.3 to the ES. KLM's smallest aircraft, the Embraer175 jet, has a capacity of 88 pax, implying a load factor of 60%. This is below a sensible viability threshold which we have assessed as 80% as an initial minimum rising to 88% (2019 Update Report para. 5.29). KLM's network wide load factor is 89.1% in 2018 (https://news.klm.com/klm-2018-traffic-results/) so the route is unlikely to be viable on the basis set out by the Applicant. We note that the response claims that there have been updated discussions with KLM in Feb 2019. We would not dispute that the airline may have expressed interest in recommencing the service but this may well depend on the support package available from RSP and from local authority stakeholders to support the re-introduction of the service. By way of comparison, our forecasts suggest that, if operated, the route could support 111,000 passengers in Year 20 with 67% connecting in Amsterdam. This would be roughly on a par with the number of passengers carried from Durham Tees Valley to Amsterdam in 2018.
ND.1.37	Part i) of the response fails to address the implications of limits on night flying on the prospects for Manston. In practice, the answer given simply demonstrates that a busy passenger schedule during the day is not an impediment to effective freighter operations as the Applicant has elsewhere tried to argue would be the case at Stansted. For the reasons we have set out at ND.1.6, to the extent that freighters are willing to confine their operations to day time hours at Frankfurt, this reflects the power of the hub and air freight consolidation at Frankfurt which would not be replicable at a small remote airport like Manston. Frankfurt is able to leverage its market power in the air freight sector in the same way as Heathrow.
ND.1.38	The response says that bellyhold freight is only cheaper where *"demand outstrips supply".* This is economically irrational as normally prices rise as demand outstrips supply. We have explained at ND.1.6 why Frankfurt has more dedicated freighter capacity than Heathrow. In terms of convenience for shippers, bellyhold is a more flexible option precisely because it uses hubbing to connect multiple points. Box 2b from the Airports Commission Interim Report 2013 illustrates the point. Hubs increase connectivity compared to point to point services.

	Box 2b: What are aviation hubs and how do they work? In a hub-and-spoke model, airlines and alliances focus their route networks on one or more key airports which maximise connecting opportunities for passengers. For example, an airline that operates direct services between three pairs of airports (A-D, B-E, and C-F) could instead route its flights via a hub (H) as shown below. This creates more route options, with passengers travelling from any airport in the network now able to access five different destinations (six, including the hub itself). Furthermore, the additional passengers transiting through the hub make it more viable for the airline to add new routes at that airport or increase frequencies on existing routes, bringing further connectivity benefits. On the other hand, such a model may incentivise airlines to replace some thinner direct routes with routes that involve a transfer, which is less convenient from the perspective of those passengers who travel on this particular route.  Dedicated freighters are inherently less flexible for shippers in terms of getting freight from A to D, E and F etc, and are a more expensive option. Hence, freighter services are being replaced as more bellyhold capacity comes on stream, other than on an ad hoc basis for special loads which can only be justified in limited circumstances.. This answer again makes reference to our 2015 Report for TfL and the FTA. The quotation cited makes clear that we were referring to constraints biting on bellyhold capacity at London not on capacity available for dedicated freighter operations. We have made clear to Azimuth for some time that they have been misrepresenting the conclusions of our 2015 Report. The Applicant asserts that e-commerce is creating a market for pure freighters to secure delivery times but this only works along narrow corridors of very dense demand. To the extent that such freighters are required (and there is little or no evidence that this is so in the UK context), there are choices as to how to serve London given the availability of capacity at Stansted today.
ND.1.39	The response claims that because of pent up demand for more freighters, movements at Manston will grow quickly. However, as noted earlier, over half of the initial movements are shown at Appendix 3.3 of the ES to operated by an integrator, which contradicts earlier

	statements that Manston will not be an integrator base. Hence, if an integrator base is not to be a feature at Manston (as we strongly believe), it is difficult to see where the initial growth might come from. In essence, this answer repeats much of the circumstantial material from earlier answers, including speculation about future operations at Stansted despite clear evidence of investment in increased air freight facilities there. Air freight operations from the dedicated facility do not impede the fast turnaround of low cost airlines, rather these airlines choose not to carry freight themselves as this would slow down their turnaround times. We would also note that when operating long sectors, Ryanair does not seek to operate 4 rotations within a day. All low cost airlines target their last arrivals late in the evening, with aircraft on the ground overnight.
ND.1.40	The answer says that mail flights are not included as they would require night operations. Again, this is different from the information shown at Appendix 3.3 of the ES which shows 770 annual movements on postal services with Boeing737 aircraft (4.5% of total freight movements). Once again, the information provided by the Applicant is contradictory.
ND.1.41	We note that the question did not highlight that the estimate of 18,000 non-domestic cargo ATMs for England and Wales was for day time ATMs only. Total non-domestic freighters in 2018 were 30,338 according to CAA Airport Statistics. 18,000 movements represents a robust estimate for the total number of non-domestic freighter ATMs across England and Wales. What is significant is that only 6,801 of these freighter movements were outside of the EU in 2018, yet Azimuth forecast Manston handling 2,746 such flights in its first year of operation rising to 4,698 in Year 3 (70% share of static market) and 7,785 by Year 20 based on the sector length and movement data in App 3.3 to the ES. This is simply not credible. The answer again claims that passenger flights will displace daytime freighters at EMA. The Applicant's assertions about capacity constraints at East Midlands are hardly borne out by the recent (18th Feb) notification by the Airport that it intends to build 1.4 hectares of apron for additional cargo activity (3-5 aircraft dependent on size) adjacent to the new UPS facility using its GPDO powers. https://www.leicestermercury.co.uk/news/business/ups-gets-green-light-114m-1277726 https://plans.nwleics.gov.uk/public-access/applicationDetails.do?activeTab=documents&keyVal=PNHJVCLR0L300. This suggests that to the extent that there is demand for additional freighters to serve the UK, EMA is already committed to providing the infrastructure required to handle them. It also would strongly suggest that growth is being driven by the integrator sector as the facility is adjacent to the new UPS distribution centre under construction. Of course, we are told elsewhere that it is not intended that Manston will be used by integrators.
ND.1.42	The Department for Transport (DfT) may not forecast freighter movements in detail but they have made a reasoned assumption based on the evidence that there is unlikely to be growth. In the context of considering the need for more airport capacity to ensure that aviation supports economic growth (see Airports NPS and Aviation Strategy Green Paper), it is not plausible to suggest that DfT would seek to understate the need. Contrary to what is stated in the response, the e-mail from the Department does not say that it is planning to produce a forecast for dedicated freighters using UK airports. What the DfT says is that it will take on board the suggestion that forecasts should be produced and consider this as part of the development of a new Aviation Strategy. The recent Aviation Strategy Green Paper does not take up the suggestion nor indicate that any forecasts are in prospect. It is our understanding that such forecasting work is not underway. The remainder of this response is pure speculation.
ND1.43	This response refers to the reference to Manston on the 2003 Future of Air Transport White Paper. We have addressed this at paras. 2.19 and 2.20 of our 2019 Update Report.

ND1.45	We recognise that discussions with airlines are likely to be commercially confidential but the lack of any commitment or documented support from any of the airlines cited as likely to operate, even in general terms, is a concern. We have set out reasons why we do not believe the list of air freight operators to be plausible in our 2019 Update Report.
ND1.46	This response simply repeats generic support for growth in the air transport sector. Policy still expects the specific need to be demonstrated for any development at an airport even within the principle of making best use of runways, other than in relation to Heathrow and the 3rd runway to which the Airports NPS applies. As we have noted in our 2019 Update Report (para. 2.21), any support for Manston within the Airports Commission work was as a reliever airport for local uses, business and general aviation.
Ns.1.24	See answer to CA1.15 above.
Ns.1.28	The response does not provide the requested information regarding the comparative size of night noise quotas at other airports where they exist.
SE.1.2	This answer asserts that there would be a 45% increase in staying visitors in the local area as a consequence of the Airport handling passenger flights. The calculation appears to be based on the assumption that 25% of 1.4 million passengers will stay overnight in the local area. It is important to note that 1.4 mppa passengers is only 700,000 people making an outward and a return journey. Based on the route network proposed for Manston, we would expect the vast majority of passengers to be outbound leisure largely from the local catchment area (as we set out in Section 5 of our 2019 Update Report). Only the routes to Amsterdam and Dublin might be expected to attract a material proportion of foreign visitors, and these routes make up 22% of our passenger forecast. Given that the Applicant's passenger forecast is overstated and, even assuming half of the passengers on these two routes were foreign resident, the impact on local staying visitors (other than connected with the possible ad hoc cruise charters) would be no more than ¼ of that suggested by the Applicant on the most optimistic basis that all of these passengers remained in the local area.
SE.1.3	No comment on response.
SE.1.5	This section provides little in terms of new information and, in fact, highlights some additional flaws in the Applicant's analysis. We refer the ExA to the analysis in our 2017 and 2019 reports. Direct employment – EMA is not an unreasonable comparator but as previously stated the figures for East Midlands are inflated by significant non-airport related employment on the Pegasus Business Park. We do not believe that this has been taken account of. The application of productivity growth only from Year 11 is illogical given the explanation provided. We would in fact expect productivity growth to be higher in the early years as an airport is getting established and growing as companies are able to benefit from rapid growth in economies of scale. Indirect/Induced Employment – this still does not address the issue of what study area is actually being examined and, hence, whether multipliers adopted are appropriate. Catalytic – we remain of the view that these multipliers are too high in the context of the operation of Manston, the surrounding area and the extent of alternatives. Again, there is still no consideration of the study area involved and the influence of this on any catalytic multiplier. In relation to construction labour available locally, while it would appear that RSP is seeking to make appropriate partnerships locally in terms of new entrants to the market, there is little evidence that they have considered how to work with existing construction firms operating in the area to try to ensure opportunities are recognised by and accessible to these firms.

	The appendices provide some more detail on the breakdown of on-site employment. It is difficult to comment further on these, particularly as it is not the breakdown of employment that is at question here but the overall scale, which is ultimately linked to the demand forecasts. However, in relation to freight employment, in particular, we note that no source for the employment density assumptions is provided and there may be double counting between the employment directly by the airport company and third party employment in this activity. Overall, this makes it difficult to comment on their validity or otherwise. We would, nonetheless, make the following observations: • if there are 507 direct airport employees related to cargo handling, what do the other 1,250 employed by other companies do? This appears to be based on the assumption of 50% express freight use (i.e. integrators), which again contradicts the other statements made in response that there will be no integrators operations based at the Airport. • 600 employees in MRO/aircraft dismantling is excessive. The demise of the Monarch Engineering heavy maintenance operation illustrates the problems in the market. http://www.travelweekly.co.uk/articles/320450/hundreds-of-jobs-lost-as-former-monarch-maintenance-arm-collapses. This operation employed 250 staff across two sites at Luton and Birmingham, excluding the line maintenance activities. These latter are associated with maintaining aircraft operations at busy airports so would not need to be replicated in hangarage at an airport like Manston. • If there are 40 staff employed in the FBO, what are the other 50 GA related staff. 40 staff in an FBO are likely to be excessive given the limited business aviation market in the vicinity of Manston given its remoteness from London? • Why would there be 50 staff associated with surface transport located at the Airport? Overall, we continue to believe that the employment density at Prestwick remains the most relevant comparator, noting that this includes Ryanair heavy maintenance activity and so may overstate the number of potential jobs if heavy maintenance or dismantling could not be attracted to Manston.
SE.1.6	This answer claims that there would be no displacement of activity from any other airport and that all the demand that Manston would attract would be unmet demand. This is at odds with claims in the Azimuth Report (see F.1.5 above) that consideration of the costs of switching operations for the airlines and forwarders has been taken into account, which would imply that at least some proportion of the 'forecast' demand is expected to have switched (been displaced) from elsewhere. For the reasons we have demonstrated, there is little or no unmet demand for additional dedicated freighter services to/from the UK and other airports have sufficient spare capacity to accommodate any requirements. Hence, given that the economic effects have, in essence, been quantified by Azimuth at the national level, given the multipliers used, the displacement effects relating to demand attracted to Manston that might otherwise have used Stansted or East Midlands in particular have to be accounted for.
SE.1.10	This answer simply reiterates Azimuth figures. No supporting evidence provided as to what export markets it is intended to serve or why the profile would be different from previously seen at Manston in terms of the import export balance (see our response to ND.1.32). The reference appendix is missing from the bundle but assumed to be FRAPORT report on activity in 2018 referred to elsewhere. The cited quote does not say anything about whether this was growth in imports or exports.
SE.1.13	We have commented on the employment assumptions at SE.1.5. The employment estimates provided by the Applicant are not robust for the reasons given in our 2017 and 2019 Reports. This is particularly so in terms of the local employment implications.

SE.1.15	We note that the question relates to the robustness of the assessment in terms of whether the 'worst case' has been identified. In so far as this question relates to the consequential implications of the levels of employment for the requirement for additional housing in the local area, this does represent very much of a 'worst case' as national level employment is construed as being realised locally. However, in terms of balancing of environmental costs and benefits, the overstatement of employment and GVA impact (see para. 3.54 of our 2019 Update Report) will mean that the balance may not have been correctly struck within the environmental assessment.

lc/7.3.19

Market Overview Demonstrating Market Demand for Office Space at East Midlands Airport and the Locality

Former DHL Offices
Unit 435 Air Cargo Centre
East Midlands Airport
Argosy Road
Castle Donington
DE74 2SE

Prepared for:-

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Prepared supplemental to a proposed Section 73 Planning Application to vary the current condition within the Planning Consent granted which limits occupation of the property to Airport related uses

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Contents

Appendices

Executive Summary

Commercial Estates Group on behalf of Anglo Scandinavian Estates 1 LLP (CEG) have owned the Air Cargo Centre in East Midlands Airport since 2012.

The Air Cargo Centre is a mixed office and warehouse park which is accessed from Beverley Road at East Midlands Airport.

One of the most substantial occupiers within the Air Cargo Centre has always been DHL who have expanded their distribution hub and representation on the Airport and vacated Unit 435 which comprises a two storey self contained detached office building of some 18,000ft² and adjacent warehouse accommodation.

The Air Cargo Centre principally, I would estimate, dates back to the late 1970s / 1980s and was evolved upon the basis that it would attract Airport related uses to help the expansion of the Airport.

Since that time the East Midlands Airport has grown organically to become an Airport of national and regional significance being stated as being the second largest freight Airport within the UK behind Heathrow and one of the major regional passenger Airports in Central England.

In the 1990s / 2000s East Midlands Airport recognised the need to widen the commercial base of the Airport and to improve its location as a business destination to complement the Airport related uses.

Between the late 1990s and the mid 2000s they actively promoted Pegasus Business Park as a prime Business Park of regional significance marketing the proposition into the national and regional markets and most particularly focusing upon its central location being equidistant between Nottingham and Derby and some 20 miles to the North of Leicester.

Pegasus Business Park was promoted through a joint venture with Wilson Bowden Developments but this came to an end in the mid 2000s, since which time there has been more limited development within the park and demand profile was in any event significantly affected by the recession.

When Pegasus Business Park was evolved some 137,000ft² of office buildings were developed over a four year period and in broad terms 70% of the occupation was to non Airport related uses and 30% of the occupation was to Airport related uses.

The non Airport related occupiers were all new inward investment relocations whereas the Airport related occupiers of UPS, The Immigration Service and Babcock were already represented onsite.

In order to bring the DHL office building up to date significant investment is required and it is clear that there is inadequate profile of demand to underwrite the investment required to refurbish the building if the building can only be offered to Airport related uses.

As a consequence, CEG are making a Planning Application to lift the current condition within the planning consent which limits the usage to Airport related occupiers.

This precedence has previously been considered in 2013 when BMI vacated the adjacent office building of 25,000ft² - planning consent was granted lifting this condition which enabled CEG to attract PKF to relocate their East Midlands Regional Office to the Airport.

As a consequence of the limited demand from Airport related uses which has been proven over the last 15 years the lack of provision of Grade A offices within the region we have concluded that the release of the condition will not be detrimental to the onward growth of the Airport but will complement its aspirations for the future and help continue to promote the Airport as a destination of regional significance.

1.0 Instructions and Introduction

1.1 Anglo Scandinavian Estates 1 LLP c/o Commercial Estates Group (CEG) own the freehold interest in the Former DHL Offices, Unit 435 Air Cargo Centre, East Midlands Airport, DE74 2SE.

1.2 The property was built in the late 1980s and has, since it was constructed, been occupied by DHL together with adjacent warehouse properties.

1.3 DHL have recently completed an extension to their Air Cargo hub within the Airport and have vacated the property.

1.4 It is understood that the original planning consent granted incorporates a condition which restricts the occupation of this building to Airport related uses.

1.5 The same condition was placed on a number of the surrounding buildings within the Airport boundary to ensure that as part of the evolution of the Airport that it was allowed to grow as a passenger and commercial Airport destination.

1.6 The Airport has grown substantially both as a commercial and passenger Airport but also as a commercial destination of significance within the East Midlands region.

1.7 The profile of occupiers and uses at Regional Airports has changed as Airport operators have realised that they need to ensure that their destinations are not entirely related upon Airport related uses.

1.8 As a consequence of its age and the fact that the property has since construction been occupied by DHL Unit 435 is now an outdated office facility in need of substantial refurbishment to upgrade the building to modern day use.

1.9 The report has been commissioned by CEG to accompany a Section 73 Planning Application which requests that the current condition limiting the use of the occupation for Airport related uses is widened to an open office use in line with Category B1(A) of the Use Classes Order 1987 (as amended).

1.10 [ ] Planning Consultants have requested a report which demonstrates the demand profile for offices within this location to consider whether or not there will be any detriment to the onward growth of the Airport in such event that the planning consent was widened.

1.11 A similar study was undertaken in June 2013 when the former offices of British Midland were vacated, this building has subsequently been refurbished to provide Grade A offices and is now the East Midlands HQ of PKF Cooper Parry. A similar Market Report and consideration of market conditions was commissioned and undertaken by myself, a copy of that report being attached within Appendix I.

1.12 This report therefore refocuses upon the office market, has due regard to the nature of the subject building and updates the market prognosis and characteristics over the period 2013 to 2018.

1.13 I am preparing this report in my capacity as a Director of FHP Property Consultants who are one of the leading Commercial Property Consultancy businesses within the East Midlands region.

1.14 In preparing the report I have the advantage / knowledge of having been personally involved in the evolution and marketing of Pegasus Business Park within the East Midlands Airport and subsequently in a number of the existing buildings both owned by Manchester Airport Group (East Midlands Airport) and in private ownership.

2.0 The Property

2.1 The property provides a 1980s constructed two storey detached self contained office building of brick elevations under pitched roof which is understood to provide approximately 1,672m² (18,000ft²) net of offices over two floors.

2.2 The property is located within the boundary of East Midlands Airport and forms part of the mixed office and warehouse development known as the Air Cargo Centre, the majority of which is still owned by CEG.

2.3 The property sits immediately adjacent to the former offices of British Midland which is now occupied by PKF Cooper Parry Chartered Accountants as their Regional East Midlands Office and is provided with a self contained car park for approximately 100 cars.

2.4 It is understood that the offices were originally constructed for DHL who vacated the premises in late 2017 having relocated this office function to their main distribution and office building which is also located within East Midlands Airport.

2.5 The building provides two floors of open plan offices. Photographs of the property both internally and externally are attached within Appendix II.

2.6 The property offers a tired and outdated internal specification as follows:-

- Entrance reception incorporating lift and stairs access fronting Bennerley Road
- Two floors of open plan offices
- Male, female and disabled WC facilities to each floor
- Solid floors with carpet finishes
- Suspended ceiling with inset lighting
- Aluminium powder coated double glazed windows

3.0 East Midlands Airport – Commercial Overview

3.1 It is my understanding that East Midlands Airport was opened in 1965 since which time it has established itself as the country's second largest Air Cargo Airport behind Heathrow.

3.2 In addition the Airport is one of the UK's recognised regional passenger Airports with approximately four million passengers reported to use the Airport on an annual basis.

3.3 FHP was formed in 1990s and it was during the 1990s that we first became involved with East Midlands Airport when at that time Hallam Land Management were seeking to promote Ginbro Farm and more latterly in the late 1990s when the East Midlands Airport sought to attract Joint Venture Developers to promote non core surplus land within the Airport's boundary to improve the Airport's relationship with the regional community and to promote a Regional Business Park which would be open to Airport and non Airport related uses.

3.4 The nature of the East Midlands Airport as a commercial destination as a consequence was transformed, in particular by:-

1. The planning consent which was granted on Ginbro Farm in the early 1990s and negotiated by Hallam Land Management – this released in excess of 100 acres in the south western quadrant of the Airport's boundary and was subsequently acquired by East Midlands Airport who attracted DHL to relocate their UK air freight headquarters to East Midlands Airport and enabled the implementation and expansion of additional long stay car parking in support of the Airport's growth.

2. The evolution and implementation of Pegasus Business Park through a Joint Venture Agreement between Wilson Bowden Developments and the East Midlands Airport which was entered into in or around 1997. Here I was personally involved in the evolution of Pegasus Business Park acting on behalf of Wilson Bowden Developments and East Midlands Airport which saw approximately 137,000ft² and buildings developed and occupied over the period 1999 to 2002.

3.5 Of these buildings approximately 32,000ft² was taken by Airport related users with UPS, Babcock and The Immigration Service taking the opportunity to relocate their existing offices within East Midlands Airport and upgrade to more modern facilities. The remaining 105,000ft² was taken by non Airport related users, namely Powergen (now Western Power), Regus and PWC as I onwardly summarise in greater detail.

4.0 Pegasus Business Park – Buildings Developed 1999 to 2002

Occupier	Size (net)	Nature of Business
United Parcel Services (UPS)	1,114m² (12,000ft²)	Airport related office serving the East Midlands Airport and the wider UPS network.
Babcock (originally Hunting Air Services)	929m² (10,000ft²)	Airport related occupier.
The Immigration Service	929m² (10,000ft²)	Airport related function.
Powergen (now Western Power)	4,180m² (45,000ft²)	Non Airport related.
Regus Serviced Office Centre	1,858m² (20,000ft²)	Non Airport related.
Price Waterhouse Coopers	3,716m² (40,000ft²)	Non Airport related regional office.

4.1 The evolution of Pegasus Business Park is fully summarised within our report dated 11th June 2013 commissioned to accompany the Section 73 Planning Application submitted on the adjacent building.

4.2 It shows that Pegasus enabled UPS, Babcock and the Immigration Office to upgrade their existing offices within the Airport but demonstrates that Pegasus was more widely regarded as a Regional Business Park which generated demand from the East Midlands from non Airport related occupiers.

4.3 Pegasus Business Park was extremely successful over its three / four years of active marketing and development and it would have continued to have grown had there not been a breakdown in the relationship between East Midlands Airport and Wilson Bowden Developments which prevented the park from being onwardly promoted and developed through the Joint Venture vehicle.

4.4 As summarised within the report of June 2013 subsequent development at East Midlands Airport has been more sporadic with the completion of the Holiday Inn Express and Premier Inn Hotels and two phases of offices implemented by Cannock Developments, the first phase being Cygnus Court - three smaller individual units of between 418m² (4,500ft²) and 743m² (8,000ft²) and Osprey House, a self contained building extending to 2,369m² (25,500ft²).

4.5 The evolution of the development of these properties and a summary of the marketing that was undertaken was summarised within our report June 2013.

4.6 The analysis undertaken in 2013 demonstrated that the majority of demand generated was from non Airport related uses.

5.0 Office Market Update - 2013 to 2018

5.1 Our report of June 2013 profiled the demand for offices at that time.

5.2 In the intervening period there has been little change in the occupational line up within the Airport albeit at the time of preparing the report PWC have recently downsized their East Midlands office on the park by approximately 50% with Savills (Nottingham) marketing approximately 18,000ft² within their office building.

5.3 A copy of the sales particulars of Savills is attached within Appendix III.

5.4 It is also appropriate and relevant to note that there has been significant new development within the distribution sector within the immediate locality, in particular with:-

1. Aldi choosing the Sawley Crossroads site approximately 2.5 miles to the North of the site and accessed from the A50 for their 1.5 million square feet two phase Midlands distribution facility.

2. The consent granted and the implementation of the East Midlands Gateway 600 acre distribution park being implemented by Segro and Roxhill where it is anticipated that ultimately 6 million square feet of distribution space will be provided, anchored by the first deals which have been announced to Amazon and Shop Direct.

5.5 The implementation of the distribution park complements the existing distribution focus, both within the Airport most particularly dominated by the DHL distribution facility and to the North of Castle Donington cantered on Willow Farm and more particularly the East Midlands Distribution Centre.

5.6 These developments improve the regional significance of the location which was already recognised as a strategic office location on the M1 corridor as previously highlighted.

5.7 It is understood, in speaking with Savills, that of the 18,000ft² which has been vacated by PWC within their building that terms have been agreed to let 6,000ft² to HBC for a non Airport related use and that the discussions are ongoing with a major service company for their East Midlands office to potentially relocate from Ashby, again a non Airport related use.

5.8 MAG have continued to market their surplus land within the boundary of East Midlands Airport and have the capacity to build additional new build offices both within Pegasus Business Park and adjacent to the National Grid building at the entrance to the park but so far as we are aware no significant interest has been attracted which can stimulate speculative development either from Airport or non Airport related uses.

5.9 The former DHL building is tired and in need of substantial refurbishment to attract an office occupier and initial cost estimates indicate that between £1,200,000 and £1,500,000 will need to be spent on the building to bring it up to modern day standards and to provide accommodation to a similar standard to that which has been offered by PWC within the PWC Building which has no restriction on user.

5.10 The marketing of the building will of course not exclude Airport related uses and this sector will, as part of the marketing, be targeted and therefore in such event that an Airport related user is in the market the building will still be available for occupation but having regard to the fact that the last Airport related office user was last attracted to the site when Pegasus was initially conceived in the early 2000s it is clear that it is more likely that the potential occupier for the site will be of a non Airport related use as opposed to being directly Airport related.

5.11 The vibrancy of the business element of the Airport is important both to increase the stature of the East Midlands Airport as a destination – attracting PKF Cooper Parry in 2013 to relocate their East Midlands office bringing together their offices from Nottingham, Derby and Leicester together with HSBC bringing a Regional Office into the park only helps to strengthen the business element of the Airport which of course, through both its passenger and freight traffic, highly dependent upon the business as well as the domestic markets.

5.12 Within our report of June 2013 we undertook a case study on the development of the last speculative office building within the East Midlands Airport, namely Osprey House. This is now occupied by National Grid.

5.13 There has been no speculative office development within the Airport, nor within the region, since that time of any significance.

5.14 The Airport is one of the most significant office locations within the North West Leicestershire District Council boundary with demand being generated from within the region with the average size of office occupier being larger than one finds elsewhere on the principle Business Parks which are located on the M1 corridor.

5.15 The East Midlands M1 corridor office market is dominated by the office parks of:-

1. Grove Park / Meridian Business Park, J21, M1

2. To a much lesser extent, Forest Business Park adjacent to the Bardon and Mount Park Distribution Parks at J22

3. Pride Park, Derby / Interchange Office Park, J25, M1

4. Nottingham Business Park / Phoenix Office Park, J26, M1

5. Sherwood Business Park, J27, M1

5.16 With the exception of Sherwood Business Park at J27 which is a former Enterprise Zone where there is an oversupply of offices there has been no significant speculative development undertaken since we last evaluated the market profile of the area.

5.17 The office market within the East Midlands area as a whole has relied upon the provision of Grade A refurbishment projects as there is inadequate confidence within the market nor has there been sufficient rental growth to underwrite speculative development.

5.18 It is our view that it is important that a building of this significance within the East Midlands Airport is brought back into use and provides Grade A offices which can be offered on an unrestrictive basis within the open market.

5.19 A building of this size should attract a further 150 to 250 employees to East Midlands Airport.

5.20 The fact that there has been no significant office occupier attracted to the Airport for some 15 years would indicate that by allowing the building to be marketed on an unconstrained basis will not have detriment impact upon the growth of the Airport and it is understood that the Airport themselves are supportive of the proposal.

5.21 In such event that the building was purely marketed and available for Airport related uses then CEG would be unable to commit to the expenditure to refurbish the building to provide a Grade A office and could only market the building on the basis that works would have to be held back until such time that an occupier for the majority of the building was identified to take the property on appropriate commercial terms.

5.22 As confirmed, the last lettings of significance to Airport related uses were to UPS (12,000ft^2), The Immigration Service (10,000ft^2) and Hunting Air Services (10,000ft^2).

5.23 All three occupiers were already located within the Airport and took the opportunity, as previously confirmed within both this report and the report of 2013, to upgrade their space from outdated facilities and since that time Hunting were acquired by Babcock and they have subsequently closed the office.

5.24 The letting prognosis and prospects of reletting the building to an Airport related use are therefore on this basis extremely low if not remote.

5.25 It is therefore for these reasons as summarised that it is appropriate to release the existing restrictive condition and allow the building to be brought back into use and provide a Grade A office facility to be provided on a speculative basis.

6.0 Further Information / Clarification

6.1 I would hope that the contents of this report are self explanatory – clarification / confirmation of any of the points arising can be provided if required.

Prepared by ....

John Proctor BSc (Hons) MRICS
FHP Property Consultants
10 Oxford Street
Nottingham
NG1 5BG

Dated 1st May 2018

Appendix I

Market Overview

Former BMI Offices
Unit 423 Air Cargo Centre
Argosy Road
East Midlands Airport
DE74 2SA

Market overview demonstrating market demand for office space at East Midlands Airport and the locality.

Prepared for:-

Anglo Scandinavian Estates 1 LLP c/o Commercial Estates Group and North West Leicestershire District Council

11 June 2013

Prepared by John Proctor BSc (Hons) MRICS – FHP

Contents

Appendices

Executive Summary;

This report has been prepared at the request of Anglo Scandinavian Estates 1 LLP c/o Commercial Estates Group as freehold owners of Building 423 Air Cargo Centre, Argosy Road, East Midlands Airport.

The building comprises a detached 1980s built two storey office building with a net internal area of approximately 25,500ft².

The report is prepared to accompany a Section 73 Planning Application to be submitted by Anglo Scandinavian Estates 1 LLP c/o Commercial Estates Group to accompany a Planning Application which is seeking to vary Condition 7 of the existing planning consent which currently allows the property to be used as offices but only upon the basis that the occupier is of an Airport related nature.

North West Leicestershire District Council have requested a report which demonstrates the demand profile for offices in this location to consider whether or not there would be any detriment to the onward growth of the Airport and the wider planning and economic strategies being evolved by North West Leicestershire to agree to the widening of the usage as requested.

This report has been provided by John M Proctor BSc (Hons) MRICS, a Director of FHP Property Consultants, and analyses the marketing which has been undertaken within the East Midlands Airport area for the past 15 years with particular reference to FHP's direct involvement in the evolution and implementation of Pegasus Business Park and more recently the marketing of individual buildings and most particularly Osprey House, a 25,000ft² building which was let to National Grid in April 2012.

The evidence indicates that there is little or no demand currently being generated from Airport related users for offices of this nature within this locality.

As a consequence the logical conclusion from FHP's perspective is that unless the planning consent in respect of the office development is widened, this office is likely to remain vacant for a considerable period of time.

The lack of demand would however by implication lead one to also conclude that widening the consent would not be of detriment to the onward growth of East Midlands Airport as a location as there is no current demand for space of this nature.

1.0 Instructions and Introduction;

1.1 I, John Proctor, a Director of FHP Property Consultants have been instructed by Anglo Scandinavian Estates 1 LLP c/o Commercial Estates Group (CEG) as freehold owners of the Former BMI Baby Offices, Unit 423 Air Cargo Centre, East Midlands Airport to review the demand profile for offices of this nature.

1.2 This report is intended to accompany a Section 73 Planning Application requesting that the restricted use which limits the occupation of this building to Airport related users only can potentially be widened to an open office use in line with Use Category B1 (A) of the Use Classes Order 1987 (as amended).

1.3 I am preparing this report in my capacity as a Director of FHP Property Consultants who are recognised as one of the leading Commercial Property Consultancy businesses within the East Midlands region.

1.4 In preparing this report I have the advantage / knowledge of having marketed office properties at East Midlands Airport since the mid 1990s.

1.5 I head the Office and Industrial Agency Teams at FHP and over the past 15 years I have, by way of illustration, acted for Wilson Bowden Developments and East Midlands Airport in the evolution and implementation of Pegasus Business Park.

1.6 Here I was personally involved as Agent to Wilson Bowden Developments from 1997 until 2005 and personally agreed the letting and sale of buildings within Pegasus to occupiers such as Powergen (subsequently E-on and Western Power), Price Waterhouse Cooper (PWC), Regus, Babcock, The Immigration Office and UPS totaling some 137,000ft^2.

1.7 After the demise of the joint venture between Wilson Bowden Developments and East Midlands Airport FHP have subsequently acted for Cannock Developments and IM Properties and most recently concluded the 25,500ft^2 letting of Osprey House on behalf of IM Properties in April 2012.

1.8 I am currently instructed by Anglo Scandinavian Estates 1 LLP c/o Commercial Estates Group, advising them as freeholders of the former offices of BMI Baby which are still subject to a lease to BMI which terminates in July 2013 and I am providing strategic advice to Manchester Airport Group on both existing office and industrial premises and their undeveloped land within the Airport boundary.

1.9 I am able to provide my commentary set in the context of also having active involvement in the wider East Midlands Airport and most particularly the three major conurbations, Leicester, Derby and Nottingham.

2.0 The Property;

2.1 I attach in Appendix I the property particulars of FHP.

2.2 The document confirms that the building comprises a 1980s constructed two storey self contained office building of brick elevations under pitched roof providing approximately 25,500ft^2 of offices over two floors.

2.3 It is my understanding that the offices were originally constructed for DHL and more recently have been used as the headquarters of BMI Baby who vacated the premises in early 2011.

2.4 The property is currently still held by BMI Baby on a lease which expires in July 2013.

2.5 Segro Estates owned the property until December 2012, the freehold interest now being owned by Commercial Estates Group.

2.6 Lambert Smith Hampton are currently advising BMI Baby and it is my understanding that they commenced marketing of the premises in September 2010 on a "soft" basis with active marketing commencing in January 2011.

2.7 FHP were originally invited to provide advice to Segro Estates in June 2012 to provide advice as to the potential marketability of the property once the BMI Baby lease terminated and onwardly their instruction was reconfirmed by Anglo Scandinavian Estates 1 LLP c/o Commercial Estates Group following their purchase of the building.

2.8 The building has been marketed since late 2010, by Lambert Smith Hampton and more recently in conjunction with soft marketing implemented by FHP and Innes England acting jointly for the freeholder.

2.9 The building provides open plan offices with its specification generally (modest modernisation and refurbishment is required) of a standard which meets the needs of an office occupier. Features of the specification include:-

- Entrance reception with lift and stairs access between the ground and first floors
- Two floors of open plan offices
- Male, female and disabled WC facilities to both floors
- Fully accessible raised floor within the office area
- Comfort cooling
- Plaster and emulsioned walls
- Aluminum powder coated double glazed windows
- Suspended ceiling within inset Category II light fittings

2.10 The property forms part of what is known as the Air Cargo Centre, a mixture of warehouse and office buildings which in themselves sit within the boundary of East Midlands Airport at Junction 23a of the M1.

2.11 East Midlands Airport opened, we believe, in 1965 and has established itself as the country's second largest air cargo operation, having grown by virtue of its central location in the UK.

2.12 In addition the Airport is one of the UK's recognised passenger airports with approximately

4.3 million passengers using East Midlands Airport in 2012.

2.13 The growth of the Airport has naturally led to parallel growth of the supporting business space required to both serve the Airport and more recently its expansion as a recognised business destination within the East Midlands area and I understand approximately 6,500 people are employed at EMA.

2.14 From my own personal experience I am of the view that the interrelationship of the East Midlands Airport with the region as a business destination was transformed particularly by two major elements, namely:-

1. The planning consent granted to Gimbro Farm in the early 1990s negotiated by Hallam Land Management which released in excess of 100 acres in the south western quadrant of the Airport's boundary which attracted DHL to locate its UK Air Freight Headquarters at East Midlands Airport and enabled the implementation of additional long stay car parking in support of the Airport's growth.

2. The ultimate Joint Venture Agreement between Wilson Bowden Developments and East Midlands Airport which was originated in the mid 1990s and implemented I believe in 1997 to promote non core surplus land within the Airport's boundary as a regional business park open to both Airport and non Airport related users, leading to the evolution and implementation of Pegasus Business Park which saw buildings developed for UPS, Babcock, The Immigration Service, Regus, Powergen and Price Waterhouse Cooper totaling 137,000ft², these buildings being developed over the period 1999 to 2002.

2.15 A copy of the marketing literature dated Autumn 2000 is enclosed within Appendix II.

3.0 Market Overview;

3.1 I am providing this brief market overview within the context of having been directly involved in the marketing of both land and buildings at East Midlands Airport since the mid 1990s. In addition I, and the Office Agency Team at FHP, have advised both Land Owners, Developers, existing Owners and Tenants of office parks, existing office premises and new build schemes within the East Midlands region.

3.2 Market trends naturally change and most recently the impact of the economic downturn, the implementation of central and local Government policies in relation to transportation and general work practices linked to the onward maturity of the digital world have affected the profile of the office market.

3.3 In the broadest terms over the past 15 / 20 years we have witnessed the growth of the out of town office park market which was through my eyes conceived in the mid 1980s and in the East Midlands area a feature of development and workplace habits during the 1990s and the 2000s followed by the demise of the out of town office locations caused by the change in workplace habits, Government transportation strategies and the economic downturn most particularly.

3.4 These market trends are reflected by the phases of development which have been seen within East Midlands Airport.

3.5 At the outset of the launch of Pegasus Business Park in the late 1990s / early 2000s there was strong demand at a time when there was:-

a) Latent demand within the area

b) A demand for out of town offices

As a consequence the development was kick started by the 44,000ft² presale to Powergen with Wilson Bowden Developments speculatively developing two buildings of 20,000ft² simultaneously which were let to The Immigration Office, Babcock and Regus.

3.6 Prelettings followed to UPS and PWC, these building being completed in 2001 / 2002. A copy of the marketing brochure prepared in 2000 is attached within Appendix III.

3.7 Onward development at Pegasus was constrained by the failing joint venture between Wilson Bowden and East Midlands Airport with the next phase of development being undertaken in 2005 / 2006 when the two budget hotels were completed and two phases of offices were implemented by Cannock Developments with the first phase being Cygnus Court, three smaller units of between 4,500ft² and 8,000ft² and latterly Osprey House, a self contained building of some 25,500ft² on which I onwardly provide detailed commentary demonstrating the demand for offices in this location from the period of 2007 to today's date.

3.8 Interestingly, and of relevance to the Planning Application, is the relationship of Airport and non Airport related occupiers who have taken space at the Airport.

3.9 In the initial phase of Pegasus there was Airport related occupation with UPS, Babcock (previously Hunting Aviation) and The Immigration Office all taking the opportunity to upgrade from their existing premises at the Airport.

3.10 Whilst I am not an expert in Airport related trends within the UK, FHP have been actively promoting offices within the Airport boundary since the mid 1990s, both within Pegasus where there are no restricted use provisions and also elsewhere within the Airport's boundary on behalf of MAG, Segro and now Anglo Scandinavian Estates 1 LLP c/o Commercial Estates Group where the restriction does exist.

3.11 What has become evident both through our own marketing and through our liaison with the Property Team at East Midlands Airport is that there has been ongoing centralisation of administrative facilities and merger of both passenger and Airport related airline providers / suppliers in parallel with the enhanced technological ways of modern working which have reduced the demand for offices at each and every Airport location.

3.12 This has been clearly illustrated by our marketing of Centennial House (marketing details attached in Appendix IV) – here we have acted for MAG for the past five years seeking to promote offices from 500ft² to 10,000ft² in a self contained two storey 1980s built office building with the space being available on flexible terms.

3.13 It has proven extremely difficult to attract occupiers and similarly other more peripheral offices within the Airport's Estate have also been vacated both within the terminal building and elsewhere within the Airport's boundary as this trend is continued.

3.14 MAG themselves, through both the Property Teams at East Midlands Airport and Manchester, promote the availability of the land and are regularly in communication with the principal office occupiers and freight forwarders etc who occupy space at Airports through their existing portfolio and estate of their managed Airports throughout the UK and it is significant that there has not been a single notable inward investment of an Airport related occupier over and above the relocation / expansion of the offices of UPS, Babcock and The Immigration Service which occurred simultaneous with the implementation of the Pegasus Business Park proposals in the late 1990s.

3.15 This concern has been raised by MAG to both ourselves and Colliers who have been jointly appointed to promote surplus buildings and land at the Airport and they are now wishing to understand how they might be able to promote the Airport to a wider audience to help the onward growth of the Airport as a business destination.

4.0 Market Evidence of Occupational Trends / Demand at East Midlands Airport;

4.1 Office accommodation of this nature within the East Midlands Airport boundary has been actively marketed since the late 1990s.

4.2 The initial marketing was driven by the evolution and growth of Pegasus Business Park which grew quickly in the late 1990s / early 2000s at a time when out of town business parks were expanding quickly.

4.3 The growth of Pegasus was in part fuelled by the relocation of Airport based operators with UPS, The Immigration Service and Babcock all taking advantage of an upgrade in the standard of accommodation that they previously occupied on site.

4.4 Despite the fact that as part of the marketing all other Airport operators and Airport related users were identified, no other significant Airport related occupiers have been attracted to Pegasus albeit Heavyweight Air Express have took some 6,000ft² in Cygnus Court in 2009 expanding their existing operation which was previously located within a warehouse unit.

4.5 Marketing of Pegasus through the joint venture between Wilson Bowden and East Midlands Airport came to an end in 2004 / 2005 as East Midlands Airport retook control of marketing the site which coincides with the sale of the Airport to the National Express Group and subsequently to MAG.

4.6 Marketing of surplus land has however been onwardly undertaken by MAG and more recently FHP and Colliers International have been appointed on a Joint Agency basis (in 2012) to promote the land.

4.7 In the interim period Cannock Developments have implemented two schemes, namely Cygnus Court, a three unit scheme of two storey detached offices adjacent to the offices of PWC developed in 2004 and the development of Osprey house, a self contained 25,000ft² developed in 2006 / 2007.

4.8 The purpose of this report is to analyse the demand for Airport related users at East Midlands Airport in order that North West Leicestershire District Council should consider whether to continue to protect office buildings for Airport related uses.

4.9 The best evidence is up to date market testing and whilst I have provided a brief overview on the wider marketing which has been undertaken at East Midlands Airport since 1995 the best evidence is the more recent marketing which has occurred on buildings offering similar size and nature of accommodation to that provided by the former BMI building.

4.10 I am able to provide that evidence by reference to:-

1. An analysis and summary of the marketing which was undertaken on Osprey House – a new build self contained three storey office of the same size as the BMI building where FHP acted as Joint Agents with Lambert Smith Hampton, marketing over the period 2007 to 2012 (the building ultimately being let to National Grid who are now in occupation).

2. The marketing of the first floor of Pembroke House by Lambert Smith Hampton which was marketed from January 2011 and let to Miranda Technologies in October 2012.

3. By reference to the marketing of the BMI building itself which has been undertaken by Lambert Smith Hampton over the period September 2010 to today's date and more latterly in conjunction with FHP acting on behalf of Anglo Scandinavian Estates 1 LLP c/o Commercial Estates Group where soft marketing commenced in the Autumn of 2012.

5.0 Osprey House – A Case Study;

5.1 I have attached as a separate document the marketing meeting minutes and enquiry schedules of both FHP and Lambert Smith Hampton over the period June 2007 to completion of the letting in April 2012.

Property Summary;

5.2 I attach in Appendix V three marketing brochures which were developed during the life of the marketing:-

a) The original brochure being prepared October 2005

b) The updated brochure prepared and issued early 2008

c) The final brochure completed and issued 2011

5.3 In summary, Lambert Smith Hampton and FHP were instructed in the Autumn of 2005 to jointly market the proposed speculative development of Osprey House on behalf of Cannock Developments.

5.4 Over the entire period from October 2005 until the letting concluded to National Grid the property was marketed in a structured way including:-

a) Erection of signage

b) Preparation of marketing brochures

c) Local and national advertising

d) Continual and regular (in broad terms 3 to 6 monthly) mailing to Airport related occupiers, Property Agents and businesses within the East Midlands region

e) Registration on relevant websites including www.estatesgazette.com, www.novaloca.com, www.fhp.co.uk and www.lsh.co.uk

f) Preparation of flyers and postcards (both hard copy and more latterly digital)

g) Preparation of a dedicated website www.osprey-house.co.uk

5.5 The initiatives are summarised within the marketing meeting minutes enclosed within the separate document and the enquiries which were generated throughout the life of the marketing are summarised on the enquiry sheets.

5.6 For ease of reference I have summarised the key dates as follows:-

September 2007	Practical Completion of Osprey House.
November 2007	Onsite launch – Agents key occupiers invited.
March 2008	Detailed negotiations commenced with E-on.
May 2008	Draft Heads of Terms issued to E-on and agreed June 2009
February 2009	E-on withdrew from the negotiations
February 2009	Active marketing recommenced
April 2009	Detailed interest from i2 Limited, a serviced office occupier. Financial terms could not be agreed and i2 became nervous of the location.
Summer 2008 to Spring 2010	Osprey was considered as a potential relocation of Alstom Limited (commercial boilers division) to relocate facilities 12,000ft² from Derby and Ashby.
January 2010	Property considered by Games Warehouse (5,000ft² requirement) to occupy one floor.
April 2010 to September 2010	Osprey House / East Midlands Airport considered by Leicestershire Fire Authority for their headquarters.
April 2010	Initial interest received from Chinook Sciences (renewable regeneration specialists) for 12,000ft².
May 2010	Proposal submitted to Chinook Sciences.
June 2010	Redesign for the marketing package recommended. Relaunch of brochure commissioned June 2010.

June 2010	Terms agreed with Chinook Sciences Limited.
June 2010	Relaunch of marketing package put on hold.
September 2010	Chinook withdrew from the transaction on HR grounds.
September 2010	Reactivated marketing campaign, i.e. new brochure, new signage, dedicated website, postcards and emailers.
December 2010	Interest received from Countrywide Surveyors (10,000ft²).
January / February 2011	Full relaunch of marketing, mailing and launch of website.
April 2011	Interest received from National Grid (25,000ft² requirement).
June – October 2011	Detailed negotiations with National Grid.
October 2011	Terms agreed with National Grid.
April 2012	Building let to National Grid.

5.7 The building was actively marketed for more than four years following Practical Completion.

5.8 The void period was exaggerated over and above what one would ordinarily expect to see for a building of this size and nature by virtue of the fact that completion of the building was shortly before the commencement of the economic downturn and the weakening for demand for out of town offices as previously summarised.

5.9 What is surprising is that if one analyses all of the enquiries that were received / entertained over the marketing period there is a distinct lack of demand from Airport related users. This profile of demand endorses the market commentary offered.

6.0 Pembroke House;

6.1 Pembroke House is a 20,000ft² self contained building which was developed and completed by Wilson Bowden Developments at the entrance of Pegasus Business Park and completed in 2000 – the building was originally let to The Immigration Service who still occupy the ground floor and Babcock who relocated from older 1970s offices within the Airport who had acquired Hunting Air who had a longstanding representation at EMA.

6.2 LSH commenced marketing in January 2011 and agreed a letting to Miranda Technologies (an IT company) who relocated from their offices in Stamford on Soar, Leicestershire (North of Loughborough) with lease completion being October 2012 (a marketing period of 22 months).

6.3 Details for Pembroke House are attached in Appendix VI.

7.0 Unit 423;

7.1 BMI Baby commissioned soft marketing of this building in September 2010 appointing LSH to act upon their behalf – active marketing commenced in parallel with their vacation of the building in January 2011.

7.2 LSH actively marketed the building and I attach within Appendix VII both the original and more up to date marketing particulars of LSH.

7.3 The marketing included erection of signage, mailing and advertising with the property being fully exposed to the market in an active manner since the beginning of 2011.

7.4 I understand in speaking to Philip Quiggin at LSH who handled the enquiries that the levels of demand at the outset were poor albeit interest was received during 2011 from Miranda Technologies and Micros, both of whom are IT companies with regional offices based within the East Midlands region.

7.5 As the BMI lease comes to an end in July 2013 Segro (who previously owned the building prior to CEG's purchase) asked FHP and Innes England as Joint Agents to undertake parallel soft marketing of the space which commenced in the Autumn of 2012.

7.6 Since that time interest has been generated in the property (as previously confirmed) by a major corporate company and a regionally based professional services company.

7.7 The property has therefore been actively marketed now for more than 2.5 years and one would hope that the discussions with the professional company will yield to a successful letting as these discussions are advanced.

7.8 Over the 2.5 year period there has not been a single expression of interest however from an Airport related use.

8.0 <u>Demand Overview / Interpretation;</u>

8.1 From my own experience I have always seen East Midlands Airport as contributing to the East Midlands economy. It has the ability to provide a well accessed, high profile commercial location in a position which is equidistant between Nottingham and Derby and whilst accessible via the A1 from Leicester there is less linkage to Leicester from my own experience.

8.2 The occupiers who have been attracted to the Airport have cited these components as being the major reasons as to why they choose this location.

8.3 The original deal on Pegasus was the sale of 44,000ft² to Powergen. They brought together operations from Nottingham and Coventry.

8.4 PWC merged their East Midlands offices into Castle Donington with National Grid bringing together offices from Junction 26 of the M1 in North Nottingham and Rugby.

8.5 The most recent occupier into the East Midlands Airport is Miranda Technologies who as previously confirmed occupy the first floor of Pembroke House in following Babcock's relocation (this letting completing some 22 months after marketing of the space commenced). Miranda were previously based in Stamford on Soar, a village approximately four miles North of Loughborough, who were bringing together more regional representation thereby requiring a strategically located office with easy access to both the East and West Midlands. Colliers International in Birmingham represented Miranda in their search for premises.

8.6 There are signs that there is a slight strengthening demand for offices on the M1 corridor, witnessed by the occupation of National Grid and Miranda, together with the level of interest which has more recently been generated on Building 423 itself.

8.7 As previously confirmed it is our understanding from LSH that the enquiries generated on this building through 2011 were relatively poor with a slight improvement during 2012 with interest expressed from Miranda Technologies (who took Pembroke House) and Micros, a software company, seeking to bring together their Leicester and Nottingham Offices into one building.

8.8 More recently, and in conjunction with the more active marketing implemented by FHP on behalf of Anglo Scandinavian Estates 1 LLP c/o Commercial Estate Group, there has been a higher level of interest with Building 423 being considered in detail by both a corporate company and a professional company who have representation in Nottingham, Derby and Leicester.

8.9 Negotiations with the professional company are at an advanced stage and there are strong prospects that terms may be agreed which would enable the professional company to locate their regional office in this location.

8.10 What is clear however is that there is very little evidence of Airport related demand for office occupiers at East Midlands Airport. This is proven by extensive marketing which has been undertaken over the past 15 years where FHP have either had a direct or indirect involvement. At the outset of the marketing of Pegasus there was latent demand from within the Airport which led to UPS, Babcock and The Immigration Office taking space within the initial development phases in late 1999 / early 2000s.

8.11 Since that time I cannot find evidence of substantial interest in EMA from Airport related users from the marketing which has been undertaken on space of a similar size and profile to Unit 423.

8.12 There is additional space within the Airports estate which is vacant together with the surplus development land which is being onwardly marketed.

8.13 If a significant occupier is attracted to EMA then their use can be accommodated on a design and build basis.

8.14 There is regular turnover of existing stock both within the East Midlands Airport property portfolio and within the separately owned buildings illustrated by the previous marketing of individual buildings and suites within Pegasus, at Osprey House and Cygnus Court.

8.15 My conclusion therefore having regard to the marketing evidence summarised within this report is that if the existing restriction remains that it is most likely that Building 423 will remain vacant for the foreseeable future.

8.16 The evidence of the marketing which I have summarised does indicate that by considering an open consent for office usage that this will not be detrimental to the growth of the office as the location is not currently generating demand from this sector.

8.17 Indeed one could argue that by widening the consent this will actually contribute to onward growth by enhancing the size and stature of this location regionally. Even when users are not Airport related they do use the facilities within both the Airport and the immediate vicinity.

8.18 I would hope that the contents of this report demonstrate that there has been both active marketing of the Subject Property since early 2011 which has confirmed that there is no interest from an Airport related user and that the evidence and case study of Osprey House and the overall market commentary linked to my involvement in Pegasus Business Park and other buildings within the East Midlands Airport over the past 15 years demonstrate similarly that there is very little market demand from Airport related users for this location.

Prepared by [redacted]....

John Proctor
FHP
[redacted]

Dated 24 June 2013

Appendix I

FHP Particulars

To Let

1,184m² (12,740ft²) - 2,375m² (25,561ft²)

High quality office with large open plan floor plate and excellent secure parking

Nearby facilities include:

Nearby occupiers include:

Argosy Road
Pegasus Business Park
Castle Donington
DE74 2SA

+ Sought after business park address
+ Easy access to Notts, Derby and Leicester
+ Travel to London by train in 1hr 30min from East Midlands Airport
+ High quality specification
+ Excellent parking provision

Visit our website www.fhp.co.uk

0115 950 7577

Fisher Hargreaves Proctor Ltd I 10 Oxford Street Nottingham NG1 5BG

PROPERTY CONSULTANTS

Office | Derbyshire, DE74 2SA

Argosy Road
Pegasus Business Park
Castle Donington
DE74 2SA

1,184m² (12,740ft²) to 2,375m² (25,561ft²)

+ An Outstanding Location
Pegasus Business Park is part of East Midlands Airport, making it one of the best located office parks in the East Midlands.

It offers almost instant access to the M1 at J23A and the A42. The A50 at J24A is within 5 minutes drive and East Midlands Parkway station is just 10 minutes drive away.

These unparalleled transport connections have already attracted a number of big names to this outstanding location.

+ The Property
The offices have been fitted out to a high standard by the current tenant. The accommodation is predominantly open plan together with a number of partitioned offices, meeting rooms, training rooms and canteen.

The property offers:

+ Air conditioning
+ Raised access floors
+ Passenger lift
+ Suspended ceiling
+ Category II lighting
+ 201 parking spaces
+ Passenger lift
+ Double glazing throughout

+ Service Charge
A small estate charge is applied to cover landscaping, road clearance and security issues.

More information is available upon application to the agents.

Visit our website www.fhp.co.uk

0115 950 7577

Fisher Hargreaves Proctor Ltd | 10 Oxford Street Nottingham NG1 5BG

FHP PROPERTY CONSULTANTS

Offices

+ Accommodation

We calculate the following Net Internal Areas:

Floor	M^2	Ft^2
Ground Floor	1,191	12,820
First Floor	1,184	12,740
Total NIA:	**2,375**	**25,560**

(This information is given for guidance purposes only and prospective tenants are advised to undertake their own measurements prior to contract)

+ Rent

Rent on application.

+ Business Rates

The property is current assessed for Rating purposes with a 2010 Rateable Value of £320,000. Please contact the agents for an outline of the Rates payable.

(This information is given for guidance purposes only and prospective tenants are advised to undertake their own enquires of the Local Authority)

+ A Day at Pegasus Business Park

7.30am	Quick work out in the gym at Raddison Blu.
8.15am	Grab a coffee on the way to work from Costa Coffee.
9.30am	First meeting of the day in the plush new meeting room.
11.00am	Back to the Raddison Blu for our sales seminar.
1.30pm	Lunch from M&S Food.
3.00pm	Informal team brainstorming session in the kitchen/breakout space – great brainstorming session.
6.00pm	Meet partner and go to the airport to catch flight to Barcelona. Great weekend and I didn't have to pay for airport parking.

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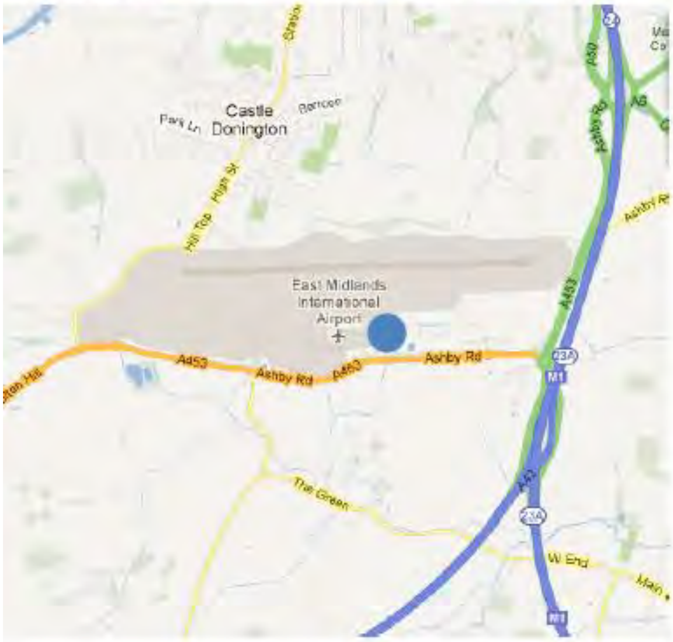
Office | Derbyshire, DE74 2SA

Offices



+Journey Times

Destination	Time	Distance (Approx)
Nottingham	28 minutes	14 miles
Derby	22 minutes	15 miles
Leicester	32 minutes	19 miles
Birmingham	45 minutes	40 miles
Coventry	50 minutes	42 miles
Stoke	57 minutes	47 miles

+Nearby Transport Hubs

Destination	Time	Distance (Approx)
East Midlands Airport	2 mins	0.5 miles
East Midlands Parking	10 mins	7 miles
Birmingham Airport	41 mins	37 miles
London St Pancras	1hr 50 mins	By train from EMP

+ Interested

For further information or to make arrangements to view please contact:

James Hartley
FHP – Nottingham
T: 0115 9507577
M: 07887 787882
E: james@fhp.co.uk

George Dunnicliff
FHP – Derby
T: 01332 343222
M: 07876 396008
E: george@fhp.co.uk

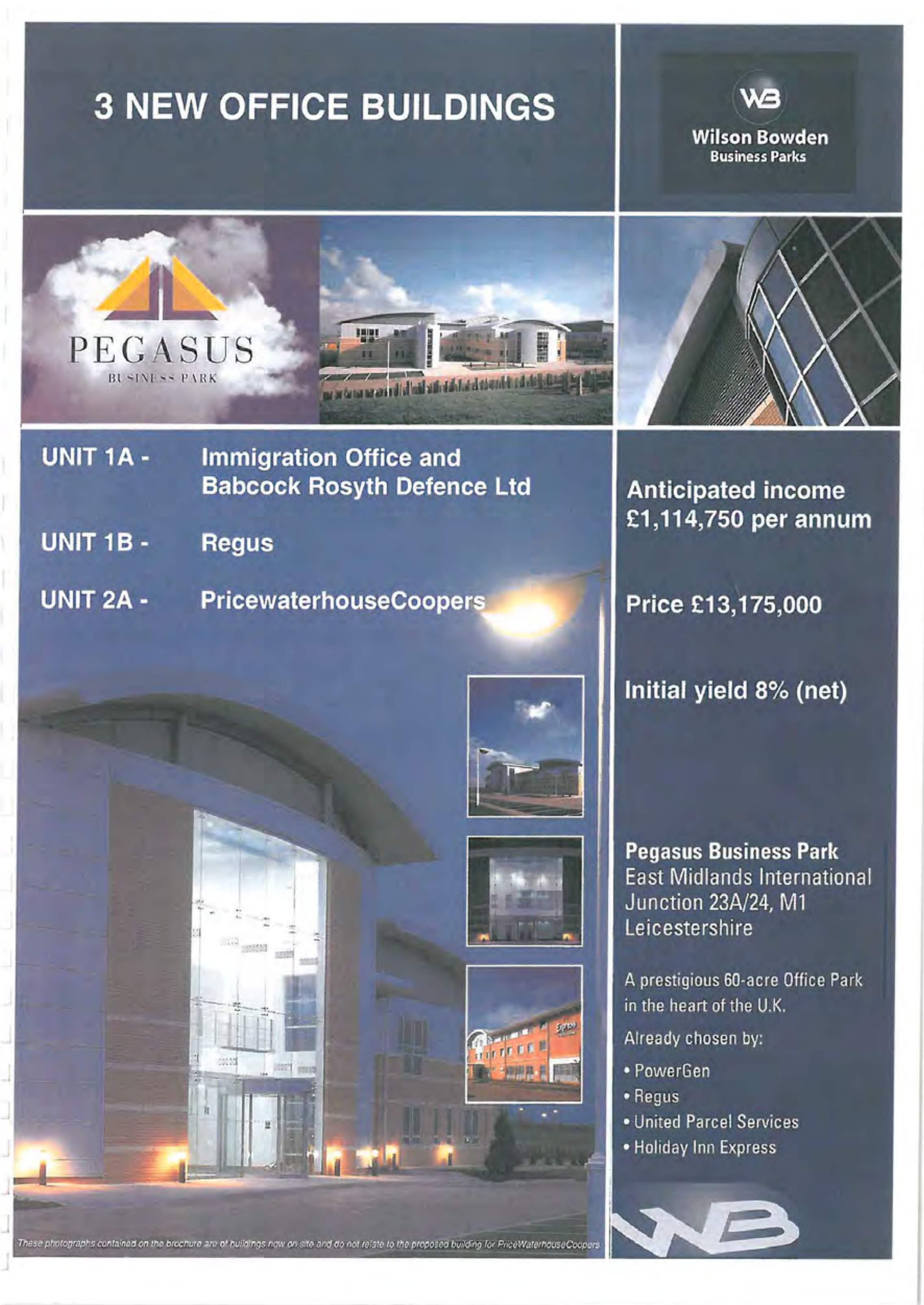
Or contact our joint agents:

Tim Richardson
Innes England
T: 01332 362244
E: trichardson@innes-england.com

FHP PROPERTY CONSULTANTS

Appendix II

Pegasus Business Park Marketing Literature dated Autumn 2000


3 NEW OFFICE BUILDINGS
Wilson Bowden
Business Parks
PEGASUS
BUSINESS PARK
UNIT 1A - Immigration Office and Babcock Rosyth Defence Ltd
UNIT 1B - Regus
UNIT 2A - PricewaterhouseCoopers
Anticipated income £1,114,750 per annum
Price £13,175,000
Initial yield 8% (net)
Pegasus Business Park
East Midlands International
Junction 23A/24, M1
Leicestershire
A prestigious 60-acre Office Park in the heart of the U.K.
Already chosen by:
• PowerGen
• Regus
• United Parcel Services
• Holiday Inn Express
These photographs contained on the brochure are of buildings now on site and do not relate to the proposed building for PriceWaterhouseCoopers

BUILDINGS 1A, 1B and 2A PEGASUS BUSINESS PARK
JUNCTION 23A, M1 LEICESTERSHIRE

INVESTMENT CONSIDERATIONS

- Pegasus Business Park is a joint venture development by Wilson Bowden Developments Limited in conjunction with the East Midlands Airport.
- Pegasus Business Park provides a 62 acre masterplanned Business Park which is designed to provide upon completion a 60,385m² (650,000ft²) Office Park, hotels and creche facilities.
- The Park is situated immediately **adjacent to East Midlands Airport** accessed from **Junction 23A of the M1** central to Nottingham, Derby and Leicester.
- Conceived as the first regional Business Park for the East Midlands. Occupiers also include **Powergen, UPS and Express Holiday Inns.**
- Units 1A and 1B have recently been completed and let to the **Immigration Service, Babcock Rosyth Defence Limited** and **Regus Plc** and provide approximately 1,933m² (20,811ft²) and 2,221m² (23,912ft²) respectively.
- Terms have been agreed for **PricewaterhouseCoopers** to locate their new East Midlands Regional office to the Park. The 3,716m² (40,000ft²) building (2A) is due for completion September 2002 (term certain).
- New leases ranging between 11 years and 15 years 6 months.
- Rental levels ranging from £146.93/m² (£13.65/sqft) to £158.77/m² (£14.75/sqft).
- Minimum rental uplift of 2% per annum compounded at first review for the PricewaterhouseCoopers building.
- Anticipated total net income **£1,114,750 pa**
- Price - **£13,175,000** exclusive of VAT reflecting an initial yield of **8%** net of costs at 5.7625%
- Full unexploited Capital Allowances will be made available to the Purchaser.

Fisher Hargreaves Proctor 0115 950 7577 FPDsavills Wilson Bowden Developments

1

BUILDINGS 1A, 1B and 2A PEGASUS BUSINESS PARK
JUNCTION 23A, M1 LEICESTERSHIRE

INTRODUCTION:

Wilson Bowden Developments Limited are developing the Pegasus Business Park with their joint venture partners the East Midlands Airport. Units 1A and 1B have recently been completed and have been let to the Immigration Service, Babcock Rosyth Defence Limited and Regus Plc.

Terms have been agreed to pre-let Unit 2A to P.W. & Co for the new East Midlands regional office of PricewaterhouseCoopers. A detailed planning application has been submitted for Unit 2A with the anticipated completion date being 10th September 2002.

Wilson Bowden Developments Limited and the East Midlands Airport are seeking to dispose of the three buildings subject to the occupational tenancies as a single package.

PEGASUS BUSINESS PARK – EVOLUTION:

The Park comprises a 62 acre masterplanned Business Park conceived to provide a regional Business Park serving the East Midlands region.

Work commenced on site in March 1999 since which time 9,929m² (106,882ft²) of offices have been completed together with the 90 bed Holiday Inn Express Hotel at the entrance to the Park.

The detailed planning application for the PwC building has been submitted and a further planning application is imminent for the next phase of speculative buildings.

BUILDINGS 1A, 1B and 2A PEGASUS BUSINESS PARK
JUNCTION 23A, M1 LEICESTERSHIRE

LOCATION:

Pegasus Business Park is situated adjacent to the East Midlands International Airport, which is strategically located in the centre of the country giving easy access to the immediate surrounding cities of Nottingham, Derby and Leicester.

- By road, Pegasus Business Park is easily accessed from Junction 23A or 24 of the M1 motorway, where the A42(M) and A50(T) all converge and is therefore central to Nottingham, Derby and Leicester. Excellent communications provides access to the following:

Birmingham	33 miles	Liverpool	91 miles
Bristol	118 miles	London	116 miles
Derby	12 miles	Manchester	73 miles
Leeds	81 miles	Nottingham	16 miles
Leicester	19 miles	Sheffield	48 miles

- Rail communications are good with Loughborough, Long Eaton, Nottingham and Derby stations all accessible via a short bus or taxi ride from Pegasus Business Park. These are all served by the main Inter-City trains operated by Midland Mainline and Central Trains. A new Midland Parkway mainline station is proposed to be developed by 2003 (subject to the outcome of the public enquiry) at Kegworth which is located only 2.5 miles to the north east.

- By air, Pegasus Business Park, due to it's location adjacent to East Midlands Airport, benefits from British Midland's scheduled flights to fourteen European destinations and on-ward destinations from Brussels, Amsterdam and Frankfurt.

BUILDINGS 1A, 1B and 2A PEGASUS BUSINESS PARK
JUNCTION 23A, M1 LEICESTERSHIRE

EAST MIDLANDS AIRPORT:

East Midlands Airport opened in 1965 and has now established itself as the country's second air cargo operation having exploited its central location in the UK. The airport currently handles more than 175,000 tonnes of freight and 14,000 tonnes of mail and is currently ranked in the Top 20 European Airports in terms of total cargo through-put. Figures produced in 2000 indicated that EMA handled 26% of the UK's cargo carried on dedicated freighter aircraft.

In addition, over 2.2 million passengers used East Midlands Airport in the year 2000. In the first half of 2001 passenger figures are up 7.3%. The largest growth has been in the inclusive tour and charter markets, particularly to the Greek Islands, Cyprus and Majorca. Direct flights to Orlando commence in summer 2002, which are expected to lead to a significant increase in passenger traffic.

The airport's runway was extended last year and is now the 6th longest in the UK giving the airport an excellent opportunity for further expansion.

THE BUILDINGS:

Units 1A and 1B have been completed and comprise detached 2 storey buildings whereas Unit 2A is designed over 3 storeys. The individual building specifications vary slightly but principally include:

- Feature 2 storey reception areas
- Comfort cooling and full air conditioning*
- Triple glazing
- Fully accessible metal encapsulated raised floors with three compartment floor boxes with power provision
- Suspended ceilings with Inset Category II lighting
- Passenger lifts
- Full carpeting
- Male and female WCs to each floor*

* The PwC building includes full air conditioning to include humidification and dehumidification.

BUILDINGS 1A, 1B and 2A PEGASUS BUSINESS PARK
JUNCTION 23A, M1 LEICESTERSHIRE

Floor plans (both to scale and reduced) together with copies of the agreed specifications are available upon request.

CAR PARKING:

The buildings are provided with a better than average level of car parking. The ratio for Units 1A and 1B is one space per 25m² (269ft²). The anticipated ratio for the PwC building is one space per 20m² (215ft²).

TENURE:

The freehold interest is being retained by the East Midlands Airport who are granting a new 150 year Headlease.

The ground rent payable under the Headlease is equivalent to 10% of the annual rents **received** under the Underlease.

TENANCIES:

Unit 1A:

Ground Floor:

Terms have been agreed for **The Secretary of State for The Environment Transport Local Government and The Regions** to enter into a new **15 year lease** drawn on effective full repairing and insuring terms via service charge provisions and incorporating 5 yearly upward only rent reviews.

The anticipated rental is **£152,662 pa (£158.77/m² - £14.75/ft²).**

The suite is to be occupied by the **Immigration Office.**

BUILDINGS 1A, 1B and 2A PEGASUS BUSINESS PARK
JUNCTION 23A, M1 LEICESTERSHIRE

First Floor:

The first floor is to be let to **Babcock Rosyth Defence Limited** on the basis of a **15 year lease** drawn on effective full repairing and insuring terms via service charge provision and incorporating 5 yearly upward only rent reviews.

The anticipated rental is **£146,552 pa (£150.74/m² - £14/sqft)**

Unit 1B:

The property is let to **Regus Business Centres (UK) Limited** on the basis of a **25 year lease** which incorporates a break clause at the end **of 15 years 6 months** which can be triggered by 12 months prior written notice.

The initial rent is **£359,397 pa (£15.03/ft²).** At rent review, the open market rental is uplifted by a further 10.11% to rentalise the financial contribution made by the developer towards the Regus fit out.

The base rent is therefore **£146.93/m² (£13.65/ft²)**

Unit 2A:

Heads of Terms have been agreed for the property to be let to **P.W. & Co** on the basis of a **15 year lease** drawn on full repairing and insuring terms with 5 yearly upward only rent reviews.

The lease incorporates a tenant only break clause operable at the end of the tenth year of the term by serving a minimum of 12 months prior notice in writing. This will trigger a 12 months rental penalty.

At first review the rental is subject to a **minimum rental uplift** calculated by applying growth at the rate of **2% per annum (compounded).** Thereafter the reviews are upward only without indexation.

BUILDINGS 1A, 1B and 2A PEGASUS BUSINESS PARK
JUNCTION 23A, M1 LEICESTERSHIRE

The anticipated initial rent is **£580,000 pa (£156.08/m² - £14.50/ft²)***.

P.W. & Co have an option to request that the building is extended by a further 1,858m² (20,000ft²). The option is valid for 6 months following the exchange of the Agreement for Lease and would be let on terms consistent with those previously summarised.

* The rental is subject to a Confidentiality Agreement jointly binding on the Landlord & Tenant.

GROSS AND NET RENTAL INCOME:

The anticipated gross annual rental is	**£1,238,611 pa.**
The net rental income is anticipated as being	**£1,114,750 pa.**

TENANT'S CONVENANTS:

Unit 1A:

The Immigration Office are to occupy the ground floor suite. The Heads of Terms have been agreed and the Lease is to be taken in the name of The Secretary of State for The Environment Transport and The Regions.

Babcock Rosyth Defence Limited is principally engaged in the re-fit and repair of naval vessels and in heavy engineering and manufacture.

The office at Pegasus is to be occupied by Hunting Contract Services who provide administrative and facility contracts to the Ministry of Defence. In March 2000 Babcock Rosyth Defence Limited acquired the whole of the share capital of FBM Marine Holdings (UK) Limited and FBM Lairdside Limited. This business is now re-named FBM Babcock is Europe's leading supplier of fast passenger ferries to the expanding world market.

BUILDINGS 1A, 1B and 2A PEGASUS BUSINESS PARK JUNCTION 23A, M1 LEICESTERSHIRE

Financial highlights for the year ending 31st March 2001 reputed turnover of **£172,408,000,** profit prior to taxation of **£9,903,000** and net assets (and shareholders funds) of **£9,625,000**.

Unit 1B:

Regus Plc (formerly Regus Business Centres Plc) successfully achieved the simultaneous listings on the London Stock Exchange and NASDAQ in October 2000.

Regus are providers of high quality business services to the global economy and their international network of adaptable business centres allows Regus customers to outsource, completely or in part their work space requirements. By December 2000, Regus operated 64,070 work stations in 335 centres across 48 countries.

The Regus Centre at East Midlands Airport provides 280 work stations.

Unit 2A:

The property is to be let to P.W. & Co which is an unlimited company wholly owned by the Partnership of PricewaterhouseCoopers. PricewaterhouseCoopers are the largest providers of financial services in the world.

RENTAL EVIDENCE:

Since its inception, Pegasus has demonstrated sustained demand.

Powergen's 4,180m² (45,000ft²) building was completed in April 2000 and purchased. The Regus letting was completed in 2001 and is structured off a base rent of £13.65/ft² reflecting the rental for the standard developer's specification with the rent uplifted to £15.03/ft² to rentalise the Regus fit-out.

BUILDINGS 1A, 1B and 2A PEGASUS BUSINESS PARK
JUNCTION 23A, M1 LEICESTERSHIRE

Unit 2C comprises a 2 storey building of 1,594m² (17,159ft²) let to United Parcel Services (UPS) on a new 15 year lease. The building has been constructed to a differing specification which together with operational issues between the Airport and UPS reflects in the rental of £129.17/m² (£12/ft²).

Unit 1A was constructed on a speculative basis and completed in late 2001. The rental agreed with Babcock reflects £150.70m² (£14/ft²) and the letting to the Immigration Service reflects £158.77/m² (£14.75ft²).

The quoting rent on the park is now £166.85/m² (£15.50/ft²)

ESTATE MANAGEMENT COMPANY:

The roads within Pegasus are private and the upkeep and maintenance of all common areas within the Park are administered by the East Midlands Airport via service charge provisions.

Contributions to the service charge are calculated based on the ratio of the size of the plot in proportion to the whole park.

COLLATERAL WARRANTIES:

The tenant and the purchaser receive the benefit of collateral warranty documentation drawn under seal from the appointed professional team to include:

- Architects – Stephen George & Partners, Leicester
- Structural Engineers: BWB Engineers, Nottingham
- Sub-contractors with design responsibilities

BUILDINGS 1A, 1B and 2A PEGASUS BUSINESS PARK
JUNCTION 23A, M1 LEICESTERSHIRE

CAPITAL ALLOWANCES:

Fully unexploited capital allowances will be available in respect of the properties and further details will be provided in due course.

VAT:

The developers have elected to waive the exemption to VAT which will be payable at standard rate.

FINANCIAL PROPOSAL:

Our clients are seeking **offers in respect of buildings 1A and 1B together with a forward commitment to purchase building 2A** in the order of:-

£13,175,000
(Thirteen Million One Hundred and Seventy Five Thousand Pounds)

Subject to contract and exclusive of VAT.

Our clients will seek to adopt an agreed multiplier which will be applied to the agreed rental for the PwC building to include the 1,858m² (20,000ft²) extension should this option be exercised.

INITIAL YIELD:

8.00% net of costs at 5.7625%

BUILDINGS 1A, 1B and 2A PEGASUS BUSINESS PARK
JUNCTION 23A, M1 LEICESTERSHIRE

FURTHER INFORMATION:

Further information is available by contacting:

Scott Tyler
020 7409 8825

Philip Hunt
020 7409 8805

FPDSavills Commercial Limited
20 Grosvenor Hill
London
W1K 3HQ
Fax: 020 7409 2635

John Proctor
0115 8411130

Fisher Hargreaves Proctor
10 Oxford Street
Nottingham
NG1 5BG
Fax:0115 950 7688


CURRENT MASTERPLAN
Wilson Bowden
Business Parks
PEGASUS
BUSINESS PARK
EAST MIDLANDS INTERNATIONAL
Already chosen by:
POWERGEN
Regus
UPS
Express
Unit 1a
Coming soon
5 Star Hotel
PRICEWATERHOUSECOOPERS
To Junction 24, M1
Junction 23A
Granada Services
and Hotel
To the Airport
Retail Facilities
Airport Main Entrance

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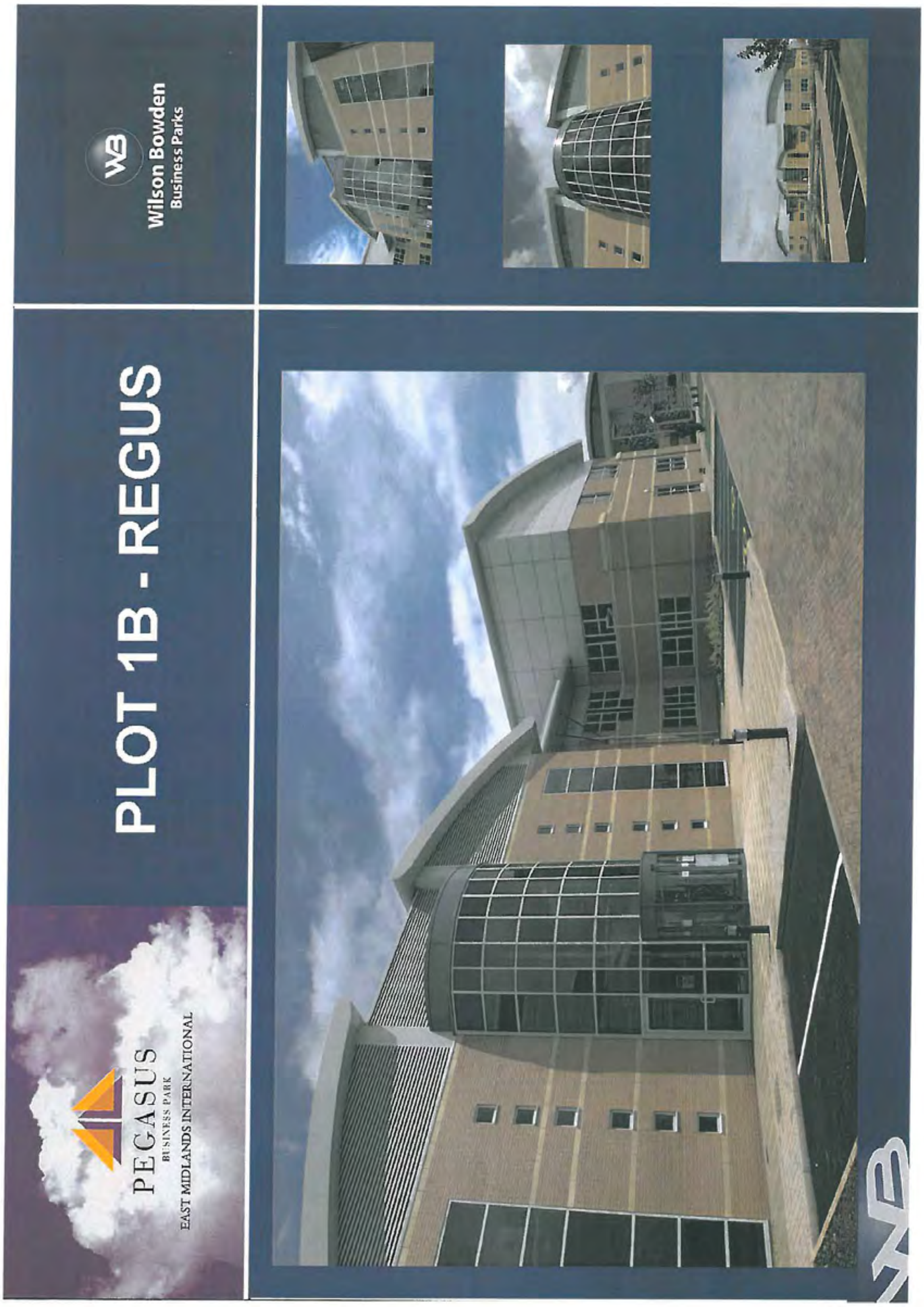
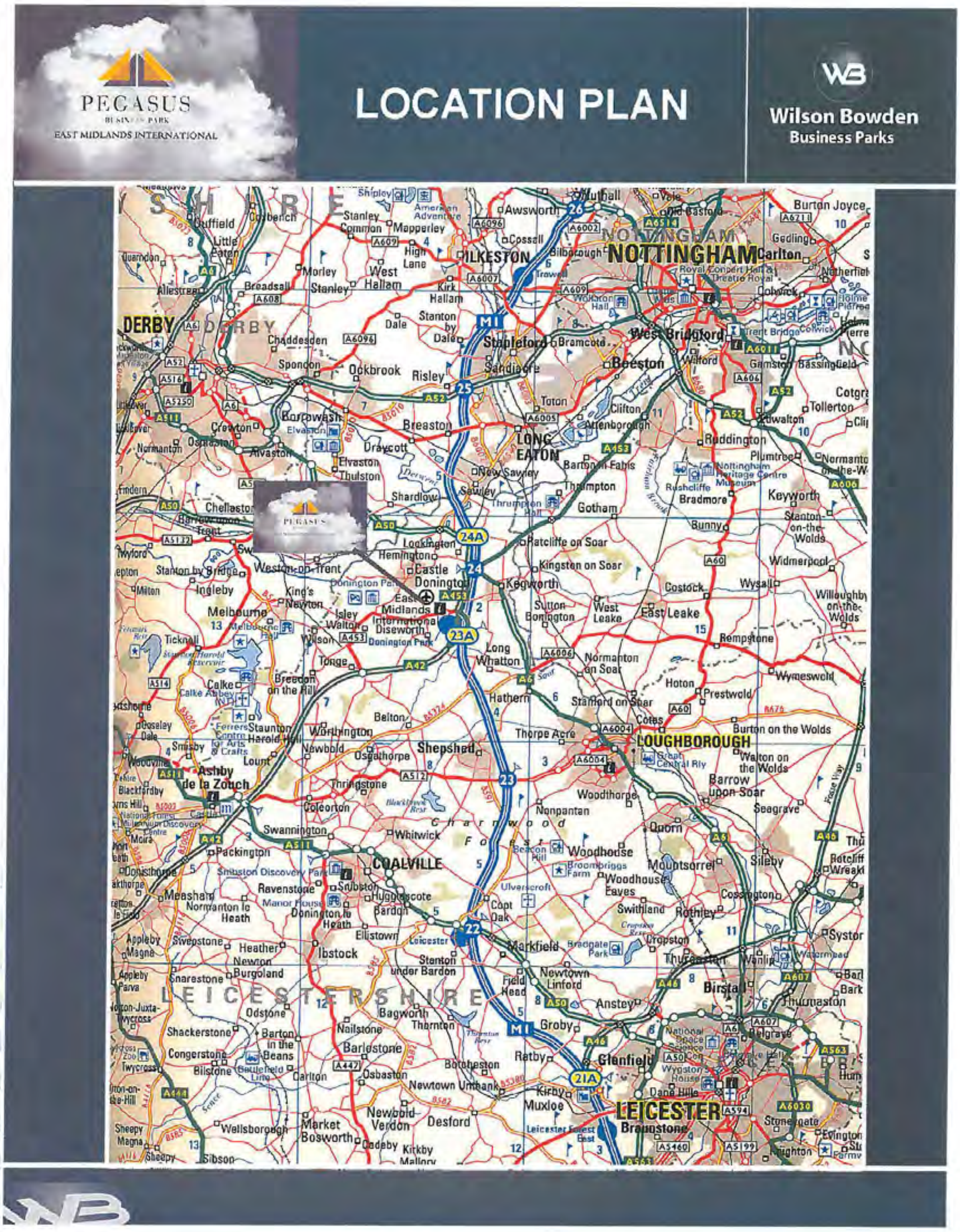
PROPERTY CONSULTANTS


PLOT 1B - REGUS
Wilson Bowden
Business Parks
PEGASUS
BUSINESS PARK
EAST MIDLANDS INTERNATIONAL


Wilson Bowden
Business Parks
PLOT 2A
PricewaterhouseCoopers
PEGASUS
BUSINESS PARK
EAST MIDLANDS INTERNATIONAL
SOUTH ELEVATION
EAST ELEVATION
PEGASUS BUSINESS PARK · 40,000sqft + 20,000sqft expansion · ELEVATIONS 7118FH01/a



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PEGASUS
BUSINESS PARK
EAST MIDLANDS INTERNATIONAL

TENANCY SCHEDULE
Units 1A, 1B & 2A
Pegasus Business Park

Wilson Bowden
Business Parks

Unit	Tenant	Size	Initial Rent p.a.	Initial Rent per sq.ft.	Lease Terms
1A Ground Floor	The Secretary of State for the Environment, Transport Local Government and the regions.	10,350 ft² 961.5 m²	£152,662	£14.75	15 year lease effective FRI. 5-yearly upward only rent reviews.
1A First Floor	Babcock Rosyth Defence Ltd	10,468 ft² 972.4 m²	£146,552	£14.00	15 year lease effective FRI. 5 yearly upward only rent reviews.
Unit 1B	Regus Business Centres (UK) Ltd	23,912 ft² 2,221.4 m²	£359,397	£15.03 (*1)	25 year lease incorporating tenant break clause at the end of 15 years 6 months drawn on FRI terms with 5 yearly, upward only rent reviews. At review the open market rental value is uplifted by 10.11% to reflect rentalisation of a capital contribution to the Regus fit out.
Unit 2a	P.W. & Co (*2)	40,000 ft² 3,716 m²	£580,000 (*4)	£14.50 (*5)	15 year lease, FRI with 5 yearly upward only rent reviews incorporating a tenant-only break clause at the end of the 10th year triggered by 12 months notice and a 12-month rent penalty. Minimum (Rental growth at the first review with initial rent indexed by 2% p.a. compounded)
		84,730 ft² 5,871.3 m²	**£1,238,611** (*6)		

NOTES

1. The rental of £15.03 includes an uplift.

2. P.W & Co. are an unlimited company wholly owned by the Partnership of P. W & Co. The building is to be the East Midlands regional office of PWC.

3. P.W & Co. have the benefit of an option to extend from 3,716 m² (40,000 ft²) to 5,574 m² (60,000 ft²). The option is for 6 months following exchange of The Agreement for Lease.

4. The figure of £580,000 p.a. is the anticipated annual rental which will be calculated by applying £14.50 per ft² to the agreed Net Internal Floor Area prior to the issue of the Certificate of Practical Completion.

5. The initial rental is subject to minimum rental growth at the first review.

6. The figure of £1,238,611 is the gross rental payable. The buildings are to be sold subject to a 150-year ground lease with 10% ground rent payable. The net initial rent is therefore £1,114,750.

FHP
PROPERTY CONSULTANTS

BUILDINGS 1A, 1B and 2A PEGASUS BUSINESS PARK
JUNCTION 23A, M1 LEICESTERSHIRE

DISCLAIMER

FPDSavills Commercial Limited and Fisher Hargreaves Proctor themselves and for the Vendors of the property whose Agents they are give notice that:

- Particulars are set out as a general outline only for the guidance of intending purchasers and do not constitute, nor constitute part of, an offer or contract;
- All descriptions, dimensions, references to conditions and necessary permissions for use and occupation and their details are given in good faith and are believed to be correct but any intending purchaser should not rely on them as statements or representations of fact but must satisfy themselves by inspection or otherwise as to the correctness of each of them;
- No person in the employment of FPDSavills Commercial Limited and Fisher Hargreaves Proctor has any authority to make or give any representations or warranty whatever in relation to these properties or their particulars nor enter into any contract relating to the property on behalf of FPDSavills Commercial Limited and Fisher Hargreaves Proctor nor any contract on behalf of the vendors;
- No responsibility can be accepted for any expenses incurred by intending purchasers in inspecting properties which have been sold or withdrawn.
- FPDSavills Commercial Limited and Fisher Hargreaves Proctor have not made any investigations into the existence or otherwise of any issues concerning pollution and potential land, air or water contamination. The purchaser is responsible for making his own enquiries in this regard.
- *FPDSavills Commercial Limited and Fisher Hargreaves Proctor have not measured the property and have relied on those areas supplied by the landlord.*

September 2001

Fisher Hargreaves Proctor
0115 950 7577

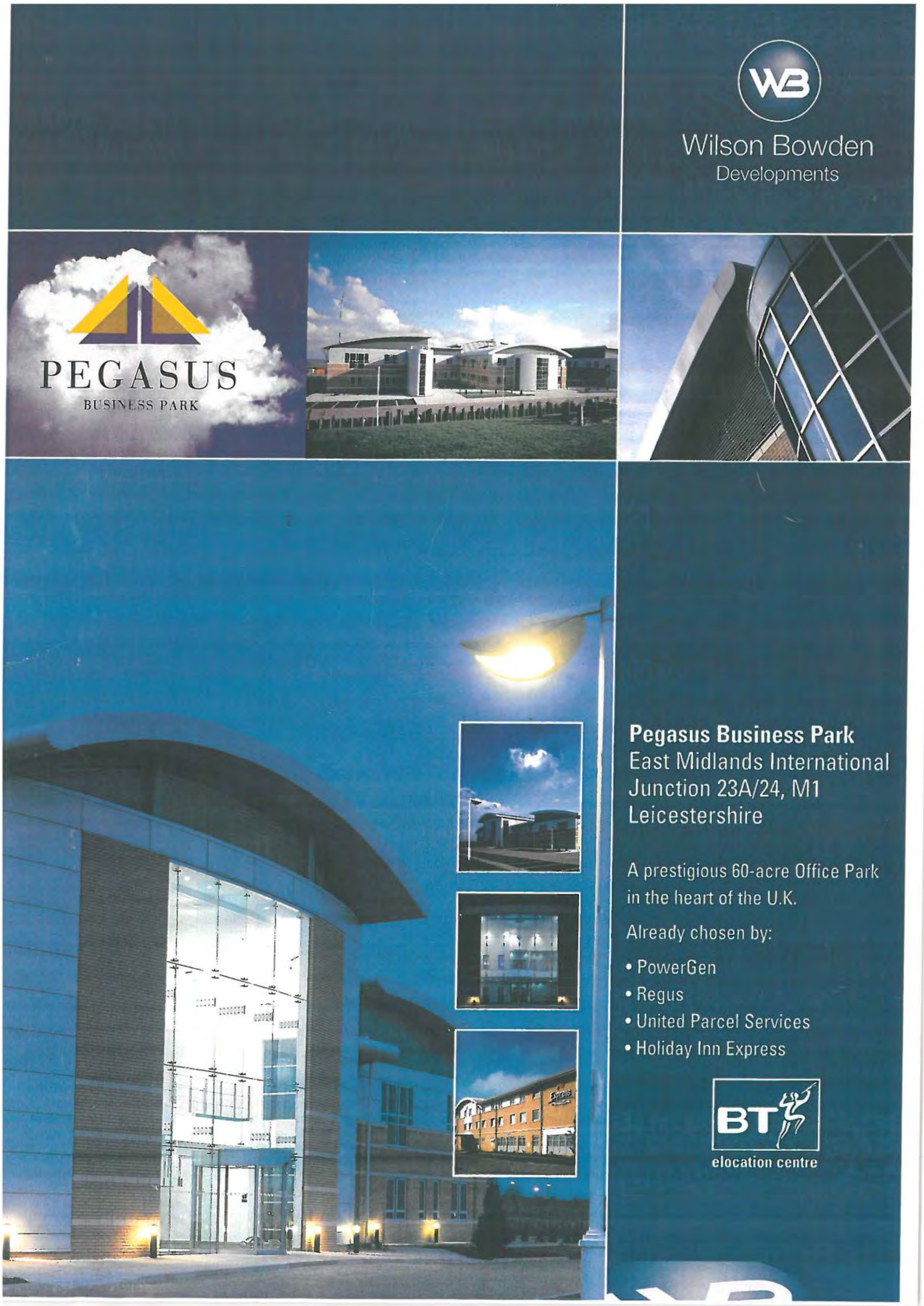
FPDsavills

12

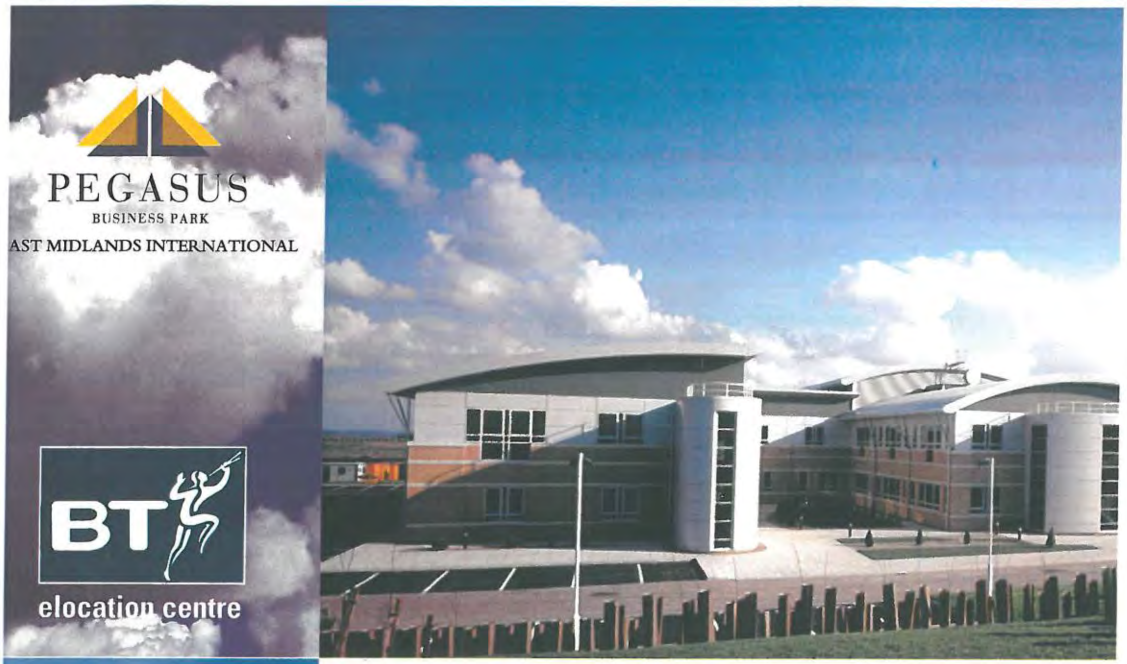
Wilson Bowden Developments

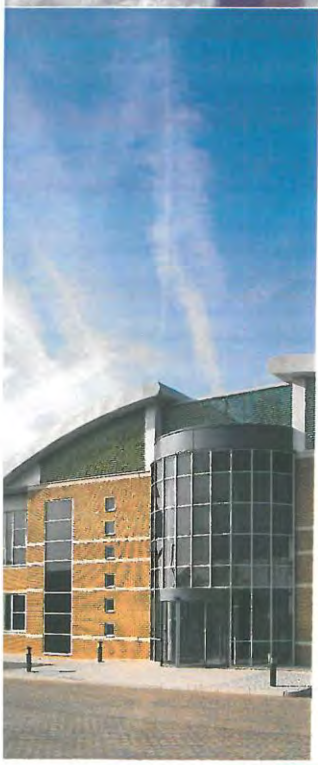
Appendix III

Marketing Brochure for Pegasus Business Park from 2000



FHP
PROPERTY CONSULTANTS





At the Heart of the United Kingdom

The Vision

Pegasus was conceived to meet the demand for a Regional Business Park at the heart of the U.K. and central to the East Midlands.

Since on-site construction commenced in April 1999, the Park has established itself as a proven location being chosen by major office and hotel users with an active ongoing rolling development programme.

Communications

The Park offers unrivalled infrastructure by road, rail, air and e-commerce.

The M1, A42(M) and A50(T) all converge on Pegasus. The new Midland Parkway Mainline Station is under construction at Kegworth, 2.5 miles from the site and regular bus services link to Nottingham, Derby, Leicester and Loughborough. The park is also adjacent to East Midlands Airport.

Pegasus is a BT e-location with the Park being provided with access to the highest level of bandwidth, which can carry voice and data communications utilising the very latest technology.

Complementary Facilities

Retail and leisure facilities add to the vitality of the Park with two major hotel groups choosing Pegasus, which compliment the existing retail and leisure facilities. Three further health and fitness clubs are located within 2.5 miles of the site.

By Road

	time	distance (miles)
Birmingham	43 mins	38
Bristol	1 hr 58 mins	127
Derby	23 mins	17
Leeds	1 hr 17 mins	81
Leicester	26 mins	20
Liverpool	2 hrs	95
London	1 hr 57 mins	117
Manchester	1 hr 44 mins	80
Nottingham	20 mins	13
Sheffield	52 mins	53

By Air

	time
Aberdeen	1 hr 25 mins
Amsterdam	1 hr
Belfast	1 hr 10 mins
Brussels	1 hr 30 mins
Dublin	1 hr
Edinburgh	55 mins
Guernsey	1 hr 15 mins
Jersey	1 hr
Paris	1hr 10 mins

80% (approximately)* of the UK's population is within 2 hours drive.

**source: Experian*

"Pegasus provides us with a strategic location in relation to our customer base, combined with access to excellent communications"

John Whale
Head of Property,
4,087.6m² (44,000 ft²)
PowerGen

A Masterplanned Regional Business Park

Masterplanning of the buildings, infrastructure and landscaping has produced a high quality environment.

Set in over 60 acres, Pegasus will ultimately provide up to 60,387 m² (650,000 ft²) of efficient and flexible accommodation being developed on a rolling development programme or bespoke to meet specific requirements. Each building is designed to be complimentary yet individual with generous on-site car parking available. The standard specification includes raised floors and comfort cooling with full air-conditioning available if required.

Schematic and financial proposals can be provided for units ranging in size from 929 m² (10,000 ft²) upwards.

Buildings, Environment and Quality

Chosen by East Midlands Airport as their joint development partner, Wilson Bowden Properties' proven track record has resulted in a cohesive, masterplanned office environment which will further evolve through designing specific office buildings and undertaking a rolling programme of speculative development. The quality of Pegasus is endorsed by the early success of the scheme.

Holiday Inn Express
150 bed hotel.

United Parcel Services
1,579 m² (17,000 ft²)

JMP/HG
01/07/13

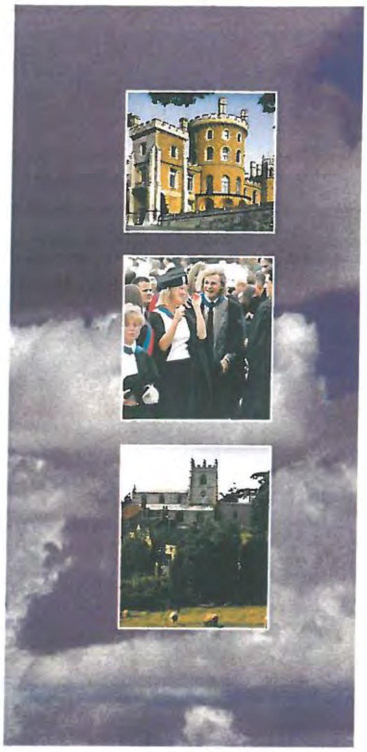

PEGASUS
BUSINESS PARK
EAST MIDLANDS INTERNATIONAL
"As the UK's largest operator of business centres, the new centre at Pegasus Business Park is part of our strategic expansion plans for the East Midlands and the final stage of our plans to have a business centre at all of the UK's regional airports. Our centres prove attractive to both new start-ups and large multinationals alike and I'm sure this new centre will prove equally attractive by providing a wide range of businesses instant access to the East Midlands marketplace."
Mark Dixon
Regus
2,208 m² (23,778 ft²)
Regus
Mark Dixon

People and Lifestyle

Pegasus Business Park is central to the East Midlands within the heart of the UK, an area which offers unrivalled communications, a highly skilled workforce and an excellent quality of life.

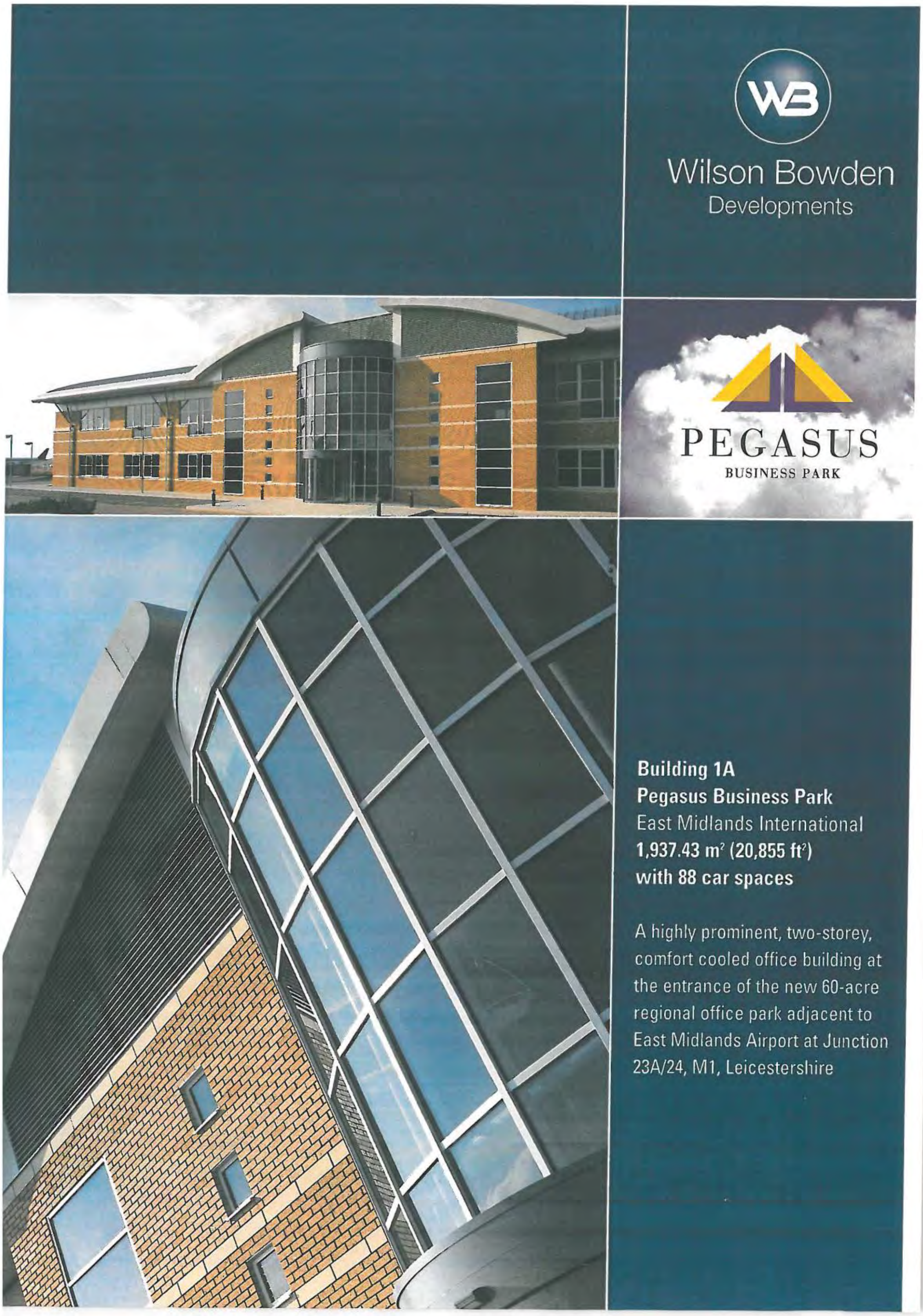
The proximity of the Peak District and The Vale of Belvoir complement the vibrance of the principal towns and cities with a full range of shopping, leisure and cultural facilities close at hand.

A comprehensive choice of competitively priced housing and schools are to be found within the area. In terms of higher education, the East Midlands has seven universities, which inter-relate with the commercial and social infrastructure of the Region.



Major Employers within the East Midlands include:

- Boots
- Woolworths
- Powergen
- Egg
- Capital One
- Alliance and Leicester
- Astra Zeneca
- Fisher Scientific
- Pedigree Masterfoods
- Pepsico
- Rolls Royce


Wilson Bowden
Developments
PEGASUS
BUSINESS PARK
Building 1A
Pegasus Business Park
East Midlands International
1,937.43 m² (20,855 ft²)
with 88 car spaces
A highly prominent, two-storey, comfort cooled office building at the entrance of the new 60-acre regional office park adjacent to East Midlands Airport at Junction 23A/24, M1, Leicestershire

PEGASUS
BUSINESS PARK
EAST MIDLANDS INTERNATIONAL

Building Unit 1A

Situated at the entrance of Pegasus, Building Unit 1A is the first speculative office building within the Park.

The building provides approximately **1,937.43 m² (20,855 ft²)** net office space together with 88 on-site car spaces.

Specification

- Feature double height reception
- Comfort cooled environment
- Full access raised floors
- Full carpeting
- Suspended ceiling with category-II lighting
- 8 person passenger lift
- Double glazed sound attenuated windows
- 88 on-site car spaces

On-Site Facilities

On and off-site retail and leisure facilities add to the vitality of the Park. There are three health and fitness centres within one mile, extensive hotel and conference facilities and established public transport links to Nottingham, Derby, Leicester and Loughborough.

Terms

The premises are available on lease terms by negotiation, drawn on full repairing and insuring terms and incorporating 5-yearly rent reviews.

V.A.T

V.A.T will apply.

Wilson Bowden Developments
Forest Business Park, Bardon Hill
Leicestershire, LE67 1UB
Tel 01530 276276 • Fax 01530 814810

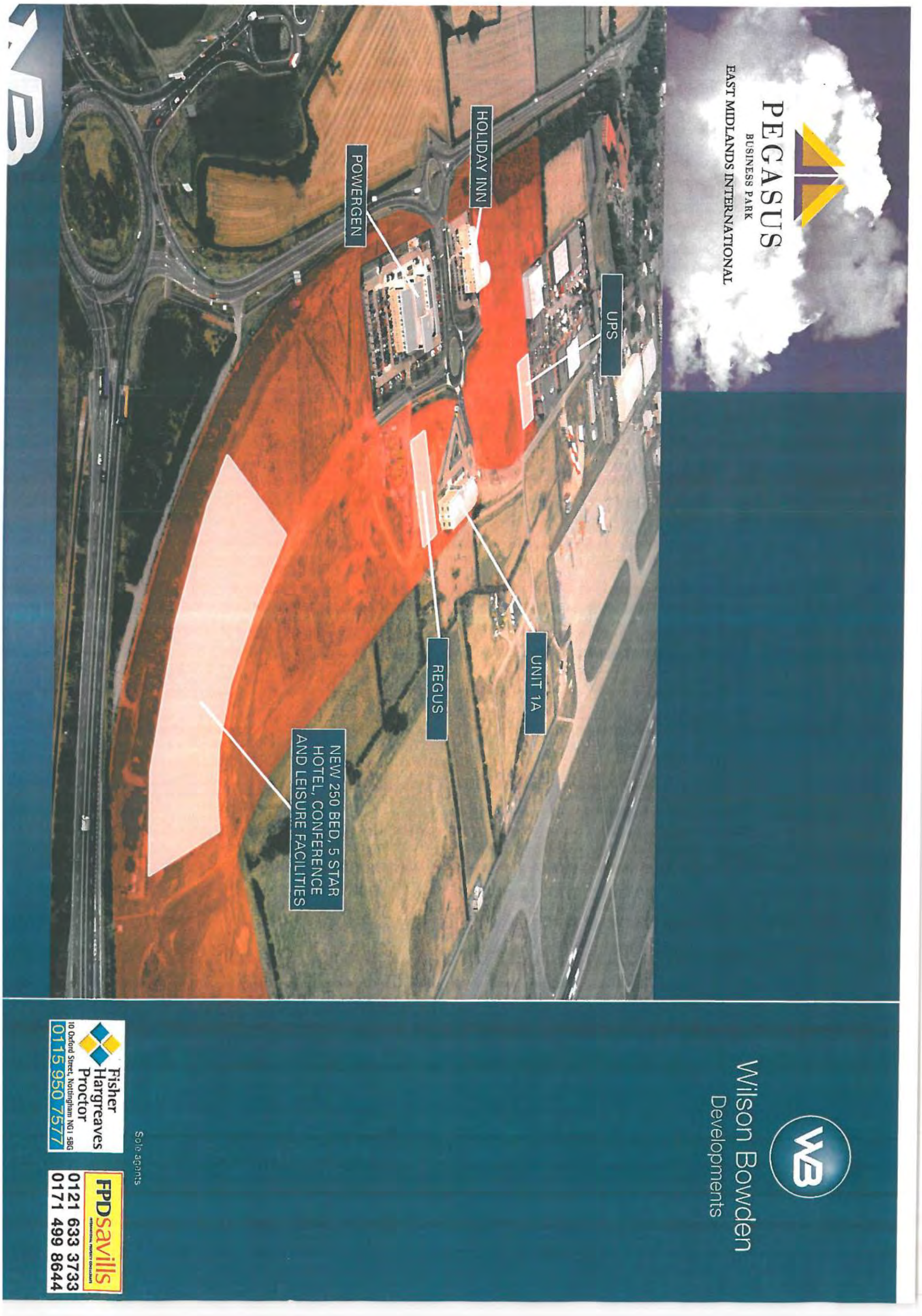
In partnership with
East Midlands Airport

Sole agents

Fisher Hargreaves Proctor
10 Oxford Street, Nottingham NG1 5BG
0115 950 7577
John Proctor

FPDsavills
INTERNATIONAL PROPERTY CONSULTANTS
0121 633 3733
0171 499 8644
Birmingham: Nick Williams


PEGASUS
BUSINESS PARK
EAST MIDLANDS INTERNATIONAL
Already chosen by:
Regus
ups
Express by Holiday Inn
Coming soon 5 Star Hotel
To the Airport Retail Facilities
Airport Main Entrance
Granada Services and Hotel
Junction 23A
To Junction 24, M1
Wilson Bowden Developments



FHP PROPERTY CONSULTANTS

Appendix IV

Centennial House Details

Offices | Derby, DE74 2SA

Offices

To Let

19m² (200ft²) to 186m² (2,000ft²)

Flexible offices with excellent parking.




Centennial House
Beverley Road
East Midlands Airport
DE74 2SA

+ Two miles to Junction 23a M1 Motorway
+ Flexible lease terms
+ Good access to public transport

Visit our website www.fhp.co.uk

01332 343222

Fisher Hargreaves Proctor | 8 Riverside Court Pride Park Derby DE24 8JN

FHP PROPERTY CONSULTANTS

Office | Derby, DE74 2SA

Offices

+ The Location

Centennial House forms part of East Midlands Airport. East Midlands Airport is centrally located between Nottingham, Derby and Leicester approximately two miles from Junction 23a of the M1 Motorway. In addition the area affords excellent access to the A50 trunk road which in turn links the M1 and M6 Motorways.

+ The Property

Centennial House is a multi let office building arranged over ground and first floor. The offices provide a range of cellular and open plan accommodation and the specification benefits from:-

- Lift
- Communal WC
- Kitchen facilities
- Painted plaster walls
- Category II lighting
- Perimeter trunking
- Carpets
- Car park to the rear

+ Accommodation

Office	M^2	Ft^2	Rent pa
1	65	700	£8,400
2	46	500	£6,000
4	63	681	£8,172
9	135	1,456	£14,560
11	39	420	£5,040
12	68	735	£8,820
13	77	829	£9,948
16	19	200	£2,600
17	19	200	£2,600
18	186	2,000	£20,000

(this information is given for guidance purposes only)

+ Lease Terms

The offices are available to lease by way of a new flexible full repairing and insuring leases. Rental details are available upon request from the agent.

+ Service Charge

A service charge will be levied to cover the maintenance, utilities and upkeep of the communal areas at Centennial House. Further details of the service charge are available upon request from the agents.

+ VAT

Each party is to be responsible for their own legal costs incurred with this transaction.

+Planning

We await confirmation from the local planning authority but assume the premises are suitable for B1a (office) use.

(This information is given for guidance purpose only and perspective tenants are advised to verify this information with Northwest Leicestershire Local Authority on 01530 454545).

+ Service Charge

Each party is to be responsible for their own legal costs incurred with this transaction.

+ Business Rates

The offices are separately assessed for business rates purposes and further details are available upon request from the agents.

(This information is given for guidance purposes only and perspective tenants are advised to verify this information with Northwest Leicestershire Local Authority on 01530 454545).

+ Interested

For further information or to make arrangements to view please contact:

George Dunnicliff
FHP Derby
T: 01332 343222
E: george@fhp.co.uk

FHP www.fhp.co.uk 01332 343 222

Fisher Hargreaves Proctor | www.fhp.co.uk
8 Riverside Court Pride Park Derby DE24 8JN

Appendix V

Three Sets of Osprey House Details

2,345 m^2 (25,250 sq ft) - Grade A Offices

PEGASUS BUSINESS PARK, EAST MIDLANDS AIRPORT, LEICESTERSHIRE, DE74 2UZ

NOW COMPLETE

To Let

OspreyHouse

OspreyHouse

Location

Pegasus Business Park is part of the East Midlands Airport. It enjoys separate access off the A453 before you reach the airport coming from the M1 Motorway.

Pegasus Business Park is situated around half a mile from Junction 23a of the M1, with Junction 24 and 24a, the A42 and A50 all being within 2 miles. The building is at the heart of the East Midlands being virtually equidistant from the cities of Nottingham, Leicester and Derby.

Pegasus has fantastic road connections, is situated next to an international airport and also has the benefit of an excellent bus service with buses every 30 minutes from Derby, Nottingham and Loughborough stopping at Pegasus Business Park only a short walk from Osprey House.

Description

Osprey House is a stunning three storey Headquarters Building which offers grade A office space in an outstanding location with excellent car parking.

Companies such as PricewaterhouseCoopers, Babcock International, Regus and E.ON have all been attracted to Pegasus with its range of on and off site retail and leisure facilities.

The specification includes:

- Full air conditioning
- Fully accessible raised floors
- Broadband enabled location
- Suspended ceiling with LG3 lighting
- 8 person passenger lift
- 104 car parking spaces

FHP PROPERTY CONSULTANTS

OspreyHouse

Floor Areas

We have measured the building and calculate that the net internal floor area is as follows.

Ground floor	805 sq m	8,650 sq ft
First floor	770 sq m	8,300 sq ft
Second floor	770 sq m	8,300 sq ft
Total	2,345 sq m	25,250 sq ft
104 car parking spaces		

Indicative Upper Floor Plan

Ground Floor Plan

Rateable Value

The building will be assessed for rating purposes upon occupation. An estimate of business rates payable can be obtained from the agents.

Estate Charge

A small estate charge is applied on Pegasus Business Park as a whole to cover landscaping, road clearance and security issues. Details are available from the agents.

VAT

VAT will be payable on the rent and service charge.

Disposal Terms

The property is available as a whole or in part on the basis of a fully repairing and insuring lease with 5 yearly rent reviews. For quoting terms please contact the agents.

Viewing and Further Details

OspreyHouse

Plans, elevations and specification are available from the agents:

Fisher Hargreaves Proctor 0115 950 7577

Fisher Hargreaves Proctor
10 Oxford Street
Nottingham
NG1 5BG

Contact: Edward Hine
Tel: 0115 841 1134
Email: edwardh@fhp.co.uk
Web: www.fhp.co.uk

Lambert Smith Hampton Property Solutions

Lambert Smith Hampton
17-21 Hounds Gate
Nottingham
NG1 7DR

Contact: Philip Quiggin
Tel: 0115 976 6603
Email: pquiggin@lsh.co.uk
Web: www.lsh.co.uk

OspreyHouse

Location

Pegasus Business Park is part of the East Midlands Airport. It enjoys separate access off the A453 before you reach the airport coming from the M1 Motorway.

Pegasus Business Park is situated around half a mile from Junction 23a of the M1, with Junction 24 and 24a, the A42 and A50 all being within 2 miles. The building is at the heart of the East Midlands being virtually equidistant from the cities of Nottingham, Leicester and Derby.

Pegasus has fantastic road connections, is situated next to an international airport and also has the benefit of an excellent bus service with buses every 30 minutes from Derby, Nottingham and Loughborough stopping at Pegasus Business Park only a short walk from Osprey House.

The recently completed East Midlands Parkway rail station now offers high frequency connections to London, Derby, Leicester and Nottingham, with a shuttle service to the Osprey House site every 10-15 minutes.

Description

Osprey House is a stunning three storey Headquarters Building which offers grade A office space in an outstanding location with excellent car parking.

Companies such as PricewaterhouseCoopers, Babcock International, Regus and E.ON have all been attracted to Pegasus with its range of on and off site retail and leisure facilities.

The specification includes:

- Full air conditioning
- Fully accessible raised floors
- Broadband enabled location
- Suspended ceiling with LG3 lighting
- 8 person passenger lift
- 104 car parking spaces (overspill spaces available)

FHP PROPERTY CONSULTANTS

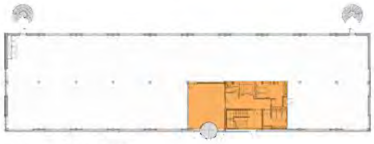
●● **Osprey**House ●●●

Floor Areas

We have measured the building and calculate that the net internal floor area is as follows.

Ground floor	780 sq m	8,392 sq ft
First floor	783 sq m	8,426 sq ft
Second floor	783 sq m	8,426 sq ft
Total	2,345 sq m	25,244 sq ft
104 car parking spaces (overspill spaces available)		

Indicative Upper Floor Plan



Ground Floor Plan

Rateable Value

The building will be assessed for rating purposes upon occupation. An estimate of business rates payable can be obtained from the agents.

Estate Charge

A small estate charge is applied on Pegasus Business Park as a whole to cover landscaping, road clearance and security issues. Details are available from the agents.

VAT

VAT will be payable on the rent and service charge.

Disposal Terms

The property is available as a whole or in part on the basis of a fully repairing and insuring lease with 5 yearly rent reviews. For quoting terms please contact the agents.

●●●

Viewing and Further Details

Plans, elevations and specification are available from the agents:

FISHER HARGREAVES PROCTOR 0115 950 7577

Fisher Hargreaves Proctor
10 Oxford Street
Nottingham
NG1 5BG

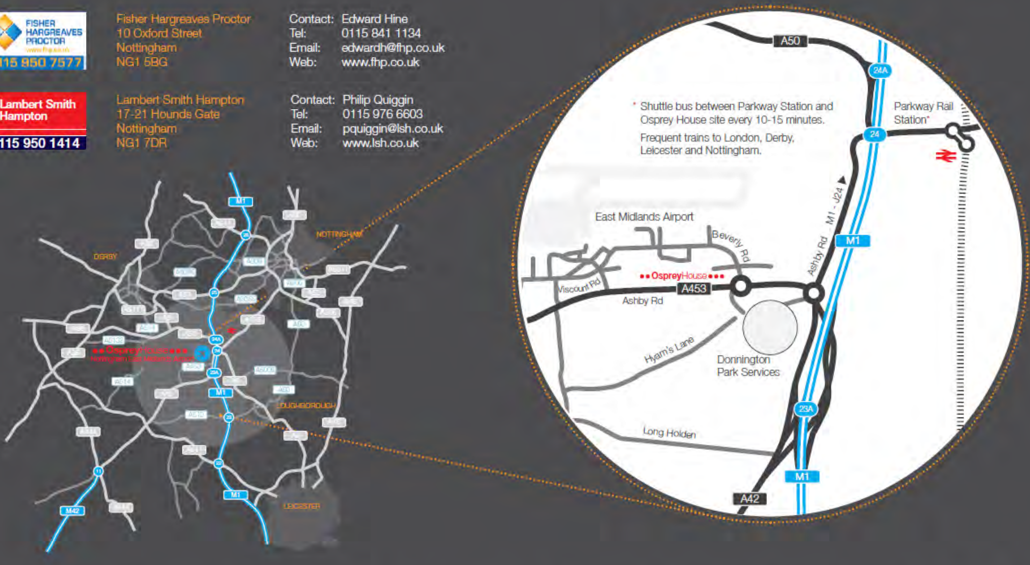
Contact: Edward Hine
Tel: 0115 841 1134
Email: edwardh@fhp.co.uk
Web: www.fhp.co.uk

Lambert Smith Hampton 0115 950 1414

Lambert Smith Hampton
17-21 Hounds Gate
Nottingham
NG1 7DR

Contact: Philip Quiggin
Tel: 0115 976 6603
Email: pquiggin@lsh.co.uk
Web: www.lsh.co.uk

●● **Osprey**House ●●●



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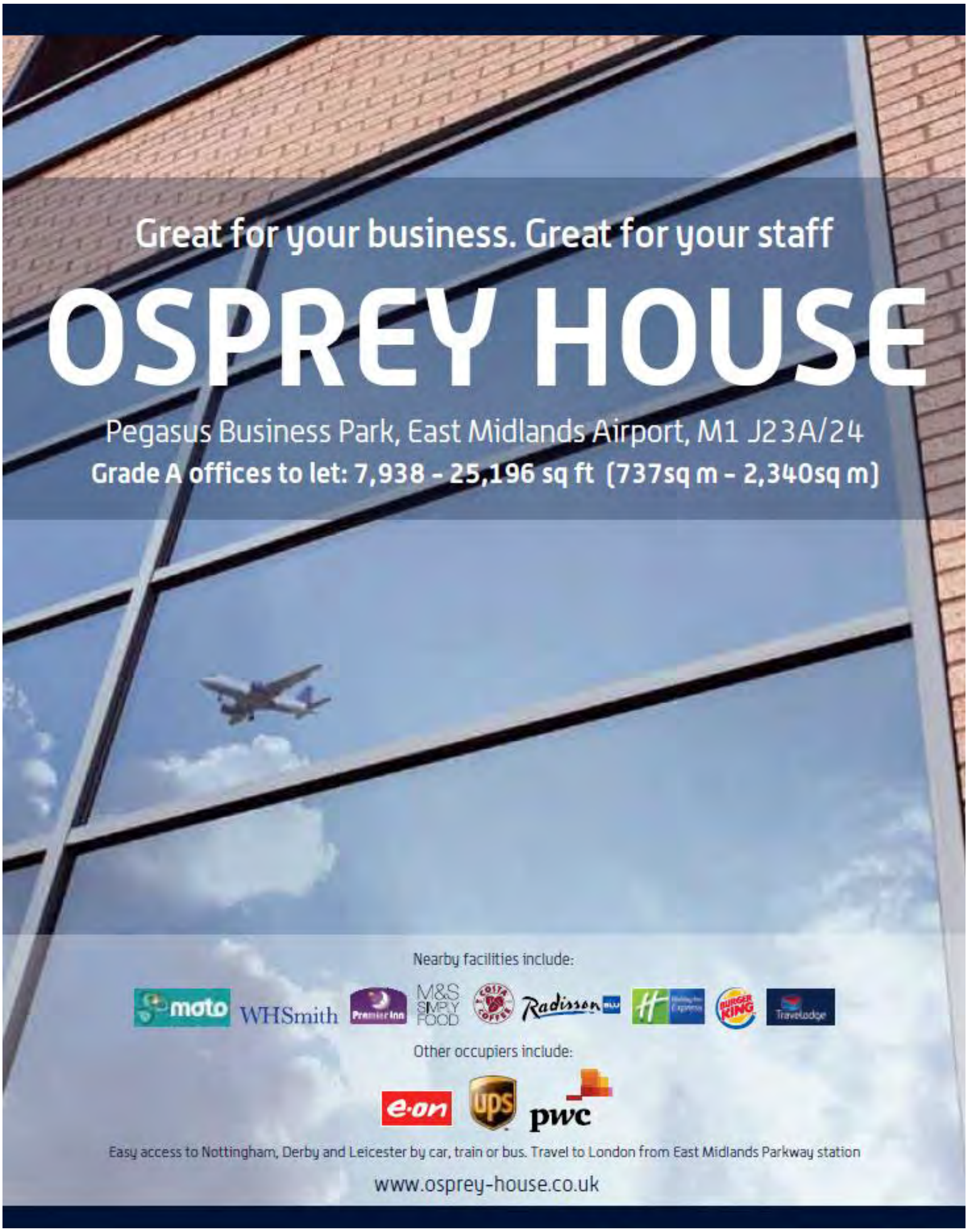

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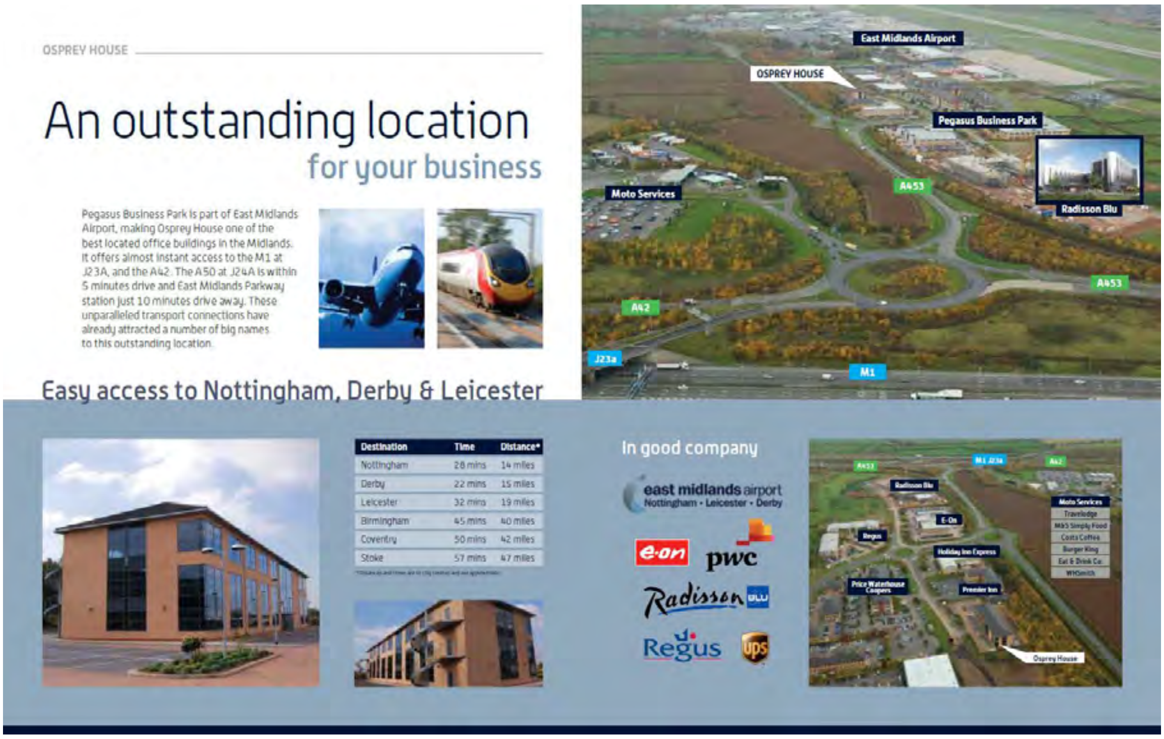

OSPREY HOUSE

An outstanding location
for your business

Pegasus Business Park is part of East Midlands Airport, making Osprey House one of the best located office buildings in the Midlands. It offers almost instant access to the M1 at J23A, and the A42. The A50 at J24A is within 5 minutes drive and East Midlands Parkway station just 10 minutes drive away. These unparalleled transport connections have already attracted a number of big names to this outstanding location.

Easy access to Nottingham, Derby & Leicester

Destination	Time	Distance*
Nottingham	28 mins	14 miles
Derby	22 mins	15 miles
Leicester	32 mins	19 miles
Birmingham	45 mins	40 miles
Coventry	50 mins	42 miles
Stoke	57 mins	47 miles

In good company

OSPREY HOUSE

The ideal new building
for your future

Osprey House provides 25,196 sq ft of Grade A open plan offices, over three floors, in an exceptional location. The flexible floor plates offer an environmental control system and excellent natural light – your staff will be effective, comfortable and happy in this new, stunning building.

Stunning three storey Grade A office space

Designed and located to meet the present and future needs of your business, the specification at Osprey House includes:

- Ground floor reception
- Comfort cooling/heating
- Open plan offices ready to receive tenant fit out
- Male, female and disabled WC facilities
- Eight person passenger lift
- Fully accessible raised floors
- Superb natural light
- Suspended ceiling with inset LG3 lighting
- 87 dedicated car parking spaces
- Additional car parking available

Accommodation	sq m	sq ft
Ground Floor Reception	39.2	422
Ground Floor Offices	737.4	7,938
First Floor Offices	781.7	8,415
Second Floor Offices	782.3	8,421
Total	2,340.6	25,196

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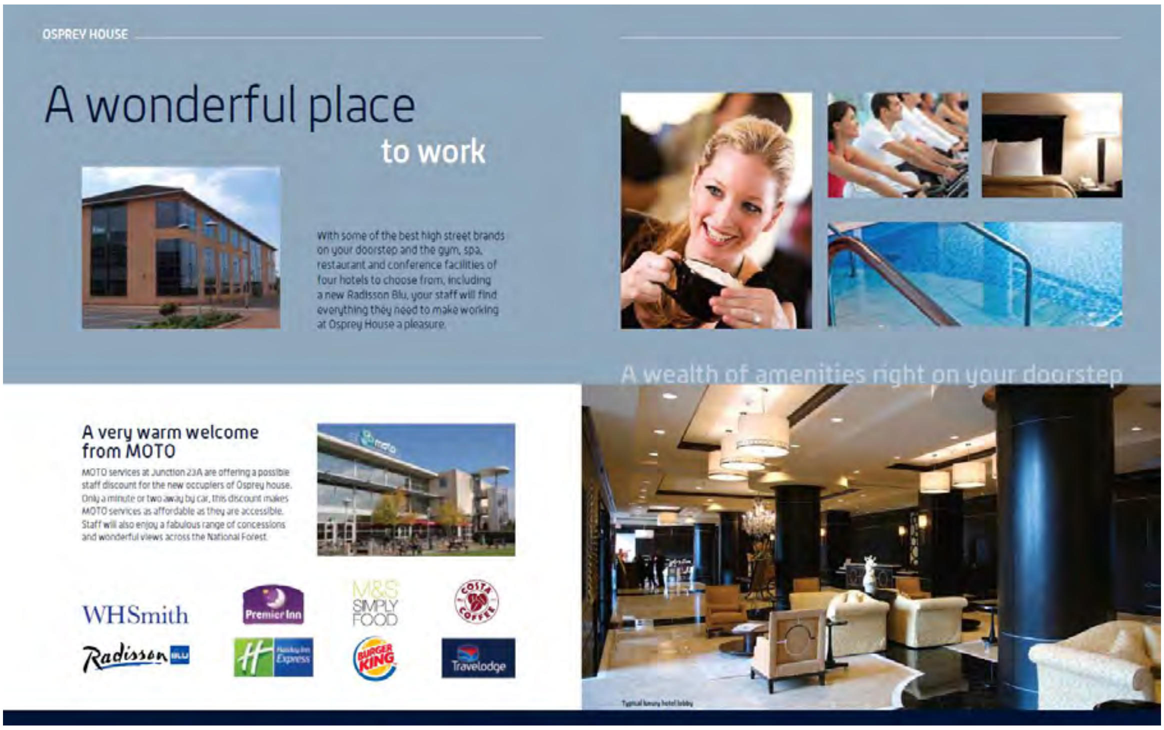
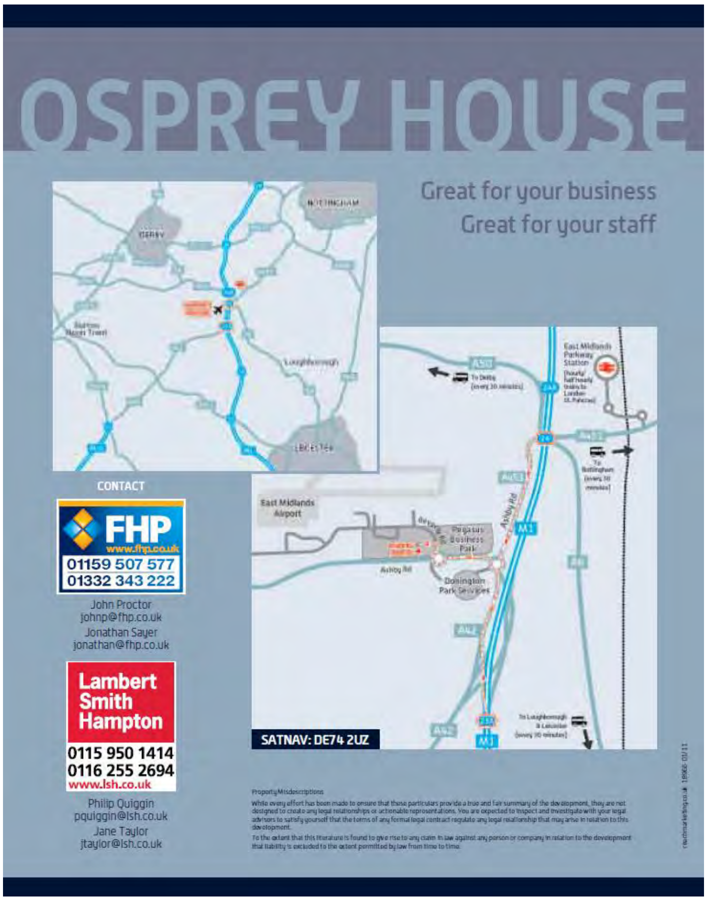




FHP PROPERTY CONSULTANTS

Appendix VI

Pembroke House Details

Lambert Smith Hampton

0115 950 1414

17/21 HOUNDS GATE NOTTINGHAM NG1 7DR

Office Property

Grade A Offices

To Let

1st Floor, Pembroke House, Pegasus Business Park, Castle Donington, Derbyshire DE74 2TU

- 486 - 971 sq m (5,225 - 10,450 sq ft)
- Premier Business Park location
- Easy access to Nottingham, Derby & Leicester
- Grade A Specification

www.lsh.co.uk

FHP PROPERTY CONSULTANTS

1st Floor, Pembroke House, Pegasus Business Park, Castle Donington, Derbyshire DE74 2TU

Location

Reproduced by permission of Ordnance Survey. © Crown copyright

Pembroke House forms part of Pegasus Business Park which is located immediately adjacent to East Midlands Airport near Castle Donington.

Pegasus Business Park benefits from excellent road communication links with Junction 23A of the M1, approximately 1 mile away. Other major arterial routes in the immediate vicinity include the A50, A453, A42 and A6 providing direct links to all the major centres across the Midlands.

Pegasus Business Park is a well established office location with a number of major companies having a presence on site, including PricewaterhouseCoopers and E.On.

Description

The premises comprise the entire first floor of a two storey construction, with brick elevations and curved panel roofs. The building incorporates double glazed windows, passenger lift and a two-storey glazed reception. Internally the suite is constructed to a Grade A specification.

The premises benefit from the following facilities/specifications:

- Air Conditioning
- Raised access floors
- Passenger Lift
- Suspended ceiling with inset CAT II Lighting
- Extensive parking

Accommodation

The accommodation has been fitted out to a high standard by the current tenant. The offices are predominantly open plan together with a number of full-height glazed partition offices, meeting rooms, reception and break out areas.

Net Internal Floor Area	Sq M	Sq Ft
Total NIA	971	10,450

VAT

All prices, premiums and rents etc. are quoted exclusive of VAT at the prevailing rate.

Legal Costs

Each party to be responsible for their own legal costs incurred in any transaction.

Business Rates

The property is currently assessed for rating purposes with a 2010 Rateable Value of £138,000. Please contact the agents for an outline of the rates payable.

Service Charge

A small estate charge is applied on Pegasus Business Park as a whole to cover landscaping, road clearance and security issues. In addition a service charge is levied to cover the costs of maintaining the building, shared with the ground floor tenant. More information is available upon application to the agents.

Terms

The premises are held on a FRI lease to expire 17th September 2016. The first floor office is available as a whole or in parts, by way of assignment or sublease(s) at a rent based on £14.00 per sq ft per annum exclusive.

Viewing and Further Information

Viewing strictly by prior appointment with the joint agents:

Jane Taylor
Lambert Smith Hampton
Tel: 0116 255 2694
jtaylor@lsh.co.uk

Phil Quiggin
Lambert Smith Hampton
Tel: 0115 950 1414
pquiggin@lsh.co.uk

Jan 2011

Lambert Smith Hampton
0116 255 2694
24 De Montfort Street Leicester LE1 7GB

Lambert Smith Hampton
0115 950 1414
1/21 Hounds Gate Nottingham NG1 7DR

FHP PROPERTY CONSULTANTS

Appendix VII

Original and Up To Date Marketing Particulars of LSH for Unit 423

Lambert Smith Hampton

0115 950 1414
www.lsh.co.uk

To Let

Office Property

High Quality HQ Office Building

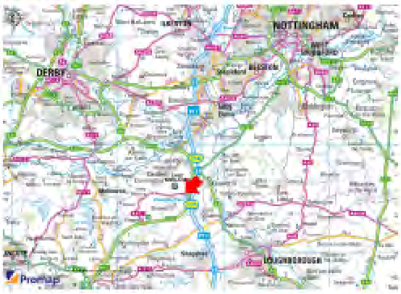
BMI Baby HQ, Argosy Road, Pegasus Business Park, Castle Donnington, Derbys, DE74 2SA

- 2,375 Sq M (25,561 Sq Ft)
- Premier Business Park location
- Easy access to Nottingham, Derby & Leicester
- High quality spec & vastly superior parking ratio

Lambert Smith Hampton
17/21 Hounds Gate, Nottingham NG1 7DR **T** +44 (0)115 950 1414

BMI Baby HQ, Argosy Road, Pegasus Business Park, Castle Donnington, Derbys, DE74 2SA

Location



Situated at Pegasus Business Park, which is located immediately adjacent to East Midlands Airport near Castle Donnington, benefiting from excellent road links with Junction 23A of the M1 approximately 1 mile away. In additon, East Midlands Parkway Railway Station is 4 miles away.

Pegasus Business Park is a well established office location with a number of major companies on-site including Pricewaterhouse Coopers and E.On.

Description

The premises comprise a two-storey construction, with brick elevations and pitched tiled roof. The building incorporates double-glazed windows, lift and reception facilities.

The premises benefit from the following facilities/specification:

- Air Conditioning
- Raised access floors
- Passenger Lift
- Suspended ceiling with insert CAT II lighting
- 201 car parking spaces

Accommodation

The accommodation has been fitted out to a high standard by the current tenant. The offices are predominantly open plan together with a number of partitioned offices, meeting rooms, training rooms and canteen.

Net Internal Floor Area	Sq Ft	Sq M
Ground Floor	12,820	1,191
First Floor	12,740	1,184
Total Net Internal Area	25,561	2,375

VAT

All prices, premiums and rents etc. are quoted exclusive of VAT at the prevailing rate.

Business Rates

The property is currently assessed for rating purposes with a 2010 Rateable Value of £320,000. Please contact the Agents for an outline of the rates payable.

Terms

The premises are held on a FRI lease to expire July 2018, subject to a tenant's option to break in July 2013. The property is available by way of assignment or sublease at the passing rent of £320,000 per annum exclusive. Alternatively, consideration will be given to a new lease on terms to be agreed.

Service Charge

A small estate charge is applied to cover landscaping, road clearance and security issues. More information is available upon application to the agents.

Planning

The use of the premises shall be restricted to offices and any use of the building shall be airport related, unless otherwise agreed in writing with the Local Planning Authority.

Viewing and Further Information

Viewing strictly by prior appointment with the sole agent:

Phil Quiggin
Lambert Smith Hampton
0115 9766603
07803 835138
pquiggin@lsh.co.uk

Jenny Clarke
Lambert Smith Hampton
0115 9766610
07720 084760
jclarke@lsh.co.uk

Mar 2012

Lambert Smith Hampton
0115 950 1414
www.lsh.co.uk

Office Property

Lambert Smith Hampton
0115 950 1414
17/21 HOUNDS GATE NOTTINGHAM NG1 7DR

High Quality HQ Office Building

To Let

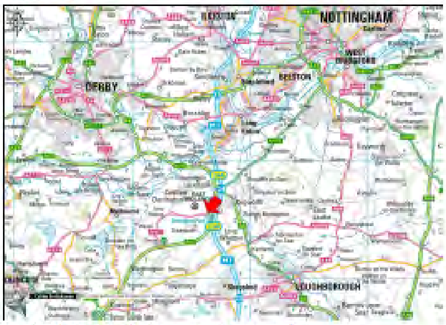
BMI Baby HQ, Argosy Road, Pegasus Business Park, Castle Donington, Derbyshire DE74 2SA

- 2,375 sq m (25,561 sq ft)
- Premier Business Park location
- Easy access to Nottingham, Derby & Leicester
- High quality spec & vastly superior parking ratio
- Short or long term lease options

www.lsh.co.uk

BMI Baby HQ, Argosy Road, Pegasus Business Park, Castle Donington, Derbyshire DE74 2SA

Location



Reproduced by permission of Ordnance Survey, © Crown copyright.

The subject property forms part of Pegasus Business Park which is located immediately adjacent to East Midlands Airport near Castle Donington.

Pegasus Business Park benefits from excellent road communication links with Junction 23A of the M1, approximately 1 mile away. In addition Nottingham Parkway rail station is situated adjacent to Ratcliffe-on-Soar power station, approximately 4 miles away, and offering connecting trains to Derby, Nottingham, London and beyond.

Pegasus Business Park is a well established office location with a number of major companies having a presence on site, including PricewaterhouseCoopers and E.On.

Description

The premises comprise a two storey construction, with brick elevations and pitched tiled roof. The building incorporates double glazed windows, passenger lift and reception facilities. Internally the accommodation is constructed to a Grade A specification, albeit now requiring some cosmetic refurbishment.

The premises benefit from the following facilities/specification:

- Air Conditioning
- Raised access floors
- Passenger Lift
- Suspended ceiling with inset CAT II Lighting
- 201 parking spaces (almost 8 spaces per 1,000 sq ft)

Accommodation

The accommodation has been fitted out to a high standard by the current tenant. The offices are predominantly open plan together with a number of partitioned offices, meeting rooms, training rooms and canteen.

Net Internal Floor Area	Sq M	Sq Ft
Ground Floor	1,191	12,820
First Floor	1,184	12,740
Total Net Internal Area	2,375	25,561

VAT

All prices, premiums and rents etc. are quoted exclusive of VAT at the prevailing rate.

Business Rates

The property is currently assessed for rating purposes with a 2010 Rateable Value of £320,000. Please contact the agents for an outline of the rates payable.

Service Charge

A small estate charge is applied to cover landscaping, road clearance and security issues. More information is available upon application to the agents.

Terms

The premises are held on a FRI lease to expire July 2018, subject to a tenant's option to break in July 2013. The property is available by way of assignment or sublease at the passing rent of £320,000 per annum exclusive.

Alternatively considertaion will be given to a new lease on terms to be agreed.

Planning

The use of the premises shall be restricted to offices and any use of the building shall be airport related, unless otherwise agreed in writing with the Local Planning Authority.

Viewing and Further Information

Viewing strictly by prior appointment with the sole agent:

Jane Taylor
Lambert Smith Hampton
Tel: 0116 255 2694
jtaylor@lsh.co.uk

Phil Quiggin
Lambert Smith Hampton
Tel: 0115 950 1414
pquiggin@lsh.co.uk

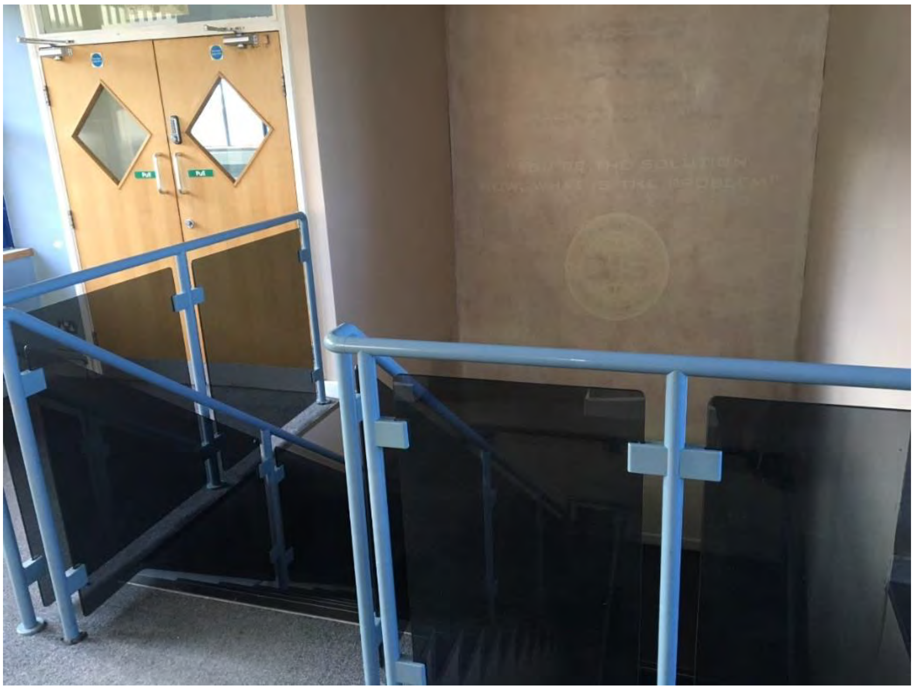
Jan 2011

Lambert Smith Hampton
0115 950 1414
17/21 HOUNDS GATE NOTTINGHAM NG1 7DR
www.lsh.co.uk

JMP/HG
01/07/13
Page 69

PROPERTY CONSULTANTS

Appendix II




Fire
exit

FHP
www.fhp.co.uk

Appendix III

www.fhp.co.uk

DONINGTON COURT
UNIT 2A DONINGTON COURT | PEGASUS BUSINESS PARK
CASTLE DONINGTON | DE74 2UZ

savills


M1
23a
Radisson
Regus
SECRETARY OF STATE
WESTERN POWER DISTRIBUTION
east midlands airport
DONINGTON COURT
DC
Premier Inn
nationalgrid
PKF Cooper Parry
DHL
Royal Mail

Investment Summary

- **Strategically located** within the UK with **access directly from the M1 motorway** and within close proximity of the A42 and A50 Dual Carriageways
- **Next to East Midlands International Airport**, one of the UK's most strategically important airports
- **Prime Business Park environment** with high profile branding opportunity
- With close proximity of **SEGRO Logistics Park**, East Midlands, Gateway and **Rail Freight Interchange**
- High Specification purpose built office building extending to **43,847 sq ft** (NIA) (4,073.60 sq m)
- Excellent parking ratio of **6.75 spaces per 1,000 sq ft**
- Passing net rent of **£355,135** per annum
- Potential gross rent **£624,782** per annum (net £561,904 per annum)
- Let in part to PriceWaterhouseCoopers Services Limited and HSBC Bank plc
- Low capital value **£170** per sq ft
- Long leasehold
- Seeking offers in excess of **£7,265,000 (Seven Million, Two Hundred & Sixty Five Thousand Pounds)**, subject to contract providing a net initial yield of **7.25%**, assuming purchasers' costs at **6.66%**
- A rental guarantee equivalent to one year, **£229,744 per annum** and the corresponding rental equivalent to the residue rent free granted to HSBC Bank plc, will be deducted from the purchase price

Donington Court | Unit 2A Donington Court
Pegasus Business Park Castle Donington | DE74 2UZ

Location

Donington Court is located on Pegasus Business Park, within the boundary of East Midlands International Airport, one of the UK's most strategically important airports outside London.

East Midlands International Airport accommodates 4.3 million passengers each year offering routes to over 80 leisure and business destinations. The Airport is the second busiest cargo airport in the UK (after Heathrow) and handles over 310,000 tonnes of air freight every year. It is the UK hub for DHL and UPS and acts in support of operations for TNT and Royal Mail as well as a number of distribution companies that have bases in the area. The world-famous Donington Park motor racing circuit is also near by.

Demographics

The East Midlands has an excellent track record for attracting flourishing world class companies in the transport, healthcare, professional services, food and drink and environmental sectors. The area offers a competitive environment supported by world leading research and development capabilities, a highly skilled workforce and it also benefits from being at the centre of the UK transport network.

"EAST MIDLANDS AIRPORT IS SITUATED ADJACENT TO JUNCTION 23A OF THE M1 MOTORWAY BENEFITING FROM IMMEDIATE ACCESS TO THE NATIONAL MOTORWAY NETWORK AND A DIRECT ROUTE TO LONDON"

Donington Court | Unit 2A Donington Court
Pegasus Business Park Castle Donington | DE74 2UZ

Connectivity

In addition to air travel, East Midlands Airport is situated adjacent to Junction 23A of the M1 Motorway benefiting from immediate access to the national motorway network and a direct route to London (2 hour drive time) and Leeds (1.5 hour drive time). The Airport also benefits from direct access to Birmingham via the A42 (40 miles to the south west). The A50 dual carriageway, situated directly to the north of the Airport, provides direct access to the M6 Motorway.

East Midlands parkway station is a short 10 minute taxi ride away from the property providing frequent direct trains to London St Pancras International Station in under 1 hour and 30 minutes.

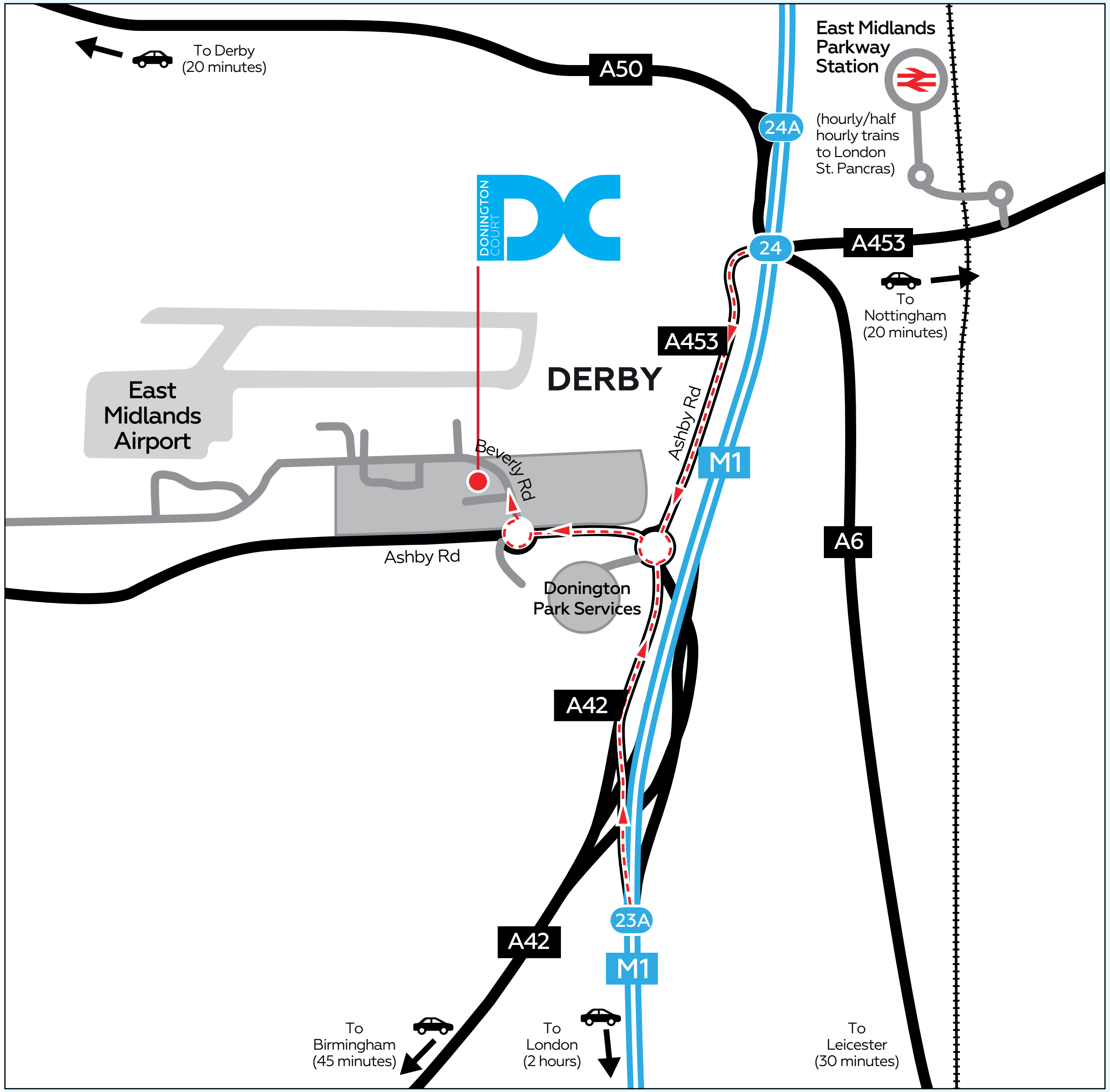
Logistics

The property is within close proximity of SEGRO Logistics Park East Midlands Gateway (SLPEMG) which is a 700 acre development with planning consent for up to 6,000,000 sq ft of logistics accommodation. The development incorporates a 50 acre Strategic Rail Freight Interchange (SRFI) which will include a rail freight terminal, capable of handling up to sixteen 775m rail freight trains per day, container storage and HGV parking.

Extensive infrastructure works are currently underway. These works include improvements to Junction 24 and 24A of the M1 including the introduction of a smart motorway system by Highways England, safer access to the A50 at Lockington and Hemington and the new Kegworth Bypass.

Situation

Donington Court occupies a prominent position within Pegasus Business Park on one of the principle airport boundary roads leading to the passenger terminal and numerous cargo facilities. Surrounding office occupiers include HSBC, Regus, Nikon, PKF Cooper-Parry, National Grid, PWC, UPS and Home Office and there also are several hotels nearby including Premier Inn, Holiday Inn Express, Radisson Blu and Thistle.

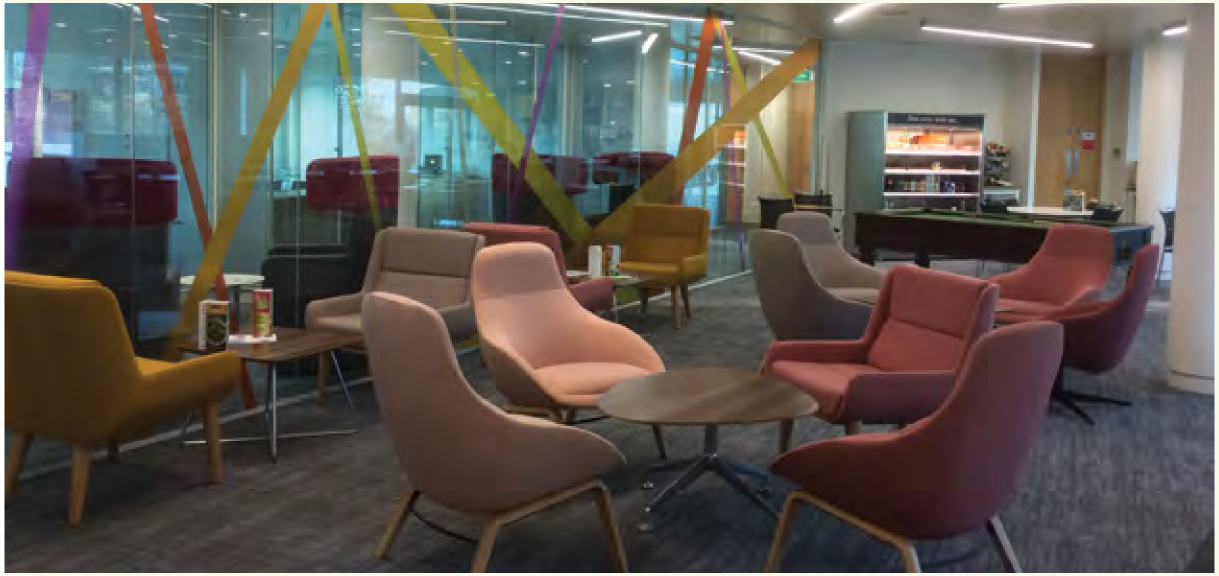


Description

Donnington Court was constructed in 2002 to provide high specification Grade A headquarters offices primarily arranged over ground, first and second floor.

The building provides the following amenities:

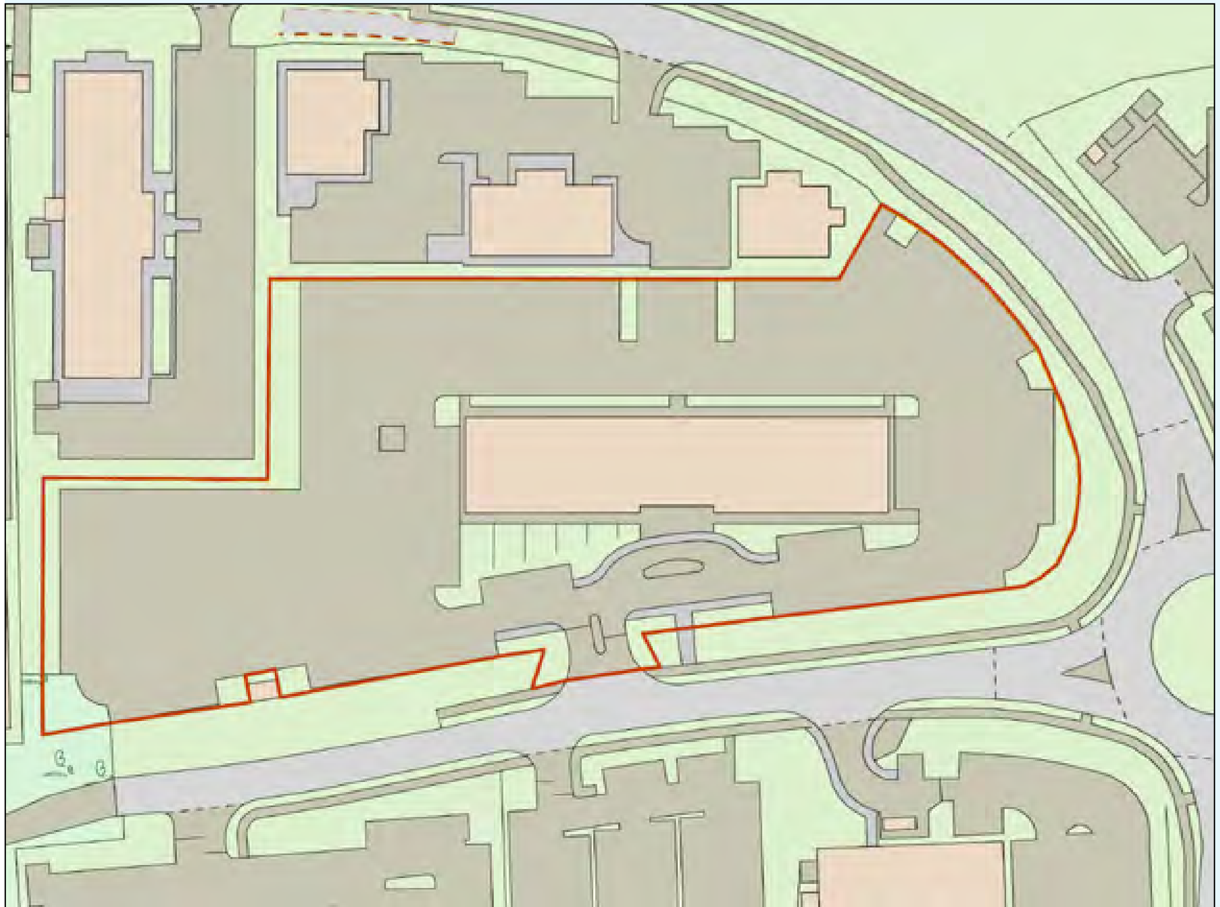
- Air conditioning
- Fully accessed raised floors.
- Suspended ceilings with recessed integral lighting
- Feature double height reception
- Excellent parking ratio with 265 secure parking spaces and more potentially available (6.75 spaces per 1,000 sq ft)
- Fully refurbished and with the benefit of an attractive Concierge Reception
- Passenger lift(s)
- Dedicated kitchen and WC facilities
- DDA compliant
- 24 hour access and CCTV monitoring



Accommodation

Net Internal Area	Size (Sq Ft)	Size (Sq M)
Ground Floor	13,520	1,256.1
First Floor	13,245	1,230.5
Second Floor	13,558	1,259.6
Roof	3,524	327.4
Total	**43,847**	**4,073.6**

The property has been measured in accordance with the RICS Code of Measuring Practice, published in 2007 (6th Edition). We have not measured the property nor have we calculated the floor areas in accordance with IPMS 3 – Offices. The site extends to approximately 3.209 acres (1.299 hectares).



NOTE:- Reproduced from the Ordnance Survey Map with the permission of the Controller of H.M. Stationery Office. © Crown copyright licence number 100024244 Savills (UK) Limited. NOTE:- Published for the purposes of identification only and although believed to be correct accuracy is not guaranteed.

Tenure

The property is held on a long leasehold from East Midlands International Airport Limited for a term of 150 years from 26 November 2002, subject to a head rent equivalent to 10% of rents received and £400 ground rent.

After deduction of the head rent and ground rent, the net rent received is £355,135 per annum.

The property is let on two full repairing and insuring leases, in part, as follows:

Ground Floor Left Wing (6,469 sq ft) let to PriceWaterhouseCoopers Services Limited – 10 years with effect from 26 November 2017, subject to rent review in the 5th year of the term, 26 November 2022, and tenant break clause on 26 November 2022, at a rental of £98,465 per annum, reflecting £15.22 per sq ft.

First Floor Left and Right Wings (13,245 sq ft) let to PriceWaterhouseCoopers Services Limited – 10 years with effect from 26 November 2017, subject to rent review in the 5th year of the term, 26 November 2022 and tenant break clause on 26 November 2022, at a rental of £201,535 per annum, reflecting £15.22 per sq ft.

Second Floor West Wing (6,232 sq ft) let to HSBC Bank plc – 10 years with effect from 6 April 2018, subject to rent review in the 5th year of the term and tenant break clause on 6 April 2023 at a rental of £95,038 per annum, reflecting £15.25 per sq ft.

Vacant space

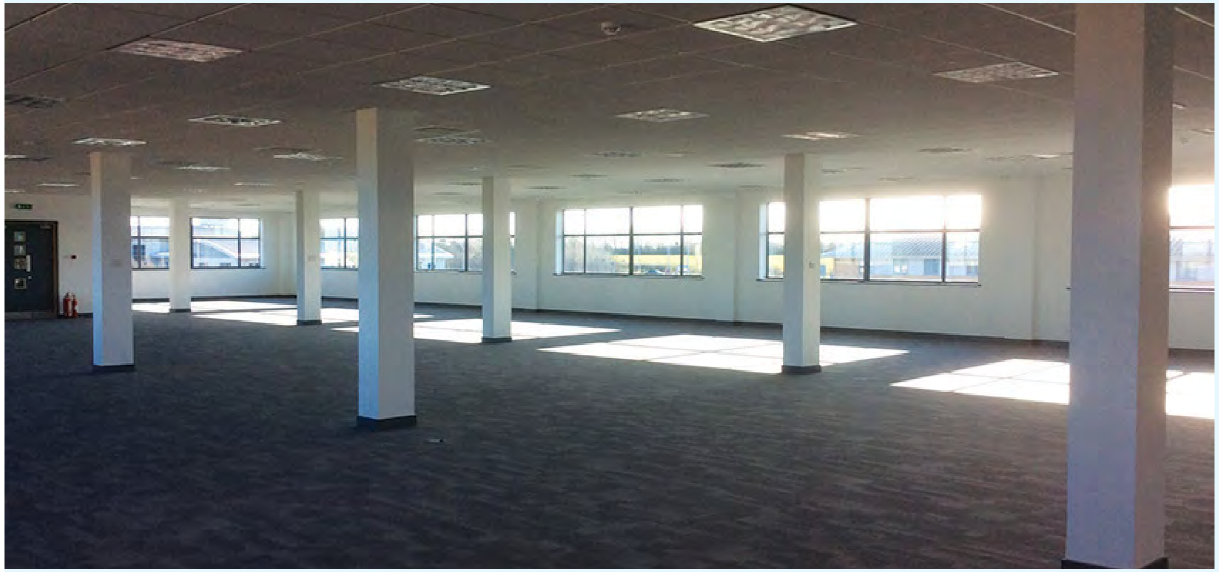
Reflecting the above tenancies, two suites remain vacant and are currently being marketed as follows:

Ground Floor Right Wing (Office B) 5,976 sq ft (555.19 sq m)

Second Floor Right Wing (Office B) 7,326 sq ft (680.60 sq m)

In addition to the above, there is ancillary storage in the roof void extending to 3,524 sq ft (327.4 sq m).

Based on the above tenancies we are of the opinion that an ERV of £15.25 per sq ft would be applicable on the remaining two suites and 50% of the main space rate of £7.63 per sq ft on ancillary storage providing an additional gross rental of £229,744 per annum.



Covenants

PriceWaterhouseCoopers Services Limited

D&B Rating of 4A1 – represents minimum risk of business failure score

	Fiscal Non consolidated GBP 30 Jun 2016 (000's)	Fiscal Non consolidated GBP 30 Jun 2015 (000's)	Fiscal Non consolidated GBP 30 Jun 2014 (000's)
Sales Turnover	1,832,831	1,708,763	1,534,890
Profit / (Loss) Before Taxes	102,337	93,223	59,600
Tangible Net Worth	16,374	71,519	29,027
Net Current Assets (Liabilities)	(161,798)	(110,152)	(157,900)

HSBC Bank plc

D&B Rating of 5A1 – represents minimum risk of business failure score

	Fiscal Consolidated GBP 31 Dec 2016 (000's)	Fiscal Consolidated GBP 31 Dec 2015 (000's)	Fiscal Consolidated GBP 31 Dec 2014 (000's)
Sales Turnover	20,041,000	18,630,000	18,313,000
Profit / (Loss) Before Taxes	874,000	2,971,000	1,953,000
Tangible Net Worth	34,195,000	30,486,000	28,784,000
Net Current Assets (Liabilities)	65,577,000	42,025,000	38,543,000

EPC

The property has an Energy Performance Rating of:

D81
C71.

VAT

The property is elected for VAT. We would anticipate the transaction being treated as a Transfer of a Going Concern (TOGC), however prospective purchasers should make their own enquiries.

Proposal

We are seeking offers in excess of **£7,265,000 (Seven Million, Two Hundred & Sixty Five Thousand Pounds)**, subject to contract providing a net initial yield of **7.25%**, assuming purchaser's costs at **6.66%**.

A rental guarantee equivalent to one year, **£229,744 per annum** and the corresponding rental equivalent to the residue rent free granted to HSBC Bank plc, will be deducted from the purchase price.

Donington Court | Unit 2A Donington Court
Pegasus Business Park Castle Donington | DE74 2UZ

Savills Nottingham

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nottingham@savills.com

Contacts

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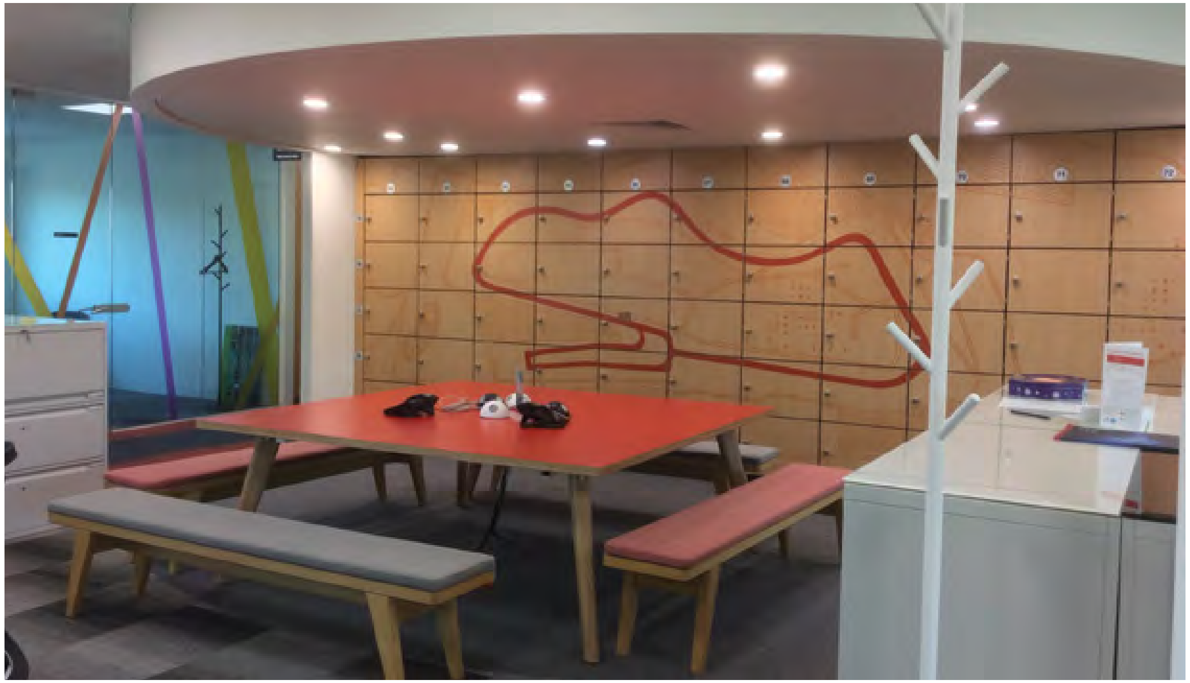
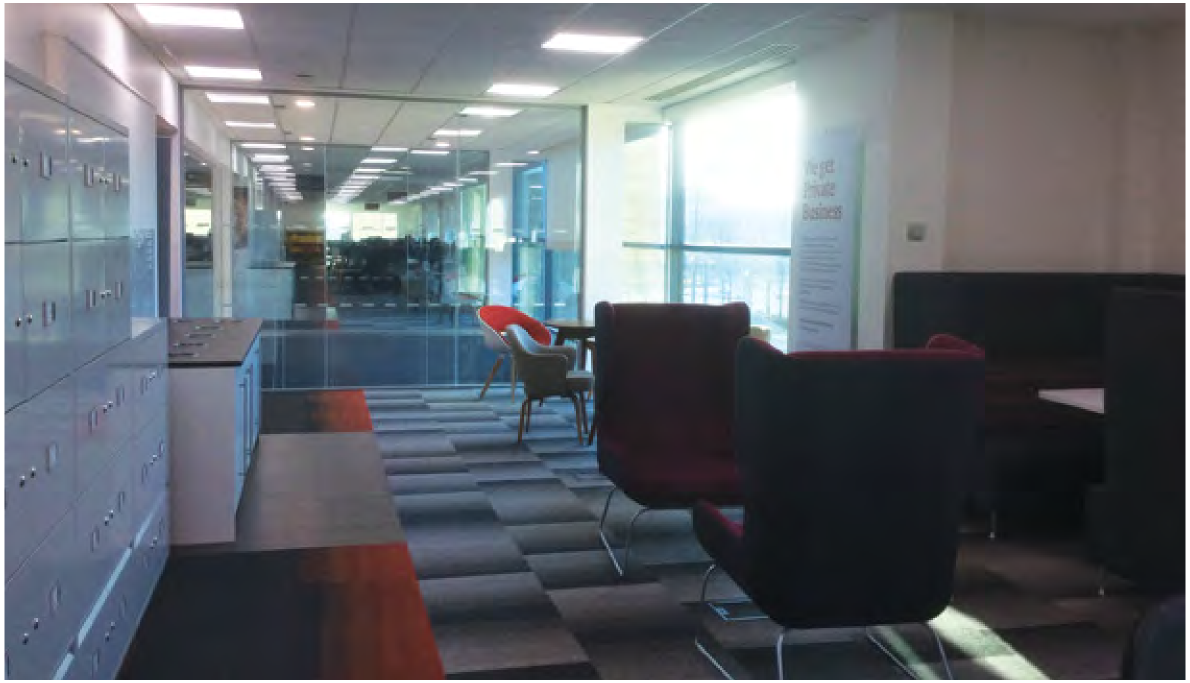
E: vktori@savills.com

Christine Thorn
T: +44 (0) 115 934 8152
E: cthorn@savills.com





TO LET

UNIT 2A DONINGTON COURT , PEGASUS BUSINESS PARK,
CASTLE DONINGTON , DE74 2UZ

SUMMARY

- Strategically located within the UK with access directly from the M1 motorway and within close proximity of the A42 and A50 Dual Carriageways
- Next to East Midlands International Airport, one of the UK's most strategically important airports
- Prime Business Park environment with high profile branding opportunity
- High specification Grade A offices , forming part of a Headquarters office building , available as a whole or individual suites of 6,040 sq ft (561.17 sq m) and 13,672 sq ft (1,270.19 sq m)
- Excellent parking ratio with 111 secure parking spaces and more potentially available
- Fully refurbished and with the benefit of an attractive Concierge Reception

savills

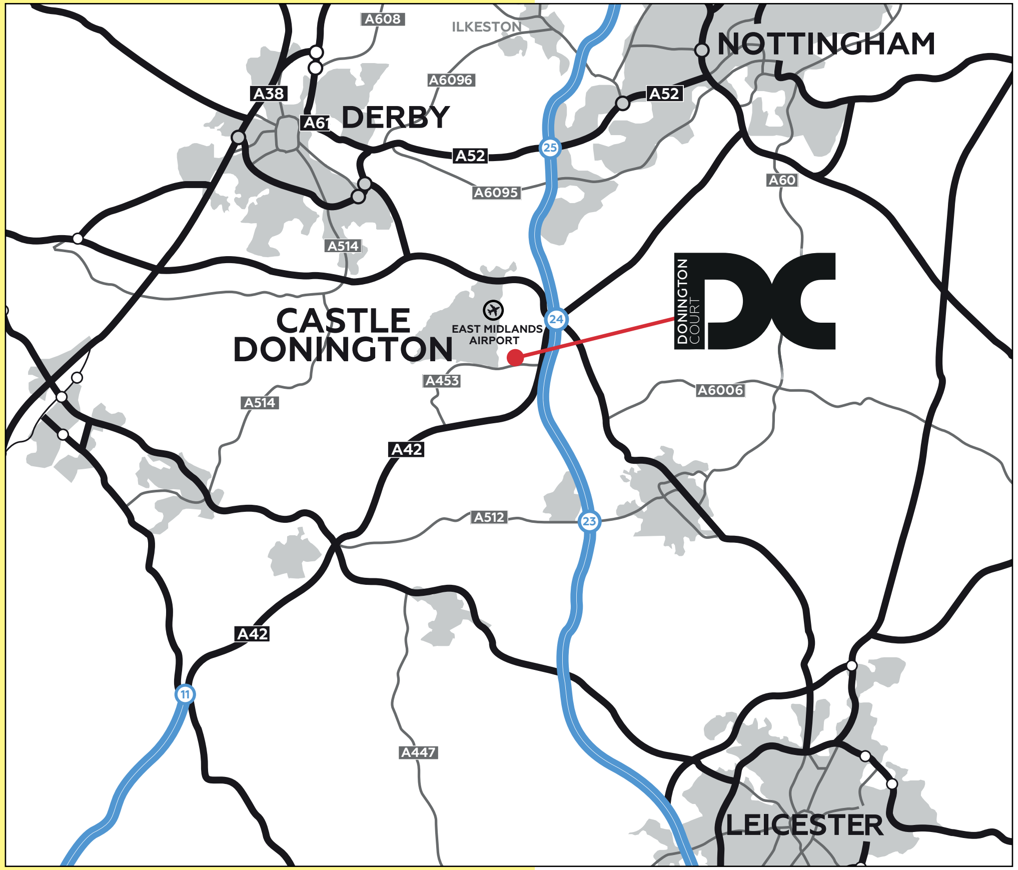
LOCATION

Donington Court is located on Pegasus Business Park, within the boundary of East Midlands International Airport, one of the UK's most strategically important airports outside London.

East Midlands International Airport accommodates 4.3 million passengers each year offering routes to over 80 leisure and business destinations. The Airport is the second busiest cargo airport in the UK (after Heathrow) and handles over 310,000 tonnes of air freight every year. It is the UK hub for DHL and UPS and acts in support of operations for TNT and Royal Mail as well as a number of distribution companies that have bases in the area. The world-famous Donington Park motor racing circuit is also near by.

DEMOGRAPHICS

The East Midlands has an excellent track record for attracting flourishing world class companies in the transport, healthcare, professional services, food and drink and environmental sectors. The area offers a competitive environment supported by world leading research and development capabilities, a highly skilled workforce and it also benefits from being at the centre of the UK transport network.




M1
23a
Radisson
Regus
SECRETARY OF STATE
WESTERN POWER DISTRIBUTION
east midlands airport
DONINGTON COURT
DC
nationalgrid
PKF Cooper Parry
DHL
Royal Mail

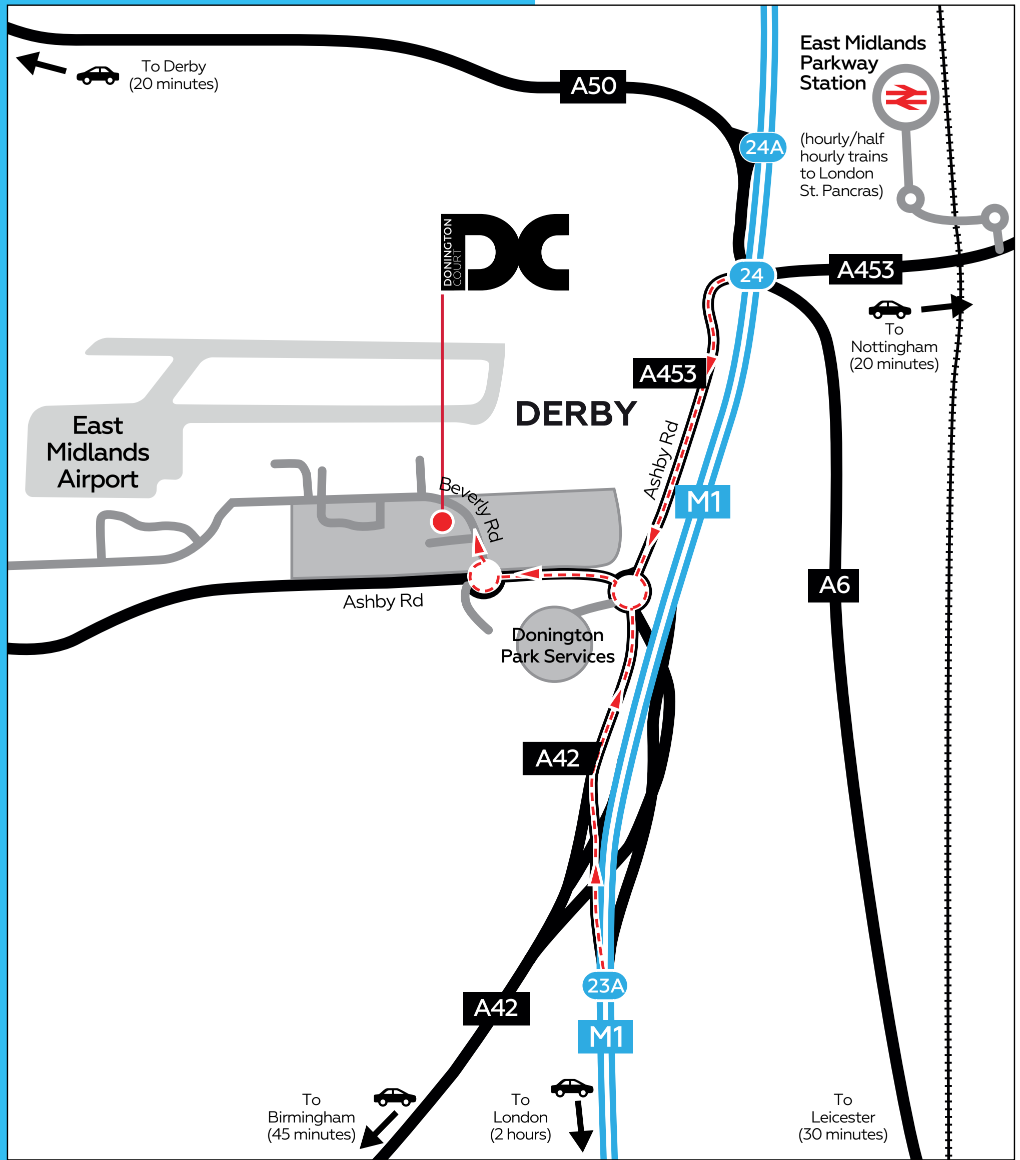
CONNECTIVITY

In addition to air travel, East Midlands Airport is situated adjacent to Junction 23A of the M1 Motorway benefiting from immediate access to the national motorway network and a direct route to London (2 hour drive time) and Leeds (1.5 hour drive time). The Airport also benefits from direct access to Birmingham via the A42 (40 miles to the south west). The A50 dual carriageway, situated directly to the north of the Airport, provides direct access to the M6 Motorway.

East Midlands parkway station is a short 10 minute taxi ride away from the property providing frequent direct trains to London St Pancras International Station in under 1 hour and 30 minutes.

SITUATION

Donington Court occupies a prominent position within Pegasus Business Park on one of the principle airport boundary roads leading to the passenger terminal and numerous cargo facilities. Surrounding office occupiers include Regus, Nikon, PKF Cooper-Parry, National Grid, PWC, UPS and Home Office and there also are several hotels nearby including Premier Inn, Holiday Inn Express, Radisson Blu, and Thistle.



EAST MIDLANDS INTERNATIONAL AIRPORT ACCOMMODATES 4.3 MILLION PASSENGERS EACH YEAR OFFERING ROUTES TO OVER 80 LEISURE AND BUSINESS DESTINATIONS

DESCRIPTION

Donington Court was constructed in 2002 to provide high specification Grade A Headquarters offices arranged over the ground amenities:

- Air conditioning
- Fully accessed raised floors.
- Suspended ceilings with recessed integral lighting
- Feature double height reception
- Excellent parking ratio with 111 secure parking spaces and more potentially available
- Fully refurbished and with the benefit of an attractive Concierge Reception
- Passenger lift(s)
- Dedicated kitchen and WC facilities
- DDA compliant
- 24 hour access and CCTV monitoring

"THE AREA OFFERS A COMPETITIVE ENVIRONMENT SUPPORTED BY WORLD LEADING RESEARCH AND DEVELOPMENT CAPABILITIES"


strategy&
pwc
Everyone plays a part
Advice into action

ACCOMMODATION

Net Internal Area	Size (Sq Ft)	Size (Sq M)
Ground Floor	6,040	561.17
Second Floor	13,672	1,270.19
Total	**19,712**	**1,831.36**

The second floor can be sub-divided.

"EAST MIDLANDS AIRPORT IS SITUATED ADJACENT TO JUNCTION 23A OF THE M1 MOTORWAY BENEFITING FROM IMMEDIATE ACCESS TO THE NATIONAL MOTORWAY NETWORK AND A DIRECT ROUTE TO LONDON"

BUSINESS RATES

The current rating assessment is for the whole building and an appeal is due to be submitted splitting the ground and second floors.

For guidance purposes the current assessment adopts a base rate Rateable Value of £125 per sq m, namely £5.56 per sq ft payable.

RENT

£16.50 per sq ft exclusive.

VAT

VAT will be applicable to this transaction.

TERMS

The property is offered on flexible new full repairing and insuring terms.

LEGAL COSTS

Each party will be responsible for their own legal costs involved in this transaction.

> THE PROPERTY OCCUPIES A PROMINENT POSITION WITHIN DONINGTON COURT ON ONE OF THE PRINCIPLE AIRPORT BOUNDARY ROADS LEADING TO THE PASSENGER TERMINAL

SAVILLS NOTTINGHAM

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VIEWING

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E: vktori@savills.com

Christine Thorn
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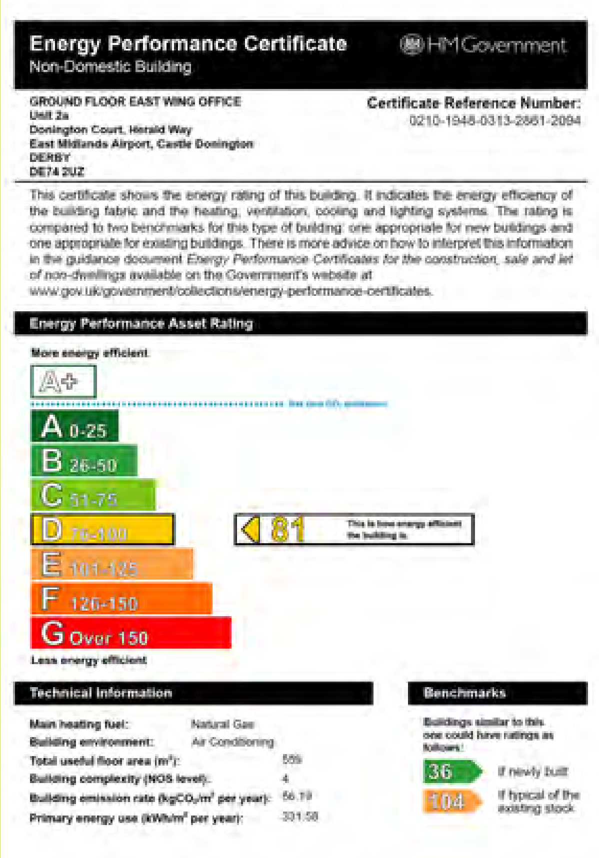
E: cthorn@savills.com

EPCs



Energy Performance Certificate
Non-Domestic Building
HM Government

GROUND FLOOR EAST WING OFFICE
Unit 2a
Donington Court, Herald Way
East Midlands Airport, Castle Donington
DERBY
DE74 2UZ

Certificate Reference Number:
0210-1948-0313-2861-2094

This certificate shows the energy rating of this building. It indicates the energy efficiency of the building fabric and the heating, ventilation, cooling and lighting systems. The rating is compared to two benchmarks for this type of building: one appropriate for new buildings and one appropriate for existing buildings. There is more advice on how to interpret this information in the guidance document *Energy Performance Certificates for the construction, sale and let of non-dwellings* available on the Government's website at www.gov.uk/government/collections/energy-performance-certificates.

Energy Performance Asset Rating

More energy efficient
A+
A 0-25
B 26-50
C 51-75
D 76-100
E 101-125
F 126-150
G Over 150
Less energy efficient

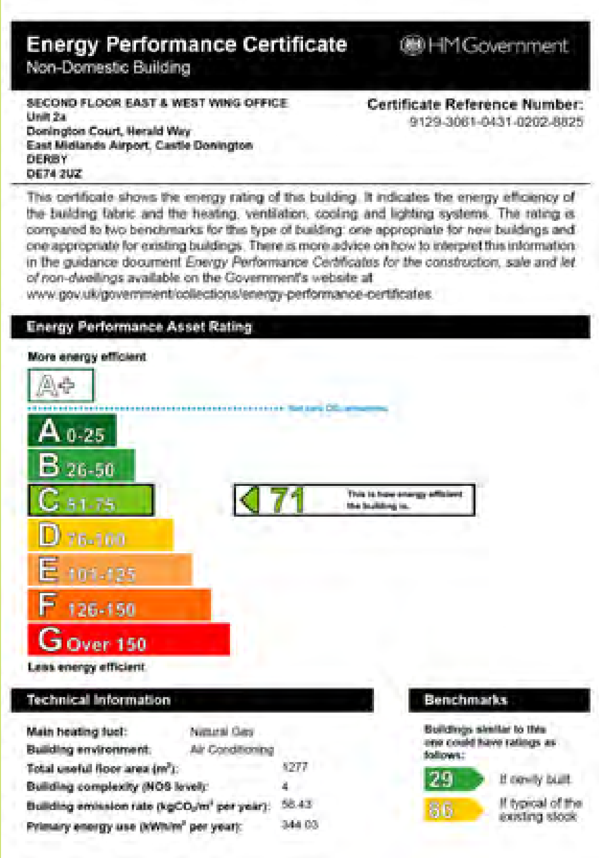
81 This is how energy efficient the building is.

Technical Information

Main heating fuel:	Natural Gas
Building environment:	Air Conditioning
Total useful floor area (m^2):	559
Building complexity (NOS level):	4
Building emission rate ($kgCO_2/m^2$ per year):	56.19
Primary energy use (kWh/m^2 per year):	331.58

Benchmarks

Buildings similar to this one could have ratings as follows:
36 If newly built
104 If typical of the existing stock



Energy Performance Certificate
Non-Domestic Building
HM Government

SECOND FLOOR EAST & WEST WING OFFICE
Unit 2a
Donington Court, Herald Way
East Midlands Airport, Castle Donington
DERBY
DE74 2UZ

Certificate Reference Number:
9129-3061-0431-0202-8825

This certificate shows the energy rating of this building. It indicates the energy efficiency of the building fabric and the heating, ventilation, cooling and lighting systems. The rating is compared to two benchmarks for this type of building: one appropriate for new buildings and one appropriate for existing buildings. There is more advice on how to interpret this information in the guidance document *Energy Performance Certificates for the construction, sale and let of non-dwellings* available on the Government's website at www.gov.uk/government/collections/energy-performance-certificates.

Energy Performance Asset Rating

More energy efficient
A+
A 0-25
B 26-50
C 51-75
D 76-100
E 101-125
F 126-150
G Over 150
Less energy efficient

71 This is how energy efficient the building is.

Technical Information

Main heating fuel:	Natural Gas
Building environment:	Air Conditioning
Total useful floor area (m^2):	1277
Building complexity (NOS level):	4
Building emission rate ($kgCO_2/m^2$ per year):	58.43
Primary energy use (kWh/m^2 per year):	344.03

Benchmarks

Buildings similar to this one could have ratings as follows:
29 If newly built
86 If typical of the existing stock

York Aviation

Appendix B

York Aviation LLP
Primary House
Spring Gardens
Macclesfield
Cheshire SK10 2DX
Tel: 01625 614051
Fax: 01625 426159
E-mail: louise.congdon@yorkaviation.co.uk
www.yorkaviation.co.uk

Sally Dixon,
Azimuth Associates,
17 Island Wall,
Whitstable,
Kent CT5 1EP.
19th October 2017

Dear Ms Dixon,

Manston Airport

I am in receipt of your letter of 18th October, to which you requested a response by 20th October. I will deal with the points that you raise.

i. James Brass correctly stated, in October 2016, that, as our work for the FTA was in the public domain, we would have no difficulty with you properly citing it in your work, nor his letter, and that we stood over the conclusions of that work. However, we did not expect that it would be used as a primary consultation document and placed on RSP's website as such, giving the impression that we were working for RSP. This was the reason for the concern that I have expressed.

ii. In relation to the so-called TfL paper on Freight Connectivity, I am unsure what hard copy version was provided to you by TfL but it is quite clear from the Freedom of Information disclosure made by TfL that the note referred to in your proposed DCO application documentation was that prepared by ourselves and to which I refer. The FOI disclosure is at: https://tfl.gov.uk/corporate/transparency/freedom-of-information/foi-request-detail?referenceId=FOI-0891-1718
You will see that the note is identical to that which you quote and is clearly marked with our logo.

iii. The reports upon which we have expressed concern are indeed Volumes I, II and III as placed on RSP's website. I cannot comment on TfL's views on these reports but at no time did they consult with ourselves in relation to these reports and their reliance on our earlier work.

iv. We have had no communication with Ros McIntyre and cannot comment on any views expressed.

v. In relation to your interpretation of our earlier work, the position remains as set out in my previous letter. This will be set out more fully in our report which you will be able to review in due course.

vi. Whilst our report is not yet finalised, we have, of course, discussed the matters with Pinsent Masons and they reflected our views in their letter to PINS.

vii. Pinsent Masons did not demand that your reports are withdrawn, rather the paragraph quoted states that our report will be part of the evidence to be submitted in the event that RSP's proposal is not withdrawn from the DCO process.

In the light of the formality of the process in which we are engaged, I would suggest that future correspondence should be routed through the correct channels, via PINS as appropriate.

Yours faithfully,

[redacted]

Managing Partner

Ms L. Congdon,
York Aviation,
Primary House, Spring Gardens,
Macclesfield, Cheshire SK10 2DX

18th October 2017

Dear Louise,

Manston Airport - Pinsent Masons letter to the Planning Inspectorate

Thank you for your letter dated 17th October. In response to the points you raise I would like to draw your attention to the following:

a) Your statement that the reports written on behalf of RSP did not have your clearance

The York Aviation report I cite is in the public domain and therefore, I believe, does not require your clearance. For clarity, this is:

> York Aviation (2015), *Implications for the Air Freight Sector of Different Airport Capacity Options*. Available from http://content.tfl.gov.uk/air-freight-implications-from-new-capacity.pdf

However, I would remind you that both Tony Freudmann and I spoke to your colleague, James Brass, on the 10th October 2016, specifically to discuss your 2015 report. We subsequently received a letter dated 13th October 2016 confirming that you continued to stand by your report. It was made clear during our discussions that I would be citing your work and you raised no objections at that time. Indeed, Tony Freudmann, in his email to you dated 13th October said, "*Can I ask if you would have a problem with this going into the public domain?*" The reply from James Brass on the same date was, "*No problem from my perspective. It only says what we would say publicly anyway*." I regard that as sufficient clearance, as well as confirmation that it is in the public domain.

In your letter dated 17th October 2017, you make reference to the "earlier" work for Transport for London. **I am unclear as to what this refers and would be grateful for your clarification**. During a heated discussion at a meeting of the Combined Churches of Herne Bay on Monday evening, Ms Ros McIntyre of No Night Flights referred to your involvement in the hard copy report provided to me by Transport for London. Indeed, she was most insistent and I am able to provide the venue's recording of what she alleges. However, there is absolutely no mention of York Aviation contained within the report provided to me by TfL and I was specifically told by them that TfL had produced the report in-house.

For your reference, the TfL report is entitled 'Note on Freight Connectivity' and commences with the sentence:

"This note explains the approach taken to estimating the number of pure freighter air transport movements at the London airports in 2050 under three different scenarios of capacity growth:

- *Maximum use of existing capacity;*
- *2+2+2 - additional runways at each of Gatwick and Stansted;*

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➢ *New 4 runway hub*."

On the 23rd February 2017 I sent a copy of volumes I, II and III of my work to Transport for London and they have made no complaint. **I would be grateful for your clarification that we are discussing the same report.** Ros McIntyre also insisted that **York Aviaton now believe that Stansted has ample capacity for freighters and I would be grateful for your confirmation or rebuttal of her statement** (recording and/or transcript of this is also available at your request).

b) Your claim of selective and incomplete quotations used in my reports

I absolutely refute this allegation **and would ask you to provide specific examples**. My understanding of your 2015 report and your subsequent clarifications is that there will be a substantial shortage of capacity for air freighters in the South East by 2050. This is the point I make, backed up by your report as well as a number of others. I do not use your report for any other purpose. Conclusions about Manston Airport are drawn from my research.

I note from your letter of the 17th October that you are currently working on a report that will form part of Stone Hill Park's evidence to PINS in due course. Since the report is as yet unfinished, **I would be interested to know your position in regard to why Pinsent Masons have drawn the preemptive conclusions detailed in their letter to the Planning Inspectorate dated 11th October 2017**. Indeed, it is surprising that Pinsent Masons have demanded that this evidence is withdrawn from the RSP proposals forthwith without having received the findings from your report or waiting for you to clarify the exact nature of the alleged incorrect citation. For clarity, the Pinsent Masons letter states at 1.8.6 that:

> "*It is worth noting that PSP's aviation consultant, Dr Sally Dixon of Azimuth Associates, has incorrectly cited York Aviation's work in support of its proposals, which York Aviation will be dealing with as part of SHP's evidence to deal with the RSP proposals in the event that they are not withdrawn forthwith*."

I do hope you understand why I am persisting with this matter. A number of agencies have identified that the UK will increasingly suffer economically from a lack of airport capacity in the South East. I believe, based on my research, that the re-opening of Manston Airport could provide much-needed relief, particularly for freighters. Manston Airport is situated in an area of considerable deprivation and the jobs that could result from the airport operation outlined by RSP would do much to address this long-term problem. At a personal level, my reputation is being questioned in a public arena. Your allegations may have serious professional ramifications, which is why I cannot allow them to go unchallenged.

Due to the seriousness of this matter, I would ask that you respond as soon as possible and certainly before Friday 20th October 2017.

Yours sincerely,

Sally Dixon

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Sally Dixon,
Azimuth Associates,
17 Island Wall,
Whitstable,
Kent CT5 1EP.

17th October 2017

Dear Ms Dixon,

Manston Airport

I am in receipt of your letter of 16th October, to which you requested a response within 2 days. I will deal with the points that you raise.

We were alerted by Pinsent Masons in early September this year to the reliance being placed by yourself, on behalf of RSP, on both our report for the Freight Transport Association (FTA) and also earlier work for Transport for London. Although there had been earlier correspondence (October 2016) regarding our 2015 work for FTA, where we confirmed that we considered it to be *"a robust and sensible analysis of the potential future development of the air cargo market in London …………if additional runway capacity is not provided within the London system"*, we were very surprised to find that:

a) the reports were being presented as primary evidence by RSP in its consultation documentation this summer without any clearance by or notification to ourselves; and

b) that there were repeated instances in your reports where the views expressed in our reports had been selectively and incompletely quoted, without proper context, with conclusions drawn from our work which go beyond those that could reasonably be made when the reports are read and understood in totality.

This view is reflected in Pinsent Masons' letter to the Planning Inspectorate.

When James Brass responded to you in 6th October, he made clear that we now had a conflict of interest in relation to Manston but, nonetheless, he provided you with guidance as to the applicability of our 2004 work for ACI EUROPE. In the circumstances of our engagement by Stonehill Park, it would have been inappropriate at that point to raise the specific areas of concern in relation to the use of our past work.

In terms of your accusation that we have supplied a copy of our report to 'Manston Pickle', I can assure you that we have had no communication with that organisation, nor any knowledge of the report to which they refer, unless it is one of those posted on RSP's website.

As noted in the Pinsent Masons' letter to PINS, we are working on a report which will form part of Stonehill Park's evidence to PINS in due course.

Yours faithfully,

[redacted]

Louise Congdon
Managing Partner

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Ms L. Congdon,
York Aviation,
Primary House,
Spring Gardens,
Macclesfield,
Cheshire SK10 2DX

16th October 2017

Dear Louise,

Manston Airport - Pinsent Masons letter to the Planning Inspectorate

I have recently read the letter from Pinsent Masons on behalf of Stone Hill Park, your client, to the Planning Inspectorate dated 11th October. I am writing to you with reference to paragraph 1.8.6 of their letter, which states that I have incorrectly cited your work.

On the 3rd of October I had occasion to contact your colleague, James Brass, on a different matter. He replied to me on the 6th October but made no mention of my alleged incorrect citation of your work.

More recently it appears that you have provided a copy of your report concerning Manston to a small group of protestors working under the banner of No Night Flights and operating a Facebook page with the name “Manston Pickle”. Their posting on the 12th of October says:

> *And did you see the little jibe in the media report in which this appeared (see below) that RSP has misrepresented a report by York Aviation? Who says so? York Aviation says so. Now, we already knew this 'cos a little bird sent the York Aviation report to contacts of ours recently. And, as misrepresentations go, we think it's pretty bare-faced.*

I am disappointed that you did not contact me immediately, out of professional courtesy, when you concluded that there had been an error in my understanding of your work. I can assure you that I had no intention of any such discourtesy and, if you would provide me with the details of the error as you see it, I will make any adjustments that are necessary.

Since the way you have handled this situation is potentially damaging to my career, I am currently taking advice from Counsel on how to proceed. I look forward to hearing from you at your earliest possible convenience and in any event within the next two days.

Yours sincerely,

Sally Dixon

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Tony Freudmann
RiverOak Investment Corp.,
LLC One Atlantic Street,
Suite 703 Stamford,
CT 06901 U.S.A.

13 October 2016

Dear Tony

Freight Demand in the London Area and Manston Airport

Following our conversation the other day regarding the recent report produced by AviaSolutions on the Commercial Viability of Manston Airport, I promised to write to you in relation to our current views on the work undertaken by York Aviation for the Freight Transport Association and Transport for London and entitled *"Implications for the Air Freight Sector of Different Airport Capacity Options"* and published in January 2015. I can confirm that we continue to stand by the content of this report and believe it to be a robust and sensible analysis of the potential future development of the air cargo market in London. This includes our analysis of the growth in the demand for air freight moving forward and the potential constraints facing the market if additional runway capacity is not provided within the London system.

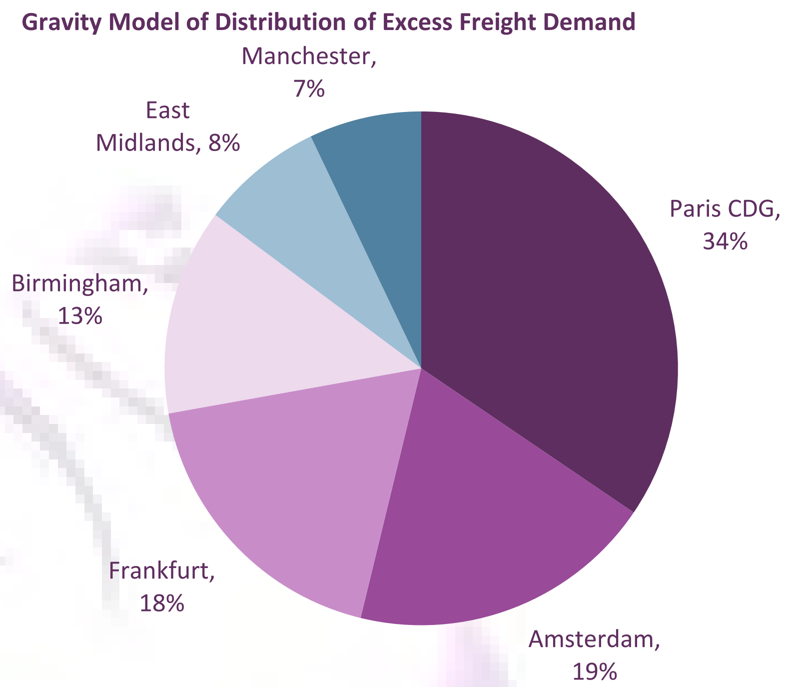
Best regards

[redacted]

James Brass
Partner

Gravity Model of Distribution of Excess Demand

- In considering how excess air freight demand from the London system might be served by trucking to other airports in the UK and on the continent, we have developed a basic gravity model to estimate the distribution.
- The model includes three UK airports: the national freight hub at East Midlands and the two primary regional long haul passenger gateways at Manchester and Birmingham. It also includes the three main European hub airports, which all have a significant freight presence now and are likely to grow both bellyhold and freighter capacity in to the future.
- The attraction factor within this model is forecast workload units (a workload unit is one passenger or 100kg of freight) at each airport in 2050 based on the Airports Commission traffic forecasts in its Interim Report. Passenger numbers have been adjusted to reflect the proportion of long haul passengers. Freight is assumed to grow from current levels through to 2050 in line with passenger numbers.
- The distance decay factor within the model is the road haulage cost of transporting a truck load of freight to the relevant airport from London. Freight rates have been derived from data provided by the Freight Transport Association. Distances have been derived from the fastest road route to the destination airport from Google Maps.
- This demonstrates that we would anticipate that a significant proportion of the excess demand will be trucked overseas to the major continental hub airports to take advantage of their extensive long haul networks.
- UK regional airports, despite being substantially closer to London in most cases, cannot match the level of attractiveness offered by the continental hubs and their wider global networks. Consequently, other UK airports are only expected to handle around 28% of any excess demand.



OAG ANALYSER
VERSION: 2.0.1. Data load date: 24 Feb 2019

SEARCH ATTRIBUTES/PARAMETERS:
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Metrics: [Frequency, FreightTons (Total)]
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Carrier Category: All
Include alliance affiliates: false
To/From: Airport(s) Included[FRA]
Flight Type: All
Service type: A,F,M,Q
Include Surface: false
Non-stop: true
Equipment Group: A,H,J,JN,JW,P,RJ,T,
Period: Month 01Feb2019 to 29Feb2020
TimeSeries: true

MONTHLY DATED AT 2 2019
REPORT DATED AT: Feb 28-2019. TIME: 11:07 (GMT)

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Air China	Zhengzhou	Frankfurt I	1030	1505	5	5	500.0	201903
AirBridgeC	Abu Dhabi	Frankfurt I	0115	0500	2	4	560.0	201903
AirBridgeC	Abu Dhabi	Frankfurt I	0115	0600	6	4	560.0	201904
AirBridgeC	Abu Dhabi	Frankfurt I	0115	0600	6	4	560.0	201907
AirBridgeC	Abu Dhabi	Frankfurt I	0115	0600	6	4	560.0	201910
AirBridgeC	Frankfurt I	Abu Dhabi	1500	2315	5	5	700.0	201903
AirBridgeC	Frankfurt I	Abu Dhabi	1500	2315	5	4	560.0	201909
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AirBridgeC	Frankfurt I	Milan Mal	1440	1620	1	4	440.0	201910
AirBridgeC	Frankfurt I	Milan Mal	1455	1635	5	4	440.0	201912
AirBridgeC	Frankfurt I	Milan Mal	1455	1635	2	4	560.0	202001
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AirBridgeC	Frankfurt I	Moscow Sl	1650	2210	6	4	440.0	201904
AirBridgeC	Frankfurt I	Moscow Sl	1855	0015	5	4	440.0	201906
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AirBridgeC	Frankfurt I	Oslo Garde	1225	1430	2	4	560.0	201908
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AirBridgeC	Moscow D	Frankfurt I	1135	1305	3	4	560.0	201902

AirBridgeC	Moscow D	Frankfurt I	1135	1305	3	5	700.0	202001
AirBridgeC	Moscow D	Frankfurt I	1610	1740	6	5	700.0	201906
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AirBridgeC	Moscow Sł	Frankfurt I	0630	0805	1	1	110.0	201902
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AirBridgeC	Moscow Sł	Frankfurt I	1120	1255	5	4	440.0	201912
AirBridgeC	Moscow Sł	Frankfurt I	1220	1355	6	4	440.0	201907
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Asiana Airl	Vienna Int	Frankfurt I	1500	1640	7	4	400.0	201911
Asiana Airl	Vienna Int	Frankfurt I	1620	1800	3 5	8	800.0	201912
British Airv	Frankfurt I	London He	2020	2100	6	4	215.6	201910
British Airv	Frankfurt I	Madrid Ad	1725	2005	3	5	269.5	202001
British Airv	Frankfurt I	Nottinghar	2000	2035	7	4	215.6	202002
British Airv	London He	Frankfurt I	1700	1925	6	4	215.6	201905
British Airv	London Lu	Frankfurt I	1040	1315	34	9	485.1	201907
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British Airv	Madrid Ad	Frankfurt I	1620	1855	45	8	360.0	201906
British Airv	Madrid Ad	Frankfurt I	1620	1855	45	8	360.0	201912
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Cargologic	Chicago O'	Frankfurt I	1400	0535	5	4	440.0	202002
Cargologic	Frankfurt I	Atlanta Ha	1835	2255	3	5	550.0	201907
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Cargologic	Houston G	Frankfurt I	1245	0515	4	4	440.0	201907
Air China	Frankfurt I	Tianjin	1930	0650	4 6	8	800.0	201904
Air China	Frankfurt I	Tianjin	1930	0650	4 6	8	800.0	201907
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AirBridgeC	Frankfurt I	Moscow Sł	1855	0015	5	5	550.0	201905
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Cathay Pac	Dubai Al M	Frankfurt I	0300	0700	5	5	700.0	201911
Cathay Pac	Frankfurt I	Dubai Al M	1925	0445	6	5	540.0	202002
Cathay Pac	Frankfurt I	Milan Mal	0920	1035	1	4	432.0	201908
Cathay Pac	Frankfurt I	Milan Mal	1230	1355	1	4	432.0	201905
Cathay Pac	Frankfurt I	Mumbai	1540	0420	5	5	540.0	201903
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China Sout	Frankfurt I	Guangzhou	1500	0815	1	4	400.0	201906
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AirBridgeC	Chicago O'	Frankfurt I	1635	0810	1	4	560.0	201903
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AirBridgeC	Frankfurt I	Moscow Sl	1910	0030	3	5	700.0	201907
AirBridgeC	Frankfurt I	Moscow Sl	1910	0030	3	5	700.0	201910
AirBridgeC	Frankfurt I	Moscow Sl	2050	0210	5	5	700.0	201905
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AirBridgeC	Frankfurt I	Oslo Garde	1420	1625	2	1	110.0	201902
AirBridgeC	Houston G	Frankfurt I	1710	1000	4	5	700.0	201908
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Cargologic	Frankfurt I	Dubai Al M	1425	2345	6	5	550.0	201911
Cargologic	Frankfurt I	Dubai Al M	1455	0015	5	4	440.0	201906
Cargologic	Frankfurt I	Dubai Al M	1620	0135	3	4	440.0	201904
Cargologic	Houston G	Frankfurt I	1245	0515	7	4	440.0	201910
Cargologic	Houston G	Frankfurt I	1245	0515	4	4	440.0	201906
Cargologic	Houston G	Frankfurt I	1245	0515	4	4	440.0	201912
Cathay Pac	Amsterdar	Frankfurt I	1205	1315	5	4	560.0	201907
Cathay Pac	Delhi	Frankfurt I	0215	0640	4	4	560.0	201909
Cathay Pac	Delhi	Frankfurt I	0230	0740	1	5	540.0	201907
Cathay Pac	Dubai Al M	Frankfurt I	0300	0700	5	4	560.0	201912
Cathay Pac	Frankfurt I	Dubai Al M	1630	0140	6	4	528.0	201903
Cathay Pac	Frankfurt I	Paris Charl	0840	1010	4	5	700.0	202001
China Sout	Frankfurt I	Guangzhou	1355	0815	2 4 6	12	1,200.0	201902
China Sout	London Sta	Frankfurt I	0835	1035	2	4	400.0	202002
China Sout	Shanghai P	Frankfurt I	0650	1220	1 4 6	13	1,300.0	201907
Emirates	Dubai Al M	Frankfurt I	0140	0530	7	4	412.0	201902
Emirates	Dubai Al M	Frankfurt I	1240	1630	7	4	412.0	201902
Emirates	Dubai Al M	Frankfurt I	1240	1730	7	1	103.0	201903
Emirates	Frankfurt I	Dubai Al M	0930	1735	7	4	412.0	201907
Emirates	Frankfurt I	Dubai Al M	1500	0005	3	4	412.0	201902

Emirates	Frankfurt I	Dubai Al M	1940	0445	4	4	412.0	201911
Emirates	Frankfurt I	Dubai Al M	2010	0515	5	4	412.0	202002
Emirates	Maastricht	Frankfurt I	1040	1155	6	4	412.0	201912
Air China	Zhengzhou	Frankfurt I	1215	1650	3	4	400.0	201904
Air China	Zhengzhou	Frankfurt I	1215	1650	3	5	500.0	202001
AirBridgeC	Chicago O'	Frankfurt I	1635	0810	1	4	560.0	201906
AirBridgeC	Chicago O'	Frankfurt I	1635	0810	1	5	700.0	201909
AirBridgeC	Chicago O'	Frankfurt I	1635	0810	1	5	700.0	201912
AirBridgeC	Frankfurt I	Moscow D	2000	0135	6	4	560.0	201903
AirBridgeC	Frankfurt I	Moscow Sl	1855	0015	1	5	550.0	201907
AirBridgeC	Frankfurt I	Moscow Sl	1910	0030	3	5	700.0	201905
AirBridgeC	Frankfurt I	Oslo Garde	1225	1430	2	4	560.0	201911
AirBridgeC	Frankfurt I	Zaragoza A	0630	0830	2	4	560.0	201905
AirBridgeC	Frankfurt I	Zaragoza A	0630	0830	2	4	560.0	202002
AirBridgeC	Frankfurt I	Zaragoza A	0645	0900	2	4	560.0	201909
AirBridgeC	Houston G	Frankfurt I	1610	0800	7	5	700.0	201906
AirBridgeC	Houston G	Frankfurt I	1710	1000	4	4	560.0	201912
AirBridgeC	Krasnoyars	Frankfurt I	1135	1255	2	4	560.0	201909
AirBridgeC	Moscow D	Frankfurt I	0810	0940	1	4	560.0	201911
AirBridgeC	Moscow D	Frankfurt I	1135	1305	3	4	560.0	201911
AirBridgeC	Moscow D	Frankfurt I	1610	1740	6	4	560.0	201903
AirBridgeC	Moscow Sl	Frankfurt I	1120	1255	5	4	440.0	201906
AirBridgeC	Moscow Sl	Frankfurt I	1220	1355	6	4	440.0	201904
AirBridgeC	Moscow Sl	Frankfurt I	1255	1430	5	4	440.0	201904
AirBridgeC	Moscow Sl	Frankfurt I	1255	1430	5	4	440.0	201907
Asiana Airl	Frankfurt I	Seoul Inch	2015	1400	2 4 7	14	1,400.0	201910
Asiana Airl	London Sta	Frankfurt I	1610	1830	2 4 7	14	1,400.0	201912
Asiana Airl	Vienna Int	Frankfurt I	1500	1640	7	4	400.0	201904
British Airv	Frankfurt I	London He	2020	2100	6	4	215.6	201904
British Airv	Frankfurt I	London Lu	0750	0820	34	8	431.2	201911
British Airv	Frankfurt I	Madrid Ad	1725	2005	3	4	215.6	201908
British Airv	Frankfurt I	Nottinghar	2000	2035	7	5	269.5	201903
Cargologic	Atlanta Ha	Frankfurt I	2025	1125	5	5	550.0	202001
Cargologic	Chicago O'	Frankfurt I	1400	0535	5	4	440.0	201912
Cargologic	Chicago O'	Frankfurt I	1400	0535	1	4	440.0	201903
Cargologic	Frankfurt I	Atlanta Ha	1430	1850	2	4	440.0	201908
Cargologic	Frankfurt I	Dubai Al M	1425	2345	6	4	440.0	201907
Cargologic	Frankfurt I	Dubai Al M	1620	0135	3	4	440.0	201911
Cargologic	Frankfurt I	Dubai Al M	1620	0135	3	5	550.0	202001
Cargologic	Frankfurt I	Dubai Al M	1920	0440	1	5	550.0	201907
Cargologic	Frankfurt I	London Sta	1535	1610	6	4	440.0	201905
Cargologic	Frankfurt I	London Sta	1535	1610	6	5	550.0	201911
Cargologic	Frankfurt I	London Sta	1535	1610	6	4	440.0	202001
Cathay Pac	Delhi	Frankfurt I	0215	0640	4	4	560.0	201907
Cathay Pac	Delhi	Frankfurt I	0215	0645	4	3	324.0	201903
Cathay Pac	Dubai Al M	Frankfurt I	0305	0805	7	1	108.0	201903
Cathay Pac	Dubai Al M	Frankfurt I	0305	0805	7	5	540.0	201912

Cathay Pac	Frankfurt I	Amsterdar	0900	1025	5	5	700.0	201911
Cathay Pac	Frankfurt I	Amsterdar	1845	2005	6	4	432.0	201909
Cathay Pac	Frankfurt I	Dubai Al M	1745	0205	5	4	560.0	201904
Cathay Pac	Frankfurt I	Milan Malp	1230	1355	1	4	432.0	201903
Cathay Pac	Frankfurt I	Paris Charl	1145	1305	4	4	432.0	201904
Cathay Pac	Mumbai	Frankfurt I	1130	1645	6	4	432.0	201910
China Sout	Frankfurt I	Guangzhou	1355	0815	2 4 6	12	1,200.0	201903
China Sout	Frankfurt I	Shanghai P	1520	0650	2 5 7	14	1,400.0	201903
China Sout	Guangzhou	Frankfurt I	0100	0600	7	4	400.0	202001
China Sout	London Sta	Frankfurt I	0835	1055	4 6	8	800.0	201904
China Sout	Shanghai P	Frankfurt I	0650	1220	1 4 6	13	1,300.0	201903
Emirates	Dubai Al M	Frankfurt I	0140	0630	7	4	412.0	201910
AirBridgeC	Abu Dhabi	Frankfurt I	0115	0500	2	4	560.0	201905
AirBridgeC	Abu Dhabi	Frankfurt I	0115	0500	2	4	560.0	202002
AirBridgeC	Abu Dhabi	Frankfurt I	0115	0600	6	5	700.0	201908
AirBridgeC	Frankfurt I	Abu Dhabi	1300	2215	1	5	700.0	201904
AirBridgeC	Frankfurt I	Abu Dhabi	1500	2315	5	4	560.0	201912
AirBridgeC	Frankfurt I	London Sta	1925	1905	6	4	560.0	201912
AirBridgeC	Frankfurt I	Milan Malp	1440	1620	1	4	440.0	202002
AirBridgeC	Frankfurt I	Milan Malp	1455	1635	2	5	700.0	201912
AirBridgeC	Frankfurt I	Milan Malp	1455	1635	2	4	560.0	202002
AirBridgeC	Frankfurt I	Moscow Sh	1230	1750	4	4	560.0	201903
AirBridgeC	Frankfurt I	Moscow Sh	1650	2210	6	5	550.0	201908
AirBridgeC	Frankfurt I	Moscow Sh	1855	0015	1	4	440.0	201911
AirBridgeC	Frankfurt I	Moscow Sh	1935	0055	7	3	390.0	201902
AirBridgeC	Frankfurt I	Moscow Sh	2050	0210	5	4	560.0	201903
AirBridgeC	Frankfurt I	Oslo Garde	1225	1430	2	2	280.0	201902
AirBridgeC	Frankfurt I	Zaragoza A	0645	0900	2	4	560.0	201903
AirBridgeC	Frankfurt I	Zaragoza A	0645	0900	2	4	560.0	201906
AirBridgeC	Houston G	Frankfurt I	1610	0800	7	4	560.0	201905
AirBridgeC	Houston G	Frankfurt I	1710	1000	4	5	700.0	201910
AirBridgeC	Leipzig/Ha	Frankfurt I	1720	1850	5	4	560.0	201910
AirBridgeC	Moscow D	Frankfurt I	1135	1305	3	4	560.0	201912
AirBridgeC	Moscow Sh	Frankfurt I	1220	1355	6	4	440.0	202001
British Airv	Frankfurt I	London He	2020	2100	6	5	269.5	201906
British Airv	Frankfurt I	London Lu	0750	0820	34	8	431.2	201906
British Airv	Frankfurt I	Madrid Ad	1725	2005	3	4	215.6	201906
British Airv	Frankfurt I	Madrid Ad	1725	2005	3	4	215.6	201909
British Airv	Frankfurt I	Nottinghar	2000	2035	7	4	215.6	201907
British Airv	London He	Frankfurt I	1700	1925	6	4	215.6	202001
British Airv	London Lu	Frankfurt I	1040	1315	34	8	431.2	201906
Cargologic	Atlanta Ha	Frankfurt I	2025	1125	5	4	440.0	201904
Cargologic	Frankfurt I	Atlanta Ha	1430	1850	2	4	440.0	202002
Cargologic	Frankfurt I	Chicago O'	0815	1100	5	5	550.0	201908
Cargologic	Frankfurt I	Dubai Al M	1425	2345	6	4	440.0	201912
Cargologic	Frankfurt I	Dubai Al M	1620	0135	3	4	440.0	201912
Cargologic	Frankfurt I	Dubai Al M	1920	0440	1	4	440.0	201906

Cargologic	Houston G	Frankfurt I	1245	0515	7	4	440.0	201911
Cargologic	Houston G	Frankfurt I	1245	0515	7	4	440.0	202001
Cargologic	London Sta	Frankfurt I	1250	1525	3	4	440.0	201906
Cargologic	London Sta	Frankfurt I	1250	1525	3	4	440.0	201909
Cargologic	London Sta	Frankfurt I	1250	1525	3	4	440.0	202002
Cathay Pac	Delhi	Frankfurt I	0215	0640	4	5	700.0	202001
Cathay Pac	Delhi	Frankfurt I	0230	0740	1	4	432.0	201906
Cathay Pac	Delhi	Frankfurt I	0230	0740	1	5	540.0	201909
Cathay Pac	Dubai Al M	Frankfurt I	0305	0805	7	4	432.0	201905
Cathay Pac	Frankfurt I	Amsterdar	0900	1025	5	4	560.0	201910
Cathay Pac	Frankfurt I	Amsterdar	1845	2005	6	5	540.0	201906
Cathay Pac	Frankfurt I	Dubai Al M	1920	0430	6	1	140.0	201902
Cathay Pac	Frankfurt I	Dubai Al M	1925	0445	6	5	540.0	201903
Cathay Pac	Frankfurt I	Milan Malp	0920	1035	1	5	540.0	201909
Cathay Pac	Frankfurt I	Milan Malp	1230	1355	1	5	540.0	201909
Cathay Pac	Frankfurt I	Milan Malp	1230	1355	1	5	540.0	201912
Cathay Pac	Mumbai	Frankfurt I	0935	1420	6	5	540.0	201903
China Sout	Frankfurt I	Guangzhou	1520	0740	5	4	400.0	201909
China Sout	Guangzhou	Frankfurt I	0555	1220	1	5	500.0	201904
China Sout	Guangzhou	Frankfurt I	0555	1220	1	5	500.0	201907
China Sout	Guangzhou	Frankfurt I	0555	1220	1	4	400.0	201910
AirBridgeC	Abu Dhabi	Frankfurt I	0115	0500	2	5	700.0	201904
AirBridgeC	Abu Dhabi	Frankfurt I	0115	0600	6	5	700.0	201906
AirBridgeC	Frankfurt I	Milan Malp	1455	1635	2	5	700.0	201907
AirBridgeC	Frankfurt I	Moscow D	2000	0135	6	4	560.0	201912
AirBridgeC	Frankfurt I	Moscow D	2000	0135	6	5	700.0	202002
AirBridgeC	Frankfurt I	Moscow Sh	1230	1750	4	5	700.0	202001
AirBridgeC	Frankfurt I	Moscow Sh	1910	0030	3	4	560.0	201904
AirBridgeC	Frankfurt I	Oslo Garde	1225	1430	2	5	700.0	201904
AirBridgeC	Houston G	Frankfurt I	1610	0800	7	4	560.0	201910
AirBridgeC	Houston G	Frankfurt I	1710	1000	4	5	700.0	201905
AirBridgeC	Houston G	Frankfurt I	1710	1000	4	4	560.0	201911
AirBridgeC	Houston G	Frankfurt I	1710	1000	4	5	700.0	202001
AirBridgeC	Los Angele	Frankfurt I	2015	1640	2	4	560.0	201908
AirBridgeC	Moscow D	Frankfurt I	1045	1215	5	5	700.0	201905
AirBridgeC	Moscow D	Frankfurt I	1045	1215	5	5	700.0	201911
AirBridgeC	Moscow D	Frankfurt I	1610	1740	6	5	700.0	202002
AirBridgeC	Moscow Sh	Frankfurt I	0605	0740	1	5	550.0	201904
AirBridgeC	Moscow Sh	Frankfurt I	0605	0740	1	4	440.0	202001
AirBridgeC	Moscow Sh	Frankfurt I	0825	1000	4	4	560.0	201904
AirBridgeC	Moscow Sh	Frankfurt I	0825	1000	4	4	560.0	201907
Asiana Airl	London Sta	Frankfurt I	1610	1830	2 4 7	13	1,300.0	201908
Asiana Airl	Vienna Inte	Frankfurt I	1500	1640	7	4	400.0	201905
Asiana Airl	Vienna Inte	Frankfurt I	1620	1800	3 5	9	900.0	201911
British Airv	Frankfurt I	Madrid Ad	1725	2005	3	5	269.5	201907
British Airv	London He	Frankfurt I	1700	1925	6	5	269.5	201903
British Airv	London He	Frankfurt I	1700	1925	6	4	215.6	201909

British Airv	London Lu	Frankfurt I	1040	1315	34	10	539.0	202001
British Airv	London Lu	Frankfurt I	1440	1720	7	4	215.6	202002
British Airv	Madrid Ad	Frankfurt I	1620	1855	45	10	450.0	201905
British Airv	Madrid Ad	Frankfurt I	1715	1945	3	4	215.6	201911
Cargologic	Chicago O'	Frankfurt I	1400	0535	5	5	550.0	201903
Cargologic	Chicago O'	Frankfurt I	1400	0535	1	4	440.0	201906
Cargologic	Frankfurt I	Atlanta Ha	1305	1725	5	5	550.0	201911
Cargologic	Frankfurt I	Atlanta Ha	1430	1850	2	5	550.0	201904
Cargologic	Frankfurt I	Atlanta Ha	1430	1850	2	5	550.0	201907
Cargologic	Frankfurt I	Atlanta Ha	1430	1850	2	5	550.0	201910
Cargologic	Frankfurt I	Atlanta Ha	1835	2255	3	4	440.0	201906
Cargologic	Frankfurt I	Dubai Al M	1620	0135	3	5	550.0	201910
Cargologic	Frankfurt I	Dubai Al M	1920	0440	1	4	440.0	201911
Cargologic	Frankfurt I	Dubai Al M	1920	0440	1	4	440.0	202001
Cargologic	Frankfurt I	London Sta	1535	1610	6	4	440.0	201904
Cargologic	London Sta	Frankfurt I	1250	1525	3	4	440.0	201911
Cargologic	London Sta	Frankfurt I	1250	1525	3	5	550.0	202001
Cathay Pac	Dubai Al M	Frankfurt I	0300	0700	5	4	560.0	201902
Cathay Pac	Frankfurt I	Amsterdar	1145	1305	4	4	432.0	201910
Cathay Pac	Frankfurt I	Dubai Al M	1620	0130	6	1	140.0	201903
Cathay Pac	Frankfurt I	Dubai Al M	1925	0445	6	5	540.0	201908
Cathay Pac	Frankfurt I	Milan Malp	0920	1035	1	4	432.0	201904
Cathay Pac	Frankfurt I	Paris Charl	0840	1010	4	3	420.0	201902
Cathay Pac	Mumbai	Frankfurt I	1130	1645	6	5	540.0	201906
Cathay Pac	Mumbai	Frankfurt I	1240	1725	6	5	540.0	202002
China Sout	Frankfurt I	Guangzhou	1440	0815	7	4	400.0	201905
China Sout	Frankfurt I	Guangzhou	1440	0815	7	4	400.0	201911
China Sout	Frankfurt I	Guangzhou	1520	0740	5	4	400.0	201904
China Sout	Guangzhou	Frankfurt I	0100	0600	7	4	400.0	201905
China Sout	Guangzhou	Frankfurt I	0100	0600	7	5	500.0	201912
AirBridgeC	Chicago O'	Frankfurt I	1635	0810	1	4	560.0	201910
AirBridgeC	Frankfurt I	Abu Dhabi	1500	2315	5	4	560.0	201907
AirBridgeC	Frankfurt I	Chicago O'	1835	2120	5	4	560.0	201907
AirBridgeC	Frankfurt I	Milan Malp	1440	1620	1	5	550.0	201904
AirBridgeC	Frankfurt I	Milan Malp	1505	1645	3	5	700.0	202001
AirBridgeC	Frankfurt I	Moscow D	2000	0135	6	4	560.0	201905
AirBridgeC	Frankfurt I	Moscow Sh	1230	1750	4	4	560.0	201904
AirBridgeC	Frankfurt I	Moscow Sh	1230	1750	4	4	560.0	201911
AirBridgeC	Frankfurt I	Moscow Sh	1650	2210	6	5	550.0	201903
AirBridgeC	Frankfurt I	Moscow Sh	1855	0015	5	4	440.0	201904
AirBridgeC	Frankfurt I	Moscow Sh	1855	0015	1	4	440.0	201903
AirBridgeC	Frankfurt I	Moscow Sh	1855	0015	1	5	550.0	201909
AirBridgeC	Frankfurt I	Moscow Sh	2050	0210	5	5	700.0	201908
AirBridgeC	Frankfurt I	Oslo Garde	1225	1430	2	5	700.0	201907
AirBridgeC	Frankfurt I	Zaragoza A	0630	0830	2	4	560.0	201906
AirBridgeC	Frankfurt I	Zaragoza A	0645	0900	2	4	560.0	201905
AirBridgeC	Frankfurt I	Zaragoza A	0645	0900	2	4	560.0	202001

AirBridgeC	Houston G	Frankfurt I	1610	0800	7	4	560.0	201907
AirBridgeC	Krasnoyars	Frankfurt I	1135	1255	2	4	560.0	201911
AirBridgeC	Los Angele	Frankfurt I	2015	1640	2	4	560.0	201905
AirBridgeC	Moscow D	Frankfurt I	0810	0940	1	5	700.0	201907
AirBridgeC	Moscow D	Frankfurt I	0810	0940	1	4	560.0	201910
AirBridgeC	Moscow Sl	Frankfurt I	0555	0730	1	5	550.0	201904
AirBridgeC	Moscow Sl	Frankfurt I	0825	1000	4	5	700.0	201910
AirBridgeC	Moscow Sl	Frankfurt I	1255	1430	5	5	550.0	201911
AirBridgeC	Moscow Sl	Frankfurt I	1255	1430	5	5	550.0	202001
Asiana Airl	Frankfurt I	Seoul Inch	2015	1400	2 4 7	13	1,300.0	201906
Asiana Airl	Frankfurt I	Seoul Inch	2015	1400	2 4 7	12	1,200.0	202002
Asiana Airl	London Sta	Frankfurt I	1610	1830	2 4 7	13	1,300.0	202001
Asiana Airl	Vienna Int	Frankfurt I	1620	1800	3 5	10	1,000.0	201905
Asiana Airl	Vienna Int	Frankfurt I	1620	1800	3 5	9	900.0	201908
British Airv	Frankfurt I	London He	2020	2100	6	5	269.5	201911
British Airv	Frankfurt I	London Lu	0750	0820	34	9	485.1	201907
British Airv	Frankfurt I	Nottinghar	2000	2035	7	4	215.6	201905
British Airv	London Lu	Frankfurt I	1440	1720	7	5	269.5	201906
British Airv	Madrid Ad	Frankfurt I	1620	1855	45	8	360.0	201902
British Airv	Madrid Ad	Frankfurt I	1715	1945	3	4	215.6	201908
Cargologic	Atlanta Ha	Frankfurt I	2025	1125	5	4	440.0	201902
Cargologic	Atlanta Ha	Frankfurt I	2025	1125	5	4	440.0	201909
Cargologic	Atlanta Ha	Frankfurt I	2025	1125	5	4	440.0	201912
Cargologic	Chicago O'	Frankfurt I	1400	0535	1	5	550.0	201912
Cargologic	Frankfurt I	Chicago O'	0815	1100	1	4	440.0	202002
Cargologic	Frankfurt I	Dubai Al M	1920	0440	1	4	440.0	201908
Cargologic	Houston G	Frankfurt I	1245	0515	7	5	550.0	201903
Cargologic	Houston G	Frankfurt I	1245	0515	4	4	440.0	202002
Cathay Pac	Delhi	Frankfurt I	0230	0740	1	3	324.0	201904
Cathay Pac	Dubai Al M	Frankfurt I	0300	0700	5	5	700.0	201905
Cathay Pac	Frankfurt I	Amsterdar	1145	1305	4	4	432.0	201907
Cathay Pac	Frankfurt I	Amsterdar	1145	1320	4	1	108.0	201906
Cathay Pac	Frankfurt I	Amsterdar	1845	2005	6	5	540.0	201908
Cathay Pac	Frankfurt I	Dubai Al M	1745	0205	5	5	700.0	201908
Cathay Pac	Frankfurt I	Dubai Al M	1925	0445	6	5	540.0	201911
Cathay Pac	Frankfurt I	Dubai Al M	1925	0445	6	4	432.0	202001
Cathay Pac	Frankfurt I	Milan Malp	1230	1355	1	5	540.0	201904
China Carg	Frankfurt I	Shanghai P	1710	1120	1 4	8	800.0	201903
Air China	Zhengzhou	Frankfurt I	1030	1505	5	4	400.0	201904
Air China	Zhengzhou	Frankfurt I	1215	1650	3	4	400.0	201906
Air China	Zhengzhou	Frankfurt I	1215	1650	3	4	400.0	201909
AirBridgeC	Abu Dhabi	Frankfurt I	0115	0500	2	4	560.0	201908
AirBridgeC	Abu Dhabi	Frankfurt I	0115	0600	6	4	560.0	201902
AirBridgeC	Frankfurt I	Abu Dhabi	1300	2215	1	4	560.0	201908
AirBridgeC	Frankfurt I	Abu Dhabi	1500	2315	5	4	560.0	201904
AirBridgeC	Frankfurt I	Chicago O'	1835	2120	5	5	700.0	202001
AirBridgeC	Frankfurt I	London Sta	1925	1905	6	4	560.0	201905

AirBridgeC	Frankfurt I	Milan Mal|	1440	1620	1	4	440.0	201908
AirBridgeC	Frankfurt I	Milan Mal|	1505	1645	3	5	700.0	201907
AirBridgeC	Frankfurt I	Moscow D	2000	0135	6	5	700.0	201911
AirBridgeC	Frankfurt I	Moscow Sl	1230	1750	4	5	700.0	201905
AirBridgeC	Frankfurt I	Moscow Sl	1650	2210	6	4	440.0	201909
AirBridgeC	Frankfurt I	Moscow Sl	1650	2210	6	5	550.0	202002
AirBridgeC	Frankfurt I	Moscow Sl	2050	0210	5	4	560.0	201910
AirBridgeC	Frankfurt I	Oslo Garde	1225	1430	2	4	560.0	201903
AirBridgeC	Frankfurt I	Oslo Garde	1225	1430	2	4	560.0	201909
AirBridgeC	Krasnoyars	Frankfurt I	1135	1255	2	5	700.0	201907
AirBridgeC	Leipzig/Ha	Frankfurt I	1720	1850	5	4	560.0	201906
AirBridgeC	Leipzig/Ha	Frankfurt I	1720	1850	5	4	560.0	202002
AirBridgeC	Los Angele	Frankfurt I	2015	1640	2	4	560.0	201906
AirBridgeC	Moscow D	Frankfurt I	0810	0940	1	5	700.0	201909
AirBridgeC	Moscow D	Frankfurt I	0810	0940	1	5	700.0	201912
AirBridgeC	Moscow D	Frankfurt I	0810	0940	1	4	560.0	202002
AirBridgeC	Moscow D	Frankfurt I	1135	1305	3	5	700.0	201910
AirBridgeC	Moscow D	Frankfurt I	1610	1740	6	4	560.0	202001
AirBridgeC	Moscow Sl	Frankfurt I	0825	1000	4	4	560.0	201903
AirBridgeC	Moscow Sl	Frankfurt I	0825	1000	4	4	560.0	201906
AirBridgeC	Moscow Sl	Frankfurt I	1120	1255	5	4	440.0	201904
AirBridgeC	Moscow Sl	Frankfurt I	1220	1355	6	4	440.0	201905
AirBridgeC	Moscow Sl	Frankfurt I	1255	1430	5	4	560.0	201902
AirBridgeC	Moscow Sl	Frankfurt I	1255	1430	5	4	440.0	201912
Asiana Airl	London Sta	Frankfurt I	1610	1830	2 4 7	13	1,300.0	201904
Asiana Airl	Vienna Inte	Frankfurt I	1620	1800	3 5	8	800.0	201904
Asiana Airl	Vienna Inte	Frankfurt I	1620	1800	3 5	9	900.0	201907
British Airv	Frankfurt I	London He	2020	2100	6	5	269.5	202002
British Airv	Frankfurt I	Nottinghar	2000	2035	7	4	215.6	201911
British Airv	London He	Frankfurt I	1700	1925	6	4	215.6	201910
British Airv	Madrid Ad	Frankfurt I	1715	1945	3	4	215.6	201912
Cargologic	Atlanta Ha	Frankfurt I	2025	1125	5	5	550.0	201903
Cargologic	Chicago O'	Frankfurt I	1400	0535	5	4	440.0	201904
Cargologic	Chicago O'	Frankfurt I	1400	0535	5	4	440.0	201907
Cargologic	Chicago O'	Frankfurt I	1400	0535	1	4	440.0	201908
Cargologic	Frankfurt I	Atlanta Ha	1305	1725	5	5	550.0	201905
Cargologic	Frankfurt I	Atlanta Ha	1305	1725	5	4	440.0	201912
Cargologic	Frankfurt I	Atlanta Ha	1430	1850	2	4	440.0	201903
Cargologic	Frankfurt I	Atlanta Ha	1430	1850	2	4	440.0	201906
Cargologic	Frankfurt I	Chicago O'	0815	1100	1	4	440.0	201908
Cargologic	Frankfurt I	Dubai Al M	1425	2345	6	4	440.0	201905
Cargologic	Frankfurt I	Dubai Al M	1455	0015	5	4	440.0	201907
Cargologic	Frankfurt I	Dubai Al M	1920	0440	1	4	440.0	201902
Cathay Pac	Delhi	Frankfurt I	0230	0740	1	4	432.0	201905
Cathay Pac	Dubai Al M	Frankfurt I	0305	0805	7	4	432.0	201911
Cathay Pac	Frankfurt I	Amsterdar	0900	1025	5	4	560.0	201909
Cathay Pac	Frankfurt I	Dubai Al M	1745	0205	5	4	560.0	201909

Air China	Zhengzhou	Frankfurt I	1030	1505	5	5	500.0	202001
Air China	Zhengzhou	Frankfurt I	1215	1650	3	4	400.0	201903
AirBridgeC	Abu Dhabi	Frankfurt I	0115	0600	6	4	560.0	201912
AirBridgeC	Chicago O'	Frankfurt I	1635	0810	1	5	700.0	201907
AirBridgeC	Frankfurt I	Abu Dhabi	1300	2215	1	4	560.0	201905
AirBridgeC	Frankfurt I	Abu Dhabi	1300	2215	1	4	560.0	202001
AirBridgeC	Frankfurt I	Abu Dhabi	1500	2315	5	5	700.0	201911
AirBridgeC	Frankfurt I	Abu Dhabi	1500	2315	5	5	700.0	202001
AirBridgeC	Frankfurt I	Moscow D	2000	0135	6	5	700.0	201908
AirBridgeC	Frankfurt I	Moscow Sl	1230	1750	4	4	560.0	201902
AirBridgeC	Frankfurt I	Moscow Sl	1650	2210	6	4	440.0	201902
AirBridgeC	Frankfurt I	Moscow Sl	1855	0015	5	5	550.0	202001
AirBridgeC	Frankfurt I	Moscow Sl	2050	0210	5	4	560.0	201907
AirBridgeC	Frankfurt I	Oslo Garde	1225	1430	2	4	560.0	201906
AirBridgeC	Frankfurt I	Zaragoza A	0630	0830	2	5	700.0	201904
AirBridgeC	Frankfurt I	Zaragoza A	0645	0900	2	5	700.0	201907
AirBridgeC	Houston G	Frankfurt I	1610	0800	7	4	560.0	201911
AirBridgeC	Los Angele	Frankfurt I	2015	1640	2	4	560.0	201909
AirBridgeC	Los Angele	Frankfurt I	2015	1640	2	4	560.0	202002
AirBridgeC	Moscow D	Frankfurt I	0810	0940	1	4	560.0	201906
AirBridgeC	Moscow D	Frankfurt I	1610	1740	6	5	700.0	201908
AirBridgeC	Moscow Sl	Frankfurt I	0400	0520	5	1	110.0	201902
AirBridgeC	Moscow Sl	Frankfurt I	0555	0730	1	4	440.0	201903
AirBridgeC	Moscow Sl	Frankfurt I	0555	0730	1	4	440.0	201906
AirBridgeC	Moscow Sl	Frankfurt I	1255	1430	5	4	440.0	202002
Asiana Airl	Frankfurt I	Seoul Inch	2000	1430	3 5	10	1,000.0	201905
Asiana Airl	Vienna Int	Frankfurt I	1500	1640	7	5	500.0	201909
Asiana Airl	Vienna Int	Frankfurt I	1500	1640	7	5	500.0	201912
British Airv	Frankfurt I	London He	2020	2100	6	4	215.6	201902
British Airv	Frankfurt I	London Lu	0750	0820	34	8	431.2	201903
British Airv	London Lu	Frankfurt I	1440	1720	7	5	269.5	201903
British Airv	London Lu	Frankfurt I	1440	1720	7	4	215.6	201910
British Airv	Madrid Ad	Frankfurt I	1620	1855	45	9	405.0	201911
British Airv	Madrid Ad	Frankfurt I	1715	1945	3	4	215.6	202002
Cargologic	Frankfurt I	Chicago O'	0815	1100	5	4	440.0	201904
Cargologic	Frankfurt I	Dubai Al M	1920	0440	1	5	550.0	201912
Cargologic	London Sta	Frankfurt I	1250	1525	3	5	550.0	201910
Cathay Pac	Amsterdar	Frankfurt I	1200	1310	5	5	540.0	201903
Cathay Pac	Delhi	Frankfurt I	0215	0640	4	4	560.0	201912
Cathay Pac	Delhi	Frankfurt I	0230	0740	1	4	432.0	201908
Cathay Pac	Dubai Al M	Frankfurt I	0300	0700	5	5	700.0	202001
Cathay Pac	Frankfurt I	Dubai Al M	1925	0445	6	4	432.0	201905
Cathay Pac	Frankfurt I	Dubai Al M	1925	0445	6	4	432.0	201912
Cathay Pac	Frankfurt I	Milan Malp	0920	1035	1	4	432.0	201905
Cathay Pac	Frankfurt I	Milan Malp	1230	1355	1	4	432.0	201908
Cathay Pac	Frankfurt I	Milan Malp	1230	1355	1	4	432.0	201911
Cathay Pac	Frankfurt I	Paris Charl	0840	1010	4	4	560.0	201906

Cathay Pac	Mumbai	Frankfurt I	0935	1420	6	2	216.0	201902
Cathay Pac	Mumbai	Frankfurt I	1130	1645	6	4	432.0	201905
China Sout	Frankfurt I	Guangzhou	0900	0245	7	5	500.0	201909
China Sout	Frankfurt I	Guangzhou	0900	0245	7	5	500.0	201912
China Sout	Frankfurt I	Guangzhou	1440	0815	7	5	500.0	201909
China Sout	Frankfurt I	Guangzhou	1520	0740	5	5	500.0	201905
China Sout	Frankfurt I	Guangzhou	1520	0740	5	5	500.0	202001
China Sout	Guangzhou	Frankfurt I	0555	1240	5	5	500.0	201908
China Sout	Guangzhou	Frankfurt I	0555	1240	5	5	500.0	201911
Air China	Zhengzhou	Frankfurt I	1030	1505	5	4	400.0	201907
Air China	Zhengzhou	Frankfurt I	1215	1650	3	5	500.0	201905
AirBridgeC	Abu Dhabi	Frankfurt I	0115	0500	2	5	700.0	201912
AirBridgeC	Chicago O'	Frankfurt I	1635	0810	1	4	560.0	201905
AirBridgeC	Chicago O'	Frankfurt I	1635	0810	1	4	560.0	201911
AirBridgeC	Frankfurt I	Chicago O'	1835	2120	5	4	560.0	201902
AirBridgeC	Frankfurt I	Chicago O'	1835	2120	5	4	560.0	202002
AirBridgeC	Frankfurt I	Krasnoyars	1920	0910	7	4	440.0	201902
AirBridgeC	Frankfurt I	Milan Malp	1440	1620	1	5	550.0	201912
AirBridgeC	Frankfurt I	Moscow Sh	1855	0015	5	4	440.0	202002
AirBridgeC	Frankfurt I	Moscow Sh	1910	0030	3	4	560.0	201902
AirBridgeC	Frankfurt I	Moscow Sh	1910	0030	3	4	560.0	201909
AirBridgeC	Frankfurt I	Moscow Sh	1910	0030	3	4	560.0	201912
AirBridgeC	Frankfurt I	Oslo Garde	1225	1430	2	4	560.0	201905
AirBridgeC	Frankfurt I	Zaragoza A	0630	0830	2	4	560.0	201908
AirBridgeC	Houston G	Frankfurt I	1610	0800	7	4	560.0	201908
AirBridgeC	Moscow D	Frankfurt I	1045	1215	5	5	700.0	201903
AirBridgeC	Moscow D	Frankfurt I	1610	1740	6	4	560.0	201910
AirBridgeC	Moscow Sh	Frankfurt I	0605	0740	1	4	440.0	201903
AirBridgeC	Moscow Sh	Frankfurt I	0605	0740	1	5	550.0	201909
AirBridgeC	Moscow Sh	Frankfurt I	0825	1000	4	4	560.0	201909
AirBridgeC	Moscow Sh	Frankfurt I	1220	1355	6	5	550.0	201911
AirBridgeC	Moscow Sh	Frankfurt I	1255	1430	5	5	550.0	201903
AirBridgeC	Moscow Sh	Frankfurt I	1255	1430	5	4	440.0	201906
AirBridgeC	Moscow Sh	Frankfurt I	1530	1705	7	4	560.0	201903
Asiana Airl	Frankfurt I	Seoul Inch	2000	1430	3 5	8	800.0	201906
Asiana Airl	Frankfurt I	Seoul Inch	2000	1430	3 5	8	800.0	201912
Asiana Airl	Frankfurt I	Seoul Inch	2015	1400	2 4 7	13	1,300.0	201904
Asiana Airl	London Sta	Frankfurt I	1610	1830	2 4 7	13	1,300.0	201903
Asiana Airl	Vienna Int	Frankfurt I	1500	1640	7	4	400.0	201907
Asiana Airl	Vienna Int	Frankfurt I	1500	1640	7	4	400.0	201910
Asiana Airl	Vienna Int	Frankfurt I	1620	1800	3 5	8	800.0	201906
British Airv	Frankfurt I	London Lu	0750	0820	34	8	431.2	201909
British Airv	Frankfurt I	London Lu	0750	0820	34	8	431.2	201912
British Airv	London Lu	Frankfurt I	1040	1315	34	8	431.2	201903
British Airv	Madrid Ad	Frankfurt I	1620	1855	45	9	405.0	201910
Cargologic	Atlanta Ha	Frankfurt I	2025	1125	5	4	440.0	201907
Cargologic	Chicago O'	Frankfurt I	1400	0535	1	5	550.0	201904

Cargologic	Chicago O'	Frankfurt I	1400	0535	1	5	550.0	201907
Cargologic	Frankfurt I	Atlanta Ha	1430	1850	2	4	440.0	201909
Cargologic	Frankfurt I	Atlanta Ha	1835	2255	3	4	440.0	201911
Cargologic	Frankfurt I	Atlanta Ha	1835	2255	3	5	550.0	202001
Cargologic	Frankfurt I	Chicago O'	0815	1100	1	5	550.0	201904
Cargologic	Frankfurt I	Dubai Al M	1620	0135	3	5	550.0	201905
Cargologic	Frankfurt I	London Sta	1535	1610	6	4	440.0	201909
Cargologic	London Sta	Frankfurt I	1250	1525	3	4	440.0	201903
Cargologic	London Sta	Frankfurt I	1250	1525	3	4	440.0	201912
Cathay Pac	Amsterdar	Frankfurt I	1205	1315	5	5	700.0	201905
Cathay Pac	Frankfurt I	Amsterdar	0900	1025	5	4	560.0	201907
Cathay Pac	Frankfurt I	Dubai Al M	1925	0445	6	4	432.0	201909
Cathay Pac	Frankfurt I	Milan Malp	1230	1355	1	4	432.0	202002
Cathay Pac	Frankfurt I	Paris Charl	0840	1010	4	4	560.0	201903
Cathay Pac	Mumbai	Frankfurt I	1240	1725	6	4	432.0	202001
China Sout	Frankfurt I	Guangzhou	0900	0245	7	4	400.0	201905
China Sout	Frankfurt I	Guangzhou	1520	0740	5	4	400.0	201912
China Sout	Frankfurt I	Guangzhou	1520	0740	5	4	400.0	202002
Air China	Frankfurt I	Tianjin	1930	0650	4 6	9	900.0	201903
Air China	Zhengzhou	Frankfurt I	1215	1650	3	4	400.0	201902
AirBridgeC	Abu Dhabi	Frankfurt I	0115	0600	6	4	560.0	201905
AirBridgeC	Chicago O'	Frankfurt I	1635	0810	1	4	560.0	201902
AirBridgeC	Chicago O'	Frankfurt I	1635	0810	1	4	560.0	202001
AirBridgeC	Frankfurt I	Abu Dhabi	1300	2215	1	5	700.0	201907
AirBridgeC	Frankfurt I	London Sta	1925	1905	6	5	700.0	202002
AirBridgeC	Frankfurt I	Milan Malp	1440	1620	1	4	440.0	201906
AirBridgeC	Frankfurt I	Milan Malp	1455	1635	5	5	550.0	202001
AirBridgeC	Frankfurt I	Moscow D	2000	0135	6	4	560.0	201910
AirBridgeC	Frankfurt I	Moscow Sł	1230	1750	4	4	560.0	202002
AirBridgeC	Frankfurt I	Moscow Sł	1650	2210	6	5	550.0	201911
AirBridgeC	Frankfurt I	Moscow Sł	1855	0015	5	4	440.0	201909
AirBridgeC	Frankfurt I	Moscow Sł	1855	0015	1	5	550.0	201904
AirBridgeC	Leipzig/Ha	Frankfurt I	1720	1850	5	4	560.0	201907
AirBridgeC	Los Angele	Frankfurt I	2015	1640	2	5	700.0	201910
AirBridgeC	Moscow D	Frankfurt I	1135	1305	3	4	560.0	201906
AirBridgeC	Moscow D	Frankfurt I	1135	1305	3	4	560.0	201909
AirBridgeC	Moscow D	Frankfurt I	1135	1305	3	4	560.0	202002
AirBridgeC	Moscow D	Frankfurt I	1610	1740	6	4	560.0	201904
AirBridgeC	Moscow Sł	Frankfurt I	0555	0730	1	5	550.0	201912
AirBridgeC	Moscow Sł	Frankfurt I	0555	0730	1	4	440.0	202002
AirBridgeC	Moscow Sł	Frankfurt I	1120	1255	5	4	440.0	201907
AirBridgeC	Moscow Sł	Frankfurt I	1220	1355	6	5	550.0	201908
Asiana Airl	Frankfurt I	Seoul Inch	2015	1400	2 4 7	12	1,200.0	201911
Asiana Airl	London Sta	Frankfurt I	1610	1830	2 4 7	13	1,300.0	201906
Asiana Airl	Vienna Int	Frankfurt I	1620	1800	3 5	9	900.0	201903
British Airv	Frankfurt I	London Lu	0750	0820	34	8	431.2	202002
British Airv	Frankfurt I	Nottinghar	2000	2035	7	4	215.6	201910

British Airv	London He	Frankfurt I	1700	1925	6	5	269.5	201911
British Airv	London Lu	Frankfurt I	1040	1315	34	8	431.2	201909
British Airv	London Lu	Frankfurt I	1440	1720	7	4	215.6	201907
British Airv	Madrid Ad	Frankfurt I	1620	1855	45	8	360.0	201907
British Airv	Madrid Ad	Frankfurt I	1715	1945	3	4	215.6	201909
Cargologic	Chicago O'	Frankfurt I	1400	0535	5	5	550.0	202001
Cargologic	Frankfurt I	Atlanta Ha	1305	1725	5	4	440.0	201909
Cargologic	Frankfurt I	Atlanta Ha	1430	1850	2	5	550.0	201912
Cargologic	Frankfurt I	Chicago O'	0815	1100	5	5	550.0	201911
Cargologic	Frankfurt I	Dubai Al M	1425	2345	6	5	550.0	201906
Cargologic	Frankfurt I	Dubai Al M	1455	0015	5	5	550.0	201905
Cargologic	Frankfurt I	Dubai Al M	1620	0135	3	4	440.0	202002
Cargologic	Frankfurt I	London Sta	1535	1610	6	4	440.0	201912
Cargologic	Houston G	Frankfurt I	1245	0515	4	4	440.0	201911
Cargologic	Houston G	Frankfurt I	1245	0515	4	5	550.0	202001
Cathay Pac	Delhi	Frankfurt I	0215	0640	4	4	560.0	201911
Cathay Pac	Delhi	Frankfurt I	0535	1005	1	4	432.0	201902
Cathay Pac	Dubai Al M	Frankfurt I	0300	0700	5	4	560.0	201907
Cathay Pac	Dubai Al M	Frankfurt I	0300	0705	7	4	496.0	201902
Cathay Pac	Dubai Al M	Frankfurt I	0305	0805	7	4	432.0	201908
Cathay Pac	Frankfurt I	Dubai Al M	1745	0205	5	4	560.0	201906
Cathay Pac	Frankfurt I	Dubai Al M	1925	0445	6	5	540.0	201906
Cathay Pac	Frankfurt I	Milan Malp	0905	1025	7	4	528.0	201903
Cathay Pac	Frankfurt I	Milan Malp	0920	1035	1	4	432.0	201906
Cathay Pac	Frankfurt I	Milan Malp	1230	1355	1	4	432.0	201906
Cathay Pac	Frankfurt I	Mumbai	1540	0420	5	4	432.0	201902
Cathay Pac	Mumbai	Frankfurt I	1240	1725	6	5	540.0	201911
Air China	Zhengzhou	Frankfurt I	1215	1650	3	4	400.0	201912
Air China	Zhengzhou	Frankfurt I	1215	1650	3	4	400.0	202002
AirBridgeC	Abu Dhabi	Frankfurt I	0115	0600	6	4	560.0	201909
AirBridgeC	Frankfurt I	Abu Dhabi	1500	2315	5	5	700.0	201908
AirBridgeC	Frankfurt I	Chicago O'	1835	2120	5	5	700.0	201908
AirBridgeC	Frankfurt I	Milan Malp	1455	1635	5	4	440.0	201904
AirBridgeC	Frankfurt I	Milan Malp	1455	1635	2	5	700.0	201910
AirBridgeC	Frankfurt I	Milan Malp	1505	1645	3	4	560.0	201904
AirBridgeC	Frankfurt I	Moscow Sh	1855	0015	1	4	440.0	201902
AirBridgeC	Frankfurt I	Moscow Sh	1855	0015	1	4	440.0	201908
AirBridgeC	Frankfurt I	Moscow Sh	2050	0210	5	4	560.0	201904
AirBridgeC	Houston G	Frankfurt I	1610	0800	7	4	560.0	201904
AirBridgeC	Krasnoyars	Frankfurt I	1135	1255	2	5	700.0	201910
AirBridgeC	Leipzig/Ha	Frankfurt I	1720	1850	5	4	560.0	201912
AirBridgeC	Los Angele	Frankfurt I	2015	1640	2	5	700.0	201912
AirBridgeC	Moscow D	Frankfurt I	1045	1215	5	4	560.0	201907
AirBridgeC	Moscow D	Frankfurt I	1045	1215	5	4	560.0	201910
AirBridgeC	Moscow Sh	Frankfurt I	1220	1355	6	5	550.0	202002
AirBridgeC	Moscow Sh	Frankfurt I	1530	1705	7	3	390.0	201902
Asiana Airl	Frankfurt I	Seoul Inch	2000	1430	3 5	9	900.0	201908

Asiana Airl	Frankfurt I	Seoul Inch	2000	1430	3 5	9	900.0	201911
Asiana Airl	Vienna Int	Frankfurt I	1500	1640	7	5	500.0	201906
Asiana Airl	Vienna Int	Frankfurt I	1500	1640	7	4	400.0	202002
British Airv	Frankfurt I	Madrid Ad	1725	2005	3	4	215.6	201903
British Airv	Frankfurt I	Madrid Ad	1725	2005	3	5	269.5	201910
British Airv	Frankfurt I	Nottinghar	2000	2035	7	4	215.6	202001
British Airv	London He	Frankfurt I	1700	1925	6	4	215.6	201904
British Airv	London Lu	Frankfurt I	1040	1315	34	10	539.0	201905
British Airv	London Lu	Frankfurt I	1040	1315	34	8	431.2	201912
British Airv	Madrid Ad	Frankfurt I	1620	1855	45	8	360.0	201904
Cargologic	Atlanta Ha	Frankfurt I	2025	1125	5	4	440.0	201910
Cargologic	Chicago O'	Frankfurt I	1400	0535	1	4	440.0	201902
Cargologic	Frankfurt I	Atlanta Ha	1305	1725	5	4	440.0	201902
Cargologic	Frankfurt I	Atlanta Ha	1835	2255	3	4	440.0	201902
Cargologic	Frankfurt I	Atlanta Ha	1835	2255	3	5	550.0	201905
Cargologic	Frankfurt I	Chicago O'	0815	1100	1	4	440.0	201902
Cargologic	Frankfurt I	Dubai Al M	1425	2345	6	4	440.0	201902
Cargologic	Frankfurt I	Dubai Al M	1920	0440	1	4	440.0	201905
Cargologic	Frankfurt I	Dubai Al M	1920	0440	1	4	440.0	202002
Cargologic	Frankfurt I	London Sta	1535	1610	6	4	440.0	201910
Cargologic	Houston G	Frankfurt I	1245	0515	7	4	440.0	201904
Cargologic	Houston G	Frankfurt I	1245	0515	7	4	440.0	201907
Cargologic	Houston G	Frankfurt I	1245	0515	4	4	440.0	201902
Cargologic	Houston G	Frankfurt I	1245	0515	4	5	550.0	201905
Cargologic	London Sta	Frankfurt I	1250	1525	3	5	550.0	201907
Cathay Pac	Delhi	Frankfurt I	0215	0640	4	5	700.0	201905
Cathay Pac	Delhi	Frankfurt I	0215	0640	4	4	560.0	202002
Cathay Pac	Dubai Al M	Frankfurt I	0300	0700	5	5	700.0	201908
Cathay Pac	Frankfurt I	Amsterdar	0900	1025	5	4	560.0	201906
Cathay Pac	Frankfurt I	Amsterdar	1145	1305	4	3	324.0	201906
Cathay Pac	Frankfurt I	Amsterdar	1145	1305	4	4	432.0	201909
Cathay Pac	Frankfurt I	Amsterdar	1845	2005	6	4	432.0	201907
Cathay Pac	Frankfurt I	Paris Charl	0840	1010	4	4	560.0	201909
Cathay Pac	Frankfurt I	Paris Charl	0840	1010	4	4	560.0	202002
China Sout	Frankfurt I	Guangzhou	0900	0245	7	5	500.0	201903
China Sout	Frankfurt I	Guangzhou	0900	0245	7	5	500.0	201906
Air China	Frankfurt I	Tianjin	1930	0650	4 6	9	900.0	201910
Air China	Zhengzhou	Frankfurt I	1030	1505	5	4	400.0	201910
Air China	Zhengzhou	Frankfurt I	1215	1650	3	4	400.0	201908
AirBridgeC	Abu Dhabi	Frankfurt I	0115	0500	2	4	560.0	201902
AirBridgeC	Abu Dhabi	Frankfurt I	0115	0600	6	5	700.0	201911
AirBridgeC	Chicago O'	Frankfurt I	1635	0810	1	4	560.0	201908
AirBridgeC	Frankfurt I	Chicago O'	1835	2120	5	4	560.0	201909
AirBridgeC	Frankfurt I	London Sta	1925	1905	6	5	700.0	201903
AirBridgeC	Frankfurt I	London Sta	1925	1905	6	4	560.0	201909
AirBridgeC	Frankfurt I	Milan Malp	1440	1620	1	4	440.0	201903
AirBridgeC	Frankfurt I	Milan Malp	1440	1620	1	5	550.0	201909

AirBridgeC	Frankfurt I	Milan Mal	1455	1635	5	5	550.0	201908
AirBridgeC	Frankfurt I	Milan Mal	1455	1635	2	4	560.0	201906
AirBridgeC	Frankfurt I	Milan Mal	1455	1635	2	4	560.0	201909
AirBridgeC	Frankfurt I	Milan Mal	1505	1645	3	4	560.0	201903
AirBridgeC	Frankfurt I	Moscow D	2000	0135	6	4	560.0	201907
AirBridgeC	Frankfurt I	Moscow Sl	1230	1750	4	4	560.0	201906
AirBridgeC	Frankfurt I	Moscow Sl	1230	1750	4	4	560.0	201909
AirBridgeC	Frankfurt I	Moscow Sl	1230	1750	4	4	560.0	201912
AirBridgeC	Frankfurt I	Moscow Sl	1855	0015	5	4	440.0	201912
AirBridgeC	Frankfurt I	Moscow Sl	1910	0030	3	4	560.0	202002
AirBridgeC	Frankfurt I	Moscow Sl	2050	0210	5	4	560.0	201906
AirBridgeC	Frankfurt I	Oslo Garde	1225	1430	2	5	700.0	201912
AirBridgeC	Frankfurt I	Zaragoza A	0630	0830	2	4	560.0	201911
AirBridgeC	Houston G	Frankfurt I	1710	1000	4	4	560.0	201903
AirBridgeC	Krasnoyars	Frankfurt I	1135	1255	2	4	560.0	201903
AirBridgeC	Krasnoyars	Frankfurt I	1135	1255	2	4	560.0	201906
AirBridgeC	Los Angele	Frankfurt I	2015	1640	2	4	560.0	201903
AirBridgeC	Moscow D	Frankfurt I	0810	0940	1	4	560.0	201902
AirBridgeC	Moscow Sl	Frankfurt I	0555	0730	1	4	440.0	201905
AirBridgeC	Moscow Sl	Frankfurt I	0605	0740	1	4	440.0	201906
AirBridgeC	Moscow Sl	Frankfurt I	0825	1000	4	4	560.0	201912
AirBridgeC	Moscow Sl	Frankfurt I	0825	1000	4	4	560.0	202002
Asiana Airl	Frankfurt I	Seoul Inch	2000	1430	3 5	8	800.0	201909
Asiana Airl	London Sta	Frankfurt I	1610	1830	2 4 7	13	1,300.0	201909
British Airv	Frankfurt I	Madrid Ad	1725	2005	3	4	215.6	202002
British Airv	London Lu	Frankfurt I	1440	1720	7	4	215.6	201904
British Airv	Madrid Ad	Frankfurt I	1715	1945	3	4	215.6	201906
Cargologic	Frankfurt I	Atlanta Ha	1305	1725	5	4	440.0	201906
Cargologic	Frankfurt I	Atlanta Ha	1430	1850	2	4	440.0	201902
Cargologic	Frankfurt I	Atlanta Ha	1835	2255	3	4	440.0	201908
Cargologic	Frankfurt I	Chicago O'	0815	1100	1	5	550.0	201907
Cargologic	Frankfurt I	Dubai Al M	1425	2345	6	5	550.0	201903
Cargologic	Frankfurt I	Dubai Al M	1425	2345	6	4	440.0	201909
Cargologic	Frankfurt I	Dubai Al M	1425	2345	6	5	550.0	202002
Cargologic	Frankfurt I	Dubai Al M	1455	0015	5	5	550.0	202001
Cargologic	Frankfurt I	Dubai Al M	1620	0135	3	4	440.0	201902
Cargologic	Houston G	Frankfurt I	1245	0515	7	4	440.0	201902
Cargologic	Houston G	Frankfurt I	1245	0515	7	4	440.0	201905
Cathay Pac	Delhi	Frankfurt I	0215	0640	4	5	700.0	201908
Cathay Pac	Frankfurt I	Amsterdar	1145	1305	4	5	540.0	201908
China Sout	Frankfurt I	Guangzhou	1500	0815	1	5	500.0	201909
China Sout	Frankfurt I	Shanghai P	1520	0650	2 5 7	13	1,300.0	201905
China Sout	Guangzhou	Frankfurt I	0100	0600	7	4	400.0	201910
China Sout	London Sta	Frankfurt I	0835	1055	4 6	10	1,000.0	201908
China Sout	London Sta	Frankfurt I	0835	1055	4 6	9	900.0	202001
Air China	Frankfurt I	Tianjin	1930	0650	4 6	9	900.0	201911
AirBridgeC	Abu Dhabi	Frankfurt I	0115	0500	2	4	560.0	201911

AirBridgeC	Abu Dhabi	Frankfurt I	0115	0500	2	4	560.0	202001
AirBridgeC	Chicago O'	Frankfurt I	1635	0810	1	5	700.0	201904
AirBridgeC	Frankfurt I	Abu Dhabi	1300	2215	1	4	560.0	201911
AirBridgeC	Frankfurt I	Chicago O'	1835	2120	5	5	700.0	201905
AirBridgeC	Frankfurt I	Chicago O'	1835	2120	5	5	700.0	201911
AirBridgeC	Frankfurt I	Krasnoyars	0750	2040	5	1	110.0	201902
AirBridgeC	Frankfurt I	Milan Mal	1440	1620	1	4	440.0	201905
AirBridgeC	Frankfurt I	Milan Mal	1455	1635	5	4	440.0	201910
AirBridgeC	Frankfurt I	Milan Mal	1505	1645	3	5	700.0	201910
AirBridgeC	Frankfurt I	Moscow Sl	1230	1750	4	5	700.0	201908
AirBridgeC	Frankfurt I	Moscow Sl	1650	2210	6	4	440.0	201912
AirBridgeC	Frankfurt I	Moscow Sl	1855	0015	5	5	550.0	201908
AirBridgeC	Frankfurt I	Moscow Sl	1855	0015	5	5	550.0	201911
AirBridgeC	Frankfurt I	Moscow Sl	1855	0015	1	4	440.0	201905
AirBridgeC	Frankfurt I	Moscow Sl	1910	0030	3	4	560.0	201903
AirBridgeC	Frankfurt I	Zaragoza A	0630	0830	2	5	700.0	201907
AirBridgeC	Frankfurt I	Zaragoza A	0630	0830	2	5	700.0	201910
AirBridgeC	Frankfurt I	Zaragoza A	0645	0900	2	5	700.0	201910
AirBridgeC	Houston G	Frankfurt I	1610	0800	7	4	560.0	202001
AirBridgeC	Houston G	Frankfurt I	1710	1000	4	4	560.0	201907
AirBridgeC	Leipzig/Ha	Frankfurt I	1720	1850	5	4	560.0	201909
AirBridgeC	Moscow D	Frankfurt I	0810	0940	1	4	560.0	201903
AirBridgeC	Moscow D	Frankfurt I	1135	1305	3	4	560.0	201903
AirBridgeC	Moscow Sl	Frankfurt I	1120	1255	5	5	550.0	201911
AirBridgeC	Moscow Sl	Frankfurt I	1120	1255	5	5	550.0	202001
AirBridgeC	Moscow Sl	Frankfurt I	1220	1355	6	4	440.0	201902
AirBridgeC	Moscow Sl	Frankfurt I	1255	1430	5	5	550.0	201905
Asiana Airl	Frankfurt I	Seoul Inch	2000	1430	3 5	8	800.0	201902
Asiana Airl	Frankfurt I	Seoul Inch	2015	1400	2 4 7	13	1,300.0	201905
Asiana Airl	London Sta	Frankfurt I	1610	1830	2 4 7	13	1,300.0	201907
Asiana Airl	Vienna Int	Frankfurt I	1500	1640	7	5	500.0	201903
Asiana Airl	Vienna Int	Frankfurt I	1620	1800	3 5	9	900.0	201910
British Airv	Frankfurt I	Nottinghar	2000	2035	7	4	215.6	201904
British Airv	London Lu	Frankfurt I	1040	1315	34	8	431.2	201902
British Airv	Madrid Ad	Frankfurt I	1620	1855	45	10	450.0	202001
British Airv	Madrid Ad	Frankfurt I	1715	1945	3	5	269.5	201905
Cargologic	Chicago O'	Frankfurt I	1400	0535	1	4	440.0	201905
Cargologic	Chicago O'	Frankfurt I	1400	0535	1	4	440.0	202001
Cargologic	Frankfurt I	Atlanta Ha	1305	1725	5	4	440.0	202002
Cargologic	Frankfurt I	Atlanta Ha	1835	2255	3	4	440.0	202002
Cargologic	Frankfurt I	Chicago O'	0815	1100	1	4	440.0	202001
Cargologic	Frankfurt I	Dubai Al M	1425	2345	6	5	550.0	201908
Cargologic	Frankfurt I	Dubai Al M	1455	0015	5	4	440.0	201910
Cargologic	Frankfurt I	Dubai Al M	1620	0135	3	4	440.0	201903
Cargologic	Houston G	Frankfurt I	1245	0515	4	5	550.0	201908
Cathay Pac	Amsterdar	Frankfurt I	1205	1315	5	4	560.0	201904
Cathay Pac	Delhi	Frankfurt I	0535	1005	1	4	432.0	201903

Cathay Pac	Dubai Al M	Frankfurt I	0305	0805	7	4	432.0	201904
Cathay Pac	Dubai Al M	Frankfurt I	0305	0805	7	4	432.0	202001
Cathay Pac	Frankfurt I	Amsterdar	0900	1025	5	4	560.0	202002
Cathay Pac	Frankfurt I	Amsterdar	1845	2005	6	4	432.0	201904
Cathay Pac	Frankfurt I	Amsterdar	1845	2005	6	4	432.0	201910
Cathay Pac	Frankfurt I	Dubai Al M	1630	0140	6	2	280.0	201902
Cathay Pac	Frankfurt I	Milan Mal	0905	1025	7	4	496.0	201902
Air China	Frankfurt I	Tianjin	1930	0650	4 6	9	900.0	201905
Air China	Frankfurt I	Tianjin	1930	0650	4 6	9	900.0	202001
Air China	Zhengzhou	Frankfurt I	1030	1505	5	4	400.0	201902
Air China	Zhengzhou	Frankfurt I	1215	1650	3	5	500.0	201907
AirBridgeC	Abu Dhabi	Frankfurt I	0115	0500	2	5	700.0	201907
AirBridgeC	Abu Dhabi	Frankfurt I	0115	0600	6	5	700.0	201903
AirBridgeC	Frankfurt I	Abu Dhabi	1300	2215	1	5	700.0	201909
AirBridgeC	Frankfurt I	Abu Dhabi	1300	2215	1	5	700.0	201912
AirBridgeC	Frankfurt I	Abu Dhabi	1500	2315	5	4	560.0	201910
AirBridgeC	Frankfurt I	Chicago O'	1835	2120	5	4	560.0	201910
AirBridgeC	Frankfurt I	London Sta	1925	1905	6	4	560.0	201904
AirBridgeC	Frankfurt I	Milan Mal	1440	1620	1	4	440.0	202001
AirBridgeC	Frankfurt I	Milan Mal	1455	1635	5	5	550.0	201903
AirBridgeC	Frankfurt I	Milan Mal	1455	1635	5	4	440.0	201906
AirBridgeC	Frankfurt I	Milan Mal	1505	1645	3	4	560.0	201908
AirBridgeC	Frankfurt I	Moscow D	2000	0135	6	4	560.0	201902
AirBridgeC	Frankfurt I	Moscow Sł	1650	2210	6	5	550.0	201906
AirBridgeC	Frankfurt I	Moscow Sł	1855	0015	5	4	440.0	201907
AirBridgeC	Frankfurt I	Moscow Sł	1855	0015	1	4	440.0	201906
AirBridgeC	Frankfurt I	Moscow Sł	1855	0015	1	4	440.0	202002
AirBridgeC	Frankfurt I	Oslo Garde	1225	1430	2	5	700.0	201910
AirBridgeC	Frankfurt I	Zaragoza A	0630	0830	2	4	560.0	201903
AirBridgeC	Frankfurt I	Zaragoza A	0630	0830	2	4	560.0	201909
AirBridgeC	Frankfurt I	Zaragoza A	0645	0900	2	4	560.0	201908
AirBridgeC	Frankfurt I	Zaragoza A	0645	0900	2	4	560.0	201911
AirBridgeC	Leipzig/Ha	Frankfurt I	1720	1850	5	3	420.0	201902
AirBridgeC	Leipzig/Ha	Frankfurt I	1720	1850	5	5	700.0	201908
AirBridgeC	Los Angele	Frankfurt I	2015	1640	2	4	560.0	202001
AirBridgeC	Moscow D	Frankfurt I	1045	1215	5	5	700.0	201908
AirBridgeC	Moscow D	Frankfurt I	1610	1740	6	4	560.0	201905
AirBridgeC	Moscow Sł	Frankfurt I	1120	1255	5	4	440.0	201902
AirBridgeC	Moscow Sł	Frankfurt I	1220	1355	6	4	440.0	201909
AirBridgeC	Moscow Sł	Frankfurt I	1255	1430	5	5	550.0	201908
AirBridgeC	Moscow Sł	Frankfurt I	1515	1650	7	4	440.0	201903
Asiana Airl	London Sta	Frankfurt I	1610	1830	2 4 7	12	1,200.0	201911
Asiana Airl	Vienna Int	Frankfurt I	1500	1640	7	4	400.0	201908
Asiana Airl	Vienna Int	Frankfurt I	1620	1800	3 5	10	1,000.0	202001
British Airv	London Lu	Frankfurt I	1040	1315	34	9	485.1	201908
British Airv	London Lu	Frankfurt I	1440	1720	7	5	269.5	201909
British Airv	London Lu	Frankfurt I	1440	1720	7	5	269.5	201912

Cargologic	Chicago O'	Frankfurt I	1400	0535	5	4	440.0	201909
Cargologic	Chicago O'	Frankfurt I	1400	0535	1	5	550.0	201909
Cargologic	Chicago O'	Frankfurt I	1400	0535	1	4	440.0	202002
Cargologic	Frankfurt I	Atlanta Ha	1305	1725	5	5	550.0	202001
Cargologic	Frankfurt I	Atlanta Ha	1835	2255	3	4	440.0	201903
Cargologic	Frankfurt I	Atlanta Ha	1835	2255	3	4	440.0	201909
Cargologic	Frankfurt I	Chicago O'	0815	1100	5	5	550.0	201903
Cargologic	Frankfurt I	Dubai Al M	1425	2345	6	4	440.0	202001
Cargologic	Frankfurt I	Dubai Al M	1455	0015	5	5	550.0	201903
Cargologic	Frankfurt I	London Sta	1535	1610	6	4	440.0	201907
Cargologic	Houston G	Frankfurt I	1245	0515	4	4	440.0	201909
Cargologic	London Sta	Frankfurt I	1250	1525	3	4	440.0	201904
Cathay Pac	Delhi	Frankfurt I	0215	0640	4	4	560.0	201906
Cathay Pac	Frankfurt I	Milan Malp	1005	1120	7	1	140.0	201903
Cathay Pac	Frankfurt I	Milan Malp	1230	1355	1	5	540.0	201907
Cathay Pac	Frankfurt I	Paris Charl	1145	1305	4	5	540.0	201905
Cathay Pac	Mumbai	Frankfurt I	1130	1645	6	4	432.0	201909
Air China	Zhengzhou	Frankfurt I	1215	1650	3	4	400.0	201911
AirBridgeC	Frankfurt I	Abu Dhabi	1500	2315	5	4	560.0	202002
AirBridgeC	Frankfurt I	London Sta	1925	1905	6	4	560.0	201910
AirBridgeC	Frankfurt I	Milan Malp	1455	1635	5	4	470.0	201902
AirBridgeC	Frankfurt I	Milan Malp	1455	1635	2	4	560.0	201905
AirBridgeC	Frankfurt I	Milan Malp	1455	1635	2	4	560.0	201911
AirBridgeC	Frankfurt I	Milan Malp	1505	1645	3	4	560.0	201909
AirBridgeC	Frankfurt I	Milan Malp	1505	1645	3	4	560.0	202002
AirBridgeC	Frankfurt I	Moscow Sh	1650	2210	6	4	440.0	201907
AirBridgeC	Frankfurt I	Moscow Sh	1855	0015	5	5	550.0	201903
AirBridgeC	Frankfurt I	Moscow Sh	1910	0030	3	4	560.0	201911
AirBridgeC	Frankfurt I	Moscow Sh	1910	0030	3	5	700.0	202001
AirBridgeC	Frankfurt I	Oslo Garde	1225	1430	2	4	560.0	202001
AirBridgeC	Frankfurt I	Zaragoza A	0645	0900	2	4	560.0	202002
AirBridgeC	Houston G	Frankfurt I	1610	0800	7	5	700.0	201909
AirBridgeC	Krasnoyars	Frankfurt I	1135	1255	2	5	700.0	201912
AirBridgeC	Leipzig/Ha	Frankfurt I	1720	1850	5	5	700.0	201911
AirBridgeC	Los Angele	Frankfurt I	2015	1640	2	4	560.0	201911
AirBridgeC	Moscow D	Frankfurt I	0810	0940	1	4	560.0	202001
AirBridgeC	Moscow D	Frankfurt I	1045	1215	5	4	560.0	201902
AirBridgeC	Moscow D	Frankfurt I	1135	1305	3	5	700.0	201905
AirBridgeC	Moscow Sh	Frankfurt I	0500	0635	1	4	440.0	201902
AirBridgeC	Moscow Sh	Frankfurt I	0555	0730	1	4	440.0	201908
AirBridgeC	Moscow Sh	Frankfurt I	0825	1000	4	4	560.0	201911
AirBridgeC	Moscow Sh	Frankfurt I	1255	1430	5	4	440.0	201910
Asiana Airl	London Sta	Frankfurt I	1610	1830	2 4 7	12	1,200.0	202002
British Airv	Frankfurt I	London Lu	0750	0820	34	10	539.0	201905
British Airv	Frankfurt I	London Lu	0750	0820	34	9	485.1	201908
British Airv	Frankfurt I	Madrid Ad	1725	2005	3	5	269.5	201905
British Airv	Frankfurt I	Nottinghar	2000	2035	7	5	269.5	201909

British Airv	London He	Frankfurt I	1700	1925	6	4	215.6	201902
British Airv	London He	Frankfurt I	1700	1925	6	4	215.6	201912
British Airv	London He	Frankfurt I	1700	1925	6	5	269.5	202002
British Airv	London Lu	Frankfurt I	1040	1315	34	8	431.2	201904
British Airv	London Lu	Frankfurt I	1440	1720	7	4	215.6	201905
Cargologic	Atlanta Ha	Frankfurt I	2025	1125	5	5	550.0	201905
Cargologic	Chicago O'	Frankfurt I	1400	0535	1	4	440.0	201910
Cargologic	Frankfurt I	Atlanta Ha	1305	1725	5	4	440.0	201907
Cargologic	Frankfurt I	Chicago O'	0815	1100	5	5	550.0	201905
Cargologic	Frankfurt I	Chicago O'	0815	1100	5	4	440.0	201912
Cargologic	Frankfurt I	Chicago O'	0815	1100	1	4	440.0	201910
Cargologic	Frankfurt I	Dubai Al M	1425	2345	6	4	440.0	201910
Cargologic	Frankfurt I	Dubai Al M	1620	0135	3	4	440.0	201908
Cargologic	Frankfurt I	London Sta	1535	1610	6	5	550.0	201908
Cargologic	Houston G	Frankfurt I	1245	0515	7	5	550.0	201909
Cargologic	London Sta	Frankfurt I	1250	1525	3	4	440.0	201908
Cathay Pac	Amsterdar	Frankfurt I	1205	1315	5	4	560.0	201906
Cathay Pac	Frankfurt I	Dubai Al M	1745	0205	5	4	560.0	201907
Cathay Pac	Mumbai	Frankfurt I	1130	1645	6	4	432.0	201904
Cathay Pac	Mumbai	Frankfurt I	1240	1725	6	2	216.0	201902
China Sout	Frankfurt I	Guangzhou	0900	0245	7	4	400.0	201904
China Sout	Frankfurt I	Guangzhou	1440	0815	7	4	400.0	201907
China Sout	Frankfurt I	Guangzhou	1500	0815	1	4	400.0	201905
China Sout	Frankfurt I	Guangzhou	1500	0815	1	4	400.0	201911
China Sout	Frankfurt I	Guangzhou	1520	0740	5	5	500.0	201903
China Sout	Guangzhou	Frankfurt I	0555	1220	1	4	400.0	201903
China Sout	Guangzhou	Frankfurt I	0555	1240	5	4	400.0	201909
Air China	Frankfurt I	Tianjin	1930	0650	4 6	9	900.0	202002
Air China	Zhengzhou	Frankfurt I	1030	1505	5	4	400.0	201909
Air China	Zhengzhou	Frankfurt I	1030	1505	5	4	400.0	201912
Air China	Zhengzhou	Frankfurt I	1030	1505	5	4	400.0	202002
AirBridgeC	Abu Dhabi	Frankfurt I	0115	0500	2	4	560.0	201906
AirBridgeC	Chicago O'	Frankfurt I	1635	0810	1	4	560.0	202002
AirBridgeC	Frankfurt I	Abu Dhabi	1300	2215	1	4	560.0	201910
AirBridgeC	Frankfurt I	Abu Dhabi	1500	2315	5	4	560.0	201906
AirBridgeC	Frankfurt I	Chicago O'	1835	2120	5	4	560.0	201906
AirBridgeC	Frankfurt I	London Sta	1925	1905	6	4	560.0	201907
AirBridgeC	Frankfurt I	Milan Malp	1455	1635	5	4	440.0	202002
AirBridgeC	Frankfurt I	Milan Malp	1455	1635	2	4	560.0	201908
AirBridgeC	Frankfurt I	Moscow D	2000	0135	6	4	560.0	201909
AirBridgeC	Frankfurt I	Moscow Sh	1650	2210	6	4	440.0	201910
AirBridgeC	Frankfurt I	Zaragoza A	0630	0830	2	5	700.0	201912
AirBridgeC	Frankfurt I	Zaragoza A	0645	0900	2	5	700.0	201912
AirBridgeC	Houston G	Frankfurt I	1610	0800	7	5	700.0	201912
AirBridgeC	Houston G	Frankfurt I	1610	0800	7	4	560.0	202002
AirBridgeC	Houston G	Frankfurt I	1710	1000	4	4	560.0	201906
AirBridgeC	Leipzig/Ha	Frankfurt I	1720	1850	5	5	700.0	202001

AirBridgeC	Los Angele	Frankfurt I	2015	1640	2	5	700.0	201904
AirBridgeC	Moscow D	Frankfurt I	1045	1215	5	4	560.0	202002
AirBridgeC	Moscow D	Frankfurt I	1135	1305	3	4	560.0	201908
AirBridgeC	Moscow Sł	Frankfurt I	0555	0730	1	4	440.0	201911
AirBridgeC	Moscow Sł	Frankfurt I	0825	1000	4	5	700.0	201908
AirBridgeC	Moscow Sł	Frankfurt I	1055	1230	7	4	440.0	201902
AirBridgeC	Moscow Sł	Frankfurt I	1120	1255	5	5	550.0	201903
AirBridgeC	Moscow Sł	Frankfurt I	1120	1255	5	4	440.0	201909
AirBridgeC	Moscow Sł	Frankfurt I	1220	1355	6	4	440.0	201910
Asiana Airl	Frankfurt I	Seoul Inch	2015	1400	2 4 7	13	1,300.0	201903
Asiana Airl	London Sta	Frankfurt I	1610	1830	2 4 7	13	1,300.0	201905
Asiana Airl	Vienna Int	Frankfurt I	1500	1640	7	4	400.0	202001
Asiana Airl	Vienna Int	Frankfurt I	1620	1800	3 5	8	800.0	201902
Asiana Airl	Vienna Int	Frankfurt I	1620	1800	3 5	8	800.0	201909
British Airv	Frankfurt I	London Lu	0750	0820	34	10	539.0	202001
British Airv	Frankfurt I	Nottinghar	2000	2035	7	5	269.5	201906
British Airv	London Lu	Frankfurt I	1440	1720	7	4	215.6	201902
British Airv	London Lu	Frankfurt I	1440	1720	7	4	215.6	201908
British Airv	Madrid Ad	Frankfurt I	1620	1855	45	8	360.0	202002
British Airv	Madrid Ad	Frankfurt I	1715	1945	3	4	215.6	201904
British Airv	Madrid Ad	Frankfurt I	1715	1945	3	5	269.5	201907
Cargologic	Frankfurt I	Chicago O'	0815	1100	5	4	440.0	202002
Cargologic	Frankfurt I	Dubai Al M	1455	0015	5	4	440.0	201909
Cargologic	Frankfurt I	Dubai Al M	1455	0015	5	4	440.0	201912
Cargologic	Frankfurt I	Dubai Al M	1455	0015	5	4	440.0	202002
Cargologic	Frankfurt I	London Sta	1535	1610	6	4	440.0	201902
Cargologic	Houston G	Frankfurt I	1245	0515	7	5	550.0	201906
Cargologic	Houston G	Frankfurt I	1245	0515	7	5	550.0	201912
Cathay Pac	Dubai Al M	Frankfurt I	0300	0700	5	5	700.0	201903
Cathay Pac	Dubai Al M	Frankfurt I	0305	0805	7	5	540.0	201909
Cathay Pac	Dubai Al M	Frankfurt I	0305	0805	7	4	432.0	202002
Cathay Pac	Frankfurt I	Amsterdar	0900	1025	5	4	560.0	201904
Cathay Pac	Frankfurt I	Dubai Al M	1925	0445	6	4	432.0	201904
Cathay Pac	Frankfurt I	Dubai Al M	1925	0445	6	4	432.0	201907
Cathay Pac	Frankfurt I	Dubai Al M	1925	0445	6	4	432.0	201910
Cathay Pac	Frankfurt I	Paris Charl	0840	1010	4	4	560.0	201907
Air China	Frankfurt I	Tianjin	1930	0650	4 6	8	800.0	201902
Air China	Frankfurt I	Tianjin	1930	0650	4 6	10	1,000.0	201908
Air China	Zhengzhou	Frankfurt I	1030	1505	5	5	500.0	201905
Air China	Zhengzhou	Frankfurt I	1030	1505	5	5	500.0	201908
Air China	Zhengzhou	Frankfurt I	1215	1650	3	5	500.0	201910
AirBridgeC	Abu Dhabi	Frankfurt I	0115	0500	2	5	700.0	201910
AirBridgeC	Frankfurt I	Abu Dhabi	1300	2215	1	4	560.0	201906
AirBridgeC	Frankfurt I	London Sta	1925	1905	6	4	560.0	202001
AirBridgeC	Frankfurt I	Milan Mal	1440	1620	1	4	440.0	201911
AirBridgeC	Frankfurt I	Milan Mal	1455	1635	5	4	440.0	201909
AirBridgeC	Frankfurt I	Milan Mal	1505	1645	3	5	700.0	201905

AirBridgeC	Frankfurt I	Milan Malp	1505	1645	3	4	560.0	201911
AirBridgeC	Frankfurt I	Moscow Sł	1855	0015	1	5	550.0	201912
AirBridgeC	Frankfurt I	Moscow Sł	1935	0055	7	4	560.0	201903
AirBridgeC	Frankfurt I	Moscow Sł	2050	0210	5	5	700.0	202001
AirBridgeC	Houston G	Frankfurt I	1710	1000	4	4	560.0	201902
AirBridgeC	Krasnoyars	Frankfurt I	1135	1255	2	4	560.0	201905
AirBridgeC	Krasnoyars	Frankfurt I	1135	1255	2	4	560.0	201908
AirBridgeC	Krasnoyars	Frankfurt I	1135	1255	2	4	560.0	202001
AirBridgeC	Krasnoyars	Frankfurt I	1235	1255	2	4	560.0	201902
AirBridgeC	Los Angele	Frankfurt I	2015	1640	2	4	560.0	201902
AirBridgeC	Moscow D	Frankfurt I	1045	1215	5	5	700.0	202001
AirBridgeC	Moscow D	Frankfurt I	1610	1740	6	4	560.0	201909
AirBridgeC	Moscow Sł	Frankfurt I	0605	0740	1	4	440.0	201911
AirBridgeC	Moscow Sł	Frankfurt I	1120	1255	5	5	550.0	201905
AirBridgeC	Moscow Sł	Frankfurt I	1220	1355	6	5	550.0	201903
AirBridgeC	Moscow Sł	Frankfurt I	1220	1355	6	5	550.0	201906
Asiana Airl	Frankfurt I	Seoul Inch	2000	1430	3 5	9	900.0	201907
Asiana Airl	Vienna Int	Frankfurt I	1500	1640	7	4	400.0	201902
British Airv	Frankfurt I	London He	2020	2100	6	4	215.6	201905
British Airv	Frankfurt I	London He	2020	2100	6	4	215.6	202001
British Airv	Frankfurt I	Nottinghar	2000	2035	7	4	215.6	201902
British Airv	Madrid Ad	Frankfurt I	1620	1855	45	10	450.0	201908
Cargologic	Atlanta Ha	Frankfurt I	2025	1125	5	4	440.0	201906
Cargologic	Atlanta Ha	Frankfurt I	2025	1125	5	4	440.0	202002
Cargologic	Chicago O'	Frankfurt I	1400	0535	5	4	440.0	201906
Cargologic	Frankfurt I	Chicago O'	0815	1100	5	4	440.0	201909
Cargologic	Frankfurt I	Chicago O'	0815	1100	1	5	550.0	201909
Cargologic	Frankfurt I	Chicago O'	0815	1100	1	5	550.0	201912
Cargologic	Frankfurt I	Dubai Al M	1425	2345	6	4	440.0	201904
Cargologic	Frankfurt I	Dubai Al M	1620	0135	3	5	550.0	201907
Cargologic	Houston G	Frankfurt I	1245	0515	4	4	440.0	201903
Cathay Pac	Amsterdar	Frankfurt I	1200	1310	5	4	432.0	201902
Cathay Pac	Amsterdar	Frankfurt I	1205	1315	5	4	560.0	201910
Cathay Pac	Delhi	Frankfurt I	0215	0640	4	1	140.0	201903
Cathay Pac	Delhi	Frankfurt I	0215	0645	4	2	248.0	201902
Cathay Pac	Dubai Al M	Frankfurt I	0300	0700	5	4	560.0	202002
Cathay Pac	Dubai Al M	Frankfurt I	0305	0805	7	3	324.0	201907
Cathay Pac	Dubai Al M	Frankfurt I	0305	0805	7	3	324.0	201910
Cathay Pac	Frankfurt I	Amsterdar	0900	1025	5	5	700.0	201905
Cathay Pac	Frankfurt I	Amsterdar	0900	1025	5	4	560.0	201912
Cathay Pac	Frankfurt I	Amsterdar	1845	2005	6	4	432.0	201905
Cathay Pac	Frankfurt I	Dubai Al M	1745	0205	5	5	700.0	201905
Cathay Pac	Frankfurt I	Paris Charl	0840	1010	4	5	700.0	201905
Cathay Pac	Frankfurt I	Paris Charl	0840	1010	4	5	700.0	201908
Cathay Pac	Mumbai	Frankfurt I	1240	1725	6	4	432.0	201912
China Carg	Shanghai P	Frankfurt I	0920	1410	3 7	8	800.0	201903
Air China	Frankfurt I	Tianjin	1930	0650	4 6	9	900.0	201906

Air China	Frankfurt I	Tianjin	1930	0650	4 6	8	800.0	201909
Air China	Zhengzhou	Frankfurt I	1030	1505	5	4	400.0	201906
AirBridgeC	Abu Dhabi	Frankfurt I	0115	0500	2	4	560.0	201909
AirBridgeC	Frankfurt I	Abu Dhabi	1300	2215	1	4	560.0	201903
AirBridgeC	Frankfurt I	Krasnoyars	1920	0810	7	4	440.0	201903
AirBridgeC	Frankfurt I	Milan Mal	1440	1620	1	5	550.0	201907
AirBridgeC	Frankfurt I	Milan Mal	1455	1635	5	5	550.0	201905
AirBridgeC	Frankfurt I	Milan Mal	1455	1635	2	4	530.0	201902
AirBridgeC	Frankfurt I	Milan Mal	1505	1645	3	4	560.0	201902
AirBridgeC	Frankfurt I	Milan Mal	1505	1645	3	4	560.0	201912
AirBridgeC	Frankfurt I	Moscow Sl	0445	1005	7	1	140.0	201902
AirBridgeC	Frankfurt I	Moscow Sl	1230	1750	4	4	560.0	201907
AirBridgeC	Frankfurt I	Moscow Sl	1855	0015	1	4	440.0	201910
AirBridgeC	Frankfurt I	Moscow Sl	2050	0210	5	3	420.0	201902
AirBridgeC	Frankfurt I	Moscow Sl	2050	0210	5	4	560.0	201909
AirBridgeC	Houston G	Frankfurt I	1610	0800	7	5	700.0	201903
AirBridgeC	Houston G	Frankfurt I	1710	1000	4	4	560.0	202002
AirBridgeC	Krasnoyars	Frankfurt I	1135	1255	2	4	560.0	202002
AirBridgeC	Los Angele	Frankfurt I	2015	1640	2	5	700.0	201907
AirBridgeC	Moscow D	Frankfurt I	0810	0940	1	5	700.0	201904
AirBridgeC	Moscow D	Frankfurt I	1045	1215	5	4	560.0	201909
AirBridgeC	Moscow D	Frankfurt I	1045	1215	5	4	560.0	201912
AirBridgeC	Moscow Sl	Frankfurt I	0605	0740	1	4	440.0	201910
AirBridgeC	Moscow Sl	Frankfurt I	0825	1000	4	5	700.0	201905
AirBridgeC	Moscow Sl	Frankfurt I	1120	1255	5	4	440.0	202002
Asiana Airl	London Sta	Frankfurt I	1610	1830	2 4 7	12	1,200.0	201902
Asiana Airl	Vienna Inte	Frankfurt I	1620	1800	3 5	8	800.0	202002
British Airv	Frankfurt I	London He	2020	2100	6	4	215.6	201907
British Airv	Frankfurt I	London Lu	0750	0820	34	8	431.2	201902
British Airv	Frankfurt I	Madrid Ad	1725	2005	3	4	215.6	201902
British Airv	Frankfurt I	Madrid Ad	1725	2005	3	4	215.6	201911
British Airv	London Lu	Frankfurt I	1440	1720	7	4	215.6	201911
British Airv	Madrid Ad	Frankfurt I	1620	1855	45	8	360.0	201909
Cargologic	Atlanta Ha	Frankfurt I	2025	1125	5	5	550.0	201908
Cargologic	Atlanta Ha	Frankfurt I	2025	1125	5	5	550.0	201911
Cargologic	Chicago O'	Frankfurt I	1400	0535	5	5	550.0	201905
Cargologic	Frankfurt I	Atlanta Ha	1305	1725	5	4	440.0	201904
Cargologic	Frankfurt I	Atlanta Ha	1305	1725	5	4	440.0	201910
Cargologic	Frankfurt I	Atlanta Ha	1430	1850	2	4	440.0	201911
Cargologic	Frankfurt I	Atlanta Ha	1430	1850	2	4	440.0	202001
Cargologic	Frankfurt I	Atlanta Ha	1835	2255	3	4	440.0	201904
Cargologic	Frankfurt I	Chicago O'	0815	1100	5	4	440.0	201902
Cargologic	Frankfurt I	Chicago O'	0815	1100	1	4	440.0	201903
Cargologic	Frankfurt I	Dubai Al M	1920	0440	1	5	550.0	201904
Cargologic	Houston G	Frankfurt I	1245	0515	4	5	550.0	201910
Cathay Pac	Amsterdar	Frankfurt I	1205	1315	5	4	560.0	201909
Cathay Pac	Delhi	Frankfurt I	0215	0640	4	4	560.0	201904

Cathay Pac	Dubai Al M	Frankfurt I	0300	0700	5	4	560.0	201906
Cathay Pac	Dubai Al M	Frankfurt I	0300	0700	5	4	560.0	201909
Cathay Pac	Dubai Al M	Frankfurt I	0300	0705	7	4	528.0	201903
Cathay Pac	Dubai Al M	Frankfurt I	0305	0805	7	5	540.0	201906
Cathay Pac	Frankfurt I	Milan Malp	0920	1035	1	5	540.0	201907
Cathay Pac	Frankfurt I	Milan Malp	0920	1035	1	3	324.0	201910
Cathay Pac	Frankfurt I	Milan Malp	1230	1355	1	4	432.0	201910
China Sout	Frankfurt I	Guangzhou	1440	0815	7	4	400.0	201904
AirBridgeC	Abu Dhabi	Frankfurt I	0115	0600	6	4	560.0	202001
AirBridgeC	Frankfurt I	Abu Dhabi	1500	2315	5	4	560.0	201902
AirBridgeC	Frankfurt I	Abu Dhabi	1500	2315	5	5	700.0	201905
AirBridgeC	Frankfurt I	Chicago O'	1835	2120	5	4	560.0	201912
AirBridgeC	Frankfurt I	London Sta	1925	1905	6	5	700.0	201906
AirBridgeC	Frankfurt I	Milan Malp	1455	1635	5	5	550.0	201911
AirBridgeC	Frankfurt I	Milan Malp	1505	1645	3	4	560.0	201906
AirBridgeC	Frankfurt I	Moscow D	2000	0135	6	4	560.0	201904
AirBridgeC	Frankfurt I	Moscow Sh	1650	2210	6	4	440.0	201905
AirBridgeC	Frankfurt I	Moscow Sh	1650	2210	6	4	440.0	202001
AirBridgeC	Frankfurt I	Moscow Sh	1855	0015	5	4	560.0	201902
AirBridgeC	Frankfurt I	Moscow Sh	1855	0015	1	4	440.0	202001
AirBridgeC	Frankfurt I	Oslo Garde	1225	1430	2	4	560.0	202002
AirBridgeC	Frankfurt I	Zaragoza A	0630	0830	2	4	560.0	202001
AirBridgeC	Frankfurt I	Zaragoza A	2030	2245	1	4	560.0	201902
AirBridgeC	Houston G	Frankfurt I	1610	0800	7	4	560.0	201902
AirBridgeC	Moscow D	Frankfurt I	0810	0940	1	4	560.0	201905
AirBridgeC	Moscow D	Frankfurt I	0810	0940	1	4	560.0	201908
AirBridgeC	Moscow D	Frankfurt I	1045	1215	5	4	560.0	201906
AirBridgeC	Moscow D	Frankfurt I	1610	1740	6	4	560.0	201907
AirBridgeC	Moscow Sh	Frankfurt I	0555	0730	1	4	440.0	201902
AirBridgeC	Moscow Sh	Frankfurt I	0605	0740	1	5	550.0	201912
AirBridgeC	Moscow Sh	Frankfurt I	0605	0740	1	4	440.0	202002
AirBridgeC	Moscow Sh	Frankfurt I	0825	1000	4	4	560.0	201902
AirBridgeC	Moscow Sh	Frankfurt I	1120	1255	5	4	440.0	201910
AirBridgeC	Moscow Sh	Frankfurt I	1255	1430	5	4	440.0	201909
Asiana Airl	Frankfurt I	Seoul Inche	2000	1430	3 5	8	800.0	202002
Asiana Airl	Frankfurt I	Seoul Inche	2015	1400	2 4 7	13	1,300.0	201907
British Airv	Frankfurt I	London He	2020	2100	6	5	269.5	201903
British Airv	Frankfurt I	Madrid Ad	1725	2005	3	4	215.6	201912
British Airv	London He	Frankfurt I	1700	1925	6	5	269.5	201908
British Airv	Madrid Ad	Frankfurt I	1715	1945	3	4	215.6	201903
Cargologic	Chicago O'	Frankfurt I	1400	0535	5	5	550.0	201908
Cargologic	Chicago O'	Frankfurt I	1400	0535	5	5	550.0	201911
Cargologic	Frankfurt I	Atlanta Ha	1305	1725	5	5	550.0	201903
Cargologic	Frankfurt I	Atlanta Ha	1430	1850	2	4	440.0	201905
Cargologic	Frankfurt I	Chicago O'	0815	1100	5	5	550.0	202001
Cargologic	Frankfurt I	Dubai Al M	1455	0015	5	5	550.0	201908
Cargologic	Frankfurt I	Dubai Al M	1455	0015	5	5	550.0	201911

Cargologic	Frankfurt I	Dubai Al M	1920	0440	1	4	440.0	201903
Cargologic	Frankfurt I	Dubai Al M	1920	0440	1	5	550.0	201909
Cargologic	Frankfurt I	London Sta	1535	1610	6	5	550.0	201906
Cargologic	Frankfurt I	London Sta	1535	1610	6	5	550.0	202002
Cargologic	Houston G	Frankfurt I	1245	0515	7	4	440.0	201908
Cargologic	Houston G	Frankfurt I	1245	0515	4	4	440.0	201904
Cathay Pac	Dubai Al M	Frankfurt I	0300	0700	5	4	560.0	201904
Cathay Pac	Dubai Al M	Frankfurt I	0300	0700	5	4	560.0	201910
Cathay Pac	Frankfurt I	Paris Charl	0840	1010	4	5	700.0	201910
Cathay Pac	Mumbai	Frankfurt I	1130	1645	6	5	540.0	201908
China Sout	Frankfurt I	Guangzhou	0900	0245	7	4	400.0	201902
China Sout	Frankfurt I	Guangzhou	1440	0815	7	4	400.0	201910
China Sout	Frankfurt I	Guangzhou	1500	0815	1	4	400.0	201902
China Sout	Frankfurt I	Guangzhou	1520	0740	5	4	400.0	201906
China Sout	Frankfurt I	Shanghai P	1520	0650	2 5 7	12	1,200.0	201902
China Sout	Frankfurt I	Shanghai P	1520	0650	2 5 7	12	1,200.0	202002
Emirates	Maastricht	Frankfurt I	1040	1155	6	5	515.0	202002
Etihad Airv	Frankfurt I	Barbados	0850	1200	4	5	519.5	201905
Iberia	Madrid Ad	Frankfurt I	1620	1840	6	4	205.6	201907
Iberia	Madrid Ad	Frankfurt I	1725	2005	3	5	257.0	201910
Korean Air	Frankfurt I	Seoul Inch	1735	1205	6	5	700.0	201908
Korean Air	Frankfurt I	Seoul Inch	1735	1205	6	5	700.0	201911
Korean Air	Moscow Sl	Frankfurt I	1340	1455	5	4	415.6	201906
Korean Air	Moscow Sl	Frankfurt I	1345	1500	6	4	560.0	201907
Korean Air	Moscow Sl	Frankfurt I	1345	1500	23	9	935.1	202001
Korean Air	Vienna Int	Frankfurt I	1325	1455	4	4	560.0	201909
LATAM Ca	Amsterdar	Frankfurt I	1610	1820	7	5	500.0	201903
LATAM Ca	Amsterdar	Frankfurt I	1610	1820	6	4	400.0	201902
LATAM Ca	Frankfurt I	Sao Paulo	1920	0325	7	4	400.0	202001
LATAM Ca	Frankfurt I	Sao Paulo	1920	0325	6	4	400.0	201904
LATAM Ca	Frankfurt I	Sao Paulo	1920	0325	6	4	400.0	202001
Lufthansa	Almaty	Frankfurt I	0950	1320	7	4	340.0	201904
Lufthansa	Cairo Inter	Frankfurt I	0530	0950	3	5	425.0	201907
Lufthansa	Cairo Inter	Frankfurt I	0600	1015	1	5	425.0	201904
Lufthansa	Chicago O'	Frankfurt I	0145	1705	234	12	1,020.0	201909
Lufthansa	Chicago O'	Frankfurt I	2215	1320	6	1	85.0	201903
Lufthansa	Chicago O'	Frankfurt I	2230	1335	1	1	103.9	201902
Lufthansa	Dakar Blais	Frankfurt I	0100	0900	6	4	415.6	201904
Lufthansa	Dakar Blais	Frankfurt I	2130	0530	1	4	415.6	201908
Lufthansa	Dallas Dall	Frankfurt I	0310	1930	7	1	85.0	201903
Lufthansa	Dallas Dall	Frankfurt I	0525	2150	2	4	415.6	201909
Lufthansa	Dallas Dall	Frankfurt I	0605	2230	2 6	1	103.9	201906
Lufthansa	Dallas Dall	Frankfurt I	1410	0530	6	2	170.0	201903
Lufthansa	Dallas Dall	Frankfurt I	1410	0630	6	1	85.0	201903
Lufthansa	Frankfurt I	Ashgabat	0445	1305	6	4	340.0	201907
Lufthansa	Frankfurt I	Ashgabat	0510	1430	6	3	255.0	201902
Lufthansa	Frankfurt I	Atlanta Ha	1620	2015	2	1	103.9	201902

Lufthansa (	Frankfurt I	Beijing Cap	0950	0120	2 4 7	10	1,039.0	201910
Lufthansa (	Frankfurt I	Bengaluru	1335	0200	3	4	340.0	201904
Lufthansa (	Frankfurt I	Bengaluru	1335	0200	3	5	425.0	201907
Lufthansa (	Frankfurt I	Cairo Inter	2050	0045	2	3	255.0	201908
Lufthansa (	Frankfurt I	Cairo Inter	2110	0055	7	4	340.0	201905
Lufthansa (	Frankfurt I	Chicago O'	1935	2220	5	1	85.0	201902
Lufthansa (	Frankfurt I	Dakar Blais	2115	0220	1	4	340.0	201902
Lufthansa (	Frankfurt I	Dammam	1350	2125	1	1	85.0	201902
Lufthansa (	Frankfurt I	Dammam	1425	2110	1	4	340.0	201907
Lufthansa (	Frankfurt I	Johannesb	0545	1630	7	4	340.0	201908
Lufthansa (	Frankfurt I	Los Angele	1230	1530	3	4	340.0	201908
Lufthansa (	Frankfurt I	Mexico Cit	1425	2020	6	3	311.7	201904
Lufthansa (	Frankfurt I	Mexico Cit	1425	2020	6	3	311.7	201910
Lufthansa (	Frankfurt I	Mumbai	1550	0420	34	8	680.0	201903
Lufthansa (	Frankfurt I	New York J	2120	2355	3	5	425.0	201907
Lufthansa (	Frankfurt I	Novosibirs	0450	1605	3 5 7	7	595.0	201909
Lufthansa (	Frankfurt I	Novosibirs	1405	0120	3 5	8	680.0	201910
Lufthansa (	Frankfurt I	Riyadh Kin	0840	1610	7	4	340.0	201903
Lufthansa (	Frankfurt I	Seattle-Ta	0845	1010	5	5	425.0	201905
Lufthansa (	Frankfurt I	Shanghai P	0720	0105	1 3	6	623.4	201902
Lufthansa (	Frankfurt I	Shanghai P	0820	0105	1 3	8	831.2	201906
Lufthansa (	Frankfurt I	Shanghai P	1305	0550	2345 7	23	2,389.7	201905
Lufthansa (	Frankfurt I	Tel Aviv-ya	1610	2100	2	1	103.9	201902
China Sout	Frankfurt I	Shanghai P	1520	0650	2 5 7	13	1,300.0	201911
China Sout	Frankfurt I	Shanghai P	1520	0650	2 5 7	13	1,300.0	202001
China Sout	London Sta	Frankfurt I	0835	1035	2	4	400.0	202001
China Sout	Shanghai P	Frankfurt I	0650	1220	2 5 7	13	1,300.0	201911
China Sout	Shanghai P	Frankfurt I	0650	1220	1 4 6	13	1,300.0	201911
Emirates	Dubai Al M	Frankfurt I	0140	0630	7	4	412.0	201911
Emirates	Dubai Al M	Frankfurt I	1240	1630	4	4	412.0	201902
Emirates	Dubai Al M	Frankfurt I	1240	1630	4	4	412.0	201912
Emirates	Frankfurt I	Dubai Al M	1355	2300	6	4	412.0	201902
Emirates	Frankfurt I	Dubai Al M	1500	0005	3	4	412.0	201909
Emirates	Frankfurt I	Dubai Al M	1940	0445	4	4	412.0	201912
Emirates	Frankfurt I	Mexico Cit	2125	0140	7	4	412.0	201910
Emirates	Maastricht	Frankfurt I	0815	0930	3	4	412.0	201909
Emirates	Maastricht	Frankfurt I	0815	0930	3	4	412.0	201912
Iberia	Frankfurt I	Madrid Ad	2020	2300	6	4	205.6	201909
Iberia	Frankfurt I	Madrid Ad	2030	2250	45	8	360.0	201906
Iberia	Frankfurt I	Madrid Ad	2030	2250	45	8	360.0	202002
Iberia	Madrid Ad	Frankfurt I	1620	1955	45	8	360.0	201909
Korean Air	Frankfurt I	Seoul Inch	0900	0330	1	4	415.6	201910
Korean Air	Frankfurt I	Seoul Inch	1735	1205	6	4	560.0	201905
Korean Air	Frankfurt I	Seoul Inch	1735	1205	6	4	560.0	201912
Korean Air	Moscow Sh	Frankfurt I	0520	0635	1	4	415.6	202001
Korean Air	Moscow Sh	Frankfurt I	1340	1455	5	4	415.6	201910
Korean Air	Moscow Sh	Frankfurt I	1345	1500	6	5	700.0	201903

LATAM Ca	Amsterdar	Frankfurt I	1610	1820	6	5	500.0	201908
LATAM Ca	Frankfurt I	Sao Paulo '	1920	0325	7	5	500.0	201906
LATAM Ca	Frankfurt I	Sao Paulo '	1920	0325	6	4	400.0	201910
LATAM Ca	Frankfurt I	Sao Paulo '	1940	0335	3	5	500.0	201907
Lufthansa (	Buenos Air	Frankfurt I	0205	1950	6	4	415.6	201902
Lufthansa (	Cairo Inter	Frankfurt I	0530	0950	3	4	340.0	201906
Lufthansa (	Cairo Inter	Frankfurt I	0600	1015	1	4	340.0	201905
Lufthansa (	Chicago O'	Frankfurt I	1410	0515	5	1	85.0	201902
Lufthansa (	Dakar Blais	Frankfurt I	0835	1635	6	1	85.0	201906
Lufthansa (	Dallas Dall	Frankfurt I	0335	1945	1	4	340.0	201902
Lufthansa (	Frankfurt I	Ashgabat	0445	1305	6	5	425.0	201908
Lufthansa (	Frankfurt I	Atlanta Ha	1035	1415	3	4	415.6	201908
Lufthansa (	Frankfurt I	Atlanta Ha	1530	1915	2	5	425.0	201904
Lufthansa (	Frankfurt I	Atlanta Ha	1530	1915	2	5	425.0	201907
Lufthansa (	Frankfurt I	Atlanta Ha	1530	1915	2	4	340.0	201910
Lufthansa (	Frankfurt I	Beijing Cap	0950	0120	2 4 7	13	1,350.7	201906
Lufthansa (	Frankfurt I	Beijing Cap	1200	0435	2	2	207.8	201903
Lufthansa (	Frankfurt I	Bengaluru	1230	0055	6	4	340.0	201907
Lufthansa (	Frankfurt I	Bengaluru	1335	0200	3	4	340.0	201908
Lufthansa (	Frankfurt I	Chicago O'	0855	1110	3	3	255.0	201902
Lufthansa (	Frankfurt I	Chicago O'	1335	1605	4	4	340.0	201906
Lufthansa (	Frankfurt I	Chicago O'	2020	0005	34	6	623.4	201903
Lufthansa (	Frankfurt I	Chicago O'	2020	2305	34	2	170.0	201902
Lufthansa (	Frankfurt I	Chicago O'	2040	0025	5	3	255.0	201903
Lufthansa (	Frankfurt I	Curitiba Af	0650	1430	7	5	519.5	201906
Lufthansa (	Frankfurt I	Johannesb	0545	1630	7	4	340.0	201907
Lufthansa (	Frankfurt I	Johannesb	0555	1640	2	4	340.0	201908
Lufthansa (	Frankfurt I	Johannesb	0555	1640	2 4	4	340.0	201905
Lufthansa (	Frankfurt I	Kuwait	1550	2310	4	4	340.0	201903
Lufthansa (	Frankfurt I	Los Angele	1520	1820	6	4	340.0	201904
Cargologic	London Sta	Frankfurt I	1250	1525	3	4	440.0	201902
Cargologic	London Sta	Frankfurt I	1250	1525	3	5	550.0	201905
Cathay Pac	Delhi	Frankfurt I	0215	0640	4	5	700.0	201910
Cathay Pac	Delhi	Frankfurt I	0230	0740	1	3	324.0	201910
Cathay Pac	Frankfurt I	Amsterdar	0900	1025	5	5	700.0	201908
Cathay Pac	Frankfurt I	Amsterdar	0900	1025	5	5	700.0	202001
Cathay Pac	Frankfurt I	Dubai Al M	1745	0205	5	4	560.0	201910
Cathay Pac	Frankfurt I	Paris Charl	0840	1010	4	4	560.0	201904
Cathay Pac	Frankfurt I	Paris Charl	0840	1010	4	4	560.0	201911
Cathay Pac	Mumbai	Frankfurt I	1130	1645	6	4	432.0	201907
China Sout	Frankfurt I	Shanghai P	1520	0650	2 5 7	13	1,300.0	201906
China Sout	Frankfurt I	Shanghai P	1520	0650	1 4 6	12	1,200.0	201902
China Sout	Guangzhou	Frankfurt I	0555	1220	1	4	400.0	201906
China Sout	Guangzhou	Frankfurt I	0555	1240	5	5	500.0	201903
China Sout	Guangzhou	Frankfurt I	0555	1240	5	4	400.0	201906
Emirates	Dubai Al M	Frankfurt I	0140	0630	7	1	103.0	201903
Emirates	Dubai Al M	Frankfurt I	1055	1445	4	4	412.0	201906

Emirates	Dubai Al M	Frankfurt I	1240	1730	7	4	412.0	201907
Emirates	Dubai Al M	Frankfurt I	1320	1710	5	4	412.0	201907
Emirates	Frankfurt I	Dubai Al M	0930	1735	7	4	412.0	202001
Emirates	Frankfurt I	Dubai Al M	1500	0005	3	5	515.0	202001
Etihad Airv	Abu Dhabi	Frankfurt I	0105	0600	4	4	415.6	201906
Etihad Airv	Abu Dhabi	Frankfurt I	0105	0600	4	4	415.6	201909
Etihad Airv	Abu Dhabi	Frankfurt I	0235	0730	6	4	415.6	201909
Etihad Airv	Abu Dhabi	Frankfurt I	0235	0730	6	5	519.5	202002
Etihad Airv	Frankfurt I	Barbados	1020	1330	6	4	415.6	201902
Etihad Airv	Frankfurt I	Barbados	1020	1330	6	4	415.6	201909
Iberia	Frankfurt I	Madrid Ad	1715	1945	3	5	257.0	202001
Iberia	Madrid Ad	Frankfurt I	1620	1840	6	5	257.0	201906
Iberia	Madrid Ad	Frankfurt I	1725	2005	3	5	257.0	202001
Korean Air	Frankfurt I	Seoul Inch	0900	0330	1	4	415.6	201911
Korean Air	Moscow Sl	Frankfurt I	1340	1455	5	4	415.6	202002
Korean Air	Moscow Sl	Frankfurt I	1345	1500	6	4	560.0	202001
Korean Air	Moscow Sl	Frankfurt I	1345	1500	23	9	935.1	201904
Korean Air	Vienna Int	Frankfurt I	1325	1455	4	5	700.0	202001
LATAM Ca	Amsterdar	Frankfurt I	1610	1820	6	5	500.0	201906
Lufthansa (	Almaty	Frankfurt I	0950	1320	1 4 6	12	1,020.0	201907
Lufthansa (	Atlanta Ha	Frankfurt I	1720	0740	3	2	207.8	201902
Lufthansa (	Beijing Cap	Frankfurt I	0250	0710	6	4	415.6	201905
Lufthansa (	Beijing Cap	Frankfurt I	0320	0740	1 3 5	13	1,350.7	201904
Lufthansa (	Beijing Cap	Frankfurt I	0320	0740	1 3 5	10	1,039.0	201910
Lufthansa (	Beijing Cap	Frankfurt I	0655	1025	3	1	103.9	201902
Lufthansa (	Buenos Air	Frankfurt I	0115	1940	4	4	415.6	201904
Lufthansa (	Buenos Air	Frankfurt I	2115	1540	6	2	207.8	201910
Lufthansa (	Cairo Inter	Frankfurt I	0530	0950	3	4	340.0	201905
Lufthansa (	Cairo Inter	Frankfurt I	0530	0950	3	3	255.0	201908
Lufthansa (	Dakar Blais	Frankfurt I	0240	0940	4	3	255.0	201903
Lufthansa (	Dakar Blais	Frankfurt I	1315	2115	3	1	85.0	201904
Lufthansa (	Dakar Blais	Frankfurt I	2130	0530	1	3	292.8	201910
Lufthansa (	Dallas Dall	Frankfurt I	0225	1845	3	4	340.0	201902
Lufthansa (	Frankfurt I	Atlanta Ha	1035	1415	3	4	415.6	201909
Lufthansa (	Frankfurt I	Atlanta Ha	1055	1550	3	3	311.7	201903
Lufthansa (	Frankfurt I	Atlanta Ha	1345	1740	7	3	255.0	201902
Lufthansa (	Frankfurt I	Beijing Cap	0905	0140	5	2	207.8	201902
Lufthansa (	Frankfurt I	Bengaluru	1230	0055	6	5	425.0	201906
Lufthansa (	Frankfurt I	Tel Aviv-ya	1610	2105	2 4 6	11	935.0	201906
Lufthansa (	Frankfurt I	Tel Aviv-ya	1610	2105	2 4 6	12	1,020.0	201909
Lufthansa (	Frankfurt I	Tokyo Nari	2110	1655	2	4	415.6	201903
Lufthansa (	Frankfurt I	Tokyo Nari	2115	1655	7	4	415.6	201902
Lufthansa (	Guadalajar	Frankfurt I	0100	2020	7	1	103.9	201904
Lufthansa (	Guadalajar	Frankfurt I	0200	2020	7	4	415.6	201905
Lufthansa (	Houston G	Frankfurt I	1955	1245	2	4	340.0	201910
Lufthansa (	Hyderabad	Frankfurt I	1055	1645	2 6	9	765.0	201904
Lufthansa (	Hyderabad	Frankfurt I	1120	1710	4	5	425.0	201905

Lufthansa (	Istanbul At	Frankfurt I	0330	0530	3 5 7	12	1,020.0	201908
Lufthansa (	Los Angele	Frankfurt I	0150	2050	1	3	255.0	201903
Lufthansa (	Los Angele	Frankfurt I	1730	1320	5	4	340.0	201910
Lufthansa (	Los Angele	Frankfurt I	2050	1700	6	1	85.0	201903
Lufthansa (	Mumbai	Frankfurt I	0735	1235	1	5	425.0	201904
Lufthansa (	Mumbai	Frankfurt I	0735	1235	1	3	255.0	201910
Lufthansa (	New York J	Frankfurt I	0005	1330	1	1	85.0	201902
Lufthansa (	Novosibirs	Frankfurt I	0410	0530	7	5	425.0	201906
Lufthansa (	Novosibirs	Frankfurt I	0410	0530	6	4	340.0	201909
Lufthansa (	Novosibirs	Frankfurt I	0410	0530	4	3	255.0	201906
Lufthansa (	Novosibirs	Frankfurt I	0410	0530	3	4	340.0	201908
Lufthansa (	Sao Paulo '	Frankfurt I	0035	1750	3	1	103.9	201910
Lufthansa (	Shanghai P	Frankfurt I	0820	1350	2 7	9	935.1	201907
Lufthansa (	Shanghai P	Frankfurt I	0935	1435	2 7	5	519.5	201902
Qatar Airw	Doha	Frankfurt I	0720	1240	1	4	415.6	201902
Qatar Airw	Doha	Frankfurt I	0720	1240	1	4	415.6	202002
Qatar Airw	Doha	Frankfurt I	1225	1745	2	4	415.6	202002
Qatar Airw	Doha	Frankfurt I	1310	1830	6	4	415.6	201910
Qatar Airw	Doha	Frankfurt I	1355	1915	7	5	519.5	201906
Qatar Airw	Frankfurt I	Doha	1735	0025	4	5	519.5	201905
Qatar Airw	Frankfurt I	Doha	1735	0025	4	5	519.5	201908
Qatar Airw	Frankfurt I	Doha	1945	0235	2	4	415.6	201909
Qatar Airw	Frankfurt I	Doha	2020	0320	3	4	260.0	201903
Qatar Airw	Frankfurt I	Doha	2020	0320	3	4	260.0	201906
Saudi Arab	Frankfurt I	Jeddah	2020	0250	3	4	440.0	201902
Saudi Arab	Frankfurt I	Jeddah	2020	0250	3	4	440.0	202002
Saudi Arab	Frankfurt I	Riyadh Kin	1940	0315	1	4	400.0	201905
Saudi Arab	Riyadh Kin	Frankfurt I	0910	1420	5	5	550.0	201908
Saudi Arab	Riyadh Kin	Frankfurt I	0910	1420	5	5	550.0	202001
Turkish Air	Frankfurt I	Istanbul At	0815	1215	4	4	260.0	201907
Turkish Air	Frankfurt I	Istanbul At	1315	1815	5	4	260.0	201902
Turkish Air	Istanbul At	Frankfurt I	0430	0630	4	4	260.0	201907
Turkish Air	Istanbul At	Frankfurt I	0430	0630	23 5	12	481.2	201902
Turkish Air	Istanbul At	Frankfurt I	0430	0630	23 5	14	561.4	201905
Turkish Air	Istanbul At	Frankfurt I	1615	1815	7	4	260.0	201902
Emirates	Dubai Al M	Frankfurt I	1055	1445	4	4	412.0	201912
Emirates	Dubai Al M	Frankfurt I	1055	1445	4	4	412.0	202002
Emirates	Dubai Al M	Frankfurt I	1240	1630	4	4	412.0	201904
Emirates	Dubai Al M	Frankfurt I	1240	1630	4	5	515.0	201910
Emirates	Dubai Al M	Frankfurt I	1320	1710	5	4	412.0	201910
Emirates	Frankfurt I	Dubai Al M	0830	1735	7	4	412.0	201902
Emirates	Frankfurt I	Dubai Al M	0930	1735	7	4	412.0	201905
Emirates	Frankfurt I	Dubai Al M	1940	0445	4	4	412.0	201904
Emirates	Frankfurt I	Dubai Al M	1940	0445	4	4	412.0	201907
Emirates	Frankfurt I	Mexico Cit	1810	2325	4	4	412.0	201912
Emirates	Frankfurt I	Mexico Cit	1810	2325	4	4	412.0	202002
Emirates	Frankfurt I	Mexico Cit	2125	0140	7	4	412.0	201911

Emirates	Maastricht	Frankfurt I	0815	0930	3	5	515.0	202001
Iberia	Frankfurt I	Madrid Ad	1715	1945	3	4	205.6	201904
Iberia	Madrid Ad	Frankfurt I	1620	1840	6	5	257.0	201903
Iberia	Madrid Ad	Frankfurt I	1725	2005	3	4	205.6	201911
Korean Air	Frankfurt I	Seoul Inch	0900	0330	1	4	415.6	201905
Korean Air	Frankfurt I	Seoul Inch	1735	1205	4	4	560.0	201904
Korean Air	Frankfurt I	Seoul Inch	1735	1205	4	4	560.0	201907
Korean Air	Frankfurt I	Seoul Inch	1735	1205	23	9	935.1	201912
LATAM Ca	Frankfurt I	Sao Paulo '	1940	0335	3	4	400.0	202002
Lufthansa (	Atlanta Ha	Frankfurt I	0200	1630	67	5	519.5	201902
Lufthansa (	Atlanta Ha	Frankfurt I	0255	1640	1	3	255.0	201903
Lufthansa (	Atlanta Ha	Frankfurt I	1645	0730	3	5	519.5	201905
Lufthansa (	Beijing Cap	Frankfurt I	0320	0740	1 3 5	14	1,454.6	201907
Lufthansa (	Buenos Air	Frankfurt I	2115	1540	6	3	311.7	201904
Lufthansa (	Cairo Inter	Frankfurt I	0600	1015	1	5	425.0	201907
Lufthansa (	Chicago O'	Frankfurt I	0145	1705	234	14	1,190.0	201907
Lufthansa (	Dakar Blais	Frankfurt I	0100	0900	6	4	415.6	201910
Lufthansa (	Dakar Blais	Frankfurt I	2130	0530	1	5	519.5	201907
Lufthansa (	Dallas Dall	Frankfurt I	0525	2150	2	5	519.5	201907
Lufthansa (	Dallas Dall	Frankfurt I	0605	2230	6	4	415.6	201906
Lufthansa (	Dallas Dall	Frankfurt I	0605	2230	6	4	415.6	201909
Lufthansa (	Frankfurt I	Ashgabat	0445	1305	6	5	425.0	201906
Lufthansa (	Frankfurt I	Atlanta Ha	1830	2225	4	3	255.0	201902
Lufthansa (	Frankfurt I	Beijing Cap	1030	0305	4 7	1	103.9	201902
Lufthansa (	Frankfurt I	Bengaluru	1335	0200	3	4	340.0	201906
Lufthansa (	Frankfurt I	Cairo Inter	2110	0155	7	4	340.0	201902
Lufthansa (	Frankfurt I	Chengdu	0935	0110	1 6	9	935.1	201906
Lufthansa (	Frankfurt I	Chengdu	1045	0305	1 6	5	519.5	201902
Lufthansa (	Frankfurt I	Chicago O'	1335	1605	4	5	425.0	201905
Lufthansa (	Frankfurt I	Curitiba Af	0650	1430	7	4	415.6	201908
Lufthansa (	Frankfurt I	Johannesb	0540	1625	6	4	340.0	201909
Lufthansa (	Frankfurt I	Los Angele	1230	1530	3	4	340.0	201904
Lufthansa (	Frankfurt I	Los Angele	1450	1755	6	2	170.0	201903
Lufthansa (	Frankfurt I	Mexico Cit	1425	2020	6	5	519.5	201908
Lufthansa (	Frankfurt I	Mumbai	1730	0505	7	3	255.0	201910
Lufthansa (	Frankfurt I	Riyadh Kin	1345	2025	7	4	340.0	201905
Lufthansa (	Frankfurt I	Sao Paulo '	0445	1155	6	3	311.7	201910
Lufthansa (	Frankfurt I	Sao Paulo '	2040	0350	7	4	415.6	201904
Lufthansa (	Frankfurt I	Sao Paulo '	2210	0725	6	2	207.8	201902
Lufthansa (	Frankfurt I	Shanghai P	0820	0105	1 3	9	935.1	201905
Lufthansa (	Frankfurt I	Tokyo Nari	2115	1655	4 6	9	935.1	201903
Lufthansa (	Frankfurt I	Toronto Le	1110	1335	2	5	425.0	201904
Cathay Pac	Frankfurt I	Dubai Al M	1925	0445	6	4	432.0	201902
Cathay Pac	Frankfurt I	Milan Malp	1230	1355	1	4	432.0	201902
Cathay Pac	Frankfurt I	Paris Charl	0840	1010	4	4	560.0	201912
China Sout	Frankfurt I	Shanghai P	1520	0650	2 5 7	13	1,300.0	201908
China Sout	Guangzhou	Frankfurt I	0100	0600	7	5	500.0	201903

China Sout	Guangzhou	Frankfurt I	0555	1220	1	4	400.0	201905
China Sout	Guangzhou	Frankfurt I	0555	1220	1	4	400.0	201908
China Sout	Guangzhou	Frankfurt I	0555	1220	1	4	400.0	202001
China Sout	London Sta	Frankfurt I	0835	1035	2	4	400.0	201911
China Sout	London Sta	Frankfurt I	0835	1055	4 6	9	900.0	201906
China Sout	Shanghai P	Frankfurt I	0650	1220	2 5 7	13	1,300.0	202001
Emirates	Dubai Al M	Frankfurt I	0140	0630	7	4	412.0	201905
Emirates	Dubai Al M	Frankfurt I	0140	0630	7	4	412.0	201908
Emirates	Dubai Al M	Frankfurt I	1055	1445	4	4	412.0	201904
Emirates	Dubai Al M	Frankfurt I	1240	1630	4	4	412.0	202002
Emirates	Dubai Al M	Frankfurt I	1240	1730	7	4	412.0	202002
Emirates	Dubai Al M	Frankfurt I	1320	1710	5	5	515.0	201905
Emirates	Dubai Al M	Frankfurt I	1320	1710	5	4	412.0	202002
Emirates	Frankfurt I	Dubai Al M	0930	1735	7	4	412.0	201910
Emirates	Frankfurt I	Dubai Al M	1355	2300	6	4	412.0	201905
Emirates	Frankfurt I	Dubai Al M	1940	0445	4	4	412.0	202002
Emirates	Maastricht	Frankfurt I	0815	0930	3	4	412.0	201903
Emirates	Maastricht	Frankfurt I	0815	0930	3	4	412.0	202002
Etihad Airv	Frankfurt I	Barbados	0850	1200	4	4	415.6	202002
Etihad Airv	Frankfurt I	Barbados	1020	1330	6	4	415.6	201910
Iberia	Frankfurt I	Madrid Ad	2020	2300	6	5	257.0	201903
Iberia	Frankfurt I	Madrid Ad	2030	2250	45	8	360.0	201909
Iberia	Madrid Ad	Frankfurt I	1620	1840	6	5	257.0	201911
Iberia	Madrid Ad	Frankfurt I	1725	2005	3	4	205.6	201903
Korean Air	Frankfurt I	Seoul Inch	1735	1205	4	4	560.0	201909
Korean Air	Frankfurt I	Seoul Inch	1735	1205	4	4	560.0	201912
Korean Air	Frankfurt I	Seoul Inch	1735	1205	23	8	831.2	201911
Korean Air	Frankfurt I	Seoul Inch	1735	1205	23	9	935.1	202001
Korean Air	Moscow Sh	Frankfurt I	0520	0635	1	4	415.6	201905
Korean Air	Moscow Sh	Frankfurt I	0520	0635	1	4	415.6	201908
Korean Air	Moscow Sh	Frankfurt I	1340	1455	5	4	415.6	201907
Korean Air	Moscow Sh	Frankfurt I	1345	1500	23	9	935.1	201912
Korean Air	Vienna Inte	Frankfurt I	1325	1455	4	4	560.0	201903
LATAM Ca	Amsterdar	Frankfurt I	1610	1820	7	4	400.0	201907
LATAM Ca	Amsterdar	Frankfurt I	1610	1820	7	4	400.0	201910
LATAM Ca	Frankfurt I	Sao Paulo '	1940	0335	3	4	400.0	201904
Lufthansa (	Almaty	Frankfurt I	0950	1220	7	1	85.0	201910
Lufthansa (	Almaty	Frankfurt I	0950	1320	1 6	3	255.0	201908
Lufthansa (	Almaty	Frankfurt I	0950	1320	1 4 6	13	1,105.0	201906
Lufthansa (	Atlanta Ha	Frankfurt I	1645	0730	3	4	415.6	201904
Lufthansa (	Atlanta Ha	Frankfurt I	1645	0730	3	4	415.6	201910
Lufthansa (	Atlanta Ha	Frankfurt I	2225	1310	6	5	425.0	201906
Lufthansa (	Beijing Cap	Frankfurt I	0250	0710	6	4	415.6	201907
Lufthansa (	Chicago O'	Frankfurt I	0145	1705	234	14	1,190.0	201905
Lufthansa (	Chicago O'	Frankfurt I	0145	1705	234	13	1,105.0	201908
Lufthansa (	Chicago O'	Frankfurt I	1420	0525	1	1	85.0	201902
Lufthansa (	Chicago O'	Frankfurt I	2215	1220	6	2	207.8	201903

Lufthansa (	Dakar Blais	Frankfurt I	0100	0900	6	4	415.6	201905
Lufthansa (	Dakar Blais	Frankfurt I	0100	0900	6	5	519.5	201908
Lufthansa (	Dakar Blais	Frankfurt I	2315	0715	1	1	85.0	201904
Lufthansa (	Frankfurt I	Almaty	0635	1805	7	3	255.0	201902
Lufthansa (	Frankfurt I	Bengaluru	1230	0055	6	3	255.0	201909
Lufthansa (	Frankfurt I	Cairo Inter	2110	0055	7	1	85.0	201903
Lufthansa (	Frankfurt I	Chicago O'	1135	1420	2	4	340.0	201902
Lufthansa (	Frankfurt I	Chicago O'	1135	1520	2	3	255.0	201903
Lufthansa (	Frankfurt I	Chicago O'	1335	1605	4	5	425.0	201908
Lufthansa (	Frankfurt I	Chicago O'	1420	1735	2	3	255.0	201903
Lufthansa (	Frankfurt I	Chicago O'	1710	1955	1	1	103.9	201902
Lufthansa (	Frankfurt I	Curitiba Af	0650	1430	7	4	415.6	201904
Lufthansa (	Frankfurt I	Dakar Blais	0930	1340	2	1	85.0	201904
Lufthansa (	Frankfurt I	Dakar Blais	0930	1340	2	1	85.0	201910
Lufthansa (	Frankfurt I	Dakar Blais	2205	0215	7	1	85.0	201910
Lufthansa (	Frankfurt I	Dallas Dall	1155	1600	3	4	340.0	201902
Lufthansa (	Frankfurt I	Kuwait	1620	2255	4	4	340.0	201907
Lufthansa (	Frankfurt I	Los Angele	1230	1530	3	5	425.0	201907
Lufthansa (	Frankfurt I	Los Angele	1520	1820	6	4	340.0	201909
Lufthansa (	Frankfurt I	Mexico Cit	1525	2120	3	1	103.9	201905
Lufthansa (	Frankfurt I	Mumbai	1730	0505	7	4	340.0	201904
Lufthansa (	Frankfurt I	Mumbai	1730	0505	7	4	340.0	201907
Lufthansa (	Frankfurt I	New York J	1950	2225	3	3	255.0	201902
Lufthansa (	Frankfurt I	Riyadh Kin	1345	2025	7	4	340.0	201908
Lufthansa (	Frankfurt I	Sao Paulo '	2040	0350	7	2	207.8	201910
Lufthansa (	Frankfurt I	Sao Paulo '	2210	0625	6	2	207.8	201902
Lufthansa (	Frankfurt I	Seattle-Ta	0845	1010	5	4	340.0	201906
Lufthansa (	Frankfurt I	Shanghai P	0915	0200	4 6	9	935.1	201906
Lufthansa (	Frankfurt I	Shanghai P	1335	0720	2345 7	21	2,181.9	201903
Lufthansa (	Frankfurt I	Tokyo Nari	2230	1700	2 4	8	831.2	201906
Lufthansa (	Frankfurt I	Tokyo Nari	2230	1700	1 3 5 7	18	1,870.2	201907
Lufthansa (	Frankfurt I	Toronto Le	1110	1335	2	5	425.0	201907
Lufthansa (	Frankfurt I	Toronto Le	1110	1335	2	4	340.0	201910
Lufthansa (	Guadalajar	Frankfurt I	0410	2230	45	6	623.4	201904
Lufthansa (	Guadalajar	Frankfurt I	0410	2230	45	8	831.2	201907
Lufthansa (	Los Angele	Frankfurt I	1730	1320	5	3	255.0	201907
Lufthansa (	Los Angele	Frankfurt I	1800	1350	3	4	340.0	201902
Lufthansa (	Los Angele	Frankfurt I	2050	1700	6	4	340.0	201909
Lufthansa (	Mumbai	Frankfurt I	0735	1235	1	4	340.0	201908
Lufthansa (	New York J	Frankfurt I	0110	1440	5	5	425.0	201905
Lufthansa (	New York J	Frankfurt I	0130	1455	6	4	340.0	201907
Lufthansa (	New York J	Frankfurt I	0130	1500	3	5	425.0	201907
Lufthansa (	New York J	Frankfurt I	0305	1635	4	4	340.0	201906
Lufthansa (	Novosibirs	Frankfurt I	0410	0530	6	5	425.0	201908
Lufthansa (	Novosibirs	Frankfurt I	0410	0530	3	4	340.0	201907
Lufthansa (	Sao Paulo '	Frankfurt I	1955	1310	7	5	519.5	201906
Lufthansa (	Seoul Inch	Frankfurt I	0205	0620	1 4 6	11	1,142.9	201910

Lufthansa (	Shanghai P	Frankfurt I	0530	1030	5 7	9	935.1	201903
Lufthansa (	Shanghai P	Frankfurt I	0820	1350	1 3456	23	2,389.7	201905
Qatar Airw	Doha	Frankfurt I	1225	1745	2	4	415.6	202001
Qatar Airw	Doha	Frankfurt I	1310	1830	5	5	519.5	202001
Qatar Airw	Doha	Frankfurt I	1355	1915	7	4	415.6	201902
Qatar Airw	Doha	Frankfurt I	1355	1915	7	4	415.6	201908
Qatar Airw	Frankfurt I	Doha	1735	0025	4	4	415.6	201907
Qatar Airw	Frankfurt I	Doha	2020	0320	3	4	260.0	201904
Qatar Airw	Frankfurt I	Doha	2020	0320	3	5	325.0	201907
Saudi Arab	Dammam	Frankfurt I	0135	0610	6	4	400.0	201907
Saudi Arab	Frankfurt I	Jeddah	0705	1420	4	5	500.0	201905
China Sout	Guangzhou	Frankfurt I	0555	1240	5	4	400.0	201910
China Sout	London Sta	Frankfurt I	0835	1055	4 6	8	800.0	201902
China Sout	Shanghai P	Frankfurt I	0650	1220	1 4 6	13	1,300.0	201905
China Sout	Shanghai P	Frankfurt I	0650	1220	1 4 6	13	1,300.0	201912
Emirates	Dubai Al M	Frankfurt I	0140	0630	7	4	412.0	201907
Emirates	Frankfurt I	Dubai Al M	0930	1735	7	5	515.0	201909
Emirates	Frankfurt I	Dubai Al M	1355	2300	6	5	515.0	201911
Emirates	Frankfurt I	Dubai Al M	1940	0445	4	5	515.0	201910
Emirates	Frankfurt I	Dubai Al M	2010	0515	5	5	515.0	201911
Emirates	Frankfurt I	Dubai Al M	2010	0515	5	5	515.0	202001
Emirates	Frankfurt I	Mexico Cit	2025	0140	7	4	412.0	201902
Emirates	Frankfurt I	Mexico Cit	2125	0140	7	5	515.0	201912
Emirates	Frankfurt I	Mexico Cit	2125	0140	7	4	412.0	202002
Emirates	Maastricht	Frankfurt I	0815	0930	3	5	515.0	201910
Emirates	Maastricht	Frankfurt I	1040	1155	6	4	412.0	201904
Etihad Airv	Abu Dhabi	Frankfurt I	0235	0730	6	5	519.5	201908
Etihad Airv	Abu Dhabi	Frankfurt I	0235	0730	6	4	415.6	202001
Etihad Airv	Frankfurt I	Barbados	0850	1200	4	4	415.6	201903
Etihad Airv	Frankfurt I	Barbados	1020	1330	6	5	519.5	201911
Iberia	Madrid Ad	Frankfurt I	1620	1840	6	4	205.6	201909
Iberia	Madrid Ad	Frankfurt I	1620	1955	45	8	360.0	201902
Iberia	Madrid Ad	Frankfurt I	1620	1955	45	8	360.0	201912
Iberia	Madrid Ad	Frankfurt I	1725	2005	3	4	205.6	201912
Korean Air	Frankfurt I	Seoul Inch	0900	0330	1	4	415.6	201906
Korean Air	Frankfurt I	Seoul Inch	1725	1055	2 5 7	5	519.5	201902
Korean Air	Frankfurt I	Seoul Inch	1735	1205	6	5	700.0	201903
Korean Air	Moscow Sł	Frankfurt I	0520	0635	1	4	415.6	201910
Korean Air	Moscow Sł	Frankfurt I	1345	1500	23 7	2	207.8	201902
LATAM Ca	Frankfurt I	Sao Paulo '	1920	0325	7	4	400.0	201910
LATAM Ca	Frankfurt I	Sao Paulo '	1920	0325	6	5	500.0	202002
Lufthansa (	Almaty	Frankfurt I	0950	1320	7	5	425.0	201909
Lufthansa (	Beijing Cap	Frankfurt I	0250	0710	6	5	519.5	201908
Lufthansa (	Beijing Cap	Frankfurt I	0525	0855	1 5	5	519.5	201903
Lufthansa (	Beijing Cap	Frankfurt I	0525	0855	1 3 5	5	519.5	201903
Lufthansa (	Buenos Air	Frankfurt I	0115	1940	4	5	519.5	201908
Lufthansa (	Cairo Inter	Frankfurt I	0600	1015	1	4	340.0	201906

Lufthansa (	Cairo Inter	Frankfurt I	0600	1015	1	5	425.0	201909
Lufthansa (	Dakar Blais	Frankfurt I	0630	1430	1	1	85.0	201909
Lufthansa (	Dallas Dall	Frankfurt I	0325	1845	3	3	255.0	201903
Lufthansa (	Dallas Dall	Frankfurt I	0605	2230	6	3	311.7	201910
Lufthansa (	Dallas Dall	Frankfurt I	1310	0530	6	4	340.0	201902
Lufthansa (	Frankfurt I	Almaty	0730	1830	5 7	1	85.0	201909
Lufthansa (	Frankfurt I	Atlanta Ha	1520	1905	6	1	85.0	201910
Lufthansa (	Frankfurt I	Atlanta Ha	1530	1915	2	4	340.0	201908
Lufthansa (	Frankfurt I	Atlanta Ha	1930	0025	7	3	255.0	201903
Lufthansa (	Frankfurt I	Bengaluru	1335	0200	3	3	255.0	201909
Lufthansa (	Frankfurt I	Cairo Inter	2110	0055	7	4	340.0	201904
Lufthansa (	Frankfurt I	Chicago O'	1350	1605	6	4	340.0	201902
Lufthansa (	Frankfurt I	Chicago O'	1540	1855	4	3	255.0	201903
Lufthansa (	Frankfurt I	Chicago O'	2030	2315	1	1	85.0	201903
Lufthansa (	Frankfurt I	Curitiba Af	0650	1430	7	4	415.6	201907
Lufthansa (	Frankfurt I	Dakar Blais	0445	0855	6	1	85.0	201906
Lufthansa (	Frankfurt I	Dallas Dall	1530	2035	5	3	255.0	201903
Lufthansa (	Frankfurt I	Dammam	1425	2110	1	4	340.0	201906
Lufthansa (	Frankfurt I	Dammam	1425	2110	1	5	425.0	201909
China Sout	Frankfurt I	Guangzhou	0900	0245	7	4	400.0	201910
China Sout	Frankfurt I	Guangzhou	1440	0815	7	4	400.0	201908
China Sout	Guangzhou	Frankfurt I	0555	1220	1	4	400.0	201902
China Sout	Guangzhou	Frankfurt I	0555	1220	1	5	500.0	201912
China Sout	Guangzhou	Frankfurt I	0555	1220	1	4	400.0	202002
China Sout	Guangzhou	Frankfurt I	0555	1240	5	4	400.0	201912
China Sout	London Sta	Frankfurt I	0835	1035	2	4	400.0	201902
China Sout	London Sta	Frankfurt I	0835	1055	4 6	9	900.0	201910
China Sout	Shanghai P	Frankfurt I	0650	1220	2 5 7	13	1,300.0	201904
Emirates	Dubai Al M	Frankfurt I	0140	0630	7	5	515.0	201906
Emirates	Dubai Al M	Frankfurt I	1240	1630	4	5	515.0	201908
Emirates	Frankfurt I	Dubai Al M	0930	1735	7	4	412.0	201904
Emirates	Frankfurt I	Dubai Al M	1355	2300	6	5	515.0	201903
Emirates	Frankfurt I	Dubai Al M	1500	0005	3	5	515.0	201905
Emirates	Frankfurt I	Dubai Al M	1940	0445	4	5	515.0	201905
Emirates	Frankfurt I	Dubai Al M	1940	0445	4	5	515.0	201908
Emirates	Frankfurt I	Mexico Cit	1810	2325	4	5	515.0	201908
Emirates	Frankfurt I	Mexico Cit	1810	2325	4	5	515.0	202001
Etihad Airv	Frankfurt I	Barbados	0850	1200	4	4	415.6	201911
Iberia	Frankfurt I	Madrid Ad	2020	2300	6	4	205.6	201910
Iberia	Frankfurt I	Madrid Ad	2030	2250	45	10	450.0	201905
Iberia	Madrid Ad	Frankfurt I	1725	2005	3	5	257.0	201907
Korean Air	Frankfurt I	Seoul Inch	1735	1205	23	8	831.2	201908
Korean Air	Moscow Sl	Frankfurt I	1340	1455	5	4	415.6	201909
Korean Air	Moscow Sl	Frankfurt I	1345	1500	23	8	831.2	201911
Korean Air	Vienna Int	Frankfurt I	1325	1455	4	4	560.0	201906
LATAM Ca	Amsterdar	Frankfurt I	1610	1820	7	5	500.0	201909
LATAM Ca	Amsterdar	Frankfurt I	1630	1840	3	4	400.0	201912

LATAM Ca	Amsterdar	Frankfurt I	1630	1840	3	4	400.0	202002
LATAM Ca	Frankfurt I	Sao Paulo '	1920	0325	7	4	400.0	201902
LATAM Ca	Frankfurt I	Sao Paulo '	1920	0325	7	4	400.0	201905
LATAM Ca	Frankfurt I	Sao Paulo '	1920	0325	7	4	400.0	201908
LATAM Ca	Frankfurt I	Sao Paulo '	1920	0325	7	4	400.0	201911
Lufthansa (	Almaty	Frankfurt I	0245	0630	7	1	85.0	201903
Lufthansa (	Almaty	Frankfurt I	0950	1320	1 4 6	12	1,020.0	201905
Lufthansa (	Almaty	Frankfurt I	0950	1320	1 4 6	9	765.0	201908
Lufthansa (	Atlanta Ha	Frankfurt I	0055	1540	5	1	85.0	201903
Lufthansa (	Atlanta Ha	Frankfurt I	1645	0730	3	4	415.6	201909
Lufthansa (	Atlanta Ha	Frankfurt I	1720	0745	3	2	207.8	201902
Lufthansa (	Atlanta Ha	Frankfurt I	2225	1310	6	3	255.0	201909
Lufthansa (	Beijing Cap	Frankfurt I	0250	0710	6	5	519.5	201906
Lufthansa (	Beijing Cap	Frankfurt I	0250	0710	6	4	415.6	201909
Lufthansa (	Frankfurt I	Bengaluru	1230	0055	6	4	340.0	201905
Lufthansa (	Frankfurt I	Chengdu	0935	0110	1 6	7	727.3	201910
Lufthansa (	Frankfurt I	Chicago O'	1830	2045	6	1	85.0	201902
Lufthansa (	Frankfurt I	Chicago O'	2040	2325	5	1	85.0	201903
Lufthansa (	Frankfurt I	Curitiba Af	0650	1430	7	4	415.6	201905
Lufthansa (	Frankfurt I	Dakar Blais	0450	0900	7	1	85.0	201909
Lufthansa (	Frankfurt I	Dakar Blais	0930	1340	2	1	85.0	201906
Lufthansa (	Frankfurt I	Los Angele	1230	1530	3	5	425.0	201905
Lufthansa (	Frankfurt I	Los Angele	1520	1820	6	4	340.0	201910
Lufthansa (	Frankfurt I	Mexico Cit	1325	1920	6	1	103.9	201903
Lufthansa (	Frankfurt I	Mexico Cit	1735	2330	4	3	311.7	201904
Lufthansa (	Frankfurt I	Mexico Cit	1745	2330	1	4	415.6	201905
Lufthansa (	Frankfurt I	Mexico Cit	1745	2330	1	4	415.6	201908
Lufthansa (	Frankfurt I	Mumbai	1735	0605	1	4	340.0	201902
China Sout	London Sta	Frankfurt I	0835	1035	2	4	400.0	201905
China Sout	London Sta	Frankfurt I	0835	1035	2	4	400.0	201908
China Sout	London Sta	Frankfurt I	0835	1055	4 6	9	900.0	202002
China Sout	Shanghai P	Frankfurt I	0650	1220	1 4 6	14	1,400.0	201908
Emirates	Dubai Al M	Frankfurt I	1240	1630	4	5	515.0	201905
Emirates	Frankfurt I	Dubai Al M	0930	1735	7	1	103.0	201903
Emirates	Frankfurt I	Dubai Al M	1355	2300	6	4	412.0	201912
Emirates	Frankfurt I	Dubai Al M	1500	0005	3	4	412.0	201903
Emirates	Frankfurt I	Dubai Al M	1500	0005	3	4	412.0	201912
Emirates	Frankfurt I	Dubai Al M	1500	0005	3	4	412.0	202002
Etihad Airv	Abu Dhabi	Frankfurt I	0105	0600	4	5	519.5	202001
Etihad Airv	Frankfurt I	Barbados	1020	1330	6	4	415.6	201904
Iberia	Frankfurt I	Madrid Ad	1715	1945	3	4	205.6	201906
Iberia	Frankfurt I	Madrid Ad	1715	1945	3	4	205.6	201909
Iberia	Frankfurt I	Madrid Ad	1715	1945	3	4	205.6	201912
Iberia	Frankfurt I	Madrid Ad	1715	1945	3	4	205.6	202002
Iberia	Madrid Ad	Frankfurt I	1620	1955	45	9	405.0	201903
Iberia	Madrid Ad	Frankfurt I	1725	2005	3	4	205.6	201906
Korean Air	Frankfurt I	Seoul Inch	0820	0150	1	1	103.9	201902

Korean Air	Frankfurt I	Seoul Inch	0900	0330	1	4	415.6	201903
Korean Air	Frankfurt I	Seoul Inch	1735	1205	4	3	420.0	201902
Korean Air	Frankfurt I	Seoul Inch	1735	1205	23	9	935.1	201904
Korean Air	Moscow Sl	Frankfurt I	0520	0635	1	4	415.6	201911
LATAM Ca	Amsterdar	Frankfurt I	1630	1840	3	5	500.0	201905
LATAM Ca	Frankfurt I	Sao Paulo '	1920	0325	7	4	400.0	202002
Lufthansa (	Almaty	Frankfurt I	0950	1320	1 4 6	12	1,020.0	201909
Lufthansa (	Beijing Cap	Frankfurt I	0250	0710	6	4	415.6	201904
Lufthansa (	Beijing Cap	Frankfurt I	0250	0710	6	3	311.7	201910
Lufthansa (	Beijing Cap	Frankfurt I	0320	0740	1 3 5	13	1,350.7	201909
Lufthansa (	Chicago O'	Frankfurt I	0200	1705	6	1	85.0	201903
Lufthansa (	Dakar Blais	Frankfurt I	1040	1840	3	1	85.0	201910
Lufthansa (	Dallas Dall	Frankfurt I	0525	2150	2	3	311.7	201905
Lufthansa (	Dallas Dall	Frankfurt I	0605	2230	6	5	519.5	201908
Lufthansa (	Dallas Dall	Frankfurt I	0630	2150	4	3	255.0	201903
Lufthansa (	Dallas Dall	Frankfurt I	2230	1500	4	4	340.0	201910
Lufthansa (	Frankfurt I	Atlanta Ha	1520	1905	6	1	85.0	201909
Lufthansa (	Frankfurt I	Beijing Cap	1030	0305	2 4	2	207.8	201902
Lufthansa (	Frankfurt I	Bengaluru	1230	0055	6	4	340.0	201904
Lufthansa (	Frankfurt I	Cairo Inter	2050	0045	2	5	425.0	201904
Lufthansa (	Frankfurt I	Cairo Inter	2050	0045	2	5	425.0	201907
Lufthansa (	Frankfurt I	Cairo Inter	2050	0045	2	4	340.0	201910
Lufthansa (	Frankfurt I	Cairo Inter	2105	0100	5	5	425.0	201905
Lufthansa (	Frankfurt I	Cairo Inter	2110	0055	7	4	340.0	201908
Lufthansa (	Frankfurt I	Chengdu	0935	0110	1 6	9	935.1	201904
Lufthansa (	Frankfurt I	Chengdu	0935	0110	1 6	9	935.1	201907
Lufthansa (	Frankfurt I	Chicago O'	1555	1940	6	3	292.8	201903
Lufthansa (	Frankfurt I	Chicago O'	2045	2315	123	15	1,275.0	201907
Lufthansa (	Frankfurt I	Curitiba Af	0650	1430	7	1	103.9	201903
Lufthansa (	Frankfurt I	Curitiba Af	0650	1430	7	4	415.6	201909
Lufthansa (	Frankfurt I	Johannesb	0540	1625	6	4	340.0	201904
Lufthansa (	Frankfurt I	Johannesb	0555	1640	2	2	170.0	201905
Lufthansa (	Frankfurt I	Los Angele	1230	1530	3	4	340.0	201906
Lufthansa (	Frankfurt I	Mexico Cit	1425	2020	6	4	415.6	201909
Lufthansa (	Frankfurt I	Mexico Cit	1700	2255	3	3	311.7	201904
Lufthansa (	Frankfurt I	Mexico Cit	1735	2330	4	5	519.5	201905
China Sout	Guangzhou	Frankfurt I	0555	1240	5	4	400.0	201907
China Sout	London Sta	Frankfurt I	0835	1035	2	5	500.0	201904
China Sout	London Sta	Frankfurt I	0835	1035	2	5	500.0	201907
China Sout	London Sta	Frankfurt I	0835	1055	4 6	9	900.0	201905
China Sout	Shanghai P	Frankfurt I	0650	1220	2 5 7	14	1,400.0	201912
Emirates	Dubai Al M	Frankfurt I	0140	0630	7	4	412.0	201904
Emirates	Dubai Al M	Frankfurt I	1055	1445	4	4	412.0	201911
Emirates	Dubai Al M	Frankfurt I	1240	1730	7	4	412.0	201908
Emirates	Dubai Al M	Frankfurt I	1240	1730	7	4	412.0	201911
Emirates	Dubai Al M	Frankfurt I	1320	1710	5	4	412.0	201906
Emirates	Dubai Al M	Frankfurt I	1320	1710	5	4	412.0	201909

Emirates	Frankfurt I	Dubai Al M	0930	1735	7	5	515.0	201912
Emirates	Frankfurt I	Dubai Al M	1500	0005	3	5	515.0	201907
Emirates	Frankfurt I	Dubai Al M	1500	0005	3	5	515.0	201910
Emirates	Frankfurt I	Mexico Cit	2125	0140	7	5	515.0	201906
Etihad Airv	Abu Dhabi	Frankfurt I	0105	0600	4	4	415.6	202002
Etihad Airv	Abu Dhabi	Frankfurt I	0235	0730	6	4	415.6	201905
Etihad Airv	Frankfurt I	Barbados	0850	1200	4	5	519.5	201910
Etihad Airv	Frankfurt I	Barbados	1020	1330	6	5	519.5	201908
Iberia	Madrid Ad	Frankfurt I	1620	1840	6	4	205.6	201912
Iberia	Madrid Ad	Frankfurt I	1725	2005	3	4	205.6	202002
Korean Air	Frankfurt I	Seoul Inch	0900	0330	1	5	519.5	201912
Korean Air	Moscow Sh	Frankfurt I	0520	0635	1	5	519.5	201907
Korean Air	Moscow Sh	Frankfurt I	1245	1455	2 5 7	5	519.5	201902
Korean Air	Moscow Sh	Frankfurt I	1345	1500	6	5	700.0	202002
Korean Air	Moscow Sh	Frankfurt I	1345	1500	3 7	2	207.8	201902
Korean Air	Moscow Sh	Frankfurt I	1345	1500	23	8	831.2	201909
LATAM Car	Amsterdar	Frankfurt I	1610	1820	7	4	400.0	201911
LATAM Car	Amsterdar	Frankfurt I	1610	1820	6	4	400.0	201907
LATAM Car	Frankfurt I	Sao Paulo '	1920	0325	6	5	500.0	201906
LATAM Car	Frankfurt I	Sao Paulo '	1920	0325	6	4	400.0	201912
Lufthansa (	Almaty	Frankfurt I	1840	2215	7	1	85.0	201903
Lufthansa (	Atlanta Ha	Frankfurt I	0205	1630	67	2	207.8	201902
Lufthansa (	Atlanta Ha	Frankfurt I	0400	1825	6	1	103.9	201902
Lufthansa (	Atlanta Ha	Frankfurt I	1645	0730	3	4	415.6	201908
Lufthansa (	Atlanta Ha	Frankfurt I	1820	0740	3	3	311.7	201903
Lufthansa (	Atlanta Ha	Frankfurt I	2225	1310	6	4	340.0	201907
Lufthansa (	Beijing Cap	Frankfurt I	0400	0730	6	5	519.5	201903
Lufthansa (	Buenos Air	Frankfurt I	0205	1950	6	5	519.5	201903
Lufthansa (	Chicago O'	Frankfurt I	0145	1705	234	13	1,105.0	201904
Lufthansa (	Chicago O'	Frankfurt I	1630	0750	7	1	85.0	201906
Lufthansa (	Dakar Blais	Frankfurt I	0110	0810	5	1	85.0	201903
Lufthansa (	Dakar Blais	Frankfurt I	1120	1920	4	1	85.0	201905
Lufthansa (	Dallas Dalla	Frankfurt I	0605	2230	6	4	415.6	201904
Lufthansa (	Dallas Dalla	Frankfurt I	0700	2220	5	3	255.0	201903
Lufthansa (	Dallas Dalla	Frankfurt I	2230	1500	4	4	340.0	201909
Lufthansa (	Frankfurt I	Atlanta Ha	0835	1230	5	1	103.9	201902
Lufthansa (	Frankfurt I	Atlanta Ha	1920	2325	56	2	207.8	201902
Lufthansa (	Frankfurt I	Beijing Cap	0905	0140	5	5	519.5	201903
Lufthansa (	Frankfurt I	Beijing Cap	0930	0100	5	4	415.6	201906
Lufthansa (	Frankfurt I	Beijing Cap	0930	0100	5	3	311.7	201910
Lufthansa (	Frankfurt I	Beijing Cap	1030	0305	4 7	4	415.6	201903
Lufthansa (	Frankfurt I	Bengaluru	0505	1830	2	3	255.0	201902
Lufthansa (	Frankfurt I	Cairo Inter	1910	0005	5	5	425.0	201903
Lufthansa (	Frankfurt I	Chengdu	0935	0110	1 6	9	935.1	201908
China Sout	Guangzhou	Frankfurt I	0555	1240	5	5	500.0	201905
China Sout	Shanghai P	Frankfurt I	0650	1220	1 4 6	13	1,300.0	201904
Emirates	Dubai Al M	Frankfurt I	1055	1445	4	4	412.0	201903

Emirates	Dubai Al M	Frankfurt I	1240	1630	4	4	412.0	201911
Emirates	Dubai Al M	Frankfurt I	1240	1730	7	4	412.0	201910
Emirates	Dubai Al M	Frankfurt I	1320	1710	5	5	515.0	201911
Emirates	Dubai Al M	Frankfurt I	1320	1710	5	5	515.0	202001
Emirates	Frankfurt I	Dubai Al M	1940	0445	4	4	412.0	201902
Emirates	Frankfurt I	Dubai Al M	2010	0515	5	4	412.0	201909
Emirates	Frankfurt I	Mexico Cit	2125	0140	7	4	412.0	201904
Emirates	Maastricht	Frankfurt I	1040	1155	6	4	412.0	201902
Emirates	Maastricht	Frankfurt I	1040	1155	6	4	412.0	201909
Etihad Airv	Abu Dhabi	Frankfurt I	0105	0600	4	5	519.5	201910
Etihad Airv	Abu Dhabi	Frankfurt I	0235	0730	6	4	415.6	201910
Etihad Airv	Frankfurt I	Barbados	0850	1200	4	4	415.6	201902
Iberia	Frankfurt I	Madrid Ad	1715	1945	3	4	205.6	201902
Iberia	Frankfurt I	Madrid Ad	1715	1945	3	5	257.0	201905
Iberia	Frankfurt I	Madrid Ad	2020	2300	6	4	205.6	201904
Iberia	Frankfurt I	Madrid Ad	2030	2250	45	10	450.0	202001
Iberia	Madrid Ad	Frankfurt I	1620	1840	6	4	205.6	201904
Iberia	Madrid Ad	Frankfurt I	1620	1955	45	9	405.0	201910
Iberia	Madrid Ad	Frankfurt I	1725	2005	3	4	205.6	201904
Korean Air	Frankfurt I	Seoul Inch	0900	0330	1	5	519.5	201904
Korean Air	Frankfurt I	Seoul Inch	1735	1205	23	9	935.1	201905
Korean Air	Moscow Sl	Frankfurt I	0415	0620	1	1	103.9	201902
Korean Air	Moscow Sl	Frankfurt I	0520	0635	1	1	103.9	201902
Korean Air	Moscow Sl	Frankfurt I	0520	0635	1	5	519.5	201909
Korean Air	Moscow Sl	Frankfurt I	1340	1455	5	5	519.5	201903
Korean Air	Moscow Sl	Frankfurt I	1345	1500	6	4	560.0	201910
Korean Air	Moscow Sl	Frankfurt I	1345	1500	23	8	831.2	201908
Korean Air	Vienna Int	Frankfurt I	1325	1455	4	4	560.0	201912
Korean Air	Vienna Int	Frankfurt I	1325	1455	4	4	560.0	202002
Lufthansa (	Almaty	Frankfurt I	0245	0530	4	2	170.0	201902
Lufthansa (	Almaty	Frankfurt I	0950	1320	7	4	340.0	201907
Lufthansa (	Atlanta Ha	Frankfurt I	0200	1630	67	3	311.7	201903
Lufthansa (	Atlanta Ha	Frankfurt I	1550	0615	1	1	103.9	201902
Lufthansa (	Atlanta Ha	Frankfurt I	1645	0730	3	4	415.6	201906
Lufthansa (	Beijing Cap	Frankfurt I	0320	0740	1 3 5	14	1,454.6	201905
Lufthansa (	Beijing Cap	Frankfurt I	0320	0740	1 3 5	13	1,350.7	201908
Lufthansa (	Cairo Inter	Frankfurt I	0530	0950	3	4	340.0	201904
Lufthansa (	Cairo Inter	Frankfurt I	0600	0920	1 3 6	12	1,020.0	201902
Lufthansa (	Chicago O'	Frankfurt I	0135	1640	4	1	85.0	201902
Lufthansa (	Chicago O'	Frankfurt I	0145	1705	234	11	935.0	201906
Lufthansa (	Chicago O'	Frankfurt I	0235	1640	45	6	623.4	201903
Lufthansa (	Chicago O'	Frankfurt I	0710	2230	5	1	85.0	201906
Lufthansa (	Dallas Dall	Frankfurt I	2230	1500	4	4	340.0	201904
Lufthansa (	Frankfurt I	Almaty	0715	1845	3	4	340.0	201903
Lufthansa (	Frankfurt I	Ashgabat	0445	1305	6	4	340.0	201904
Lufthansa (	Frankfurt I	Atlanta Ha	1035	1415	3	5	519.5	201905
Lufthansa (	Frankfurt I	Atlanta Ha	1605	1950	6	4	340.0	201907

Lufthansa (	Frankfurt I	Beijing Cap	0930	0100	5	5	519.5	201905
Lufthansa (	Frankfurt I	Beijing Cap	0930	0100	5	5	519.5	201908
Lufthansa (	Frankfurt I	Beijing Cap	1030	0305	2 4 7	6	623.4	201902
Lufthansa (	Frankfurt I	Cairo Inter	2105	0100	5	4	340.0	201909
Lufthansa (	Frankfurt I	Chengdu	0850	0110	6	1	103.9	201903
Cathay Pac	Frankfurt I	Milan Malp	1230	1355	1	4	432.0	202001
China Sout	Frankfurt I	Guangzhou	1500	0815	1	4	400.0	201903
China Sout	Frankfurt I	Guangzhou	1520	0740	5	4	400.0	201902
China Sout	Guangzhou	Frankfurt I	0100	0600	7	5	500.0	201906
China Sout	London Sta	Frankfurt I	0835	1055	4 6	8	800.0	201909
China Sout	Shanghai P	Frankfurt I	0650	1220	2 5 7	13	1,300.0	201905
China Sout	Shanghai P	Frankfurt I	0650	1220	2 5 7	13	1,300.0	201908
China Sout	Shanghai P	Frankfurt I	0650	1220	1 4 6	13	1,300.0	202001
Emirates	Dubai Al M	Frankfurt I	0140	0630	7	4	412.0	202001
Emirates	Dubai Al M	Frankfurt I	1240	1730	7	5	515.0	201909
Emirates	Dubai Al M	Frankfurt I	1240	1730	7	5	515.0	201912
Emirates	Dubai Al M	Frankfurt I	1320	1710	5	4	412.0	201912
Emirates	Frankfurt I	Dubai Al M	1940	0445	4	4	412.0	201906
Emirates	Frankfurt I	Mexico Cit	1810	2325	4	4	412.0	201904
Emirates	Frankfurt I	Mexico Cit	1810	2325	4	5	515.0	201910
Emirates	Frankfurt I	Mexico Cit	2125	0140	7	1	103.0	201903
Emirates	Maastricht	Frankfurt I	1040	1155	6	5	515.0	201906
Etihad Airv	Abu Dhabi	Frankfurt I	0105	0600	4	4	415.6	201911
Etihad Airv	Abu Dhabi	Frankfurt I	0235	0730	6	4	415.6	201904
Etihad Airv	Abu Dhabi	Frankfurt I	0235	0730	6	5	519.5	201911
Etihad Airv	Frankfurt I	Barbados	0850	1200	4	4	415.6	201909
Etihad Airv	Frankfurt I	Barbados	0850	1200	4	4	415.6	201912
Iberia	Frankfurt I	Madrid Ad	1715	1945	3	4	205.6	201903
Iberia	Madrid Ad	Frankfurt I	1620	1840	6	4	205.6	201905
Iberia	Madrid Ad	Frankfurt I	1620	1955	45	8	360.0	201906
Korean Air	Frankfurt I	Seoul Inch	1735	1205	6	5	700.0	202002
Korean Air	Frankfurt I	Seoul Inch	1735	1205	4	4	560.0	202002
Korean Air	Frankfurt I	Seoul Inch	1735	1205	23 7	2	207.8	201902
Korean Air	Moscow Sh	Frankfurt I	1345	1500	6	5	700.0	201906
Korean Air	Moscow Sh	Frankfurt I	1345	1500	23	9	935.1	201905
Korean Air	Moscow Sh	Frankfurt I	1345	1500	23	8	831.2	202002
Korean Air	Vienna Inte	Frankfurt I	1325	1455	4	5	700.0	201910
LATAM Car	Amsterdar	Frankfurt I	1610	1820	6	5	500.0	201911
LATAM Car	Amsterdar	Frankfurt I	1610	1820	6	4	400.0	202001
LATAM Car	Amsterdar	Frankfurt I	1630	1840	3	4	400.0	201908
LATAM Car	Amsterdar	Frankfurt I	1630	1840	3	4	400.0	201911
LATAM Car	Frankfurt I	Sao Paulo '	1920	0325	7	5	500.0	201909
LATAM Car	Frankfurt I	Sao Paulo '	1920	0325	6	4	400.0	201907
LATAM Car	Frankfurt I	Sao Paulo '	1940	0335	3	5	500.0	201910
Lufthansa (	Almaty	Frankfurt I	0310	0555	3	4	340.0	201903
Lufthansa (	Atlanta Ha	Frankfurt I	1645	0730	3	5	519.5	201907
Lufthansa (	Atlanta Ha	Frankfurt I	2140	1225	6	1	85.0	201909

Lufthansa (	Beijing Cap	Frankfurt I	0525	0855	1 3 5	7	727.3	201902
Lufthansa (	Buenos Air	Frankfurt I	0115	1940	4	4	415.6	201905
Lufthansa (	Chicago O'	Frankfurt I	1635	0755	4	1	85.0	201906
Lufthansa (	Dakar Blais	Frankfurt I	2130	0530	1	5	519.5	201909
Lufthansa (	Dallas Dall	Frankfurt I	0435	1945	1	3	255.0	201903
Lufthansa (	Dallas Dall	Frankfurt I	0530	2150	4	1	85.0	201903
Lufthansa (	Frankfurt I	Almaty	0715	1845	3	4	340.0	201902
Lufthansa (	Frankfurt I	Almaty	0730	1830	3 5 7	12	1,020.0	201909
Lufthansa (	Frankfurt I	Atlanta Ha	1605	1950	6	5	425.0	201906
Lufthansa (	Frankfurt I	Beijing Cap	0930	0100	5	4	415.6	201907
Lufthansa (	Frankfurt I	Bengaluru	1335	0200	3	5	425.0	201905
Lufthansa (	Frankfurt I	Chengdu	1045	0305	1	1	103.9	201902
Lufthansa (	Frankfurt I	Chicago O'	2045	2315	123	14	1,190.0	201904
Lufthansa (	Frankfurt I	Curitiba Af	1145	1910	2	4	415.6	201904
China Sout	Frankfurt I	Guangzhou	0900	0245	7	4	400.0	201908
China Sout	Frankfurt I	Guangzhou	1440	0815	7	5	500.0	201903
China Sout	Frankfurt I	Guangzhou	1500	0815	1	5	500.0	201912
China Sout	Frankfurt I	Guangzhou	1500	0815	1	4	400.0	202002
China Sout	Frankfurt I	Shanghai P	1520	0650	2 5 7	14	1,400.0	201912
China Sout	Guangzhou	Frankfurt I	0100	0600	7	4	400.0	201904
China Sout	London Sta	Frankfurt I	0835	1035	2	5	500.0	201910
China Sout	Shanghai P	Frankfurt I	0650	1220	1 4 6	13	1,300.0	202002
Emirates	Dubai Al M	Frankfurt I	1055	1445	4	5	515.0	201905
Emirates	Dubai Al M	Frankfurt I	1055	1445	4	5	515.0	201908
Emirates	Dubai Al M	Frankfurt I	1320	1710	5	5	515.0	201903
Emirates	Frankfurt I	Dubai Al M	0930	1735	7	5	515.0	201906
Emirates	Frankfurt I	Dubai Al M	1355	2300	6	5	515.0	201908
Emirates	Frankfurt I	Dubai Al M	1355	2300	6	4	412.0	202001
Emirates	Frankfurt I	Dubai Al M	2010	0515	5	4	412.0	201904
Emirates	Frankfurt I	Mexico Cit	1810	2325	4	4	412.0	201903
Emirates	Frankfurt I	Mexico Cit	2125	0140	7	5	515.0	201909
Emirates	Maastricht	Frankfurt I	1040	1155	6	4	412.0	201910
Etihad Airv	Abu Dhabi	Frankfurt I	0105	0600	4	4	415.6	201912
Iberia	Frankfurt I	Madrid Ad	1715	1945	3	5	257.0	201907
Iberia	Frankfurt I	Madrid Ad	1715	1945	3	5	257.0	201910
Iberia	Frankfurt I	Madrid Ad	2020	2300	6	4	205.6	201905
Iberia	Frankfurt I	Madrid Ad	2020	2300	6	5	257.0	202002
Iberia	Madrid Ad	Frankfurt I	1620	1840	6	5	257.0	202002
Iberia	Madrid Ad	Frankfurt I	1620	1955	45	10	450.0	201905
Iberia	Madrid Ad	Frankfurt I	1725	2005	3	4	205.6	201902
Iberia	Madrid Ad	Frankfurt I	1725	2005	3	4	205.6	201909
Korean Air	Frankfurt I	Seoul Inch	1725	1055	6	2	280.0	201902
Korean Air	Frankfurt I	Seoul Inch	1735	1205	4	4	560.0	201903
Korean Air	Frankfurt I	Seoul Inch	1735	1205	4	4	560.0	201906
Korean Air	Frankfurt I	Seoul Inch	1735	1205	23	10	1,039.0	201910
Korean Air	Moscow Sh	Frankfurt I	1245	1455	6	2	280.0	201902
Korean Air	Moscow Sh	Frankfurt I	1345	1500	6	4	560.0	201912

Korean Air	Moscow Sl	Frankfurt I	1345	1500	23	8	831.2	201903
Korean Air	Vienna Int	Frankfurt I	0800	0930	2	2	207.8	201902
LATAM Ca	Amsterdar	Frankfurt I	1610	1820	6	4	400.0	201904
LATAM Ca	Amsterdar	Frankfurt I	1630	1840	3	4	400.0	201904
LATAM Ca	Frankfurt I	Sao Paulo '	1920	0325	7	5	500.0	201903
LATAM Ca	Frankfurt I	Sao Paulo '	1940	0335	3	5	500.0	202001
Lufthansa (	Almaty	Frankfurt I	0245	0530	6	5	425.0	201903
Lufthansa (	Beijing Cap	Frankfurt I	0645	1015	5	1	103.9	201903
Lufthansa (	Buenos Air	Frankfurt I	2115	1540	6	4	415.6	201906
Lufthansa (	Dakar Blais	Frankfurt I	0130	0830	5	1	85.0	201902
Lufthansa (	Dakar Blais	Frankfurt I	0240	1040	6	1	85.0	201906
Lufthansa (	Dakar Blais	Frankfurt I	2130	0530	1	4	396.7	201906
Lufthansa (	Dallas Dall	Frankfurt I	0335	1945	1	1	85.0	201903
Lufthansa (	Dallas Dall	Frankfurt I	0525	2150	2	4	415.6	201908
Lufthansa (	Frankfurt I	Almaty	0525	1655	5	5	425.0	201903
Lufthansa (	Frankfurt I	Almaty	0730	1830	3 5 7	12	1,020.0	201907
Lufthansa (	Frankfurt I	Ashgabat	0445	1405	6	1	85.0	201903
Lufthansa (	Frankfurt I	Atlanta Ha	1930	2325	7	1	85.0	201903
Lufthansa (	Frankfurt I	Beijing Cap	1150	0425	4	1	103.9	201903
Lufthansa (	Frankfurt I	Bengaluru	1300	0225	6	4	340.0	201903
Lufthansa (	Frankfurt I	Chennai	1715	0600	3	4	340.0	201908
Lufthansa (	Frankfurt I	Chicago O'	1220	1450	4	1	85.0	201906
Lufthansa (	Frankfurt I	Chicago O'	1420	1645	2	2	170.0	201902
China Carg	Frankfurt I	Shanghai P	1710	1120	1 4	8	800.0	201902
China Carg	Shanghai P	Frankfurt I	0920	1410	3 7	8	800.0	201902
China Sout	Frankfurt I	Guangzhou	0900	0245	7	4	400.0	201911
China Sout	Frankfurt I	Guangzhou	0900	0245	7	4	400.0	202001
China Sout	Frankfurt I	Guangzhou	1500	0815	1	4	400.0	202001
China Sout	Frankfurt I	Guangzhou	1520	0740	5	4	400.0	201910
China Sout	Guangzhou	Frankfurt I	0100	0600	7	4	400.0	201908
China Sout	London Sta	Frankfurt I	0835	1035	2	4	400.0	201903
China Sout	London Sta	Frankfurt I	0835	1055	4 6	8	800.0	201907
China Sout	Shanghai P	Frankfurt I	0650	1220	2 5 7	14	1,400.0	201903
Emirates	Dubai Al M	Frankfurt I	0140	0530	7	4	412.0	201903
Emirates	Dubai Al M	Frankfurt I	1240	1630	4	4	412.0	201907
Emirates	Dubai Al M	Frankfurt I	1240	1730	7	4	412.0	201904
Emirates	Frankfurt I	Dubai Al M	1355	2300	6	4	412.0	201907
Emirates	Frankfurt I	Dubai Al M	2010	0515	5	4	412.0	201907
Emirates	Frankfurt I	Dubai Al M	2010	0515	5	4	412.0	201910
Emirates	Frankfurt I	Mexico Cit	1810	2325	4	4	412.0	201902
Emirates	Frankfurt I	Mexico Cit	1810	2325	4	4	412.0	201909
Emirates	Frankfurt I	Mexico Cit	2125	0140	7	4	412.0	201908
Emirates	Frankfurt I	Mexico Cit	2125	0140	7	4	412.0	202001
Emirates	Maastricht	Frankfurt I	1040	1155	6	5	515.0	201911
Etihad Airv	Frankfurt I	Barbados	0850	1200	4	4	415.6	201904
Etihad Airv	Frankfurt I	Barbados	1020	1330	6	4	415.6	201912
Iberia	Frankfurt I	Madrid Ad	1715	1945	3	4	205.6	201911

Iberia	Frankfurt I	Madrid Ad	2030	2250	45	8	360.0	201904
Korean Air	Frankfurt I	Oslo Garde	1345	1555	2	1	103.9	201902
Korean Air	Frankfurt I	Seoul Inch	0900	0330	1	4	415.6	201908
Korean Air	Frankfurt I	Seoul Inch	1735	1205	6	4	560.0	201904
Korean Air	Frankfurt I	Seoul Inch	1735	1205	6	4	560.0	201907
Korean Air	Moscow Sl	Frankfurt I	0520	0635	1	4	415.6	201903
Korean Air	Moscow Sl	Frankfurt I	1340	1455	5	5	519.5	201905
Korean Air	Vienna Int	Frankfurt I	1325	1455	4	5	700.0	201905
Korean Air	Vienna Int	Frankfurt I	1325	1455	4	5	700.0	201908
Korean Air	Vienna Int	Frankfurt I	1325	1455	4	4	560.0	201911
LATAM Ca	Amsterdar	Frankfurt I	1610	1820	7	4	400.0	201902
LATAM Ca	Frankfurt I	Sao Paulo	1920	0325	7	4	400.0	201904
LATAM Ca	Frankfurt I	Sao Paulo	1920	0325	6	4	400.0	201905
LATAM Ca	Frankfurt I	Sao Paulo	1940	0335	3	5	500.0	201905
Lufthansa	Almaty	Frankfurt I	0950	1320	7	4	340.0	201908
Lufthansa	Atlanta Ha	Frankfurt I	0055	1540	5	3	255.0	201902
Lufthansa	Beijing Cap	Frankfurt I	0525	0855	1 5	2	207.8	201902
Lufthansa	Buenos Air	Frankfurt I	0115	1940	4	4	415.6	201907
Lufthansa	Buenos Air	Frankfurt I	0115	1940	4	3	311.7	201910
Lufthansa	Buenos Air	Frankfurt I	2115	1540	6	4	415.6	201907
Lufthansa	Chicago O'	Frankfurt I	0300	1705	6	3	255.0	201903
Lufthansa	Dakar Blais	Frankfurt I	0100	0900	6	4	415.6	201907
Lufthansa	Dakar Blais	Frankfurt I	0400	1200	5	1	85.0	201910
Lufthansa	Dakar Blais	Frankfurt I	0435	1135	3	4	340.0	201902
Lufthansa	Dallas Dall	Frankfurt I	0525	2150	2	5	519.5	201904
Lufthansa	Dallas Dall	Frankfurt I	0525	2150	2	3	311.7	201910
Lufthansa	Frankfurt I	Almaty	0730	1830	3 5 7	8	680.0	201908
Lufthansa	Frankfurt I	Atlanta Ha	1055	1450	3	4	415.6	201902
Lufthansa	Frankfurt I	Atlanta Ha	1520	1915	2	1	103.9	201903
Lufthansa	Frankfurt I	Beijing Cap	0950	0120	2 4 7	13	1,350.7	201904
Lufthansa	Frankfurt I	Cairo Inter	2105	0100	5	4	340.0	201906
China Sout	Guangzhou	Frankfurt I	0100	0600	7	4	400.0	201907
China Sout	Guangzhou	Frankfurt I	0555	1240	5	4	400.0	201904
China Sout	London Sta	Frankfurt I	0835	1055	4 6	9	900.0	201911
China Sout	Shanghai P	Frankfurt I	0650	1220	2 5 7	13	1,300.0	201906
China Sout	Shanghai P	Frankfurt I	0650	1220	2 5 7	13	1,300.0	201909
China Sout	Shanghai P	Frankfurt I	0650	1220	2 5 7	12	1,200.0	202002
Emirates	Dubai Al M	Frankfurt I	1055	1445	4	5	515.0	202001
Emirates	Dubai Al M	Frankfurt I	1240	1630	4	4	412.0	201909
Emirates	Dubai Al M	Frankfurt I	1240	1730	7	4	412.0	202001
Emirates	Frankfurt I	Dubai Al M	0830	1735	7	4	412.0	201903
Emirates	Frankfurt I	Dubai Al M	0930	1735	7	4	412.0	202002
Emirates	Frankfurt I	Mexico Cit	1810	2325	4	4	412.0	201906
Emirates	Maastricht	Frankfurt I	0815	0930	3	5	515.0	201907
Etihad Airv	Abu Dhabi	Frankfurt I	0105	0600	4	5	519.5	201905
Etihad Airv	Frankfurt I	Barbados	1020	1330	6	4	415.6	202001
Iberia	Frankfurt I	Madrid Ad	2020	2300	6	4	205.6	201902

Iberia	Frankfurt I	Madrid Ad	2020	2300	6	4	205.6	201912
Iberia	Frankfurt I	Madrid Ad	2030	2250	45	9	405.0	201903
Iberia	Madrid Ad	Frankfurt I	1620	1955	45	8	360.0	202002
Korean Air	Frankfurt I	Seoul Inch	0900	0330	1	5	519.5	201909
Korean Air	Frankfurt I	Seoul Inch	1735	1205	6	4	560.0	201909
Korean Air	Frankfurt I	Seoul Inch	1735	1205	23	10	1,039.0	201907
Korean Air	Moscow Sl	Frankfurt I	0520	0635	1	5	519.5	201904
Korean Air	Moscow Sl	Frankfurt I	1340	1455	5	5	519.5	201908
Korean Air	Moscow Sl	Frankfurt I	1340	1455	5	5	519.5	202001
Korean Air	Moscow Sl	Frankfurt I	1345	1500	6	2	280.0	201902
Korean Air	Moscow Sl	Frankfurt I	1345	1500	6	4	560.0	201905
Korean Air	Vienna Int	Frankfurt I	1325	1455	4	4	560.0	201904
Korean Air	Vienna Int	Frankfurt I	1325	1455	4	4	560.0	201907
LATAM Ca	Amsterdar	Frankfurt I	1610	1820	7	4	400.0	202001
LATAM Ca	Amsterdar	Frankfurt I	1630	1840	3	5	500.0	201907
LATAM Ca	Amsterdar	Frankfurt I	1630	1840	3	5	500.0	201910
LATAM Ca	Frankfurt I	Sao Paulo '	1920	0325	6	4	400.0	201909
LATAM Ca	Frankfurt I	Sao Paulo '	1940	0335	3	4	400.0	201911
Lufthansa (	Almaty	Frankfurt I	0950	1320	1 4 6	11	935.0	201910
Lufthansa (	Almaty	Frankfurt I	1615	1900	4	4	340.0	201903
Lufthansa (	Atlanta Ha	Frankfurt I	1720	0740	3	1	103.9	201903
Lufthansa (	Atlanta Ha	Frankfurt I	2225	1310	6	4	340.0	201904
Lufthansa (	Atlanta Ha	Frankfurt I	2225	1310	6	3	255.0	201910
Lufthansa (	Beijing Cap	Frankfurt I	0320	0740	1 3 5	12	1,246.8	201906
Lufthansa (	Cairo Inter	Frankfurt I	0530	0950	3	4	340.0	201909
Lufthansa (	Chicago O'	Frankfurt I	0250	1655	2	3	255.0	201903
Lufthansa (	Dakar Blais	Frankfurt I	0100	0900	6	3	311.7	201906
Lufthansa (	Dakar Blais	Frankfurt I	1120	1920	7	1	85.0	201910
Lufthansa (	Dallas Dall	Frankfurt I	0225	1845	3	1	85.0	201903
Lufthansa (	Dallas Dall	Frankfurt I	0605	2230	6	4	415.6	201907
Lufthansa (	Dallas Dall	Frankfurt I	0605	2230	2 6	1	103.9	201905
Lufthansa (	Frankfurt I	Ashgabat	0445	1305	6	4	340.0	201909
Lufthansa (	Frankfurt I	Atlanta Ha	1035	1415	3	5	519.5	201907
Lufthansa (	Frankfurt I	Atlanta Ha	1530	1915	2	4	340.0	201905
Lufthansa (	Frankfurt I	Beijing Cap	0950	0120	2 4 7	13	1,350.7	201908
Lufthansa (	Frankfurt I	Bengaluru	1230	0055	6	4	340.0	201910
Lufthansa (	Frankfurt I	Cairo Inter	2110	0055	7	4	340.0	201907
Lufthansa (	Frankfurt I	Cairo Inter	2110	0155	7	4	340.0	201903
Lufthansa (	Frankfurt I	Chengdu	0935	0110	1 6	8	831.2	201905
China Sout	Frankfurt I	Guangzhou	0900	0245	7	4	400.0	202002
China Sout	Frankfurt I	Guangzhou	1440	0815	7	5	500.0	201906
China Sout	Frankfurt I	Guangzhou	1440	0815	7	4	400.0	202002
China Sout	Guangzhou	Frankfurt I	0100	0600	7	5	500.0	201909
China Sout	Guangzhou	Frankfurt I	0555	1220	1	4	400.0	201911
China Sout	Guangzhou	Frankfurt I	0555	1240	5	5	500.0	202001
China Sout	London Sta	Frankfurt I	0835	1055	4 6	8	800.0	201912
China Sout	Shanghai P	Frankfurt I	0650	1220	2 5 7	12	1,200.0	201902

Emirates	Dubai Al M	Frankfurt I	1055	1445	4	4	412.0	201907
Emirates	Dubai Al M	Frankfurt I	1240	1730	7	5	515.0	201906
Emirates	Dubai Al M	Frankfurt I	1320	1710	5	4	412.0	201902
Emirates	Frankfurt I	Dubai Al M	1355	2300	6	5	515.0	202002
Emirates	Frankfurt I	Dubai Al M	1500	0005	3	4	412.0	201906
Emirates	Frankfurt I	Dubai Al M	1940	0445	4	4	412.0	201909
Emirates	Frankfurt I	Dubai Al M	2010	0515	5	4	412.0	201902
Emirates	Frankfurt I	Dubai Al M	2010	0515	5	5	515.0	201905
Emirates	Frankfurt I	Dubai Al M	2010	0515	5	5	515.0	201908
Emirates	Frankfurt I	Mexico Cit	1810	2325	4	4	412.0	201907
Emirates	Frankfurt I	Mexico Cit	2025	0140	7	4	412.0	201903
Emirates	Maastricht	Frankfurt I	0815	0930	3	4	412.0	201906
Emirates	Maastricht	Frankfurt I	1040	1155	6	5	515.0	201903
Etihad Airv	Abu Dhabi	Frankfurt I	0105	0600	4	5	519.5	201908
Etihad Airv	Abu Dhabi	Frankfurt I	0235	0730	6	4	415.6	201907
Etihad Airv	Frankfurt I	Barbados	0850	1200	4	4	415.6	201906
Etihad Airv	Frankfurt I	Barbados	1020	1330	6	4	415.6	201907
Iberia	Frankfurt I	Madrid Ad	2020	2300	6	5	257.0	201906
Iberia	Frankfurt I	Madrid Ad	2030	2250	45	8	360.0	201912
Iberia	Madrid Ad	Frankfurt I	1620	1840	6	5	257.0	201908
Iberia	Madrid Ad	Frankfurt I	1620	1840	6	4	205.6	202001
Korean Air	Frankfurt I	Seoul Inch	1735	1205	6	2	280.0	201902
Korean Air	Moscow Sl	Frankfurt I	1340	1455	5	4	415.6	201904
Korean Air	Moscow Sl	Frankfurt I	1345	1500	23	2	207.8	201902
LATAM Ca	Amsterdar	Frankfurt I	1610	1820	7	4	400.0	201904
LATAM Ca	Amsterdar	Frankfurt I	1630	1840	3	5	500.0	202001
LATAM Ca	Frankfurt I	Sao Paulo '	1920	0325	7	5	500.0	201912
Lufthansa (	Almaty	Frankfurt I	0950	1320	7	5	425.0	201906
Lufthansa (	Buenos Air	Frankfurt I	2115	1540	6	4	415.6	201909
Lufthansa (	Cairo Inter	Frankfurt I	0600	1015	1	4	340.0	201908
Lufthansa (	Dakar Blais	Frankfurt I	0435	1135	3	4	340.0	201903
Lufthansa (	Dakar Blais	Frankfurt I	0930	1630	1	4	340.0	201903
Lufthansa (	Frankfurt I	Ashgabat	0445	1305	6	4	340.0	201905
Lufthansa (	Frankfurt I	Atlanta Ha	1605	1950	6	3	255.0	201909
Lufthansa (	Frankfurt I	Atlanta Ha	1930	0025	56	5	519.5	201903
Lufthansa (	Frankfurt I	Atlanta Ha	1930	2325	56	6	623.4	201902
Lufthansa (	Frankfurt I	Beijing Cap	0950	0120	2 4 7	1	103.9	201903
Lufthansa (	Frankfurt I	Beijing Cap	0950	0120	2 4 7	13	1,350.7	201909
Lufthansa (	Frankfurt I	Cairo Inter	1950	0045	2	4	340.0	201903
Lufthansa (	Frankfurt I	Cairo Inter	2105	0100	5	5	425.0	201908
Lufthansa (	Frankfurt I	Cairo Inter	2105	0100	5	4	340.0	201910
Lufthansa (	Frankfurt I	Johannesb	0455	1640	1 7	8	680.0	201902
Lufthansa (	Frankfurt I	Mexico Cit	1805	2359	5	3	311.7	201904
Lufthansa (	Frankfurt I	Mumbai	1750	0525	1 5	8	680.0	201906
Lufthansa (	Frankfurt I	Mumbai	1750	0525	1 5	9	765.0	201909
Lufthansa (	Frankfurt I	New York J	1950	2325	34	6	510.0	201903
Lufthansa (	Frankfurt I	Novosibirs	0450	1605	3 5	3	255.0	201908

Lufthansa (	Frankfurt I	Novosibirs	0450	1605	3 5 7	13	1,105.0	201907
China Sout	Shanghai P	Frankfurt I	0650	1220	1 4 6	13	1,300.0	201909
Emirates	Dubai Al M	Frankfurt I	1240	1630	7	4	412.0	201903
Emirates	Frankfurt I	Dubai Al M	0930	1735	7	4	412.0	201908
Emirates	Frankfurt I	Dubai Al M	0930	1735	7	4	412.0	201911
Emirates	Maastricht	Frankfurt I	0815	0930	3	4	412.0	201911
Etihad Airv	Abu Dhabi	Frankfurt I	0105	0600	4	4	415.6	201903
Etihad Airv	Abu Dhabi	Frankfurt I	0235	0730	6	5	519.5	201906
Iberia	Frankfurt I	Madrid Ad	2020	2300	6	5	257.0	201911
Iberia	Madrid Ad	Frankfurt I	1620	1955	45	10	450.0	201908
Korean Air	Frankfurt I	Seoul Inch	0900	0330	1	1	103.9	201902
Korean Air	Frankfurt I	Seoul Inch	0900	0330	1	4	415.6	202001
Korean Air	Frankfurt I	Seoul Inch	1735	1205	23	8	831.2	201903
Korean Air	Frankfurt I	Seoul Inch	1735	1205	23	8	831.2	201906
Korean Air	Frankfurt I	Seoul Inch	1735	1205	23	8	831.2	201909
Korean Air	Frankfurt I	Seoul Inch	1735	1205	23	8	831.2	202002
Korean Air	Moscow Sh	Frankfurt I	1340	1455	5	4	415.6	201912
Korean Air	Moscow Sh	Frankfurt I	1345	1500	6	5	700.0	201908
Korean Air	Moscow Sh	Frankfurt I	1345	1500	23	10	1,039.0	201907
Korean Air	Moscow Sh	Frankfurt I	1345	1500	23	10	1,039.0	201910
Korean Air	Vienna Inte	Frankfurt I	1325	1455	4	3	420.0	201902
LATAM Ca	Amsterdar	Frankfurt I	1610	1820	7	4	400.0	201905
LATAM Ca	Amsterdar	Frankfurt I	1610	1820	7	4	400.0	202002
LATAM Ca	Amsterdar	Frankfurt I	1610	1820	6	5	500.0	201903
LATAM Ca	Amsterdar	Frankfurt I	1610	1820	6	4	400.0	201909
LATAM Ca	Amsterdar	Frankfurt I	1630	1840	3	4	400.0	201903
LATAM Ca	Frankfurt I	Sao Paulo '	1940	0335	3	4	400.0	201912
Lufthansa (	Almaty	Frankfurt I	0245	0530	6	4	340.0	201902
Lufthansa (	Almaty	Frankfurt I	0245	0530	4 7	8	680.0	201903
Lufthansa (	Almaty	Frankfurt I	0950	1320	7	4	340.0	201905
Lufthansa (	Atlanta Ha	Frankfurt I	0155	1640	1	1	85.0	201903
Lufthansa (	Atlanta Ha	Frankfurt I	0300	1630	67	6	623.4	201903
Lufthansa (	Atlanta Ha	Frankfurt I	1500	0545	5	1	103.9	201902
Lufthansa (	Atlanta Ha	Frankfurt I	2225	1310	6	4	340.0	201905
Lufthansa (	Atlanta Ha	Frankfurt I	2225	1310	6	5	425.0	201908
Lufthansa (	Beijing Cap	Frankfurt I	0400	0730	6	2	207.8	201902
Lufthansa (	Cairo Inter	Frankfurt I	0600	0920	1 3 6	13	1,105.0	201903
Lufthansa (	Chicago O'	Frankfurt I	0135	1640	45	3	292.8	201903
Lufthansa (	Chicago O'	Frankfurt I	0145	1705	234	12	1,020.0	201910
Lufthansa (	Dakar Blais	Frankfurt I	1120	1920	7	1	85.0	201906
Lufthansa (	Dakar Blais	Frankfurt I	2130	0530	1	4	415.6	201904
Lufthansa (	Dallas Dall	Frankfurt I	0410	1930	7	3	255.0	201903
Lufthansa (	Dallas Dall	Frankfurt I	0600	2220	5	2	170.0	201903
Lufthansa (	Frankfurt I	Atlanta Ha	1530	1915	2	4	340.0	201909
Lufthansa (	Frankfurt I	Atlanta Ha	1605	1950	6	4	340.0	201904
Lufthansa (	Frankfurt I	Beijing Cap	0930	0100	5	4	415.6	201909
Lufthansa (	Frankfurt I	Chengdu	0935	0110	1 6	9	935.1	201909

Lufthansa (	Frankfurt I	Chennai	1515	0445	4	4	340.0	201902
Lufthansa (	Frankfurt I	Chicago O'	1420	1635	2	1	85.0	201903
Lufthansa (	Frankfurt I	Chicago O'	1540	1755	4	4	340.0	201902
Lufthansa (	Frankfurt I	Curitiba Af	1145	1910	2	3	311.7	201906
Lufthansa (	Frankfurt I	Dakar Blais	0445	0855	6	1	85.0	201910
Lufthansa (	Frankfurt I	Dammam	1400	2125	1	2	170.0	201902
Lufthansa (	Frankfurt I	Johannesb	0455	1630	6	4	340.0	201902
Lufthansa (	Frankfurt I	Johannesb	0545	1630	7	4	340.0	201905
China Sout	Frankfurt I	Guangzhou	1500	0815	1	4	400.0	201908
China Sout	Frankfurt I	Shanghai P	1520	0650	2 5 7	13	1,300.0	201909
China Sout	Guangzhou	Frankfurt I	0100	0600	7	4	400.0	201911
China Sout	London Sta	Frankfurt I	0835	1035	2	4	400.0	201906
China Sout	Shanghai P	Frankfurt I	0650	1220	2 5 7	13	1,300.0	201910
China Sout	Shanghai P	Frankfurt I	0650	1220	1 4 6	13	1,300.0	201906
Emirates	Dubai Al M	Frankfurt I	1055	1445	4	4	412.0	201909
Emirates	Dubai Al M	Frankfurt I	1320	1710	5	4	412.0	201904
Emirates	Frankfurt I	Dubai Al M	1355	2300	6	4	412.0	201904
Emirates	Frankfurt I	Dubai Al M	1355	2300	6	4	412.0	201910
Emirates	Frankfurt I	Dubai Al M	1500	0005	3	4	412.0	201904
Emirates	Frankfurt I	Dubai Al M	1500	0005	3	4	412.0	201911
Emirates	Frankfurt I	Mexico Cit	2125	0140	7	4	412.0	201905
Emirates	Maastricht	Frankfurt I	0815	0930	3	4	412.0	201904
Emirates	Maastricht	Frankfurt I	1040	1155	6	4	412.0	201905
Emirates	Maastricht	Frankfurt I	1040	1155	6	5	515.0	201908
Emirates	Maastricht	Frankfurt I	1040	1155	6	4	412.0	202001
Etihad Airv	Abu Dhabi	Frankfurt I	0235	0730	6	4	415.6	201912
Etihad Airv	Frankfurt I	Barbados	0850	1200	4	4	415.6	201907
Etihad Airv	Frankfurt I	Barbados	1020	1330	6	4	415.6	201905
Etihad Airv	Frankfurt I	Barbados	1020	1330	6	5	519.5	202002
Iberia	Frankfurt I	Madrid Ad	2020	2300	6	5	257.0	201908
Iberia	Frankfurt I	Madrid Ad	2020	2300	6	4	205.6	202001
Iberia	Frankfurt I	Madrid Ad	2030	2250	45	8	360.0	201907
Iberia	Madrid Ad	Frankfurt I	1620	1955	45	9	405.0	201911
Iberia	Madrid Ad	Frankfurt I	1620	1955	45	10	450.0	202001
Iberia	Madrid Ad	Frankfurt I	1725	2005	3	5	257.0	201905
Iberia	Madrid Ad	Frankfurt I	1725	2005	3	4	205.6	201908
Korean Air	Frankfurt I	Seoul Inch	1735	1205	6	4	560.0	201910
Korean Air	Frankfurt I	Seoul Inch	1735	1205	4	5	700.0	201910
Korean Air	Moscow Sh	Frankfurt I	0520	0635	1	4	415.6	201906
Korean Air	Moscow Sh	Frankfurt I	1340	1455	5	2	207.8	201902
Korean Air	Moscow Sh	Frankfurt I	1345	1500	6	5	700.0	201911
Korean Air	Vienna Inte	Frankfurt I	1315	1445	4	1	140.0	201902
LATAM Cai	Amsterdar	Frankfurt I	1610	1820	7	5	500.0	201912
LATAM Cai	Amsterdar	Frankfurt I	1630	1840	3	4	400.0	201906
LATAM Cai	Frankfurt I	Sao Paulo '	1920	0325	7	4	400.0	201907
LATAM Cai	Frankfurt I	Sao Paulo '	1920	0325	6	4	400.0	201902
LATAM Cai	Frankfurt I	Sao Paulo '	1920	0325	6	5	500.0	201908

LATAM Ca	Frankfurt I	Sao Paulo '	1940	0335	3	4	400.0	201902
Lufthansa (	Almaty	Frankfurt I	0245	0530	2	3	255.0	201902
Lufthansa (	Almaty	Frankfurt I	0310	0555	3	3	255.0	201902
Lufthansa (	Almaty	Frankfurt I	0950	1320	1 4 6	13	1,105.0	201904
Lufthansa (	Cairo Inter	Frankfurt I	0600	1015	1	3	255.0	201910
Lufthansa (	Chicago O'	Frankfurt I	2115	1220	6	1	103.9	201903
Lufthansa (	Dakar Blais	Frankfurt I	0930	1630	1	2	170.0	201902
Lufthansa (	Dallas Dall	Frankfurt I	0310	1930	7	4	340.0	201902
Lufthansa (	Dallas Dall	Frankfurt I	0605	2230	2 6	2	207.8	201910
Lufthansa (	Dallas Dall	Frankfurt I	2230	1500	4	5	425.0	201905
Lufthansa (	Dallas Dall	Frankfurt I	2230	1500	4	5	425.0	201908
Lufthansa (	Frankfurt I	Atlanta Ha	0905	1310	1	1	103.9	201902
Lufthansa (	Frankfurt I	Atlanta Ha	1035	1415	3	4	415.6	201906
Lufthansa (	Frankfurt I	Cairo Inter	2050	0045	2	4	340.0	201909
Lufthansa (	Frankfurt I	Cairo Inter	2110	0055	7	5	425.0	201909
Lufthansa (	Frankfurt I	Chennai	1715	0600	3	4	340.0	201904
Lufthansa (	Frankfurt I	Chicago O'	2125	2355	3	1	85.0	201906
China Sout	Shanghai P	Frankfurt I	0650	1220	1 4 6	12	1,200.0	201902
Emirates	Dubai Al M	Frankfurt I	1055	1445	4	4	412.0	201902
Emirates	Dubai Al M	Frankfurt I	1240	1630	4	4	412.0	201903
Emirates	Dubai Al M	Frankfurt I	1240	1630	4	4	412.0	201906
Emirates	Dubai Al M	Frankfurt I	1240	1730	7	4	412.0	201905
Emirates	Frankfurt I	Dubai Al M	1940	0445	4	4	412.0	201903
Emirates	Maastricht	Frankfurt I	1040	1155	6	4	412.0	201907
Etihad Airv	Abu Dhabi	Frankfurt I	0105	0600	4	4	415.6	201902
Etihad Airv	Abu Dhabi	Frankfurt I	0235	0730	6	4	415.6	201902
Iberia	Frankfurt I	Madrid Ad	2030	2250	45	9	405.0	201910
Iberia	Madrid Ad	Frankfurt I	1620	1840	6	4	205.6	201902
Korean Air	Frankfurt I	Oslo Garde	1330	1540	2	1	103.9	201902
Korean Air	Frankfurt I	Seoul Inch	0900	0330	1	4	415.6	202002
Korean Air	Frankfurt I	Seoul Inch	1735	1105	4	1	140.0	201902
Korean Air	Frankfurt I	Seoul Inch	1735	1205	6	5	700.0	201906
Korean Air	Moscow Sh	Frankfurt I	1340	1455	5	5	519.5	201911
Korean Air	Moscow Sh	Frankfurt I	1345	1500	6	4	560.0	201909
Korean Air	Moscow Sh	Frankfurt I	1345	1500	23	8	831.2	201906
LATAM Ca	Amsterdar	Frankfurt I	1610	1820	7	4	400.0	201908
LATAM Ca	Amsterdar	Frankfurt I	1610	1820	6	4	400.0	201910
LATAM Ca	Frankfurt I	Sao Paulo '	1920	0325	6	5	500.0	201903
LATAM Ca	Frankfurt I	Sao Paulo '	1940	0335	3	4	400.0	201908
Lufthansa (	Almaty	Frankfurt I	0950	1320	1 6	1	85.0	201909
Lufthansa (	Atlanta Ha	Frankfurt I	0300	1745	7	1	85.0	201903
Lufthansa (	Beijing Cap	Frankfurt I	0655	1025	3	2	207.8	201903
Lufthansa (	Chicago O'	Frankfurt I	0135	1640	45	2	170.0	201902
Lufthansa (	Chicago O'	Frankfurt I	0150	1655	2	1	85.0	201903
Lufthansa (	Chicago O'	Frankfurt I	2315	1450	6	1	85.0	201902
Lufthansa (	Dakar Blais	Frankfurt I	0100	0900	6	4	415.6	201909
Lufthansa (	Dakar Blais	Frankfurt I	0240	0940	4	4	340.0	201902

Lufthansa (	Dallas Dalla	Frankfurt I	2230	1500	4	4	340.0	201906
Lufthansa (	Frankfurt I	Almaty	0730	1830	3 5 7	12	1,020.0	201904
Lufthansa (	Frankfurt I	Almaty	0730	1830	3 5 7	11	935.0	201910
Lufthansa (	Frankfurt I	Ashgabat	0510	1430	6	4	340.0	201903
Lufthansa (	Frankfurt I	Atlanta Ha	1035	1415	3	4	415.6	201904
Lufthansa (	Frankfurt I	Atlanta Ha	1035	1415	3	4	415.6	201910
Lufthansa (	Frankfurt I	Atlanta Ha	1520	2015	2	3	311.7	201903
Lufthansa (	Frankfurt I	Atlanta Ha	1605	1950	6	4	340.0	201905
Lufthansa (	Frankfurt I	Atlanta Ha	1605	1950	6	5	425.0	201908
Lufthansa (	Frankfurt I	Atlanta Ha	1930	2325	56	4	415.6	201903
Lufthansa (	Frankfurt I	Beijing Cap	0950	0120	2 4 7	13	1,350.7	201905
Lufthansa (	Frankfurt I	Cairo Inter	2050	0045	2	4	340.0	201906
Lufthansa (	Frankfurt I	Cairo Inter	2105	0100	5	4	340.0	201904
Lufthansa (	Frankfurt I	Cairo Inter	2105	0100	5	4	340.0	201907
Lufthansa (	Frankfurt I	Cairo Inter	2110	0055	7	3	255.0	201910
Lufthansa (	Frankfurt I	Chengdu	1045	0305	1 6	8	831.2	201903
Lufthansa (	Frankfurt I	Chennai	1715	0600	3	5	425.0	201905
Lufthansa (	Frankfurt I	Chicago O'	0810	1055	1	1	85.0	201902
Lufthansa (	Frankfurt I	Chicago O'	1335	1605	4	4	340.0	201910
Lufthansa (	Frankfurt I	Dakar Blais	1845	2350	2	4	340.0	201902
Lufthansa (	Frankfurt I	Dakar Blais	2125	0135	3	1	85.0	201910
Lufthansa (	Frankfurt I	Dakar Blais	2155	0205	7	1	85.0	201906
Lufthansa (	Frankfurt I	Johannesb	0540	1625	6	4	340.0	201910
Lufthansa (	Frankfurt I	Johannesb	0555	1640	2	5	425.0	201907
China Sout	Frankfurt I	Guangzhou	0900	0245	7	4	400.0	201907
China Sout	Frankfurt I	Guangzhou	1500	0815	1	5	500.0	201904
China Sout	Frankfurt I	Shanghai P	1520	0650	2 5 7	13	1,300.0	201904
China Sout	Frankfurt I	Shanghai P	1520	0650	2 5 7	13	1,300.0	201907
China Sout	Frankfurt I	Shanghai P	1520	0650	1 4 6	12	1,200.0	201903
China Sout	Guangzhou	Frankfurt I	0100	0600	7	4	400.0	201902
China Sout	Guangzhou	Frankfurt I	0555	1220	1	5	500.0	201909
China Sout	London Sta	Frankfurt I	0835	1035	2	4	400.0	201909
Emirates	Dubai Al M	Frankfurt I	0140	0630	7	5	515.0	201912
Emirates	Dubai Al M	Frankfurt I	1240	1630	4	5	515.0	202001
Emirates	Frankfurt I	Dubai Al M	1355	2300	6	4	412.0	201909
Emirates	Frankfurt I	Dubai Al M	1940	0445	4	5	515.0	202001
Emirates	Frankfurt I	Dubai Al M	2010	0515	5	5	515.0	201903
Emirates	Frankfurt I	Dubai Al M	2010	0515	5	4	412.0	201912
Emirates	Frankfurt I	Mexico Cit	1810	2325	4	4	412.0	201911
Emirates	Frankfurt I	Mexico Cit	2125	0140	7	4	412.0	201907
Emirates	Maastricht	Frankfurt I	0815	0930	3	4	412.0	201902
Emirates	Maastricht	Frankfurt I	0815	0930	3	5	515.0	201905
Etihad Airv	Abu Dhabi	Frankfurt I	0105	0600	4	4	415.6	201904
Etihad Airv	Frankfurt I	Barbados	0850	1200	4	5	519.5	201908
Etihad Airv	Frankfurt I	Barbados	1020	1330	6	5	519.5	201903
Etihad Airv	Frankfurt I	Barbados	1020	1330	6	5	519.5	201906
Iberia	Frankfurt I	Madrid Ad	2030	2250	45	9	405.0	201911

Iberia	Madrid Ad	Frankfurt I	1620	1840	6	4	205.6	201910
Korean Air	Frankfurt I	Seoul Inch	0900	0330	1	5	519.5	201907
Korean Air	Frankfurt I	Seoul Inch	1735	1205	4	5	700.0	201905
Korean Air	Frankfurt I	Seoul Inch	1735	1205	4	5	700.0	201908
Korean Air	Frankfurt I	Seoul Inch	1735	1205	4	4	560.0	201911
Korean Air	Frankfurt I	Seoul Inch	1735	1205	3 7	2	207.8	201902
Korean Air	Frankfurt I	Seoul Inch	1735	1205	23	2	207.8	201902
Korean Air	Moscow Sl	Frankfurt I	1345	1500	6	4	560.0	201904
LATAM Ca	Amsterdar	Frankfurt I	1610	1820	7	5	500.0	201906
LATAM Ca	Amsterdar	Frankfurt I	1630	1840	3	4	400.0	201909
LATAM Ca	Frankfurt I	Sao Paulo '	1920	0325	6	5	500.0	201911
LATAM Ca	Frankfurt I	Sao Paulo '	1940	0335	3	4	400.0	201903
Lufthansa (	Buenos Air	Frankfurt I	0115	1940	4	4	415.6	201906
Lufthansa (	Dakar Blais	Frankfurt I	0130	0830	5	4	340.0	201903
Lufthansa (	Dallas Dall	Frankfurt I	0530	2150	4	4	340.0	201902
Lufthansa (	Dallas Dall	Frankfurt I	0605	2230	6	4	415.6	201905
Lufthansa (	Frankfurt I	Almaty	0525	1655	5	2	170.0	201902
Lufthansa (	Frankfurt I	Almaty	0635	1805	7	4	340.0	201903
Lufthansa (	Frankfurt I	Ashgabat	0445	1305	6	4	340.0	201910
Lufthansa (	Frankfurt I	Atlanta Ha	1605	1950	6	3	255.0	201910
Lufthansa (	Frankfurt I	Beijing Cap	0950	0120	2 4 7	13	1,350.7	201907
Lufthansa (	Frankfurt I	Bengaluru	1230	0055	6	5	425.0	201908
Lufthansa (	Frankfurt I	Bengaluru	1335	0200	3	4	340.0	201910
Lufthansa (	Frankfurt I	Chennai	1515	0445	4	4	340.0	201903
Lufthansa (	Frankfurt I	Chennai	1715	0600	3	4	340.0	201910
Lufthansa (	Frankfurt I	Chicago O'	1000	1345	7	3	255.0	201903
Lufthansa (	Frankfurt I	Chicago O'	1335	1605	4	4	340.0	201909
Lufthansa (	Frankfurt I	Chicago O'	2045	2315	123	11	935.0	201906
Lufthansa (	Frankfurt I	Dakar Blais	1845	2350	2	4	340.0	201903
Lufthansa (	Frankfurt I	Dallas Dall	1530	1935	5	2	170.0	201903
Lufthansa (	Frankfurt I	Johannesb	0540	1625	6	5	425.0	201908
Lufthansa (	Frankfurt I	Mexico Cit	1700	2255	3	4	415.6	201908
Lufthansa (	Frankfurt I	Mexico Cit	1735	2230	4	1	103.9	201904
China Sout	Frankfurt I	Guangzhou	1440	0815	7	4	400.0	201902
China Sout	Frankfurt I	Guangzhou	1440	0815	7	4	400.0	202001
China Sout	Frankfurt I	Guangzhou	1500	0815	1	5	500.0	201907
China Sout	Frankfurt I	Guangzhou	1500	0815	1	4	400.0	201910
China Sout	Frankfurt I	Guangzhou	1520	0740	5	4	400.0	201907
China Sout	Frankfurt I	Shanghai P	1520	0650	2 5 7	13	1,300.0	201910
China Sout	Guangzhou	Frankfurt I	0100	0600	7	4	400.0	202002
China Sout	Guangzhou	Frankfurt I	0555	1240	5	4	400.0	201902
China Sout	Guangzhou	Frankfurt I	0555	1240	5	4	400.0	202002
China Sout	London Sta	Frankfurt I	0835	1035	2	5	500.0	201912
China Sout	London Sta	Frankfurt I	0835	1055	4 6	9	900.0	201903
China Sout	Shanghai P	Frankfurt I	0650	1220	2 5 7	13	1,300.0	201907
China Sout	Shanghai P	Frankfurt I	0650	1220	1 4 6	13	1,300.0	201910
Emirates	Dubai Al M	Frankfurt I	0140	0630	7	5	515.0	201909

Emirates	Dubai Al M	Frankfurt I	0140	0630	7	4	412.0	202002
Emirates	Dubai Al M	Frankfurt I	1055	1445	4	5	515.0	201910
Emirates	Dubai Al M	Frankfurt I	1320	1710	5	5	515.0	201908
Emirates	Frankfurt I	Dubai Al M	1355	2300	6	5	515.0	201906
Emirates	Frankfurt I	Dubai Al M	1500	0005	3	4	412.0	201908
Emirates	Frankfurt I	Dubai Al M	2010	0515	5	4	412.0	201906
Emirates	Frankfurt I	Mexico Cit	1810	2325	4	5	515.0	201905
Emirates	Maastricht	Frankfurt I	0815	0930	3	4	412.0	201908
Etihad Airw	Abu Dhabi	Frankfurt I	0105	0600	4	4	415.6	201907
Etihad Airw	Abu Dhabi	Frankfurt I	0235	0730	6	5	519.5	201903
Etihad Airw	Frankfurt I	Barbados	0850	1200	4	5	519.5	202001
Iberia	Frankfurt I	Madrid Ad	1715	1945	3	4	205.6	201908
Iberia	Frankfurt I	Madrid Ad	2020	2300	6	4	205.6	201907
Iberia	Frankfurt I	Madrid Ad	2030	2250	45	8	360.0	201902
Iberia	Frankfurt I	Madrid Ad	2030	2250	45	10	450.0	201908
Iberia	Madrid Ad	Frankfurt I	1620	1955	45	8	360.0	201904
Iberia	Madrid Ad	Frankfurt I	1620	1955	45	8	360.0	201907
Korean Air	Frankfurt I	Seoul Inch	1735	1205	6	4	560.0	202001
Korean Air	Frankfurt I	Seoul Inch	1735	1205	4	5	700.0	202001
Korean Air	Moscow Sh	Frankfurt I	0520	0635	1	5	519.5	201912
Korean Air	Moscow Sh	Frankfurt I	0520	0635	1	4	415.6	202002
LATAM Ca	Amsterdar	Frankfurt I	1610	1820	6	4	400.0	201905
LATAM Ca	Amsterdar	Frankfurt I	1610	1820	6	4	400.0	201912
LATAM Ca	Amsterdar	Frankfurt I	1610	1820	6	5	500.0	202002
LATAM Ca	Amsterdar	Frankfurt I	1630	1840	3	4	400.0	201902
LATAM Ca	Frankfurt I	Sao Paulo '	1940	0335	3	4	400.0	201906
LATAM Ca	Frankfurt I	Sao Paulo '	1940	0335	3	4	400.0	201909
Lufthansa (	Almaty	Frankfurt I	0245	0530	4 7	3	255.0	201902
Lufthansa (	Almaty	Frankfurt I	0245	0530	2	4	340.0	201903
Lufthansa (	Almaty	Frankfurt I	0950	1320	7	3	255.0	201910
Lufthansa (	Buenos Air	Frankfurt I	0115	1940	4	4	415.6	201909
Lufthansa (	Buenos Air	Frankfurt I	2115	1540	6	4	415.6	201905
Lufthansa (	Buenos Air	Frankfurt I	2115	1540	6	5	519.5	201908
Lufthansa (	Cairo Inter	Frankfurt I	0530	0950	3	4	340.0	201910
Lufthansa (	Chicago O'	Frankfurt I	0055	1600	6	1	85.0	201902
Lufthansa (	Dakar Blais	Frankfurt I	0110	0810	5	3	255.0	201902
Lufthansa (	Dakar Blais	Frankfurt I	1040	1840	3	1	85.0	201906
Lufthansa (	Dakar Blais	Frankfurt I	2130	0530	1	4	415.6	201905
Lufthansa (	Dallas Dall	Frankfurt I	0525	2150	2	4	415.6	201906
Lufthansa (	Dallas Dall	Frankfurt I	0600	2220	5	4	340.0	201902
Lufthansa (	Dallas Dall	Frankfurt I	1310	0530	6	2	170.0	201903
Lufthansa (	Dallas Dall	Frankfurt I	2230	1500	4	4	340.0	201907
Lufthansa (	Frankfurt I	Mexico Cit	1745	2230	1	1	103.9	201904
Lufthansa (	Frankfurt I	Moscow D	2100	0210	5	4	340.0	201902
Lufthansa (	Frankfurt I	Mumbai	1745	0520	34	9	765.0	201908
Lufthansa (	Frankfurt I	New York J	2005	2240	4	5	425.0	201908
Lufthansa (	Frankfurt I	New York J	2020	2300	56	9	765.0	201905

Lufthansa (	Frankfurt I	Riyadh Kin	1345	2025	7	4	340.0	201907
Lufthansa (	Frankfurt I	Sao Paulo '	0445	1155	5	4	415.6	201909
Lufthansa (	Frankfurt I	Shanghai P	0820	0105	1 3	7	727.3	201910
Lufthansa (	Frankfurt I	Tel Aviv-ya	1610	2105	2 4 6	12	1,020.0	201905
Lufthansa (	Frankfurt I	Tel Aviv-ya	1610	2105	2 4 6	13	1,105.0	201908
Lufthansa (	Frankfurt I	Tokyo Nari	2230	1655	6	5	519.5	201906
Lufthansa (	Frankfurt I	Tokyo Nari	2230	1700	1 3 5 7	18	1,870.2	201909
Lufthansa (	Frankfurt I	Toronto Le	1440	1720	1	1	85.0	201903
Lufthansa (	Guadalajar	Frankfurt I	0410	2230	45	9	935.1	201905
Lufthansa (	Hyderabad	Frankfurt I	1120	1710	4	4	340.0	201906
Lufthansa (	Los Angele	Frankfurt I	1800	1350	3	5	425.0	201907
Lufthansa (	Los Angele	Frankfurt I	1830	1320	5	3	255.0	201903
Lufthansa (	Los Angele	Frankfurt I	2050	1700	6	4	340.0	201904
Lufthansa (	Los Angele	Frankfurt I	2210	1800	7	4	340.0	201907
Lufthansa (	Mumbai	Frankfurt I	0735	1235	1	5	425.0	201909
Lufthansa (	Mumbai	Frankfurt I	0755	1255	45	8	680.0	201910
Lufthansa (	Novosibirs	Frankfurt I	2010	2130	7	4	340.0	201904
Lufthansa (	Novosibirs	Frankfurt I	2035	2155	4	4	340.0	201904
Lufthansa (	Shanghai P	Frankfurt I	0335	0835	2 4	8	831.2	201903
Lufthansa (	Shanghai P	Frankfurt I	0430	1000	5 7	8	831.2	201907
Lufthansa (	Shanghai P	Frankfurt I	0820	1350	1 3456	22	2,285.8	201907
Qatar Airw	Doha	Frankfurt I	0720	1240	1	4	415.6	201908
Qatar Airw	Doha	Frankfurt I	0935	1455	4	4	415.6	201902
Qatar Airw	Doha	Frankfurt I	0935	1455	4	5	519.5	201905
Qatar Airw	Doha	Frankfurt I	0935	1455	4	5	519.5	201908
Qatar Airw	Doha	Frankfurt I	1225	1745	2	5	519.5	201910
Qatar Airw	Doha	Frankfurt I	1255	1820	3	4	260.0	201906
Qatar Airw	Doha	Frankfurt I	1310	1830	6	5	519.5	201906
Qatar Airw	Doha	Frankfurt I	1310	1830	6	4	415.6	201909
Qatar Airw	Frankfurt I	Doha	1440	2130	1	5	519.5	201907
Qatar Airw	Frankfurt I	Doha	1735	0025	4	4	415.6	202002
Qatar Airw	Frankfurt I	Doha	1945	0235	2	4	415.6	201908
Qatar Airw	Frankfurt I	Doha	1945	0235	2	5	519.5	201912
Qatar Airw	Frankfurt I	Doha	2030	0320	6	5	519.5	201906
Saudi Arab	Dammam	Frankfurt I	0135	0610	6	4	400.0	201902
Saudi Arab	Frankfurt I	Jeddah	0705	1420	4	4	400.0	201907
Saudi Arab	Frankfurt I	Jeddah	0820	1535	6	4	400.0	201904
Saudi Arab	Frankfurt I	Jeddah	0820	1535	6	5	500.0	201911
Saudi Arab	Frankfurt I	Riyadh Kin	1935	0310	4	5	500.0	201908
Saudi Arab	Frankfurt I	Riyadh Kin	1935	0310	4	4	400.0	201911
Saudi Arab	Frankfurt I	Riyadh Kin	2040	0315	5	5	550.0	201905
Saudi Arab	Frankfurt I	Riyadh Kin	2040	0315	5	5	550.0	202001
Saudi Arab	Riyadh Kin	Frankfurt I	0910	1420	5	4	440.0	202002
Saudi Arab	Riyadh Kin	Frankfurt I	1045	1455	1	5	500.0	201904
Saudi Arab	Riyadh Kin	Frankfurt I	1105	1515	4	4	400.0	201911
Turkish Air	Frankfurt I	Istanbul At	2000	0005	6	4	260.0	201902
Turkish Air	Istanbul At	Frankfurt I	0430	0630	23 5	12	481.2	201909

Turkish Air	Lagos	Frankfurt I	0240	1120	5	4	260.0	201909
Lufthansa (	Frankfurt I	Toronto Le	1400	1630	5	1	85.0	201903
Lufthansa (	Guadalajar	Frankfurt I	0200	2020	7	4	415.6	201906
Lufthansa (	Guadalajar	Frankfurt I	0410	2230	45	4	415.6	201910
Lufthansa (	Hyderabad	Frankfurt I	1120	1710	4	5	425.0	201908
Lufthansa (	Hyderabad	Frankfurt I	1135	1640	2	4	340.0	201903
Lufthansa (	Istanbul At	Frankfurt I	0330	0530	3 5 7	12	1,020.0	201907
Lufthansa (	Mumbai	Frankfurt I	0655	1125	45	9	765.0	201903
Lufthansa (	Nairobi Jor	Frankfurt I	0130	0830	1 3 7	13	1,105.0	201906
Lufthansa (	New York J	Frankfurt I	0130	1455	6	4	340.0	201910
Lufthansa (	New York J	Frankfurt I	0130	1500	3	4	340.0	201904
Lufthansa (	Novosibirs	Frankfurt I	0410	0530	6	4	340.0	201905
Lufthansa (	Novosibirs	Frankfurt I	0510	0530	5	1	85.0	201903
Lufthansa (	Novosibirs	Frankfurt I	1115	1235	1 4 6	13	1,105.0	201904
Lufthansa (	Novosibirs	Frankfurt I	1115	1235	1 4 6	13	1,105.0	201907
Lufthansa (	Novosibirs	Frankfurt I	1220	1240	4	3	255.0	201902
Lufthansa (	Novosibirs	Frankfurt I	2035	2155	4	5	425.0	201905
Lufthansa (	Sao Paulo '	Frankfurt I	0035	1750	3	2	207.8	201906
Lufthansa (	Sao Paulo '	Frankfurt I	1955	1310	7	1	103.9	201903
Lufthansa (	Seoul Inch(	Frankfurt I	0205	0620	23 5 7	17	1,766.3	201909
Lufthansa (	Shanghai P	Frankfurt I	0820	1350	2 7	8	831.2	201905
Lufthansa (	Shanghai P	Frankfurt I	0935	1435	2 7	8	831.2	201903
Lufthansa (	Shanghai P	Frankfurt I	0935	1435	1 3456	22	2,285.8	201903
Qatar Airw	Doha	Frankfurt I	0720	1240	1	4	415.6	201906
Qatar Airw	Doha	Frankfurt I	1225	1745	2	4	415.6	201905
Qatar Airw	Doha	Frankfurt I	1255	1820	3	5	325.0	202001
Qatar Airw	Doha	Frankfurt I	1310	1830	6	4	415.6	201904
Qatar Airw	Frankfurt I	Doha	1945	0235	2	5	519.5	201910
Qatar Airw	Frankfurt I	Doha	2030	0320	6	5	519.5	201911
Qatar Airw	Frankfurt I	Doha	2115	0405	7	4	415.6	201911
Saudi Arab	Dammam	Frankfurt I	1450	1925	3	4	400.0	201909
Saudi Arab	Frankfurt I	Jeddah	0820	1535	6	5	500.0	201906
Saudi Arab	Frankfurt I	Riyadh Kin	1935	0310	4	4	400.0	201906
Saudi Arab	Frankfurt I	Riyadh Kin	1940	0315	1	5	500.0	201904
Saudi Arab	Frankfurt I	Riyadh Kin	2040	0315	5	5	550.0	201903
Turkish Air	Frankfurt I	Istanbul At	2000	0005	6	4	260.0	201904
Turkish Air	Frankfurt I	Istanbul At	2000	0005	6	4	260.0	201907
Turkish Air	Istanbul At	Frankfurt I	0430	0630	4	4	260.0	201903
Turkish Air	Lagos	Frankfurt I	0240	1120	5	4	260.0	201904
Lufthansa (	Frankfurt I	Almaty	0730	1830	3 5 7	1	85.0	201903
Lufthansa (	Frankfurt I	Almaty	0730	1830	3 5 7	13	1,105.0	201906
Lufthansa (	Frankfurt I	Atlanta Ha	1520	1915	2	1	85.0	201902
Lufthansa (	Frankfurt I	Beijing Cap	0930	0100	5	4	415.6	201904
Lufthansa (	Frankfurt I	Beijing Cap	1030	0305	2 4 7	5	519.5	201903
Lufthansa (	Frankfurt I	Bengaluru	0505	1830	2	4	340.0	201903
Lufthansa (	Frankfurt I	Chennai	1715	0600	3	4	340.0	201906
Lufthansa (	Frankfurt I	Chennai	1715	0600	3	4	340.0	201909

Lufthansa (	Frankfurt I	Chicago O'	0840	1055	3	1	85.0	201902
Lufthansa (	Frankfurt I	Chicago O'	1540	1755	4	1	85.0	201903
Lufthansa (	Frankfurt I	Chicago O'	2045	2315	123	11	935.0	201910
Lufthansa (	Frankfurt I	Dakar Blais	1040	1450	5	1	85.0	201906
Lufthansa (	Frankfurt I	Dallas Dall	1530	1935	5	4	340.0	201902
Lufthansa (	Frankfurt I	Dammam	1425	2110	1	3	255.0	201910
Lufthansa (	Frankfurt I	Johannesb	0545	1630	7	4	340.0	201904
Lufthansa (	Frankfurt I	Mexico Cit	1735	2330	4	5	519.5	201908
Lufthansa (	Frankfurt I	Mexico Cit	1745	2330	1	5	519.5	201907
Lufthansa (	Frankfurt I	Mexico Cit	1745	2330	1	3	311.7	201910
Lufthansa (	Frankfurt I	Mumbai	2035	0810	2	4	340.0	201909
Lufthansa (	Frankfurt I	New York J	1930	2305	6	1	85.0	201903
Lufthansa (	Frankfurt I	Riyadh Kin	1345	2025	7	3	255.0	201910
Lufthansa (	Frankfurt I	Sao Paulo '	2040	0350	7	5	519.5	201909
Lufthansa (	Frankfurt I	Shanghai P	0720	0105	1 3	8	831.2	201903
Lufthansa (	Frankfurt I	Shanghai P	0915	0200	4 6	10	1,039.0	201908
Lufthansa (	Frankfurt I	Shanghai P	0915	0300	4 6	9	935.1	201903
Lufthansa (	Frankfurt I	Tel Aviv-ya	1610	2200	6	1	85.0	201903
Lufthansa (	Frankfurt I	Tokyo Nari	2110	1655	1 3 5	12	1,246.8	201902
Lufthansa (	Frankfurt I	Tokyo Nari	2230	1700	2 4	9	935.1	201904
Lufthansa (	Frankfurt I	Toronto Le	1440	1720	5	1	85.0	201902
Lufthansa (	Frankfurt I	Toronto Le	1440	1820	1	3	255.0	201903
Lufthansa (	Houston G	Frankfurt I	2345	1625	2	2	170.0	201902
Lufthansa (	Hyderabad	Frankfurt I	0950	1455	5	5	425.0	201903
Lufthansa (	Hyderabad	Frankfurt I	1055	1645	2 6	9	765.0	201908
Lufthansa (	New York J	Frankfurt I	0220	1445	3	3	311.7	201903
Lufthansa (	Novosibirs	Frankfurt I	2035	2155	4	4	340.0	201910
Lufthansa (	Sao Paulo '	Frankfurt I	0035	1750	3	3	311.7	201905
Lufthansa (	Sao Paulo '	Frankfurt I	1955	1310	7	4	415.6	201905
Qatar Airw	Doha	Frankfurt I	0720	1240	1	4	415.6	202001
Qatar Airw	Doha	Frankfurt I	0935	1455	4	4	415.6	201911
Qatar Airw	Doha	Frankfurt I	1355	1915	7	4	415.6	201910
Qatar Airw	Frankfurt I	Doha	1440	2130	1	5	519.5	201904
Qatar Airw	Frankfurt I	Doha	1735	0025	4	4	415.6	201902
Qatar Airw	Frankfurt I	Doha	1945	0235	2	4	415.6	201902
Qatar Airw	Frankfurt I	Doha	2020	0320	3	5	325.0	201905
Qatar Airw	Frankfurt I	Doha	2030	0320	5	4	415.6	201909
Saudi Arab	Dammam	Frankfurt I	1450	1925	3	5	500.0	202001
Saudi Arab	Frankfurt I	Jeddah	2020	0250	3	5	550.0	201905
Saudi Arab	Frankfurt I	Jeddah	2020	0250	3	5	550.0	202001
Saudi Arab	Frankfurt I	Riyadh Kin	1935	0310	4	5	500.0	202001
Saudi Arab	Frankfurt I	Riyadh Kin	1940	0315	1	4	400.0	201902
Saudi Arab	Frankfurt I	Riyadh Kin	1940	0315	1	5	500.0	201909
Saudi Arab	Riyadh Kin	Frankfurt I	0910	1420	5	4	440.0	201912
Saudi Arab	Riyadh Kin	Frankfurt I	1045	1455	1	4	400.0	201910
Saudi Arab	Riyadh Kin	Frankfurt I	1105	1515	4	5	500.0	201908
Saudi Arab	Riyadh Kin	Frankfurt I	1105	1515	4	5	500.0	202001

Saudi Arab	Frankfurt I	Jeddah	0705	1420	4	4	400.0	201912
Saudi Arab	Frankfurt I	Jeddah	2020	0250	3	4	440.0	201903
Saudi Arab	Frankfurt I	Jeddah	2020	0250	3	4	440.0	201906
Saudi Arab	Frankfurt I	Riyadh Kin	1940	0315	1	5	500.0	201907
Saudi Arab	Riyadh Kin	Frankfurt I	0910	1420	5	4	440.0	201910
Saudi Arab	Riyadh Kin	Frankfurt I	1045	1455	1	4	400.0	202002
Saudi Arab	Riyadh Kin	Frankfurt I	1105	1515	4	5	500.0	201910
Turkish Air	Frankfurt I	Istanbul At	0815	1215	4	5	325.0	201905
Turkish Air	Frankfurt I	Istanbul At	0815	1215	4	5	325.0	201908
Turkish Air	Frankfurt I	Istanbul At	0815	1215	23 5	12	481.2	201902
Turkish Air	Frankfurt I	Istanbul At	0815	1215	23 5	14	561.4	201905
Turkish Air	Istanbul At	Frankfurt I	0430	0630	4	4	260.0	201910
Turkish Air	Istanbul At	Frankfurt I	0430	0630	23 5	13	521.3	201904
Turkish Air	Istanbul At	Frankfurt I	1600	1800	6	5	325.0	201906
Turkish Air	Istanbul At	Frankfurt I	1615	1815	7	5	325.0	201906
Lufthansa (	Frankfurt I	Mumbai	1745	0520	34	8	680.0	201906
Lufthansa (	Frankfurt I	New York J	2005	2240	4	4	340.0	201904
Lufthansa (	Frankfurt I	Novosibirs	1405	0120	3 5	9	765.0	201907
Lufthansa (	Frankfurt I	Riyadh Kin	1345	2025	7	1	85.0	201903
Lufthansa (	Frankfurt I	Sao Paulo '	0445	1155	5	4	415.6	201905
Lufthansa (	Frankfurt I	Shanghai P	0915	0200	4 6	8	831.2	201909
Lufthansa (	Frankfurt I	Shanghai P	1305	0550	2345 7	22	2,285.8	201908
Lufthansa (	Frankfurt I	Tel Aviv-ya	1115	1610	2	1	85.0	201908
Lufthansa (	Frankfurt I	Tokyo Nari	2110	1655	1 3 5	13	1,350.7	201903
Lufthansa (	Houston G	Frankfurt I	2340	1620	5	4	340.0	201902
Lufthansa (	Hyderabad	Frankfurt I	0950	1455	5	4	340.0	201902
Lufthansa (	Los Angele	Frankfurt I	1800	1350	3	4	340.0	201908
Lufthansa (	Los Angele	Frankfurt I	2210	1800	7	4	340.0	201908
Lufthansa (	Nairobi Jor	Frankfurt I	0130	0750	12 5 7	14	1,190.0	201902
Lufthansa (	Nairobi Jor	Frankfurt I	0130	0830	1 3 7	14	1,190.0	201907
Lufthansa (	Nairobi Jor	Frankfurt I	0130	0830	1 3 5 7	9	765.0	201905
Lufthansa (	New York J	Frankfurt I	0110	1440	5	4	340.0	201909
Lufthansa (	New York J	Frankfurt I	0130	1500	3	4	340.0	201909
Lufthansa (	Novosibirs	Frankfurt I	0410	0530	2	4	340.0	201909
Lufthansa (	Novosibirs	Frankfurt I	1140	1300	7	1	85.0	201903
Lufthansa (	Novosibirs	Frankfurt I	1220	1240	7	3	255.0	201902
Lufthansa (	Novosibirs	Frankfurt I	1915	2035	4 6	8	680.0	201907
Lufthansa (	Sao Paulo '	Frankfurt I	1955	1310	7	4	415.6	201907
Lufthansa (	Seoul Inch	Frankfurt I	0205	0620	23 5 7	14	1,454.6	201905
Lufthansa (	Seoul Inch	Frankfurt I	0205	0620	23 5 7	14	1,454.6	201908
Lufthansa (	Seoul Inch	Frankfurt I	0215	0605	1 4 6	13	1,350.7	201903
Lufthansa (	Shanghai P	Frankfurt I	0325	0855	2 4	8	831.2	201909
Lufthansa (	Shanghai P	Frankfurt I	0820	1350	2 7	7	727.3	201910
Lufthansa (	Shanghai P	Frankfurt I	0820	1350	1 3456	21	2,181.9	201906
Lufthansa (	Tel Aviv-ya	Frankfurt I	1445	1815	6	1	85.0	201902
Qatar Airw	Doha	Frankfurt I	1225	1745	2	5	519.5	201912
Qatar Airw	Doha	Frankfurt I	1255	1820	3	5	325.0	201910

Qatar Airw	Doha	Frankfurt I	1355	1915	7	5	519.5	201912
Qatar Airw	Doha	Frankfurt I	1355	1915	7	4	415.6	202002
Qatar Airw	Frankfurt I	Doha	1735	0025	4	5	519.5	202001
Qatar Airw	Frankfurt I	Doha	1945	0235	2	4	415.6	202002
Qatar Airw	Frankfurt I	Doha	2020	0320	3	4	260.0	201909
Qatar Airw	Frankfurt I	Doha	2030	0320	5	4	415.6	201907
Qatar Airw	Frankfurt I	Doha	2030	0320	5	4	415.6	201910
Saudi Arab	Frankfurt I	Jeddah	0705	1420	4	4	400.0	201906
Saudi Arab	Frankfurt I	Jeddah	0705	1420	4	4	400.0	201909
Saudi Arab	Frankfurt I	Riyadh Kin	1935	0310	4	4	400.0	201902
Saudi Arab	Frankfurt I	Riyadh Kin	1935	0310	4	4	400.0	201912
Saudi Arab	Frankfurt I	Riyadh Kin	1935	0310	4	4	400.0	202002
Saudi Arab	Frankfurt I	Riyadh Kin	1940	0315	1	4	400.0	201911
Turkish Air	Frankfurt I	Istanbul At	0815	1215	4	4	260.0	201910
Turkish Air	Frankfurt I	Istanbul At	2000	0005	7	4	160.4	201902
Turkish Air	Frankfurt I	Istanbul At	2000	0005	7	4	160.4	201905
Turkish Air	Frankfurt I	Istanbul At	2000	0005	6	5	325.0	201908
Turkish Air	Lagos	Frankfurt I	0240	1120	5	5	325.0	201903
Lufthansa (	Frankfurt I	Istanbul At	2130	0230	6	1	85.0	201902
Lufthansa (	Frankfurt I	Johannesb	0545	1630	7	1	85.0	201903
Lufthansa (	Frankfurt I	Johannesb	0545	1630	7	5	425.0	201906
Lufthansa (	Frankfurt I	Los Angele	1210	1515	3	1	85.0	201903
Lufthansa (	Frankfurt I	Mexico Cit	1425	2020	6	4	415.6	201905
Lufthansa (	Frankfurt I	Mexico Cit	1700	2255	3	3	311.7	201906
Lufthansa (	Frankfurt I	Mexico Cit	1750	2345	6	1	103.9	201910
Lufthansa (	Frankfurt I	Mexico Cit	1805	2359	5	4	415.6	201910
Lufthansa (	Frankfurt I	Mumbai	1745	0520	34	8	680.0	201904
Lufthansa (	Frankfurt I	Sao Paulo '	0445	1155	5	3	311.7	201906
Lufthansa (	Frankfurt I	Sao Paulo '	0845	1555	3	4	415.6	201905
Lufthansa (	Frankfurt I	Seattle-Ta(	0845	1010	5	3	255.0	201907
Lufthansa (	Frankfurt I	Shanghai P	0820	0105	1 3	10	1,039.0	201907
Lufthansa (	Frankfurt I	Shanghai P	1305	0550	2345 7	21	2,181.9	201906
Lufthansa (	Frankfurt I	Tel Aviv-ya	1000	1455	5	1	85.0	201906
Lufthansa (	Frankfurt I	Tokyo Nari	2115	1655	4 6	8	831.2	201902
Lufthansa (	Frankfurt I	Toronto Le	1110	1335	2	4	340.0	201908
Lufthansa (	Guadalajar	Frankfurt I	0410	2230	45	8	831.2	201909
Lufthansa (	Hyderabad	Frankfurt I	1120	1710	4	4	340.0	201910
Lufthansa (	Istanbul At	Frankfurt I	0445	0540	7	1	85.0	201902
Lufthansa (	Los Angele	Frankfurt I	0050	2050	1	1	85.0	201903
Lufthansa (	Los Angele	Frankfurt I	2025	1620	6	3	255.0	201902
Lufthansa (	New York J	Frankfurt I	0055	1420	45	2	170.0	201903
Lufthansa (	New York J	Frankfurt I	0130	1500	7	1	85.0	201903
Lufthansa (	New York J	Frankfurt I	0900	2225	2	4	340.0	201902
Lufthansa (	Novosibirs	Frankfurt I	0410	0530	7	4	340.0	201905
Lufthansa (	Novosibirs	Frankfurt I	0410	0530	6	4	340.0	201904
Lufthansa (	Novosibirs	Frankfurt I	0410	0530	4	4	340.0	201907
Lufthansa (	Novosibirs	Frankfurt I	0410	0530	3	4	340.0	201906

Lufthansa (	Novosibirs	Frankfurt I	0410	0530	3	4	340.0	201909
Lufthansa (	Novosibirs	Frankfurt I	0410	0530	2	4	340.0	201908
Lufthansa (	Sao Paulo '	Frankfurt I	1955	1310	7	4	415.6	201909
Lufthansa (	Seoul Inch(	Frankfurt I	0205	0520	7	1	103.9	201910
Lufthansa (	Seoul Inch(	Frankfurt I	0205	0620	23 5 7	15	1,558.5	201910
Lufthansa (	Seoul Inch(	Frankfurt I	0205	0620	1 4 6	13	1,350.7	201906
Lufthansa (	Shanghai P	Frankfurt I	0325	0855	2 4	9	935.1	201904
Lufthansa (	Shanghai P	Frankfurt I	0325	0855	2 4	9	935.1	201907
Lufthansa (	Shanghai P	Frankfurt I	0820	1350	1 3456	21	2,181.9	201904
Qatar Airw	Doha	Frankfurt I	0720	1240	1	5	519.5	201904
Qatar Airw	Doha	Frankfurt I	0720	1240	1	5	519.5	201907
Qatar Airw	Doha	Frankfurt I	0935	1455	4	4	415.6	201909
Qatar Airw	Doha	Frankfurt I	0935	1455	4	4	415.6	201912
Qatar Airw	Doha	Frankfurt I	1310	1830	6	5	519.5	201908
Qatar Airw	Doha	Frankfurt I	1310	1830	6	4	415.6	202001
Qatar Airw	Doha	Frankfurt I	1310	1830	5	5	519.5	201908
Qatar Airw	Doha	Frankfurt I	1355	1915	7	4	415.6	201904
Qatar Airw	Frankfurt I	Doha	2020	0320	3	4	260.0	201911
Qatar Airw	Frankfurt I	Doha	2030	0320	6	4	415.6	201902
Qatar Airw	Frankfurt I	Doha	2030	0320	6	4	415.6	201905
Qatar Airw	Frankfurt I	Doha	2030	0320	6	5	519.5	202002
Qatar Airw	Frankfurt I	Doha	2030	0320	5	4	415.6	202002
Qatar Airw	Frankfurt I	Doha	2115	0405	7	4	415.6	201902
Qatar Airw	Frankfurt I	Doha	2115	0405	7	4	415.6	201905
Saudi Arab	Dammam	Frankfurt I	0135	0610	6	5	500.0	201908
Saudi Arab	Dammam	Frankfurt I	0135	0610	6	5	500.0	201911
Lufthansa (	Frankfurt I	Mexico Cit	1745	2330	1	4	415.6	201904
Lufthansa (	Frankfurt I	Mumbai	1550	0420	34	8	680.0	201902
Lufthansa (	Frankfurt I	Mumbai	1745	0520	34	10	850.0	201905
Lufthansa (	Frankfurt I	Mumbai	2040	0915	2	2	170.0	201902
Lufthansa (	Frankfurt I	New York J	2005	2240	4	5	425.0	201905
Lufthansa (	Frankfurt I	New York J	2120	2355	3	4	340.0	201908
Lufthansa (	Frankfurt I	Novosibirs	1405	0120	3 5	10	850.0	201905
Lufthansa (	Frankfurt I	Novosibirs	1405	0120	3 5	9	765.0	201908
Lufthansa (	Frankfurt I	Sao Paulo '	0445	1155	6	4	415.6	201909
Lufthansa (	Frankfurt I	Seattle-Ta(	0825	1100	5	3	255.0	201903
Lufthansa (	Frankfurt I	Seattle-Ta(	1335	1500	7	5	425.0	201909
Lufthansa (	Frankfurt I	Seattle-Ta(	1525	1800	7	3	255.0	201903
Lufthansa (	Frankfurt I	Shanghai P	0915	0200	4 6	9	935.1	201905
Lufthansa (	Frankfurt I	Shanghai P	1335	0720	2345 7	20	2,078.0	201902
Lufthansa (	Frankfurt I	Tel Aviv-ya	1610	2105	4 6	2	170.0	201910
Lufthansa (	Guadalajar	Frankfurt I	0200	2020	7	4	415.6	201907
Lufthansa (	Houston G	Frankfurt I	1955	1245	2	5	425.0	201904
Lufthansa (	Istanbul At	Frankfurt I	0330	0530	3 5 7	13	1,105.0	201909
Lufthansa (	Los Angele	Frankfurt I	1800	1350	3	4	340.0	201904
Lufthansa (	Los Angele	Frankfurt I	1800	1350	3	4	340.0	201910
Lufthansa (	Los Angele	Frankfurt I	2025	1615	6	1	85.0	201902

Lufthansa (	Nairobi Jor	Frankfurt I	0130	0830	1 3 5 7	17	1,445.0	201904
Lufthansa (	New York J	Frankfurt I	0055	1420	45	1	85.0	201902
Lufthansa (	New York J	Frankfurt I	0110	1440	5	4	340.0	201910
Lufthansa (	New York J	Frankfurt I	0120	1445	3	1	85.0	201902
Lufthansa (	New York J	Frankfurt I	0130	1455	6	4	340.0	201905
Lufthansa (	New York J	Frankfurt I	0900	2225	2	1	85.0	201903
Lufthansa (	Novosibirs	Frankfurt I	0410	0530	3	5	425.0	201905
Lufthansa (	Novosibirs	Frankfurt I	0410	0530	2	4	340.0	201905
Lufthansa (	Novosibirs	Frankfurt I	0450	0510	5	1	85.0	201902
Lufthansa (	Novosibirs	Frankfurt I	1915	2035	4 6	8	680.0	201910
Lufthansa (	Novosibirs	Frankfurt I	2010	2130	7	4	340.0	201907
Lufthansa (	Sao Paulo '	Frankfurt I	0005	1720	3	2	207.8	201905
Lufthansa (	Seoul Inch	Frankfurt I	0155	0545	2	4	415.6	201902
Lufthansa (	Shanghai P	Frankfurt I	0325	0855	2 4	9	935.1	201905
Lufthansa (	Shanghai P	Frankfurt I	0325	0855	2 4	9	935.1	201908
Lufthansa (	Shanghai P	Frankfurt I	0430	1000	5 7	8	831.2	201904
Lufthansa (	Shanghai P	Frankfurt I	0530	1130	7	1	103.9	201903
Qatar Airw	Doha	Frankfurt I	1255	1820	3	4	260.0	201903
Qatar Airw	Doha	Frankfurt I	1255	1820	3	4	260.0	202002
Qatar Airw	Doha	Frankfurt I	1310	1830	6	4	415.6	201912
Qatar Airw	Doha	Frankfurt I	1310	1830	5	5	519.5	201903
Qatar Airw	Frankfurt I	Doha	1945	0235	2	4	415.6	201905
Qatar Airw	Frankfurt I	Doha	2020	0320	3	5	325.0	202001
Qatar Airw	Frankfurt I	Doha	2030	0320	5	4	415.6	201906
Qatar Airw	Frankfurt I	Doha	2115	0405	7	5	519.5	201909
Saudi Arab	Dammam	Frankfurt I	0135	0610	6	5	500.0	202002
Saudi Arab	Dammam	Frankfurt I	1450	1925	3	4	400.0	201911
Saudi Arab	Frankfurt I	Jeddah	0705	1420	4	4	400.0	201904
Saudi Arab	Frankfurt I	Jeddah	2020	0250	3	4	440.0	201908
Saudi Arab	Frankfurt I	Riyadh Kin	1940	0315	1	5	500.0	201912
Saudi Arab	Frankfurt I	Riyadh Kin	2040	0315	5	5	550.0	201911
Saudi Arab	Riyadh Kin	Frankfurt I	0910	1420	5	5	550.0	201905
Saudi Arab	Riyadh Kin	Frankfurt I	1045	1455	1	5	500.0	201907
Lufthansa (	Frankfurt I	Chicago O'	1335	1605	4	4	340.0	201907
Lufthansa (	Frankfurt I	Chicago O'	1555	1840	6	1	103.9	201903
Lufthansa (	Frankfurt I	Chicago O'	2020	2305	3	1	85.0	201902
Lufthansa (	Frankfurt I	Dakar Blais	0815	1320	7	4	340.0	201903
Lufthansa (	Frankfurt I	Dammam	1400	2125	1	4	340.0	201903
Lufthansa (	Frankfurt I	Istanbul At	2115	0115	2	2	170.0	201910
Lufthansa (	Frankfurt I	Johannesb	0545	1630	7	5	425.0	201909
Lufthansa (	Frankfurt I	Los Angele	1230	1530	3	4	340.0	201910
Lufthansa (	Frankfurt I	Mumbai	1730	0505	7	1	85.0	201903
Lufthansa (	Frankfurt I	Mumbai	1745	0520	34	9	765.0	201907
Lufthansa (	Frankfurt I	Mumbai	2035	0810	2	4	340.0	201910
Lufthansa (	Frankfurt I	New York J	2005	2240	4	4	340.0	201909
Lufthansa (	Frankfurt I	Novosibirs	0450	1605	3 5 7	12	1,020.0	201904
Lufthansa (	Frankfurt I	Novosibirs	1405	0120	3 5	8	680.0	201909

Lufthansa (	Frankfurt I	Riyadh Kin	0840	1610	7	3	255.0	201902
Lufthansa (	Frankfurt I	Riyadh Kin	1345	2025	7	4	340.0	201904
Lufthansa (	Frankfurt I	Sao Paulo '	0445	1155	5	4	415.6	201910
Lufthansa (	Frankfurt I	Sao Paulo '	0735	1600	5	1	103.9	201902
Lufthansa (	Frankfurt I	Sao Paulo '	2040	0350	7	4	415.6	201906
Lufthansa (	Frankfurt I	Seattle-Ta	1335	1500	7	1	85.0	201903
Lufthansa (	Frankfurt I	Shanghai P	0820	0105	1 3	9	935.1	201904
Lufthansa (	Frankfurt I	Shanghai P	0915	0200	4 6	8	831.2	201907
Lufthansa (	Frankfurt I	Shanghai P	0915	0200	4 6	8	831.2	201910
Lufthansa (	Frankfurt I	Shanghai P	0915	0300	4 6	7	727.3	201902
Lufthansa (	Frankfurt I	Tel Aviv-ya	1610	2100	2 4 6	8	680.0	201902
Lufthansa (	Frankfurt I	Tel Aviv-ya	1610	2105	2 4 6	13	1,105.0	201904
Lufthansa (	Frankfurt I	Tokyo Nari	2230	1700	2 4	9	935.1	201905
Lufthansa (	Frankfurt I	Tokyo Nari	2230	1700	1 3 5 7	17	1,766.3	201906
Lufthansa (	Houston G	Frankfurt I	2345	1625	2	1	85.0	201903
Lufthansa (	Hyderabad	Frankfurt I	1120	1710	4	4	340.0	201904
Lufthansa (	Istanbul At	Frankfurt I	0330	0530	3 5 7	8	680.0	201910
Lufthansa (	Los Angele	Frankfurt I	1800	1350	3	4	340.0	201906
Lufthansa (	Los Angele	Frankfurt I	2210	1800	7	1	85.0	201903
Lufthansa (	Mumbai	Frankfurt I	0655	1125	45	8	680.0	201902
Lufthansa (	Novosibirs	Frankfurt I	0410	0530	4	4	340.0	201904
Lufthansa (	Novosibirs	Frankfurt I	1220	1240	4	4	340.0	201903
Lufthansa (	Novosibirs	Frankfurt I	2010	2130	7	3	255.0	201910
Lufthansa (	Seoul Inch	Frankfurt I	0205	0620	4 6	2	207.8	201908
Lufthansa (	Seoul Inch	Frankfurt I	0215	0605	1 4 6	12	1,246.8	201902
Qatar Airw	Doha	Frankfurt I	0720	1240	1	4	415.6	201910
Qatar Airw	Doha	Frankfurt I	0935	1455	4	4	415.6	201906
Qatar Airw	Doha	Frankfurt I	1225	1745	2	5	519.5	201907
Qatar Airw	Doha	Frankfurt I	1255	1820	3	4	260.0	201902
Qatar Airw	Doha	Frankfurt I	1255	1820	3	4	260.0	201908
Qatar Airw	Doha	Frankfurt I	1310	1830	6	4	415.6	201902
Qatar Airw	Doha	Frankfurt I	1310	1830	6	5	519.5	201911
Qatar Airw	Doha	Frankfurt I	1310	1830	5	5	519.5	201905
Qatar Airw	Frankfurt I	Doha	2030	0320	5	5	519.5	201905
Qatar Airw	Frankfurt I	Doha	2115	0405	7	4	415.6	202002
Saudi Arab	Dammam	Frankfurt I	1450	1925	3	4	400.0	201902
Saudi Arab	Frankfurt I	Jeddah	2020	0250	3	5	550.0	201910
Saudi Arab	Frankfurt I	Riyadh Kin	1940	0315	1	4	400.0	201906
Saudi Arab	Frankfurt I	Riyadh Kin	1940	0315	1	4	400.0	201910
Saudi Arab	Frankfurt I	Riyadh Kin	2040	0315	5	4	440.0	201909
Saudi Arab	Riyadh Kin	Frankfurt I	1045	1455	1	4	400.0	201911
Lufthansa (	Frankfurt I	Chennai	1715	0600	3	5	425.0	201907
Lufthansa (	Frankfurt I	Chicago O'	1350	1605	6	2	170.0	201903
Lufthansa (	Frankfurt I	Chicago O'	1350	1705	6	2	170.0	201903
Lufthansa (	Frankfurt I	Chicago O'	2045	2315	123	13	1,105.0	201909
Lufthansa (	Frankfurt I	Curitiba Af	1145	1910	2	4	415.6	201908
Lufthansa (	Frankfurt I	Dakar Blais	2040	0050	7	1	85.0	201903

Lufthansa (	Frankfurt I	Johannesb	0445	1630	4	4	340.0	201902
Lufthansa (	Frankfurt I	Johannesb	0455	1630	6	5	425.0	201903
Lufthansa (	Frankfurt I	Johannesb	0455	1640	1 7	8	680.0	201903
Lufthansa (	Frankfurt I	Johannesb	0540	1625	6	4	340.0	201905
Lufthansa (	Frankfurt I	Johannesb	0555	1640	2 4	9	765.0	201904
Lufthansa (	Frankfurt I	Kuwait	1620	2255	4	5	425.0	201908
Lufthansa (	Frankfurt I	Los Angele	1520	1820	6	4	340.0	201907
Lufthansa (	Frankfurt I	Mexico Cit	1425	2020	6	4	415.6	201907
Lufthansa (	Frankfurt I	Mexico Cit	1805	2300	5	1	103.9	201904
Lufthansa (	Frankfurt I	Mumbai	1730	0505	7	4	340.0	201905
Lufthansa (	Frankfurt I	Mumbai	1935	0805	5	1	85.0	201902
Lufthansa (	Frankfurt I	Mumbai	2025	0855	5	1	85.0	201902
Lufthansa (	Frankfurt I	Mumbai	2035	0810	2	4	340.0	201905
Lufthansa (	Frankfurt I	New York J	2005	2240	4	4	340.0	201907
Lufthansa (	Frankfurt I	New York J	2120	2355	3	4	340.0	201904
Lufthansa (	Frankfurt I	New York J	2120	2355	3	4	340.0	201910
Lufthansa (	Frankfurt I	Novosibirs	1405	0120	3 5	8	680.0	201904
Lufthansa (	Frankfurt I	Riyadh Kin;	1345	2025	7	5	425.0	201906
Lufthansa (	Frankfurt I	Riyadh Kin;	1345	2025	7	5	425.0	201909
Lufthansa (	Frankfurt I	Seattle-Ta(	0825	1000	5	4	340.0	201902
Lufthansa (	Frankfurt I	Seattle-Ta(	1525	1700	7	1	85.0	201903
Lufthansa (	Frankfurt I	Tokyo Nari	2230	1655	6	4	415.6	201910
Lufthansa (	Guadalajar	Frankfurt I	0310	2230	45	2	207.8	201904
Lufthansa (	Guadalajar	Frankfurt I	0410	2230	4	1	103.9	201910
Lufthansa (	Houston G	Frankfurt I	1955	1245	2	5	425.0	201907
Lufthansa (	Hyderabad	Frankfurt I	1055	1645	2 6	8	680.0	201910
Lufthansa (	Hyderabad	Frankfurt I	1135	1640	2	4	340.0	201902
Lufthansa (	Istanbul At	Frankfurt I	0330	0530	7	1	85.0	201905
Lufthansa (	Istanbul At	Frankfurt I	0445	0540	3 5 7	13	1,105.0	201903
Lufthansa (	Istanbul At	Frankfurt I	0445	0640	7	1	85.0	201903
Lufthansa (	Los Angele	Frankfurt I	1730	1320	5	2	170.0	201903
Lufthansa (	Mumbai	Frankfurt I	0755	1255	45	10	850.0	201905
Lufthansa (	Nairobi Jor	Frankfurt I	0130	0830	1 3 7	10	850.0	201910
Lufthansa (	New York J	Frankfurt I	0110	1440	5	4	340.0	201906
Lufthansa (	New York J	Frankfurt I	0130	1455	6	4	340.0	201904
Lufthansa (	New York J	Frankfurt I	0130	1500	7	4	340.0	201905
Lufthansa (	Novosibirs	Frankfurt I	0410	0530	4	4	340.0	201909
Lufthansa (	Novosibirs	Frankfurt I	1115	1235	1 4 6	13	1,105.0	201906
Lufthansa (	Novosibirs	Frankfurt I	1115	1235	1 4 6	7	595.0	201909
Lufthansa (	Novosibirs	Frankfurt I	1230	1250	3	3	255.0	201902
Lufthansa (	Novosibirs	Frankfurt I	2010	2130	7	4	340.0	201908
Lufthansa (	Sao Paulo '	Frankfurt I	1955	1310	7	3	311.7	201910
Lufthansa (	Seoul Inch(	Frankfurt I	0205	0620	1 4 6	13	1,350.7	201904
Lufthansa (	Tel Aviv-ya	Frankfurt I	1725	2050	5	1	85.0	201906
Qatar Airw	Doha	Frankfurt I	0935	1455	4	4	415.6	201904
Qatar Airw	Doha	Frankfurt I	0935	1455	4	4	415.6	201907
Qatar Airw	Doha	Frankfurt I	1310	1830	6	5	519.5	201903

Lufthansa (	Frankfurt I	Dakar Blais	0445	0855	5	1	85.0	201905
Lufthansa (	Frankfurt I	Dakar Blais	0815	1320	7	4	340.0	201902
Lufthansa (	Frankfurt I	Dakar Blais	1955	0100	3	4	340.0	201903
Lufthansa (	Frankfurt I	Johannesb	0445	1630	4	4	340.0	201903
Lufthansa (	Frankfurt I	Johannesb	0545	1630	7	3	255.0	201910
Lufthansa (	Frankfurt I	Kuwait	1620	2255	4	5	425.0	201905
Lufthansa (	Frankfurt I	Kuwait	1620	2340	4	1	85.0	201902
Lufthansa (	Frankfurt I	Los Angele	1230	1530	3	4	340.0	201909
Lufthansa (	Frankfurt I	Mexico Cit	1425	2020	6	4	415.6	201906
Lufthansa (	Frankfurt I	Mexico Cit	1700	2255	3	5	519.5	201907
Lufthansa (	Frankfurt I	Mexico Cit	1700	2255	3	4	415.6	201910
Lufthansa (	Frankfurt I	Mumbai	1730	0505	7	5	425.0	201909
Lufthansa (	Frankfurt I	Mumbai	2035	0810	2	3	255.0	201906
Lufthansa (	Frankfurt I	New York J	1950	2225	34	2	170.0	201903
Lufthansa (	Frankfurt I	New York J	2020	2300	56	10	850.0	201908
Lufthansa (	Frankfurt I	Novosibirs	0450	1605	5 7	4	340.0	201909
Lufthansa (	Frankfurt I	Novosibirs	0450	1605	3 5 7	11	935.0	201910
Lufthansa (	Frankfurt I	Sao Paulo '	0735	1600	5	5	519.5	201903
Lufthansa (	Frankfurt I	Shanghai P	1305	0550	2345 7	21	2,181.9	201909
Lufthansa (	Frankfurt I	Tokyo Nari	2115	1655	7	4	415.6	201903
Lufthansa (	Frankfurt I	Tokyo Nari	2230	1655	6	4	415.6	201909
Lufthansa (	Istanbul At	Frankfurt I	0330	0530	3 5 7	11	935.0	201906
Lufthansa (	Los Angele	Frankfurt I	1730	1320	5	4	340.0	201909
Lufthansa (	Mumbai	Frankfurt I	0755	1255	45	8	680.0	201904
Lufthansa (	Nairobi Jor	Frankfurt I	0130	0830	1 3 7	12	1,020.0	201908
Lufthansa (	New York J	Frankfurt I	0055	1420	4	3	255.0	201902
Lufthansa (	New York J	Frankfurt I	0130	1455	6	5	425.0	201908
Lufthansa (	New York J	Frankfurt I	0130	1500	7	5	425.0	201909
Lufthansa (	New York J	Frankfurt I	0130	1500	3	5	425.0	201905
Lufthansa (	New York J	Frankfurt I	0305	1635	4	5	425.0	201908
Lufthansa (	Novosibirs	Frankfurt I	0410	0530	6	4	340.0	201910
Lufthansa (	Novosibirs	Frankfurt I	0410	0530	4	4	340.0	201910
Lufthansa (	Novosibirs	Frankfurt I	1115	1235	1 4 6	12	1,020.0	201905
Lufthansa (	Novosibirs	Frankfurt I	1210	1230	1	3	255.0	201902
Lufthansa (	Sao Paulo '	Frankfurt I	0035	1750	3	2	207.8	201908
Lufthansa (	Sao Paulo '	Frankfurt I	1955	1310	7	4	415.6	201908
Lufthansa (	Seoul Inch	Frankfurt I	0205	0620	1 4 6	13	1,350.7	201905
Lufthansa (	Seoul Inch	Frankfurt I	0205	0620	1 4 6	12	1,246.8	201908
Lufthansa (	Shanghai P	Frankfurt I	0430	1000	5 7	7	727.3	201910
Lufthansa (	Shanghai P	Frankfurt I	0820	1350	2 7	1	103.9	201903
Lufthansa (	Shanghai P	Frankfurt I	0820	1350	1 3456	16	1,662.4	201910
Qatar Airw	Doha	Frankfurt I	0720	1240	1	4	415.6	201911
Qatar Airw	Doha	Frankfurt I	0935	1455	4	5	519.5	202001
Qatar Airw	Doha	Frankfurt I	1225	1745	2	4	415.6	201906
Qatar Airw	Doha	Frankfurt I	1310	1830	6	5	519.5	202002
Qatar Airw	Doha	Frankfurt I	1310	1830	5	4	415.6	201906
Qatar Airw	Frankfurt I	Doha	1735	0025	4	4	415.6	201912

Qatar Airw	Frankfurt I	Doha	2030	0320	6	5	519.5	201903
Qatar Airw	Frankfurt I	Doha	2030	0320	6	4	415.6	201909
Qatar Airw	Frankfurt I	Doha	2030	0320	5	5	519.5	201903
Saudi Arab	Dammam	Frankfurt I	0135	0610	6	4	400.0	201912
Saudi Arab	Dammam	Frankfurt I	1450	1925	3	4	400.0	201904
Saudi Arab	Frankfurt I	Jeddah	0705	1420	4	5	500.0	201910
Saudi Arab	Frankfurt I	Jeddah	0820	1535	6	4	400.0	202001
Saudi Arab	Frankfurt I	Jeddah	2020	0250	3	4	440.0	201911
Lufthansa (	Frankfurt I	Cairo Inter	2110	0055	7	5	425.0	201906
Lufthansa (	Frankfurt I	Chicago O'	2045	2315	123	13	1,105.0	201905
Lufthansa (	Frankfurt I	Chicago O'	2125	2355	6	1	85.0	201906
Lufthansa (	Frankfurt I	Curitiba Af	1145	1910	2	4	415.6	201909
Lufthansa (	Frankfurt I	Dammam	1425	2110	1	4	340.0	201905
Lufthansa (	Frankfurt I	Kuwait	1620	2255	4	4	340.0	201910
Lufthansa (	Frankfurt I	Mexico Cit	1645	2240	4	1	103.9	201910
Lufthansa (	Frankfurt I	Mumbai	1745	0520	34	8	680.0	201910
Lufthansa (	Frankfurt I	Mumbai	1750	0525	1 5	9	765.0	201904
Lufthansa (	Frankfurt I	New York J	2120	2355	3	4	340.0	201909
Lufthansa (	Frankfurt I	Sao Paulo '	0445	1155	6	4	415.6	201907
Lufthansa (	Frankfurt I	Sao Paulo '	0845	1555	3	4	415.6	201909
Lufthansa (	Frankfurt I	Sao Paulo '	2040	0350	7	4	415.6	201907
Lufthansa (	Frankfurt I	Seattle-Ta(	0845	1010	5	4	340.0	201909
Lufthansa (	Frankfurt I	Seattle-Ta(	1335	1500	7	4	340.0	201904
Lufthansa (	Frankfurt I	Seattle-Ta(	1335	1500	7	4	340.0	201907
Lufthansa (	Frankfurt I	Shanghai P	1305	0550	2345 7	21	2,181.9	201904
Lufthansa (	Frankfurt I	Tokyo Nari	2110	1655	2	4	415.6	201902
Lufthansa (	Frankfurt I	Tokyo Nari	2230	1700	2 4	8	831.2	201909
Lufthansa (	Guadalajar	Frankfurt I	0200	2020	7	5	519.5	201909
Lufthansa (	Guadalajar	Frankfurt I	0205	2025	4	1	103.9	201905
Lufthansa (	Houston G	Frankfurt I	1955	1245	2	4	340.0	201909
Lufthansa (	Houston G	Frankfurt I	2340	1620	5	2	170.0	201903
Lufthansa (	Hyderabad	Frankfurt I	1055	1645	2 6	9	765.0	201906
Lufthansa (	Los Angele	Frankfurt I	1730	1320	5	4	340.0	201904
Lufthansa (	Natal	Frankfurt I	1600	0515	7	4	415.6	201902
Lufthansa (	New York J	Frankfurt I	0110	1440	5	5	425.0	201908
Lufthansa (	New York J	Frankfurt I	0130	1500	7	4	340.0	201904
Lufthansa (	New York J	Frankfurt I	0155	1420	45	6	510.0	201903
Lufthansa (	New York J	Frankfurt I	0305	1635	4	4	340.0	201909
Lufthansa (	Novosibirs	Frankfurt I	0410	0530	4	5	425.0	201905
Lufthansa (	Novosibirs	Frankfurt I	0410	0530	2	5	425.0	201904
Lufthansa (	Novosibirs	Frankfurt I	0410	0530	2	4	340.0	201910
Lufthansa (	Novosibirs	Frankfurt I	1115	1235	4 6	3	255.0	201908
Lufthansa (	Novosibirs	Frankfurt I	1915	2035	4 6	10	850.0	201908
Lufthansa (	Novosibirs	Frankfurt I	2110	2130	7	3	255.0	201902
Lufthansa (	Sao Paulo '	Frankfurt I	0005	1720	3	1	103.9	201907
Lufthansa (	Seoul Inch(	Frankfurt I	0205	0620	23 5 7	17	1,766.3	201906
Lufthansa (	Seoul Inch(	Frankfurt I	0215	0705	7	1	103.9	201903

Lufthansa (	Shanghai P	Frankfurt I	0430	0900	7	1	103.9	201910
Qatar Airw	Doha	Frankfurt I	1225	1745	2	4	415.6	201908
Qatar Airw	Doha	Frankfurt I	1225	1745	2	4	415.6	201911
Qatar Airw	Doha	Frankfurt I	1255	1820	3	4	260.0	201911
Qatar Airw	Doha	Frankfurt I	1310	1830	5	4	415.6	201904
Qatar Airw	Doha	Frankfurt I	1355	1915	7	4	415.6	202001
Qatar Airw	Frankfurt I	Doha	1440	2130	1	5	519.5	201912
Qatar Airw	Frankfurt I	Doha	1735	0025	4	4	415.6	201904
Qatar Airw	Frankfurt I	Doha	2020	0320	3	5	325.0	201910
Qatar Airw	Frankfurt I	Doha	2030	0320	5	5	519.5	201908
Qatar Airw	Frankfurt I	Doha	2030	0320	5	5	519.5	201911
Qatar Airw	Frankfurt I	Doha	2030	0320	5	5	519.5	202001
Saudi Arab	Dammam	Frankfurt I	0135	0610	6	4	400.0	201910
Saudi Arab	Dammam	Frankfurt I	1450	1925	3	4	400.0	201912
Saudi Arab	Frankfurt I	Riyadh Kin	1935	0310	4	4	400.0	201909
Saudi Arab	Riyadh Kin	Frankfurt I	1045	1455	1	4	400.0	201902
Lufthansa (	Frankfurt I	Chicago O'	2020	2305	34	2	207.8	201903
Lufthansa (	Frankfurt I	Chicago O'	2045	2315	123	12	1,020.0	201908
Lufthansa (	Frankfurt I	Curitiba Af	0650	1430	7	3	311.7	201910
Lufthansa (	Frankfurt I	Curitiba Af	1145	1910	2	5	519.5	201907
Lufthansa (	Frankfurt I	Curitiba Af	1145	1910	2	3	311.7	201910
Lufthansa (	Frankfurt I	Dallas Dall	1155	1700	3	3	255.0	201903
Lufthansa (	Frankfurt I	Johannesb	0540	1625	6	4	340.0	201907
Lufthansa (	Frankfurt I	Los Angele	1200	1605	3	3	255.0	201903
Lufthansa (	Frankfurt I	Los Angele	1450	1755	6	4	340.0	201902
Lufthansa (	Frankfurt I	Los Angele	1450	1855	6	3	255.0	201903
Lufthansa (	Frankfurt I	Mumbai	1730	0505	7	5	425.0	201906
Lufthansa (	Frankfurt I	Mumbai	1935	0805	5	5	425.0	201903
Lufthansa (	Frankfurt I	Mumbai	2035	0810	2	5	425.0	201907
Lufthansa (	Frankfurt I	New York J	2020	2300	56	8	680.0	201904
Lufthansa (	Frankfurt I	Sao Paulo '	2210	0625	6	4	415.6	201903
Lufthansa (	Frankfurt I	Seattle-Ta	0845	1010	5	4	340.0	201904
Lufthansa (	Frankfurt I	Shanghai P	0720	0105	1	1	103.9	201902
Lufthansa (	Frankfurt I	Toronto Le	1110	1335	2	4	340.0	201905
Lufthansa (	Frankfurt I	Toronto Le	1440	1720	1	4	340.0	201902
Lufthansa (	Guadalajar	Frankfurt I	0410	2230	45	6	623.4	201906
Lufthansa (	Houston G	Frankfurt I	1955	1245	2	4	340.0	201908
Lufthansa (	Hyderabad	Frankfurt I	1055	1645	2 6	8	680.0	201905
Lufthansa (	Istanbul At	Frankfurt I	0445	0540	3	1	103.9	201902
Lufthansa (	Istanbul At	Frankfurt I	0445	0540	3 5 7	8	680.0	201902
Lufthansa (	New York J	Frankfurt I	0110	1440	5	4	340.0	201907
Lufthansa (	New York J	Frankfurt I	0130	1455	6	5	425.0	201906
Lufthansa (	New York J	Frankfurt I	0130	1500	7	5	425.0	201906
Lufthansa (	New York J	Frankfurt I	0130	1500	3	4	340.0	201908
Lufthansa (	New York J	Frankfurt I	0305	1635	4	4	340.0	201904
Lufthansa (	New York J	Frankfurt I	0305	1635	4	4	340.0	201910
Lufthansa (	Novosibirs	Frankfurt I	0410	0530	7	4	340.0	201908

Lufthansa (	Novosibirs	Frankfurt I	1220	1240	7	4	340.0	201903
Lufthansa (	Novosibirs	Frankfurt I	1230	1250	3	4	340.0	201903
Lufthansa (	Sao Paulo '	Frankfurt I	0005	1720	3	2	207.8	201909
Lufthansa (	Seoul Inch	Frankfurt I	0205	0620	23 5 7	18	1,870.2	201907
Lufthansa (	Shanghai P	Frankfurt I	0935	1435	1 3456	20	2,078.0	201902
Qatar Airw	Doha	Frankfurt I	0935	1455	4	4	415.6	202002
Qatar Airw	Frankfurt I	Doha	1735	0025	4	4	415.6	201906
Qatar Airw	Frankfurt I	Doha	1945	0235	2	4	415.6	201911
Qatar Airw	Frankfurt I	Doha	2030	0320	5	4	415.6	201902
Qatar Airw	Frankfurt I	Doha	2030	0320	5	4	415.6	201912
Saudi Arab	Dammam	Frankfurt I	0135	0610	6	4	400.0	201905
Saudi Arab	Dammam	Frankfurt I	0135	0610	6	4	400.0	202001
Saudi Arab	Frankfurt I	Jeddah	0705	1420	4	5	500.0	202001
Saudi Arab	Frankfurt I	Jeddah	0820	1535	6	5	500.0	201908
Saudi Arab	Frankfurt I	Riyadh Kin	1935	0310	4	4	400.0	201904
Saudi Arab	Frankfurt I	Riyadh Kin	1940	0315	1	4	400.0	201903
Saudi Arab	Frankfurt I	Riyadh Kin	2040	0315	5	4	440.0	201906
Saudi Arab	Frankfurt I	Riyadh Kin	2040	0315	5	4	440.0	201912
Saudi Arab	Riyadh Kin	Frankfurt I	0910	1420	5	4	440.0	201909
Saudi Arab	Riyadh Kin	Frankfurt I	1045	1455	1	4	400.0	201908
Turkish Air	Frankfurt I	Istanbul At	0815	1215	4	4	260.0	201909
Turkish Air	Frankfurt I	Istanbul At	2000	0005	6	5	325.0	201903
Turkish Air	Frankfurt I	Istanbul At	2000	0005	6	5	325.0	201906
Lufthansa (	Frankfurt I	Chicago O'	1000	1245	7	1	85.0	201903
Lufthansa (	Frankfurt I	Chicago O'	1135	1420	2	1	85.0	201903
Lufthansa (	Frankfurt I	Chicago O'	1335	1605	4	4	340.0	201904
Lufthansa (	Frankfurt I	Dakar Blais	0445	0855	3	1	85.0	201905
Lufthansa (	Frankfurt I	Dakar Blais	2115	0220	1	4	340.0	201903
Lufthansa (	Frankfurt I	Kuwait	1620	2255	4	4	340.0	201909
Lufthansa (	Frankfurt I	Los Angele	1520	1820	6	4	340.0	201905
Lufthansa (	Frankfurt I	Los Angele	1520	1820	6	5	425.0	201908
Lufthansa (	Frankfurt I	Mexico Cit	1735	2330	4	4	415.6	201909
Lufthansa (	Frankfurt I	Mexico Cit	1745	2330	1	4	415.6	201906
Lufthansa (	Frankfurt I	Mumbai	1735	0605	1	4	340.0	201903
Lufthansa (	Frankfurt I	Mumbai	2035	0810	2	5	425.0	201904
Lufthansa (	Frankfurt I	New York J	2120	2355	3	5	425.0	201905
Lufthansa (	Frankfurt I	Novosibirs	0445	1650	3 5 7	13	1,105.0	201903
Lufthansa (	Frankfurt I	Sao Paulo '	0845	1555	3	4	415.6	201908
Lufthansa (	Frankfurt I	Shanghai P	0915	0200	4 6	8	831.2	201904
Lufthansa (	Frankfurt I	Shanghai P	1305	0550	2345 7	1	103.9	201903
Lufthansa (	Frankfurt I	Tel Aviv-ya	1610	2105	2 4 6	12	1,020.0	201907
Lufthansa (	Guadalajar	Frankfurt I	0100	2020	7	1	103.9	201903
Lufthansa (	Guadalajar	Frankfurt I	0200	2020	7	3	311.7	201910
Lufthansa (	Houston G	Frankfurt I	1955	1245	2	4	340.0	201905
Lufthansa (	Istanbul At	Frankfurt I	0330	0530	3	2	170.0	201910
Lufthansa (	Los Angele	Frankfurt I	1730	1320	5	5	425.0	201908
Lufthansa (	Los Angele	Frankfurt I	1800	1350	3	1	85.0	201903

Lufthansa (	Los Angele	Frankfurt I	2025	1630	6	1	85.0	201903
Lufthansa (	Los Angele	Frankfurt I	2050	1700	6	4	340.0	201905
Lufthansa (	Mumbai	Frankfurt I	0735	1235	1	4	340.0	201905
Lufthansa (	Nairobi Jor	Frankfurt I	0130	0830	1 3 7	6	510.0	201905
Lufthansa (	Nairobi Jor	Frankfurt I	0130	0830	1 3 5 7	1	85.0	201903
Lufthansa (	Natal	Frankfurt I	1600	0515	7	4	415.6	201903
Lufthansa (	New York J	Frankfurt I	0110	1440	5	4	340.0	201904
Lufthansa (	Novosibirs	Frankfurt I	0410	0430	7	1	85.0	201910
Lufthansa (	Novosibirs	Frankfurt I	0510	0530	5 7	5	425.0	201902
Lufthansa (	Novosibirs	Frankfurt I	1220	1250	4 6	2	170.0	201903
Lufthansa (	Novosibirs	Frankfurt I	1915	2035	4 6	8	680.0	201909
Lufthansa (	Seoul Inch	Frankfurt I	0205	0620	1 4 6	13	1,350.7	201909
Lufthansa (	Shanghai P	Frankfurt I	0530	1030	5 7	7	727.3	201902
Lufthansa (	Shanghai P	Frankfurt I	0820	1350	2 7	9	935.1	201909
Qatar Airw	Doha	Frankfurt I	1225	1745	2	5	519.5	201904
Qatar Airw	Doha	Frankfurt I	1310	1830	5	4	415.6	201902
Qatar Airw	Frankfurt I	Doha	1440	2130	1	4	415.6	201911
Qatar Airw	Frankfurt I	Doha	1945	0235	2	5	519.5	201904
Qatar Airw	Frankfurt I	Doha	2030	0320	6	4	415.6	201912
Saudi Arab	Dammam	Frankfurt I	1450	1925	3	4	400.0	201908
Saudi Arab	Frankfurt I	Jeddah	0705	1420	4	5	500.0	201908
Saudi Arab	Frankfurt I	Jeddah	0820	1535	6	4	400.0	201905
Saudi Arab	Frankfurt I	Jeddah	2020	0250	3	4	440.0	201904
Saudi Arab	Frankfurt I	Riyadh Kin	1935	0310	4	4	400.0	201907
Turkish Air	Frankfurt I	Istanbul At	1315	1815	5	4	260.0	201907
Turkish Air	Frankfurt I	Istanbul At	2000	0005	6	4	260.0	201909
Turkish Air	Istanbul At	Frankfurt I	0430	0630	4	4	260.0	201909
Turkish Air	Istanbul At	Frankfurt I	0430	0630	23 5	12	481.2	201910
Turkish Air	Istanbul At	Frankfurt I	1615	1815	7	4	260.0	201904
Lufthansa (	Frankfurt I	Sao Paulo '	0845	1555	3	4	415.6	201904
Lufthansa (	Frankfurt I	Sao Paulo '	0845	1555	3	5	519.5	201907
Lufthansa (	Frankfurt I	Sao Paulo '	0845	1555	3	3	311.7	201910
Lufthansa (	Frankfurt I	Seattle-Ta	0845	1010	5	5	425.0	201908
Lufthansa (	Frankfurt I	Tel Aviv-ya	0800	1250	6	1	85.0	201902
Lufthansa (	Frankfurt I	Tel Aviv-ya	1610	2100	2 4 6	12	1,020.0	201903
Lufthansa (	Frankfurt I	Tokyo Nari	2230	1700	2 4	9	935.1	201907
Lufthansa (	Frankfurt I	Toronto Le	1110	1335	2	4	340.0	201909
Lufthansa (	Frankfurt I	Toronto Le	1400	1730	5	3	255.0	201903
Lufthansa (	Guadalajar	Frankfurt I	0200	2020	7	3	311.7	201904
Lufthansa (	Guadalajar	Frankfurt I	0405	2225	5	3	311.7	201910
Lufthansa (	Hyderabad	Frankfurt I	1120	1710	4	4	340.0	201909
Lufthansa (	Los Angele	Frankfurt I	1730	1320	5	4	340.0	201906
Lufthansa (	Los Angele	Frankfurt I	1900	1350	3	3	255.0	201903
Lufthansa (	Los Angele	Frankfurt I	2050	1700	6	4	340.0	201907
Lufthansa (	Los Angele	Frankfurt I	2210	1800	7	4	340.0	201904
Lufthansa (	Mumbai	Frankfurt I	0735	1235	1	4	340.0	201906
Lufthansa (	Mumbai	Frankfurt I	0755	1255	45	8	680.0	201907

Lufthansa (	Nairobi Jor	Frankfurt I	0130	0750	12 5 7	17	1,445.0	201903
Lufthansa (	New York J	Frankfurt I	0220	1545	3	1	103.9	201902
Lufthansa (	Novosibirs	Frankfurt I	0410	0530	7	5	425.0	201909
Lufthansa (	Novosibirs	Frankfurt I	1140	1210	6	2	170.0	201902
Lufthansa (	Novosibirs	Frankfurt I	2035	2155	4	4	340.0	201907
Lufthansa (	Novosibirs	Frankfurt I	2110	2130	7	4	340.0	201903
Lufthansa (	Seoul Inch(	Frankfurt I	0205	0620	23 5 7	17	1,766.3	201904
Lufthansa (	Shanghai P	Frankfurt I	0820	1350	2 7	9	935.1	201906
Lufthansa (	Shanghai P	Frankfurt I	0935	1435	2	1	103.9	201902
Lufthansa (	Tel Aviv-ya	Frankfurt I	1840	2205	2	1	85.0	201908
Qatar Airw	Doha	Frankfurt I	0720	1240	1	4	415.6	201905
Qatar Airw	Doha	Frankfurt I	1225	1745	2	4	415.6	201903
Qatar Airw	Doha	Frankfurt I	1255	1820	3	4	260.0	201909
Qatar Airw	Doha	Frankfurt I	1255	1820	3	4	260.0	201912
Qatar Airw	Doha	Frankfurt I	1310	1830	5	4	415.6	201909
Qatar Airw	Doha	Frankfurt I	1310	1830	5	4	415.6	201912
Qatar Airw	Doha	Frankfurt I	1310	1830	5	4	415.6	202002
Qatar Airw	Doha	Frankfurt I	1355	1915	7	5	519.5	201903
Qatar Airw	Frankfurt I	Doha	1440	2130	1	4	415.6	201910
Qatar Airw	Frankfurt I	Doha	1735	0025	4	4	415.6	201909
Qatar Airw	Frankfurt I	Doha	2020	0320	3	4	260.0	201902
Qatar Airw	Frankfurt I	Doha	2020	0320	3	4	260.0	201912
Qatar Airw	Frankfurt I	Doha	2115	0405	7	5	519.5	201903
Qatar Airw	Frankfurt I	Doha	2115	0405	7	5	519.5	201906
Saudi Arab	Dammam	Frankfurt I	0135	0610	6	4	400.0	201909
Saudi Arab	Frankfurt I	Riyadh Kin;	1940	0315	1	4	400.0	202002
Saudi Arab	Frankfurt I	Riyadh Kin;	2040	0315	5	4	440.0	201902
Turkish Air	Frankfurt I	Istanbul At	0815	1215	4	4	260.0	201906
Turkish Air	Frankfurt I	Istanbul At	0815	1215	23 5	12	481.2	201910
Turkish Air	Istanbul At	Frankfurt I	0430	0630	4	5	325.0	201905
Turkish Air	Istanbul At	Frankfurt I	1600	1800	6	4	260.0	201904
Lufthansa (	Frankfurt I	Johannesb	0555	1640	2	4	340.0	201910
Lufthansa (	Frankfurt I	Kuwait	1550	2310	4	3	255.0	201902
Lufthansa (	Frankfurt I	Kuwait	1620	2255	4	4	340.0	201904
Lufthansa (	Frankfurt I	Los Angele	1520	1820	6	5	425.0	201906
Lufthansa (	Frankfurt I	Mexico Cit	1700	2155	3	1	103.9	201904
Lufthansa (	Frankfurt I	Mexico Cit	1700	2255	3	4	415.6	201905
Lufthansa (	Frankfurt I	Mexico Cit	1735	2330	4	3	311.7	201906
Lufthansa (	Frankfurt I	Mexico Cit	1805	2359	5	4	415.6	201906
Lufthansa (	Frankfurt I	Mumbai	1750	0525	1 5	9	765.0	201907
Lufthansa (	Frankfurt I	Mumbai	2035	0810	2	4	340.0	201908
Lufthansa (	Frankfurt I	Novosibirs	0450	1605	3 5 7	13	1,105.0	201905
Lufthansa (	Frankfurt I	Novosibirs	0450	1605	3 5 7	8	680.0	201908
Lufthansa (	Frankfurt I	Sao Paulo '	0445	1155	5	4	415.6	201907
Lufthansa (	Frankfurt I	Seattle-Ta(	0825	1000	5	2	170.0	201903
Lufthansa (	Frankfurt I	Shanghai P	0820	0105	1 3	8	831.2	201908
Lufthansa (	Frankfurt I	Shanghai P	1305	0550	2345 7	16	1,662.4	201910

Lufthansa (	Frankfurt I	Sharjah	1030	1925	3	4	340.0	201903
Lufthansa (	Frankfurt I	Tel Aviv-ya	1610	2105	2 4 6	8	680.0	201910
Lufthansa (	Frankfurt I	Tokyo Nari	2230	1655	6	4	415.6	201904
Lufthansa (	Frankfurt I	Tokyo Nari	2230	1700	1 3 5 7	16	1,662.4	201904
Lufthansa (	Houston G	Frankfurt I	1955	1245	2	4	340.0	201906
Lufthansa (	Los Angele	Frankfurt I	2050	1700	6	5	425.0	201906
Lufthansa (	Los Angele	Frankfurt I	2125	1630	6	2	170.0	201903
Lufthansa (	Mumbai	Frankfurt I	0755	1255	45	8	680.0	201909
Lufthansa (	Nairobi Jor	Frankfurt I	0130	0730	7	1	85.0	201910
Lufthansa (	New York J	Frankfurt I	0130	1500	7	4	340.0	201907
Lufthansa (	New York J	Frankfurt I	1000	2225	2	3	255.0	201903
Lufthansa (	Novosibirs	Frankfurt I	0410	0530	7	4	340.0	201904
Lufthansa (	Novosibirs	Frankfurt I	0410	0530	4	5	425.0	201908
Lufthansa (	Novosibirs	Frankfurt I	0410	0530	3	4	340.0	201904
Lufthansa (	Novosibirs	Frankfurt I	0410	0530	3	4	340.0	201910
Lufthansa (	Novosibirs	Frankfurt I	0510	0530	7	1	85.0	201902
Lufthansa (	Novosibirs	Frankfurt I	2010	2130	7	4	340.0	201909
Lufthansa (	Sao Paulo '	Frankfurt I	0005	1720	3	2	207.8	201904
Lufthansa (	Seoul Inch(	Frankfurt I	0215	0605	3 5 7	13	1,350.7	201903
Lufthansa (	Shanghai P	Frankfurt I	0430	1000	5 7	9	935.1	201905
Lufthansa (	Shanghai P	Frankfurt I	0820	1350	2 7	8	831.2	201908
Lufthansa (	Shanghai P	Frankfurt I	0820	1350	1 3456	23	2,389.7	201908
Qatar Airw	Doha	Frankfurt I	1355	1915	7	4	415.6	201905
Qatar Airw	Doha	Frankfurt I	1355	1915	7	4	415.6	201911
Qatar Airw	Frankfurt I	Doha	1945	0235	2	5	519.5	201907
Qatar Airw	Frankfurt I	Doha	2030	0320	6	5	519.5	201908
Qatar Airw	Frankfurt I	Doha	2030	0320	6	4	415.6	202001
Qatar Airw	Frankfurt I	Doha	2115	0405	7	4	415.6	201908
Qatar Airw	Frankfurt I	Doha	2115	0405	7	4	415.6	202001
Saudi Arab	Dammam	Frankfurt I	0135	0610	6	4	400.0	201904
Saudi Arab	Dammam	Frankfurt I	1450	1925	3	4	400.0	201903
Saudi Arab	Frankfurt I	Jeddah	0820	1535	6	5	500.0	201903
Saudi Arab	Frankfurt I	Jeddah	0820	1535	6	4	400.0	201912
Saudi Arab	Riyadh Kin	Frankfurt I	0910	1420	5	4	440.0	201904
Saudi Arab	Riyadh Kin	Frankfurt I	1045	1455	1	5	500.0	201912
Turkish Air	Frankfurt I	Istanbul At	1315	1815	5	5	325.0	201908
Turkish Air	Frankfurt I	Istanbul At	2000	0005	7	5	200.5	201903
Turkish Air	Istanbul At	Frankfurt I	1600	1800	6	5	325.0	201903
Turkish Air	Istanbul At	Frankfurt I	1600	1800	6	4	260.0	201909
Lufthansa (	Frankfurt I	Kuwait	1620	2255	4	4	340.0	201906
Lufthansa (	Frankfurt I	Mexico Cit	1700	2255	3	4	415.6	201909
Lufthansa (	Frankfurt I	Mexico Cit	1805	2359	5	4	415.6	201907
Lufthansa (	Frankfurt I	Moscow D	2130	0240	3	3	255.0	201902
Lufthansa (	Frankfurt I	Mumbai	1750	0525	1 5	9	765.0	201905
Lufthansa (	Frankfurt I	Mumbai	1750	0525	1 5	9	765.0	201908
Lufthansa (	Frankfurt I	New York J	2005	2240	4	4	340.0	201906
Lufthansa (	Frankfurt I	New York J	2020	2300	56	8	680.0	201907

Lufthansa (	Frankfurt I	New York J	2020	2300	56	8	680.0	201910
Lufthansa (	Frankfurt I	Sao Paulo '	0445	1155	6	4	415.6	201906
Lufthansa (	Frankfurt I	Seattle-Tac	0845	1010	5	4	340.0	201910
Lufthansa (	Frankfurt I	Seattle-Tac	1335	1500	7	5	425.0	201906
Lufthansa (	Frankfurt I	Tel Aviv-ya	1610	2100	2 4	2	170.0	201902
Lufthansa (	Frankfurt I	Tokyo Nari	2230	1655	6	4	415.6	201905
Lufthansa (	Frankfurt I	Tokyo Nari	2230	1655	6	5	519.5	201908
Lufthansa (	Frankfurt I	Tokyo Nari	2230	1700	2 4	7	727.3	201908
Lufthansa (	Frankfurt I	Tokyo Nari	2230	1700	1 3 5 7	1	103.9	201903
Lufthansa (	Frankfurt I	Toronto Le	1400	1630	5	2	170.0	201902
Lufthansa (	Frankfurt I	Toronto Le	1440	1720	5	1	85.0	201903
Lufthansa (	Hyderabad	Frankfurt I	1120	1710	4	4	340.0	201907
Lufthansa (	Los Angele	Frankfurt I	1730	1320	5	4	340.0	201902
Lufthansa (	Los Angele	Frankfurt I	1730	1320	5	5	425.0	201905
Lufthansa (	Los Angele	Frankfurt I	1800	1350	3	4	340.0	201909
Lufthansa (	Los Angele	Frankfurt I	2050	1700	6	5	425.0	201908
Lufthansa (	Los Angele	Frankfurt I	2210	1800	7	3	255.0	201910
Lufthansa (	Mumbai	Frankfurt I	0755	1255	45	8	680.0	201906
Lufthansa (	New York J	Frankfurt I	0120	1445	3	1	103.9	201903
Lufthansa (	New York J	Frankfurt I	0130	1455	6	4	340.0	201909
Lufthansa (	New York J	Frankfurt I	0305	1635	4	4	340.0	201907
Lufthansa (	Novosibirs	Frankfurt I	0410	0530	6	4	340.0	201907
Lufthansa (	Novosibirs	Frankfurt I	1115	1235	1 4 6	9	765.0	201908
Lufthansa (	Novosibirs	Frankfurt I	1210	1230	4	3	255.0	201903
Lufthansa (	Novosibirs	Frankfurt I	1210	1230	1	5	425.0	201903
Lufthansa (	Novosibirs	Frankfurt I	1915	2035	4 6	9	765.0	201906
Lufthansa (	Novosibirs	Frankfurt I	2035	2155	4	5	425.0	201908
Lufthansa (	Sao Paulo '	Frankfurt I	0005	1720	3	1	103.9	201906
Lufthansa (	Sao Paulo '	Frankfurt I	0035	1750	3	2	207.8	201909
Lufthansa (	Shanghai P	Frankfurt I	0335	0835	2 4	6	623.4	201902
Lufthansa (	Shanghai P	Frankfurt I	0430	1000	5 7	9	935.1	201906
Lufthansa (	Shanghai P	Frankfurt I	0430	1000	5 7	9	935.1	201909
Qatar Airw	Doha	Frankfurt I	1255	1820	3	5	325.0	201905
Qatar Airw	Doha	Frankfurt I	1310	1830	6	4	415.6	201905
Qatar Airw	Doha	Frankfurt I	1355	1915	7	4	415.6	201907
Qatar Airw	Frankfurt I	Doha	1440	2130	1	4	415.6	201908
Qatar Airw	Frankfurt I	Doha	1440	2130	1	4	415.6	202001
Qatar Airw	Frankfurt I	Doha	1735	0025	4	4	415.6	201903
Qatar Airw	Frankfurt I	Doha	1945	0235	2	4	415.6	202001
Qatar Airw	Frankfurt I	Doha	2020	0320	3	4	260.0	201908
Qatar Airw	Frankfurt I	Doha	2115	0405	7	5	519.5	201912
Saudi Arab	Dammam	Frankfurt I	1450	1925	3	5	500.0	201905
Saudi Arab	Frankfurt I	Riyadh Kin	1935	0310	4	5	500.0	201910
Saudi Arab	Frankfurt I	Riyadh Kin	2040	0315	5	4	440.0	202002
Saudi Arab	Riyadh Kin	Frankfurt I	0910	1420	5	5	550.0	201903
Saudi Arab	Riyadh Kin	Frankfurt I	0910	1420	5	4	440.0	201906
Saudi Arab	Riyadh Kin	Frankfurt I	1105	1515	4	4	400.0	201904

Lufthansa (	Frankfurt I	Mexico Cit	1805	2359	5	5	519.5	201905
Lufthansa (	Frankfurt I	Mexico Cit	1805	2359	5	5	519.5	201908
Lufthansa (	Frankfurt I	Mumbai	1745	0520	34	8	680.0	201909
Lufthansa (	Frankfurt I	Mumbai	1750	0525	1 5	7	595.0	201910
Lufthansa (	Frankfurt I	Sao Paulo '	2040	0350	7	4	415.6	201905
Lufthansa (	Frankfurt I	Sao Paulo '	2040	0350	7	4	415.6	201908
Lufthansa (	Frankfurt I	Seattle-Ta(	1335	1500	7	4	340.0	201908
Lufthansa (	Frankfurt I	Shanghai P	0820	0105	1 3	9	935.1	201909
Lufthansa (	Frankfurt I	Tokyo Nari	2230	1655	6	4	415.6	201907
Lufthansa (	Frankfurt I	Tokyo Nari	2230	1700	2 4	8	831.2	201910
Lufthansa (	Frankfurt I	Tokyo Nari	2230	1700	1 3 5 7	14	1,454.6	201908
Lufthansa (	Guadalajar	Frankfurt I	0200	2020	7	4	415.6	201908
Lufthansa (	Houston G	Frankfurt I	0045	1625	3	3	255.0	201903
Lufthansa (	London Sta	Frankfurt I	0955	1215	4	1	85.0	201903
Lufthansa (	Los Angele	Frankfurt I	2025	1620	6	1	85.0	201903
Lufthansa (	Mumbai	Frankfurt I	0735	1235	1	5	425.0	201907
Lufthansa (	Mumbai	Frankfurt I	0755	1255	45	10	850.0	201908
Lufthansa (	Nairobi Jor	Frankfurt I	0130	0750	12 7	1	85.0	201902
Lufthansa (	Novosibirs	Frankfurt I	0410	0530	7	3	255.0	201910
Lufthansa (	Novosibirs	Frankfurt I	0410	0530	6	5	425.0	201906
Lufthansa (	Novosibirs	Frankfurt I	0410	0530	2	4	340.0	201906
Lufthansa (	Novosibirs	Frankfurt I	1915	2035	4 6	8	680.0	201904
Lufthansa (	Novosibirs	Frankfurt I	2035	2155	4	4	340.0	201906
Lufthansa (	Novosibirs	Frankfurt I	2035	2155	4	3	255.0	201909
Lufthansa (	Sao Paulo '	Frankfurt I	0035	1750	3	1	103.9	201904
Lufthansa (	Sao Paulo '	Frankfurt I	1955	1310	7	4	415.6	201904
Lufthansa (	Seoul Inch(	Frankfurt I	0205	0620	1 4 6	13	1,350.7	201907
Lufthansa (	Seoul Inch(	Frankfurt I	0215	0605	3 5 7	12	1,246.8	201902
Lufthansa (	Shanghai P	Frankfurt I	0335	0835	2	1	103.9	201902
Lufthansa (	Shanghai P	Frankfurt I	0820	1350	2 7	9	935.1	201904
Qatar Airw	Doha	Frankfurt I	0720	1240	1	5	519.5	201909
Qatar Airw	Doha	Frankfurt I	1255	1820	3	5	325.0	201907
Qatar Airw	Doha	Frankfurt I	1310	1830	5	4	415.6	201910
Qatar Airw	Doha	Frankfurt I	1355	1915	7	5	519.5	201909
Qatar Airw	Frankfurt I	Doha	1440	2130	1	4	415.6	201903
Qatar Airw	Frankfurt I	Doha	2020	0320	3	4	260.0	202002
Qatar Airw	Frankfurt I	Doha	2030	0320	5	4	415.6	201904
Saudi Arab	Dammam	Frankfurt I	1450	1925	3	5	500.0	201907
Saudi Arab	Frankfurt I	Jeddah	0705	1420	4	4	400.0	201903
Saudi Arab	Frankfurt I	Jeddah	2020	0250	3	4	440.0	201912
Saudi Arab	Frankfurt I	Riyadh Kin	1935	0310	4	5	500.0	201905
Saudi Arab	Frankfurt I	Riyadh Kin	2040	0315	5	4	440.0	201904
Saudi Arab	Riyadh Kin	Frankfurt I	1045	1455	1	4	400.0	201903
Saudi Arab	Riyadh Kin	Frankfurt I	1045	1455	1	4	400.0	201906
Saudi Arab	Riyadh Kin	Frankfurt I	1105	1515	4	4	400.0	201906
Turkish Air	Frankfurt I	Istanbul At	0815	1215	23 5	13	521.3	201904
Turkish Air	Frankfurt I	Istanbul At	2000	0005	7	4	160.4	201908

Turkish Air	Istanbul At	Frankfurt I	1600	1800	6	4	260.0	201907
Turkish Air	Istanbul At	Frankfurt I	1600	1800	6	4	260.0	201910
Lufthansa (	Frankfurt I	Dakar Blais	1955	0100	3	4	340.0	201902
Lufthansa (	Frankfurt I	Dammam	1425	2110	1	4	340.0	201908
Lufthansa (	Frankfurt I	Johannesb	0540	1625	6	5	425.0	201906
Lufthansa (	Frankfurt I	Mexico Cit	1745	2330	1	5	519.5	201909
Lufthansa (	Frankfurt I	Mexico Cit	1805	2359	5	4	415.6	201909
Lufthansa (	Frankfurt I	Mumbai	2040	0915	2	4	340.0	201903
Lufthansa (	Frankfurt I	New York J	2005	2240	4	4	340.0	201910
Lufthansa (	Frankfurt I	New York J	2020	2300	56	9	765.0	201906
Lufthansa (	Frankfurt I	New York J	2120	2355	3	4	340.0	201906
Lufthansa (	Frankfurt I	Novosibirs	1405	0120	3 5	8	680.0	201906
Lufthansa (	Frankfurt I	Sao Paulo '	0445	1155	6	4	415.6	201904
Lufthansa (	Frankfurt I	Sao Paulo '	0445	1155	5	4	415.6	201904
Lufthansa (	Frankfurt I	Seattle-Ta(	1335	1500	7	3	255.0	201910
Lufthansa (	Frankfurt I	Seoul Inch(	0520	2335	3 5	2	207.8	201908
Lufthansa (	Frankfurt I	Shanghai P	1305	0550	2345 7	22	2,285.8	201907
Lufthansa (	Frankfurt I	Tokyo Nari	2230	1700	1 3 5 7	14	1,454.6	201910
Lufthansa (	Frankfurt I	Toronto Le	1010	1250	5	1	85.0	201902
Lufthansa (	Houston G	Frankfurt I	0040	1620	6	3	255.0	201903
Lufthansa (	Hyderabad	Frankfurt I	1055	1645	2 6	8	680.0	201909
Lufthansa (	Istanbul At	Frankfurt I	0330	0530	3 5 7	12	1,020.0	201904
Lufthansa (	London Sta	Frankfurt I	1750	2010	7	1	103.9	201904
Lufthansa (	Los Angele	Frankfurt I	1800	1350	3	5	425.0	201905
Lufthansa (	Los Angele	Frankfurt I	2210	1800	7	5	425.0	201906
Lufthansa (	Los Angele	Frankfurt I	2210	1800	7	5	425.0	201909
Lufthansa (	Nairobi Jor	Frankfurt I	0130	0830	1 3 7	14	1,190.0	201909
Lufthansa (	New York J	Frankfurt I	0130	1500	7	3	255.0	201910
Lufthansa (	New York J	Frankfurt I	0130	1500	3	4	340.0	201910
Lufthansa (	Novosibirs	Frankfurt I	0410	0530	7	4	340.0	201907
Lufthansa (	Novosibirs	Frankfurt I	0410	0530	2	5	425.0	201907
Lufthansa (	Novosibirs	Frankfurt I	1115	1235	1 6	4	340.0	201909
Lufthansa (	Novosibirs	Frankfurt I	1115	1235	1 4 6	11	935.0	201910
Lufthansa (	Novosibirs	Frankfurt I	1915	2035	4 6	9	765.0	201905
Lufthansa (	Novosibirs	Frankfurt I	2010	2130	7	5	425.0	201906
Lufthansa (	Sao Paulo '	Frankfurt I	0005	1720	3	2	207.8	201910
Lufthansa (	Seoul Inch(	Frankfurt I	0155	0545	2	4	415.6	201903
Lufthansa (	Shanghai P	Frankfurt I	0325	0855	2 4	8	831.2	201910
Qatar Airw	Doha	Frankfurt I	0720	1240	1	4	415.6	201903
Qatar Airw	Doha	Frankfurt I	0935	1455	4	4	415.6	201903
Qatar Airw	Doha	Frankfurt I	0935	1455	4	5	519.5	201910
Qatar Airw	Doha	Frankfurt I	1255	1820	3	4	260.0	201904
Qatar Airw	Doha	Frankfurt I	1310	1830	6	4	415.6	201907
Qatar Airw	Doha	Frankfurt I	1310	1830	5	5	519.5	201911
Qatar Airw	Frankfurt I	Doha	1440	2130	1	4	415.6	201902
Qatar Airw	Frankfurt I	Doha	1440	2130	1	4	415.6	201905
Qatar Airw	Frankfurt I	Doha	1440	2130	1	4	415.6	202002

Qatar Airw	Frankfurt I	Doha	1735	0025	4	5	519.5	201910
Saudi Arab	Dammam	Frankfurt I	1450	1925	3	4	400.0	201906
Saudi Arab	Dammam	Frankfurt I	1450	1925	3	4	400.0	202002
Saudi Arab	Frankfurt I	Jeddah	0705	1420	4	4	400.0	201902
Saudi Arab	Frankfurt I	Jeddah	0705	1420	4	4	400.0	202002
Saudi Arab	Frankfurt I	Jeddah	0820	1535	6	4	400.0	201909
Saudi Arab	Frankfurt I	Jeddah	0820	1535	6	5	500.0	202002
Saudi Arab	Frankfurt I	Riyadh Kin	1935	0310	4	4	400.0	201903
Saudi Arab	Frankfurt I	Riyadh Kin	2040	0315	5	4	440.0	201910
Saudi Arab	Riyadh Kin	Frankfurt I	0910	1420	5	4	440.0	201907
Lufthansa	Frankfurt I	Almaty	0730	1830	5 7	3	255.0	201908
Lufthansa	Frankfurt I	Almaty	0730	1830	3 5 7	13	1,105.0	201905
Lufthansa	Frankfurt I	Atlanta Ha	1105	1450	3	1	103.9	201903
Lufthansa	Frankfurt I	Atlanta Ha	1530	1915	2	4	340.0	201906
Lufthansa	Frankfurt I	Atlanta Ha	1930	0025	6	1	85.0	201903
Lufthansa	Frankfurt I	Beijing Cap	1200	0435	2	1	103.9	201902
Lufthansa	Frankfurt I	Bengaluru	1210	0135	6	1	85.0	201903
Lufthansa	Frankfurt I	Bengaluru	1300	0225	6	2	170.0	201902
Lufthansa	Frankfurt I	Cairo Inter	1910	0005	5	4	340.0	201902
Lufthansa	Frankfurt I	Cairo Inter	1950	0045	2	4	340.0	201902
Lufthansa	Frankfurt I	Cairo Inter	2050	0045	2	3	255.0	201905
Lufthansa	Frankfurt I	Chicago O'	0840	1125	5	1	85.0	201902
Lufthansa	Frankfurt I	Chicago O'	1000	1245	7	4	340.0	201902
Lufthansa	Frankfurt I	Chicago O'	2030	0015	1	3	255.0	201903
Lufthansa	Frankfurt I	Curitiba Af	1145	1910	2	4	415.6	201905
Lufthansa	Frankfurt I	Dallas Dall	1155	1600	3	1	85.0	201903
Lufthansa	Frankfurt I	Dammam	1425	2110	1	5	425.0	201904
Lufthansa	Frankfurt I	Istanbul At	2115	0115	6	1	85.0	201905
Lufthansa	Frankfurt I	Johannesb	0555	1640	2	4	340.0	201906
Lufthansa	Frankfurt I	Johannesb	0555	1640	2	4	340.0	201909
Lufthansa	Frankfurt I	Mexico Cit	1425	1920	6	1	103.9	201904
Lufthansa	Frankfurt I	Mexico Cit	1735	2330	4	4	415.6	201907
Lufthansa	Frankfurt I	Mexico Cit	1735	2330	4	3	311.7	201910
Lufthansa	Frankfurt I	Mumbai	1730	0505	7	4	340.0	201908
Lufthansa	Frankfurt I	New York J	2020	2300	56	8	680.0	201909
Lufthansa	Frankfurt I	Novosibirs	0450	1605	3 5 7	1	85.0	201903
Lufthansa	Frankfurt I	Novosibirs	0450	1605	3 5 7	13	1,105.0	201906
Lufthansa	Frankfurt I	Sao Paulo '	0445	1155	6	4	415.6	201905
Lufthansa	Frankfurt I	Sao Paulo '	0445	1155	6	5	519.5	201908
Lufthansa	Frankfurt I	Sao Paulo '	0445	1155	5	5	519.5	201908
Lufthansa	Frankfurt I	Sao Paulo '	0735	1700	5	3	311.7	201902
Lufthansa	Frankfurt I	Sao Paulo '	0845	1555	3	4	415.6	201906
Lufthansa	Frankfurt I	Seattle-Ta	1335	1500	7	4	340.0	201905
Lufthansa	Frankfurt I	Tokyo Nari	2230	1700	1 3 5 7	15	1,558.5	201905
Lufthansa	Frankfurt I	Toronto Le	1110	1335	2	4	340.0	201906
Lufthansa	Guadalajar	Frankfurt I	0410	2230	45	10	1,039.0	201908
Lufthansa	Hyderabad	Frankfurt I	1055	1645	2 6	9	765.0	201907

Lufthansa (	Istanbul At	Frankfurt I	0330	0530	5	1	85.0	201910
Lufthansa (	Istanbul At	Frankfurt I	0330	0530	3 5 7	13	1,105.0	201905
Lufthansa (	Istanbul At	Frankfurt I	0445	0540	3 5	2	170.0	201902
Lufthansa (	Los Angele	Frankfurt I	2050	1700	6	3	255.0	201910
Lufthansa (	Los Angele	Frankfurt I	2210	1800	7	4	340.0	201905
Lufthansa (	New York J	Frankfurt I	0130	1500	7	4	340.0	201908
Lufthansa (	New York J	Frankfurt I	0130	1500	3	4	340.0	201906
Lufthansa (	New York J	Frankfurt I	0305	1635	4	5	425.0	201905
Lufthansa (	Novosibirs	Frankfurt I	1140	1210	6	5	425.0	201903
Lufthansa (	Novosibirs	Frankfurt I	1150	1210	1 6	7	595.0	201903
Lufthansa (	Novosibirs	Frankfurt I	2010	2130	7	4	340.0	201905
Lufthansa (	Sao Paulo '	Frankfurt I	0005	1720	3	2	207.8	201908
Lufthansa (	Sao Paulo '	Frankfurt I	0035	1750	3	4	415.6	201907
Lufthansa (	Shanghai P	Frankfurt I	0325	0855	2 4	8	831.2	201906
Lufthansa (	Shanghai P	Frankfurt I	0430	1000	5 7	9	935.1	201908
Turkish Air	Frankfurt I	Istanbul At	1315	1815	5	4	260.0	201906
Turkish Air	Frankfurt I	Istanbul At	2000	0005	6	4	260.0	201905
Turkish Air	Istanbul At	Frankfurt I	0430	0630	23 5	12	481.2	201906
Turkish Air	Istanbul At	Frankfurt I	1615	1815	7	4	260.0	201908
Saudi Arab	Frankfurt I	Jeddah	0705	1420	4	4	400.0	201911
Saudi Arab	Frankfurt I	Jeddah	0820	1535	6	4	400.0	201902
Saudi Arab	Frankfurt I	Jeddah	2020	0250	3	5	550.0	201907
Saudi Arab	Riyadh Kin	Frankfurt I	1045	1455	1	4	400.0	201905
Saudi Arab	Riyadh Kin	Frankfurt I	1045	1455	1	4	400.0	202001
Turkish Air	Frankfurt I	Istanbul At	0815	1215	23 5	12	481.2	201906
Turkish Air	Frankfurt I	Istanbul At	0815	1215	23 5	12	481.2	201909
Turkish Air	Frankfurt I	Istanbul At	1315	1815	5	4	260.0	201910
Turkish Air	Istanbul At	Frankfurt I	1600	1800	6	5	325.0	201908
Turkish Air	Istanbul At	Frankfurt I	1615	1815	7	4	260.0	201907
Turkish Air	Lagos	Frankfurt I	0240	1120	5	5	325.0	201908
Saudi Arab	Riyadh Kin	Frankfurt I	1105	1515	4	4	400.0	201902
Turkish Air	Frankfurt I	Istanbul At	0815	1215	4	4	260.0	201903
Turkish Air	Frankfurt I	Istanbul At	0815	1215	23 5	13	521.3	201903
Turkish Air	Frankfurt I	Istanbul At	1315	1815	5	5	325.0	201903
Turkish Air	Frankfurt I	Istanbul At	1315	1815	5	4	260.0	201909
Turkish Air	Frankfurt I	Istanbul At	2000	0005	7	4	160.4	201904
Turkish Air	Istanbul At	Frankfurt I	0430	0630	23 5	13	521.3	201903
Saudi Arab	Riyadh Kin	Frankfurt I	1105	1515	4	4	400.0	201907
Turkish Air	Frankfurt I	Istanbul At	1315	1815	5	4	260.0	201904
Turkish Air	Istanbul At	Frankfurt I	0430	0630	23 5	14	561.4	201907
Turkish Air	Istanbul At	Frankfurt I	1600	1800	6	4	260.0	201902
Qatar Airw	Doha	Frankfurt I	1310	1830	5	4	415.6	201907
Qatar Airw	Frankfurt I	Doha	1440	2130	1	4	415.6	201906
Qatar Airw	Frankfurt I	Doha	1440	2130	1	5	519.5	201909
Qatar Airw	Frankfurt I	Doha	1945	0235	2	4	415.6	201906
Qatar Airw	Frankfurt I	Doha	2030	0320	6	4	415.6	201904
Qatar Airw	Frankfurt I	Doha	2115	0405	7	4	415.6	201904

Qatar Airw	Frankfurt I	Doha	2115	0405	7	4	415.6	201907
Qatar Airw	Frankfurt I	Doha	2115	0405	7	4	415.6	201910
Saudi Arab	Dammam	Frankfurt I	1450	1925	3	5	500.0	201910
Saudi Arab	Frankfurt I	Jeddah	0820	1535	6	4	400.0	201907
Saudi Arab	Frankfurt I	Riyadh Kin;	1940	0315	1	4	400.0	201908
Saudi Arab	Frankfurt I	Riyadh Kin;	1940	0315	1	4	400.0	202001
Saudi Arab	Riyadh Kin;	Frankfurt I	1105	1515	4	4	400.0	201912
Saudi Arab	Riyadh Kin;	Frankfurt I	1105	1515	4	4	400.0	202002
Turkish Air	Frankfurt I	Istanbul At	0815	1215	4	4	260.0	201904
Turkish Air	Frankfurt I	Istanbul At	0815	1215	23 5	14	561.4	201907
Turkish Air	Frankfurt I	Istanbul At	1315	1815	5	5	325.0	201905
Turkish Air	Istanbul At	Frankfurt I	0430	0630	4	4	260.0	201904
Turkish Air	Istanbul At	Frankfurt I	0430	0630	23 5	13	521.3	201908
Turkish Air	Istanbul At	Frankfurt I	1615	1815	7	5	325.0	201909
Saudi Arab	Frankfurt I	Riyadh Kin;	2040	0315	5	5	550.0	201908
Saudi Arab	Riyadh Kin;	Frankfurt I	0910	1420	5	4	440.0	201902
Saudi Arab	Riyadh Kin;	Frankfurt I	1105	1515	4	5	500.0	201905
Turkish Air	Istanbul At	Frankfurt I	0430	0630	4	4	260.0	201902
Turkish Air	Istanbul At	Frankfurt I	0430	0630	4	5	325.0	201908
Turkish Air	Istanbul At	Frankfurt I	1615	1815	7	4	260.0	201905
Turkish Air	Lagos	Frankfurt I	0240	1120	5	4	260.0	201902
Saudi Arab	Riyadh Kin;	Frankfurt I	1045	1455	1	5	500.0	201909
Saudi Arab	Riyadh Kin;	Frankfurt I	1105	1515	4	4	400.0	201903
Turkish Air	Frankfurt I	Istanbul At	0815	1215	23 5	13	521.3	201908
Turkish Air	Lagos	Frankfurt I	0240	1120	5	5	325.0	201905
Turkish Air	Istanbul At	Frankfurt I	1615	1815	7	5	325.0	201903
Turkish Air	Lagos	Frankfurt I	0240	1120	5	4	260.0	201907
Turkish Air	Lagos	Frankfurt I	0240	1120	5	4	260.0	201910
Turkish Air	Frankfurt I	Istanbul At	0815	1215	4	4	260.0	201902
Turkish Air	Frankfurt I	Istanbul At	2000	0005	7	4	160.4	201907
Turkish Air	Frankfurt I	Istanbul At	2000	0005	7	3	120.3	201910
Turkish Air	Istanbul At	Frankfurt I	0430	0630	4	4	260.0	201906
Turkish Air	Istanbul At	Frankfurt I	1600	1800	6	4	260.0	201905
Turkish Air	Istanbul At	Frankfurt I	1615	1815	7	3	195.0	201910
Turkish Air	Frankfurt I	Istanbul At	2000	0005	7	5	200.5	201906
Turkish Air	Frankfurt I	Istanbul At	2000	0005	7	5	200.5	201909
Turkish Air	Frankfurt I	Istanbul At	2000	0005	6	4	260.0	201910
Lufthansa (	Shanghai P	Frankfurt I	0820	1350	1 3456	21	2,181.9	201909
Qatar Airw	Doha	Frankfurt I	0720	1240	1	5	519.5	201912
Qatar Airw	Doha	Frankfurt I	1225	1745	2	4	415.6	201902
Qatar Airw	Doha	Frankfurt I	1225	1745	2	4	415.6	201909
Qatar Airw	Frankfurt I	Doha	1735	0025	4	4	415.6	201911
Qatar Airw	Frankfurt I	Doha	1945	0235	2	4	415.6	201903
Qatar Airw	Frankfurt I	Doha	2030	0320	6	4	415.6	201907
Qatar Airw	Frankfurt I	Doha	2030	0320	6	4	415.6	201910
Saudi Arab	Dammam	Frankfurt I	0135	0610	6	5	500.0	201903
Saudi Arab	Dammam	Frankfurt I	0135	0610	6	5	500.0	201906

Saudi Arab	Frankfurt I	Jeddah	0820	1535	6	4	400.0	201910
Saudi Arab	Frankfurt I	Jeddah	2020	0250	3	4	440.0	201909
Saudi Arab	Frankfurt I	Riyadh Kin	2040	0315	5	4	440.0	201907
Saudi Arab	Riyadh Kin	Frankfurt I	0910	1420	5	5	550.0	201911
Saudi Arab	Riyadh Kin	Frankfurt I	1105	1515	4	4	400.0	201909
Turkish Air	Lagos	Frankfurt I	0240	1120	5	4	260.0	201906

USAGE: 3367 RECORDS.

United Parcel Service (UPS) flights from London Stansted

AIRPORT

London Stansted Airport — STN / EGSS

AIRLINE

United Parcel Service (UPS) — 5X / UPS

United States (US)

DESTINATIONS

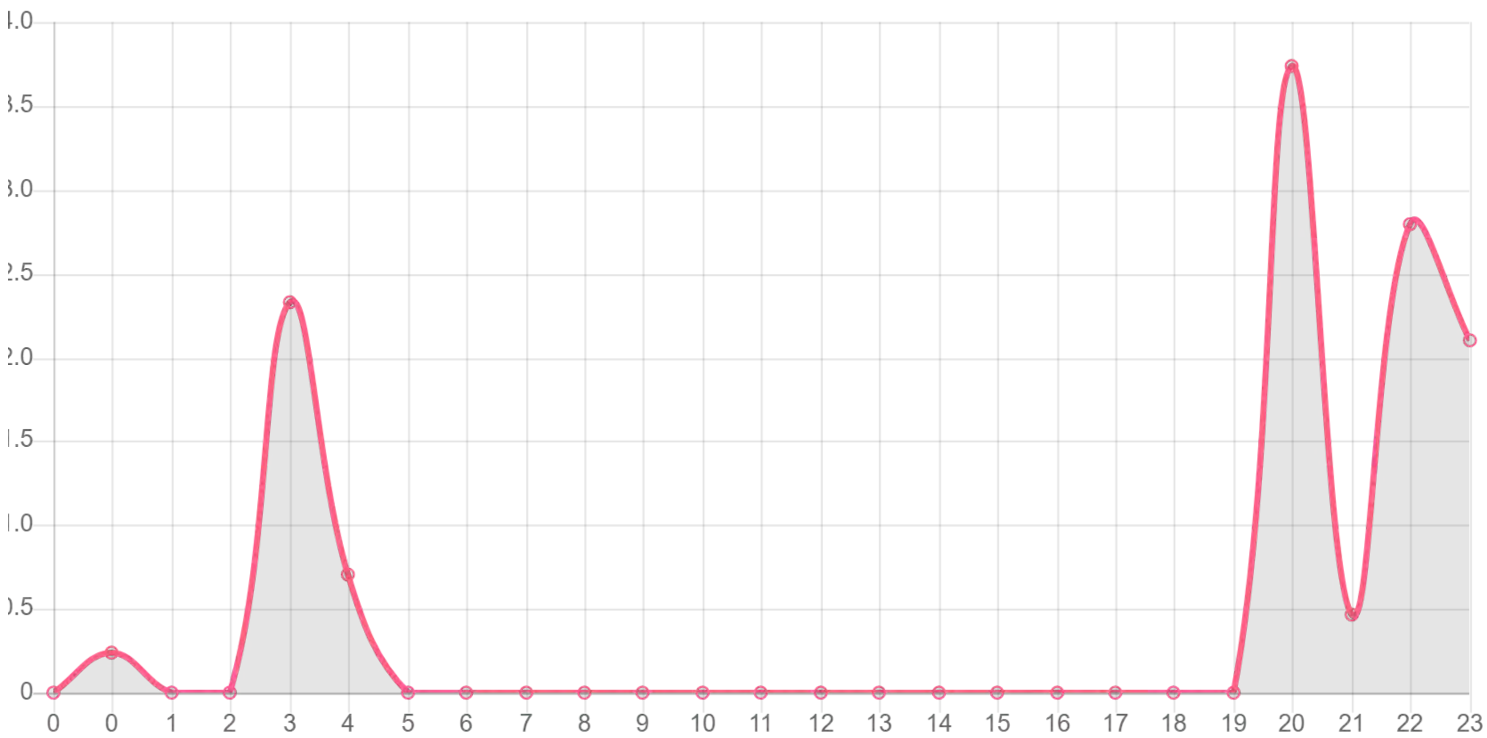
3 airports

SEAT CAPACITY

474 seats per day

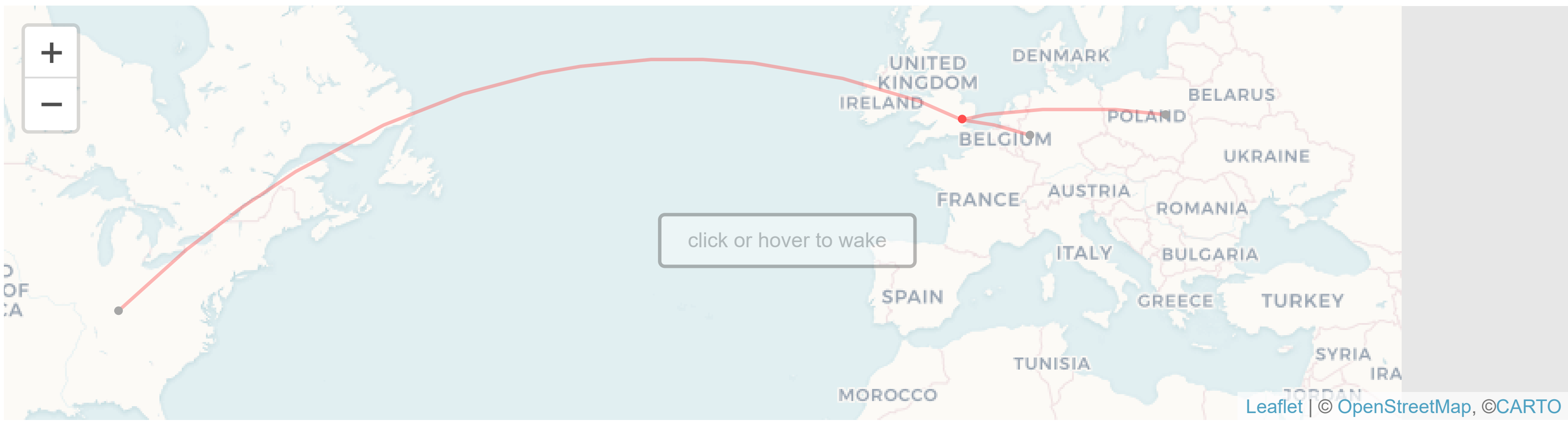
0% of total capacity.

Departures per Hour



Weekly values, based on flights in the last 30 days

Departure Map



Destinations

Top Routes

Show 10 entries

Airport	Flights per Week	Seats per Flight
Louisville International Airport (SDF)	5	237
Cologne Bonn Airport (CGN)	5	237
Warsaw Chopin Airport (WAW)	3	0

Showing 1 to 3 of 3 entries

[Previous](#) [1](#) [Next](#)

Based on flights in the last 30 days

Recent Flights

Thu, 28. Feb (lands Thu, 01. Jan): Landed

5X244 UPS244
United Parcel Service (UPS) 5X / UPS
N427UP Boeing B757-200
London (STN)
to Warsaw (WAW)
1,415km (879mi.)

Scheduled:
03:47 (03:47 UTC)
01:00 (00:00 UTC)
Duration: -430923h -47m
Turnaround: 28 hours

Actual:
03:42 (03:42 UTC)
Departed 4 min early
06:32 (05:32 UTC)
Landed 25855532 min delayed
Duration: 1h 45m

Wed, 27. Feb (lands Thu, 28. Feb): Landed

5X235 UPS235
United Parcel Service (UPS) 5X / UPS
N319UP Boeing B767-300
London (STN)
to Cologne (CGN)
493km (306mi.)

Scheduled:
23:03 (23:03 UTC)
00:56 (23:56 UTC)
Duration: 0h 53m
Turnaround: 2 hours

Actual (estimated values):
23:03 (23:03 UTC)
00:56 (23:56 UTC)
Duration: 0h 53m

Wed, 27. Feb : Landed

5X244 UPS244
United Parcel Service (UPS) 5X / UPS
N429UP Boeing B757-200
London (STN)
to Warsaw (WAW)
1,415km (879mi.)

Scheduled:
03:47 (03:47 UTC)
06:37 (05:37 UTC)
Duration: 1h 50m
Turnaround: 68 minutes

Actual (estimated values):
03:48 (03:48 UTC)
Departed 1 min delayed
06:37 (05:37 UTC)
Duration: 1h 50m

Tue, 26. Feb (lands Wed, 27. Feb): Landed

5X235 UPS235
United Parcel Service (UPS) 5X / UPS
N319UP Boeing B767-300
London (STN)
to Cologne (CGN)
493km (306mi.)

Scheduled:
23:04 (23:04 UTC)
00:49 (23:49 UTC)
Duration: 0h 45m

Actual (estimated values):
23:04 (23:04 UTC)
00:50 (23:50 UTC)
Duration: 0h 45m

Tue, 26. Feb (lands Wed, 31. Dec): Live

5X238 UPS238
United Parcel Service (UPS) 5X / UPS
N332UP Boeing B767-300
London (STN)
to Louisville (SDF)
6,528km (4,054mi.)

Scheduled:
20:45 (20:45 UTC)
19:00 (00:00 UTC)
Duration: -430892h -45m

Estimated:
20:51 (20:51 UTC)
Departed 1446 min delayed
01:02 (06:02 UTC)
Expected 25855562 min delayed
Duration: 33h 17m

Tue, 26. Feb : Landed

5X244 UPS244
United Parcel Service (UPS) 5X / UPS
N429UP Boeing B757-200
London (STN)
to Warsaw (WAW)
1,415km (879mi.)

Scheduled:
03:47 (03:47 UTC)
06:35 (05:35 UTC)
Duration: 1h 48m

Actual (estimated values):
03:45 (03:45 UTC)
Departed 1 min early
06:34 (05:34 UTC)
Duration: 1h 47m

Mon, 25. Feb (lands Tue, 26. Feb): Landed

5X205 UPS205
United Parcel Service (UPS) 5X / UPS
N304UP Boeing B767-300
London (STN)
to Cologne (CGN)
493km (306mi.)

Scheduled:
22:57 (22:57 UTC)
00:45 (23:45 UTC)
Duration: 0h 48m

Actual (estimated values):
22:57 (22:57 UTC)
00:45 (23:45 UTC)
Duration: 0h 48m

Mon, 25. Feb (lands Wed, 27. Feb): Landed

5X238 UPS238
United Parcel Service (UPS) 5X / UPS
N304UP Boeing B767-300
London (STN)
to Louisville (SDF)
6,528km (4,054mi.)

Scheduled:
20:45 (20:45 UTC)
00:15 (05:15 UTC)
Duration: 32h 30m

Actual (estimated values):
21:00 (21:00 UTC)
Departed 1455 min delayed
00:16 (05:16 UTC)
Duration: 32h 31m

Fri, 22. Feb (lands Tue, 26. Feb): Landed

5X238 UPS238

Scheduled:

Actual (estimated values):

United Parcel Service (UPS) 5X / UPS
N340UP Boeing B767-300
London (STN)
to Louisville (SDF)
6,528km (4,054mi.)

23:15 (23:15 UTC)
00:23 (05:23 UTC)
Duration: 78h 8m

21:05 (21:05 UTC)
Departed 4190 min delayed
00:23 (05:23 UTC)

Duration: 78h 8m

Fri, 22. Feb (lands Sat, 23. Feb): Landed

5X235 UPS235
United Parcel Service (UPS) 5X / UPS
N340UP Boeing B767-300
London (STN)
to Cologne (CGN)
493km (306mi.)

Scheduled:
23:12 (23:12 UTC)
00:59 (23:59 UTC)
Duration: 0h 47m

Actual (estimated values):
23:12 (23:12 UTC)
01:00 (00:00 UTC)

Duration: 0h 48m

Thu, 21. Feb (lands Fri, 22. Feb): Landed

5X235 UPS235
United Parcel Service (UPS) 5X / UPS
N323UP Boeing B767-300
London (STN)
to Cologne (CGN)
493km (306mi.)

Scheduled:
23:10 (23:10 UTC)
01:02 (00:02 UTC)
Duration: 0h 52m

Actual (estimated values):
23:09 (23:09 UTC)
01:02 (00:02 UTC)

Duration: 0h 51m

Thu, 21. Feb (lands Fri, 22. Feb): Landed

5X238 UPS238
United Parcel Service (UPS) 5X / UPS
N315UP Boeing B767-300
London (STN)
to Louisville (SDF)
6,528km (4,054mi.)

Scheduled:
20:45 (20:45 UTC)
01:22 (06:22 UTC)
Duration: 9h 37m

Actual (estimated values):
21:54 (21:54 UTC)
Departed 69 min delayed
01:22 (06:22 UTC)

Duration: 9h 37m

Thu, 21. Feb : Landed

5X244 UPS244
United Parcel Service (UPS) 5X / UPS
N429UP Boeing B757-200
London (STN)
to Warsaw (WAW)
1,415km (879mi.)

Scheduled:
03:47 (03:47 UTC)
06:38 (05:38 UTC)
Duration: 1h 51m

Actual (estimated values):
03:42 (03:42 UTC)
Departed 4 min early
06:38 (05:38 UTC)

Duration: 1h 51m

Wed, 20. Feb (lands Thu, 21. Feb): Landed

5X235 UPS235
United Parcel Service (UPS) 5X / UPS
N323UP Boeing B767-300
London (STN)
to Cologne (CGN)
493km (306mi.)

Scheduled:
22:57 (22:57 UTC)
00:43 (23:43 UTC)
Duration: 0h 45m

Actual (estimated values):
22:57 (22:57 UTC)
00:42 (23:42 UTC)

Duration: 0h 45m

Wed, 20. Feb (lands Thu, 21. Feb): Landed

5X238 UPS238
United Parcel Service (UPS) 5X / UPS
N339UP Boeing B767-300
London (STN)
to Louisville (SDF)
6,528km (4,054mi.)

Scheduled:
20:45 (20:45 UTC)
00:55 (05:55 UTC)
Duration: 9h 10m

Actual (estimated values):
21:01 (21:01 UTC)
Departed 16 min delayed
00:54 (05:54 UTC)
Duration: 9h 9m

Wed, 20. Feb : Landed

5X244 UPS244
United Parcel Service (UPS) 5X / UPS
N431UP Boeing B757-200
London (STN)
to Warsaw (WAW)
1,415km (879mi.)

Scheduled:
03:47 (03:47 UTC)
06:42 (05:42 UTC)
Duration: 1h 55m

Actual (estimated values):
03:39 (03:39 UTC)
Departed 7 min early
06:43 (05:43 UTC)
Duration: 1h 56m

Tue, 19. Feb (lands Wed, 20. Feb): Landed

5X235 UPS235
United Parcel Service (UPS) 5X / UPS
N323UP Boeing B767-300
London (STN)
to Cologne (CGN)
493km (306mi.)

Scheduled:
23:13 (23:13 UTC)
01:04 (00:04 UTC)
Duration: 0h 50m

Actual (estimated values):
23:12 (23:12 UTC)
01:04 (00:04 UTC)
Duration: 0h 50m

Tue, 19. Feb (lands Wed, 20. Feb): Landed

5X238 UPS238
United Parcel Service (UPS) 5X / UPS
N304UP Boeing B767-300
London (STN)
to Louisville (SDF)
6,528km (4,054mi.)

Scheduled:
20:45 (20:45 UTC)
00:57 (05:57 UTC)
Duration: 9h 12m

Actual (estimated values):
21:08 (21:08 UTC)
Departed 23 min delayed
00:57 (05:57 UTC)
Duration: 9h 12m

Tue, 19. Feb : Landed

5X244 UPS244
United Parcel Service (UPS) 5X / UPS
N429UP Boeing B757-200
London (STN)
to Warsaw (WAW)
1,415km (879mi.)

Scheduled:
03:47 (03:47 UTC)
06:33 (05:33 UTC)
Duration: 1h 46m

Actual (estimated values):
03:42 (03:42 UTC)
Departed 4 min early
06:33 (05:33 UTC)
Duration: 1h 46m

Mon, 18. Feb (lands Tue, 19. Feb): Landed

5X205 UPS205
United Parcel Service (UPS) 5X / UPS
N304UP Boeing B767-300
London (STN)
to Cologne (CGN)
493km (306mi.)

Scheduled:
22:56 (22:56 UTC)
00:47 (23:47 UTC)
Duration: 0h 50m

Actual (estimated values):
22:56 (22:56 UTC)
00:47 (23:47 UTC)
Duration: 0h 50m

Back to Top

Federal Express (FedEx) flights from London Stansted

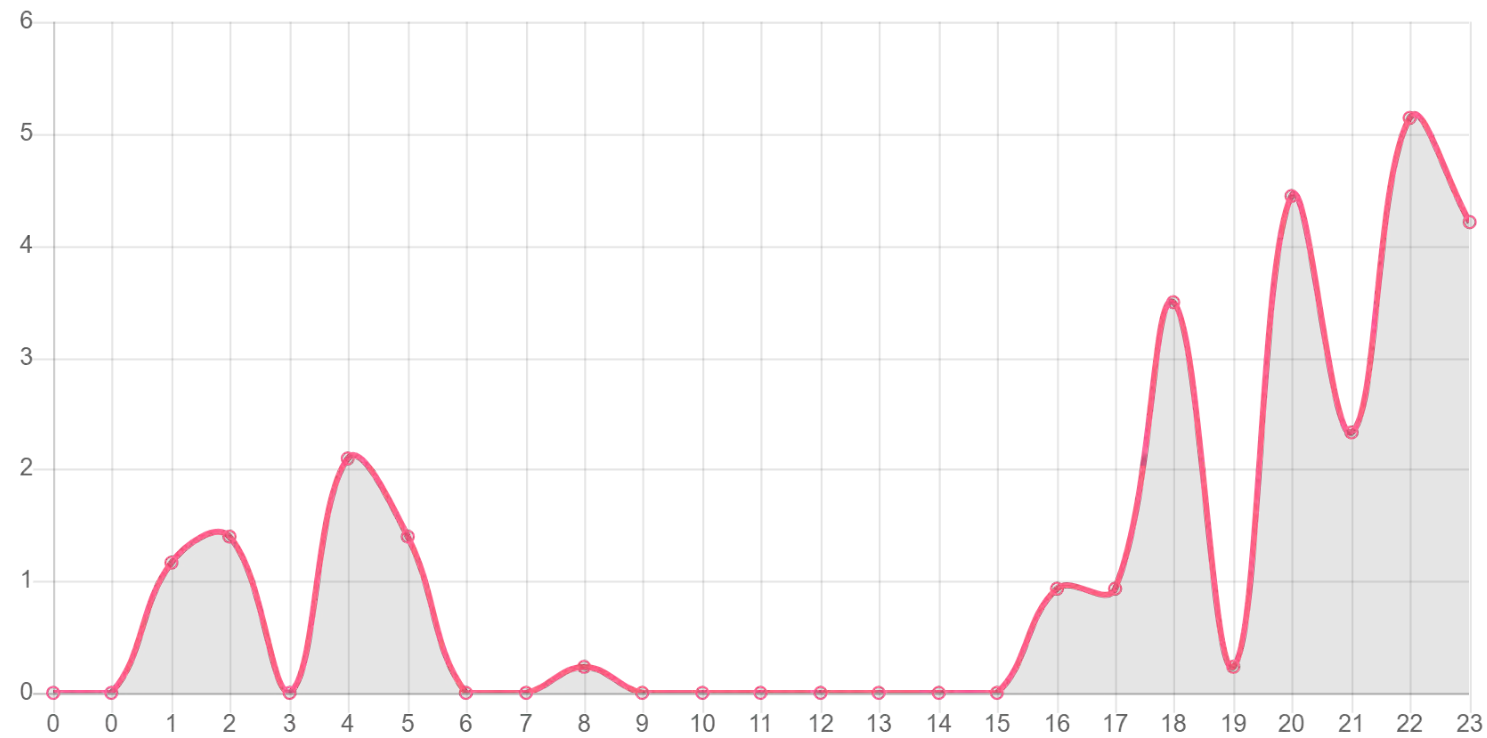
AIRPORT
London Stansted Airport STN / EGSS

AIRLINE
Federal Express (FedEx) FX / FDX
United States (US)

DESTINATIONS
7 airports

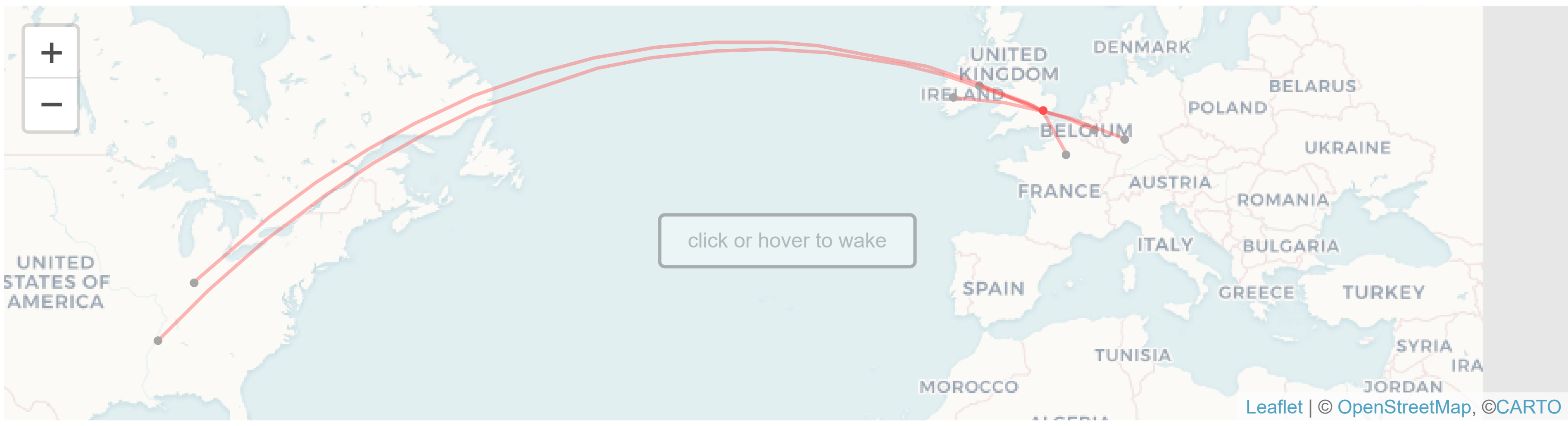
SEAT CAPACITY
0 seats per day
0% of total capacity.

Departures per Hour



Weekly values, based on flights in the last 30 days

Departure Map



Destinations

Top Routes

Show 10 entries

Airport	Flights per Week	Seats per Flight
Paris Charles de Gaulle Airport (CDG)	7	0
Liege Airport (LGG)	6	0
Memphis International Airport (MEM)	6	0
Dublin Airport (DUB)	5	0

Airport	Flights per Week	Seats per Flight
Indianapolis International Airport (IND)	2	0
Frankfurt Airport (FRA)	2	0
Shannon Airport (SNN)	1	0

Showing 1 to 7 of 7 entries

Previous 1 Next

Recent Flights

Based on flights in the last 30 days

Thu, 28. Feb : Landed

3V976 TAY976C
Federal Express (FedEx) FX / FDX
OE-IAQ Boeing B737-400
London (STN)
to Liege (LGG)
388km (241mi.)

Scheduled:
02:00 (02:00 UTC)
04:00 (03:00 UTC)
Duration: 1h 0m
Turnaround: 62 minutes

Actual:
02:09 (02:09 UTC)
Departed 9 min delayed
03:53 (02:53 UTC)
Landed 6 min early
Duration: 0h 53m

Tue, 26. Feb (lands Wed, 27. Feb): Landed

FX5201 FDX5201
Federal Express (FedEx) FX / FDX
N676FE Airbus A300-600
London (STN)
to Paris (CDG)
359km (223mi.)

Scheduled:
22:23 (22:23 UTC)
00:08 (23:08 UTC)
Duration: 0h 44m

Actual (estimated values):
22:24 (22:24 UTC)
00:08 (23:08 UTC)
Duration: 0h 44m

Tue, 26. Feb (lands Wed, 31. Dec): Landed

FX9 FDX9
Federal Express (FedEx) FX / FDX
N617FE McDonnell-Douglas MD11
London (STN)
to Indianapolis (IND)
6,444km (4,002mi.)

Scheduled:
21:56 (21:56 UTC)
19:00 (00:00 UTC)
Duration: -430893h -56m
Turnaround: 111 minutes

Actual:
22:31 (22:31 UTC)
Departed 35 min delayed
01:20 (06:20 UTC)
Landed 25854140 min delayed
Duration: 8h 24m

Tue, 26. Feb (lands Wed, 27. Feb): Landed

FX1 FDX1
Federal Express (FedEx) FX / FDX
N890FD Boeing B777-200LR
London (STN)
to Memphis (MEM)
7,042km (4,374mi.)

Scheduled:
20:50 (20:50 UTC)
00:14 (06:14 UTC)
Duration: 9h 24m
Turnaround: 2 hours

Actual (estimated values):
21:25 (21:25 UTC)
Departed 35 min delayed
00:15 (06:15 UTC)
Duration: 9h 25m

Tue, 26. Feb : Landed

FX36 FDX36
Federal Express (FedEx) FX / FDX
N528FE McDonnell-Douglas MD11
London (STN)
to Frankfurt (FRA)
617km (383mi.)

Scheduled:
18:40 (18:40 UTC)
20:45 (19:45 UTC)
Duration: 1h 4m
Turnaround: 99 minutes

Actual (estimated values):
18:41 (18:41 UTC)
20:45 (19:45 UTC)
Duration: 1h 4m

Tue, 26. Feb : Landed

FX5202 FDX5202
Federal Express (FedEx) FX / FDX
N676FE Airbus A300-600
London (STN)
to Dublin (DUB)
471km (292mi.)

Scheduled:
05:02 (05:02 UTC)
05:46 (05:46 UTC)
Duration: 0h 44m

Actual (estimated values):
05:03 (05:03 UTC)
05:47 (05:47 UTC)
Duration: 0h 45m

Tue, 26. Feb : Landed

3V976 TAY976C
Federal Express (FedEx) FX / FDX
OE-IAQ Boeing B737-400
London (STN)
to Liege (LGG)
388km (241mi.)

Scheduled:
02:00 (02:00 UTC)
04:00 (03:00 UTC)
Duration: 1h 0m

Actual:
02:00 (02:00 UTC)
03:40 (02:40 UTC)
Landed 19 min early
Duration: 0h 40m

Mon, 25. Feb (lands Tue, 26. Feb): Landed

FX6301 FDX6301
Federal Express (FedEx) FX / FDX
N972FD Boeing B757-200
London (STN)
to Liege (LGG)
388km (241mi.)

Scheduled:
23:06 (23:06 UTC)
00:48 (23:48 UTC)
Duration: 0h 42m

Actual (estimated values):
23:06 (23:06 UTC)
00:49 (23:49 UTC)
Duration: 0h 42m

Mon, 25. Feb (lands Tue, 26. Feb): Landed

FX5201 FDX5201
Federal Express (FedEx) FX / FDX

Scheduled:
22:26 (22:26 UTC)

Actual (estimated values):
22:26 (22:26 UTC)

N658FE Airbus A300-600
London (STN)
to Paris (CDG)
359km (223mi.)

00:15 (23:15 UTC)
Duration: 0h 48m
Turnaround: 86 minutes

00:16 (23:16 UTC)
Duration: 0h 49m

Mon, 25. Feb (lands Tue, 26. Feb): Landed

FX34 FDX34
Federal Express (FedEx) FX / FDX
N598FE McDonnell-Douglas MD11
London (STN)
to Cologne (CGN)
493km (306mi.)

Scheduled:
22:13 (22:13 UTC)
00:06 (23:06 UTC)
Duration: 0h 53m

Actual (estimated values):
22:13 (22:13 UTC)
00:05 (23:05 UTC)
Duration: 0h 52m

Mon, 25. Feb (lands Tue, 26. Feb): Landed

FX1 FDX1
Federal Express (FedEx) FX / FDX
N854FD Boeing B777-200LR
London (STN)
to Memphis (MEM)
7,042km (4,374mi.)

Scheduled:
20:50 (20:50 UTC)
00:17 (06:17 UTC)
Duration: 9h 27m

Actual (estimated values):
21:26 (21:26 UTC)
Departed 36 min delayed
00:16 (06:16 UTC)
Duration: 9h 26m

Mon, 25. Feb : Landed

FX9142 FDX9142
Federal Express (FedEx) FX / FDX
N573FE McDonnell-Douglas MD11
London (STN)
to Paris (CDG)
359km (223mi.)

Scheduled:
18:44 (18:44 UTC)
20:29 (19:29 UTC)
Duration: 0h 45m

Actual (estimated values):
18:45 (18:45 UTC)
20:29 (19:29 UTC)
Duration: 0h 44m

Sun, 24. Feb : Landed

FX5220 FDX5220
Federal Express (FedEx) FX / FDX
N658FE Airbus A300-600
London (STN)
to Dublin (DUB)
471km (292mi.)

Scheduled:
01:37 (01:37 UTC)
02:20 (02:20 UTC)
Duration: 0h 43m

Actual (estimated values):
01:37 (01:37 UTC)
02:20 (02:20 UTC)
Duration: 0h 43m

Sat, 23. Feb (lands Sun, 24. Feb): Landed

FX5391 FDX5391
Federal Express (FedEx) FX / FDX
N883FD Boeing B777-200LR
London (STN)
to Memphis (MEM)
7,042km (4,374mi.)

Scheduled:
23:38 (23:38 UTC)
02:59 (08:59 UTC)
Duration: 9h 21m

Actual (estimated values):
23:49 (23:49 UTC)
Departed 11 min delayed
03:00 (09:00 UTC)
Duration: 9h 22m

Sat, 23. Feb (lands Sun, 24. Feb): Landed

FX36 FDX36 Federal Express (FedEx) FX / FDX N618FE McDonnell-Douglas MD11 London (STN) to Paris (CDG) 359km (223mi.)	**Scheduled:** 23:36 (23:36 UTC) 01:16 (00:16 UTC) **Duration:** 0h 40m	**Actual (estimated values):** 23:35 (23:35 UTC) 01:16 (00:16 UTC) **Duration:** 0h 40m

Sat, 23. Feb : Landed

FX5210 FDX5210 Federal Express (FedEx) FX / FDX N676FE Airbus A300-600 London (STN) to Paris (CDG) 359km (223mi.)	**Scheduled:** 17:57 (17:57 UTC) 19:41 (18:41 UTC) **Duration:** 0h 44m	**Actual (estimated values):** 17:57 (17:57 UTC) 19:40 (18:40 UTC) **Duration:** 0h 43m

Fri, 22. Feb (lands Sat, 23. Feb): Landed

FX6301 FDX6301 Federal Express (FedEx) FX / FDX N916FD Boeing B757-200 London (STN) to Liege (LGG) 388km (241mi.)	**Scheduled:** 23:05 (23:05 UTC) 00:50 (23:50 UTC) **Duration:** 0h 45m	**Actual (estimated values):** 23:05 (23:05 UTC) 00:49 (23:49 UTC) **Duration:** 0h 44m

Fri, 22. Feb (lands Sat, 23. Feb): Landed

FX1 FDX1 Federal Express (FedEx) FX / FDX N859FD Boeing B777-200LR London (STN) to Memphis (MEM) 7,042km (4,374mi.)	**Scheduled:** 20:50 (20:50 UTC) 00:39 (06:39 UTC) **Duration:** 9h 49m	**Actual (estimated values):** 21:15 (21:15 UTC) Departed 25 min delayed 00:39 (06:39 UTC) **Duration:** 9h 49m

Fri, 22. Feb : Landed

FX5202 FDX5202 Federal Express (FedEx) FX / FDX N676FE Airbus A300-600 London (STN) to Dublin (DUB) 471km (292mi.)	**Scheduled:** 04:49 (04:49 UTC) 05:37 (05:37 UTC) **Duration:** 0h 47m	**Actual (estimated values):** 04:49 (04:49 UTC) 05:38 (05:38 UTC) **Duration:** 0h 48m

Thu, 21. Feb (lands Fri, 22. Feb): Landed

FX6301 FDX6301 Federal Express (FedEx) FX / FDX N916FD Boeing B757-200 London (STN) to Liege (LGG) 388km (241mi.)	**Scheduled:** 23:05 (23:05 UTC) 00:51 (23:51 UTC) **Duration:** 0h 45m	**Actual (estimated values):** 23:05 (23:05 UTC) 00:51 (23:51 UTC) **Duration:** 0h 45m

Carrier Name	Dep Airport Name	Arr Airport Name	Local Dep Time	Local Days Of Op	Frequency	FreightTons (Total)	Time series
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0100	6	5	519.5	201903
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0100	6	4	415.6	201904
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0100	6	4	415.6	201905
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0100	6	5	519.5	201906
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0100	6	4	415.6	201907
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0100	6	5	519.5	201908
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0100	6	4	415.6	201909
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0100	6	4	415.6	201910
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0100	6	5	519.5	201911
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0100	6	4	415.6	201912
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0100	6	4	415.6	202001
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0100	6	5	519.5	202002
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0105	6	5	519.5	201903
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0105	6	4	415.6	201904
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0105	6	4	415.6	201905
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0105	6	5	519.5	201906
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0105	6	4	415.6	201907
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0105	6	5	519.5	201908
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0105	6	4	415.6	201909
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0105	6	4	415.6	201910
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0105	6	5	519.5	201911
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0105	6	4	415.6	201912
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0105	6	4	415.6	202001
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0105	6	5	519.5	202002
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0500	7	5	519.5	201903
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0500	7	5	519.5	201903
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0500	7	4	415.6	201904
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0500	7	4	415.6	201904
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0500	7	4	415.6	201905
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0500	7	4	415.6	201905
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0500	7	5	519.5	201906
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0500	7	5	519.5	201906
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0500	7	4	415.6	201907
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0500	7	4	415.6	201907
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0500	7	4	415.6	201908
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0500	7	4	415.6	201908
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0500	7	5	519.5	201909
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0500	7	5	519.5	201909
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0500	7	4	415.6	201910
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0500	7	4	415.6	201910
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0500	7	4	415.6	201911
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0500	7	4	415.6	201911
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0500	7	5	519.5	201912
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0500	7	5	519.5	201912
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0500	7	4	415.6	202001
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0500	7	4	415.6	202001
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0500	7	4	415.6	202002
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0500	7	4	415.6	202002
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0530	5	5	519.5	201903
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0530	5	4	415.6	201904
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0530	5	5	519.5	201905
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0530	5	4	415.6	201906
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0530	5	4	415.6	201907
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0530	5	5	519.5	201908
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0530	5	4	415.6	201909
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0530	5	4	415.6	201910
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0530	5	5	519.5	201911
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0530	5	4	415.6	201912
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0530	5	5	519.5	202001
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0530	5	4	415.6	202002

Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0600	5	5	519.5	201903
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0600	5	4	415.6	201904
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0600	5	5	519.5	201905
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0600	5	4	415.6	201906
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0600	5	4	415.6	201907
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0600	5	5	519.5	201908
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0600	5	4	415.6	201909
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0600	5	4	415.6	201910
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0600	5	5	519.5	201911
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0600	5	4	415.6	201912
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0600	5	5	519.5	202001
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0600	5	4	415.6	202002
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0700	4	4	415.6	201903
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0700	4	4	415.6	201904
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0700	4	5	519.5	201905
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0700	4	4	415.6	201906
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0700	4	4	415.6	201907
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0700	4	5	519.5	201908
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0700	4	4	415.6	201909
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0700	4	5	519.5	201910
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0700	4	4	415.6	201911
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0700	4	4	415.6	201912
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0700	4	5	519.5	202001
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0700	4	4	415.6	202002
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0725	4	4	415.6	201903
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0725	4	4	415.6	201904
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0725	4	5	519.5	201905
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0725	4	4	415.6	201906
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0725	4	4	415.6	201907
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0725	4	5	519.5	201908
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0725	4	4	415.6	201909
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0725	4	5	519.5	201910
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0725	4	4	415.6	201911
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0725	4	4	415.6	201912
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0725	4	5	519.5	202001
Qatar Airways	London Stansted Apt	Paris Charles de Gau	0725	4	4	415.6	202002
Cargolux Airline	London Stansted Apt	Luxembourg	0820	3	4	450.4	201903
Cargolux Airline	London Stansted Apt	Luxembourg	0820	3	4	450.4	201904
Cargolux Airline	London Stansted Apt	Luxembourg	0820	3	5	563	201905
Cargolux Airline	London Stansted Apt	Luxembourg	0820	3	4	450.4	201906
Cargolux Airline	London Stansted Apt	Luxembourg	0820	3	5	563	201907
Cargolux Airline	London Stansted Apt	Luxembourg	0820	3	4	450.4	201908
Cargolux Airline	London Stansted Apt	Luxembourg	0820	3	4	450.4	201909
Cargolux Airline	London Stansted Apt	Luxembourg	0820	3	5	563	201910
Cargolux Airline	London Stansted Apt	Luxembourg	0820	3	4	450.4	201911
Cargolux Airline	London Stansted Apt	Luxembourg	0820	3	4	450.4	201912
Cargolux Airline	London Stansted Apt	Luxembourg	0820	3	5	563	202001
Cargolux Airline	London Stansted Apt	Luxembourg	0820	3	4	450.4	202002
Cargolux Italia S	London Stansted Apt	Luxembourg	0820	1	4	436	201903
Cargolux Italia S	London Stansted Apt	Luxembourg	0820	1	5	545	201904
Cargolux Italia S	London Stansted Apt	Luxembourg	0820	1	4	436	201905
Cargolux Italia S	London Stansted Apt	Luxembourg	0820	1	4	436	201906
Cargolux Italia S	London Stansted Apt	Luxembourg	0820	1	5	545	201907
Cargolux Italia S	London Stansted Apt	Luxembourg	0820	1	4	436	201908
Cargolux Italia S	London Stansted Apt	Luxembourg	0820	1	5	545	201909
Cargolux Italia S	London Stansted Apt	Luxembourg	0820	1	4	436	201910
Cargolux Italia S	London Stansted Apt	Luxembourg	0820	1	4	436	201911
Cargolux Italia S	London Stansted Apt	Luxembourg	0820	1	5	545	201912
Cargolux Italia S	London Stansted Apt	Luxembourg	0820	1	4	436	202001
Cargolux Italia S	London Stansted Apt	Luxembourg	0820	1	4	436	202002
China Southern	London Stansted Apt	Frankfurt Internatio	0835	4 6	9	900	201903

China Southern	London Stansted Apt	Frankfurt Internatio	0835	2	4	400	201903
China Southern	London Stansted Apt	Frankfurt Internatio	0835	2	5	500	201904
China Southern	London Stansted Apt	Frankfurt Internatio	0835	4 6	8	800	201904
China Southern	London Stansted Apt	Frankfurt Internatio	0835	4 6	9	900	201905
China Southern	London Stansted Apt	Frankfurt Internatio	0835	2	4	400	201905
China Southern	London Stansted Apt	Frankfurt Internatio	0835	2	4	400	201906
China Southern	London Stansted Apt	Frankfurt Internatio	0835	4 6	9	900	201906
China Southern	London Stansted Apt	Frankfurt Internatio	0835	2	5	500	201907
China Southern	London Stansted Apt	Frankfurt Internatio	0835	4 6	8	800	201907
China Southern	London Stansted Apt	Frankfurt Internatio	0835	4 6	10	1000	201908
China Southern	London Stansted Apt	Frankfurt Internatio	0835	2	4	400	201908
China Southern	London Stansted Apt	Frankfurt Internatio	0835	2	4	400	201909
China Southern	London Stansted Apt	Frankfurt Internatio	0835	4 6	8	800	201909
China Southern	London Stansted Apt	Frankfurt Internatio	0835	2	5	500	201910
China Southern	London Stansted Apt	Frankfurt Internatio	0835	4 6	9	900	201910
China Southern	London Stansted Apt	Frankfurt Internatio	0835	4 6	9	900	201911
China Southern	London Stansted Apt	Frankfurt Internatio	0835	2	4	400	201911
China Southern	London Stansted Apt	Frankfurt Internatio	0835	2	5	500	201912
China Southern	London Stansted Apt	Frankfurt Internatio	0835	4 6	8	800	201912
China Southern	London Stansted Apt	Frankfurt Internatio	0835	4 6	9	900	202001
China Southern	London Stansted Apt	Frankfurt Internatio	0835	2	4	400	202001
China Southern	London Stansted Apt	Frankfurt Internatio	0835	2	4	400	202002
China Southern	London Stansted Apt	Frankfurt Internatio	0835	4 6	9	900	202002
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0900	1	4	415.6	201903
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0900	1	5	519.5	201904
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0900	1	4	415.6	201905
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0900	1	4	415.6	201906
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0900	1	5	519.5	201907
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0900	1	4	415.6	201908
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0900	1	5	519.5	201909
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0900	1	4	415.6	201910
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0900	1	4	415.6	201911
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0900	1	5	519.5	201912
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0900	1	4	415.6	202001
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0900	1	4	415.6	202002
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0910	1	4	415.6	201903
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0910	1	5	519.5	201904
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0910	1	4	415.6	201905
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0910	1	4	415.6	201906
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0910	1	5	519.5	201907
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0910	1	4	415.6	201908
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0910	1	5	519.5	201909
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0910	1	4	415.6	201910
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0910	1	4	415.6	201911
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0910	1	5	519.5	201912
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0910	1	4	415.6	202001
Qatar Airways	London Stansted Apt	Milan Malpensa Apt	0910	1	4	415.6	202002
Silk Way West A	London Stansted Apt	Maastricht/Aachen	0930	4	4	440	201903
Silk Way West A	London Stansted Apt	Maastricht/Aachen	0930	4	4	440	201904
Silk Way West A	London Stansted Apt	Maastricht/Aachen	0930	4	5	550	201905
Silk Way West A	London Stansted Apt	Maastricht/Aachen	0930	4	4	440	201906
Silk Way West A	London Stansted Apt	Maastricht/Aachen	0930	4	4	440	201907
Silk Way West A	London Stansted Apt	Maastricht/Aachen	0930	4	5	550	201908
Silk Way West A	London Stansted Apt	Maastricht/Aachen	0930	4	4	440	201909
Silk Way West A	London Stansted Apt	Maastricht/Aachen	0930	4	5	550	201910
Silk Way West A	London Stansted Apt	Maastricht/Aachen	0930	4	4	440	201911
Silk Way West A	London Stansted Apt	Maastricht/Aachen	0930	4	4	440	201912
Silk Way West A	London Stansted Apt	Maastricht/Aachen	0930	4	5	550	202001
Silk Way West A	London Stansted Apt	Maastricht/Aachen	0930	4	4	440	202002
Cargolux Airline	London Stansted Apt	Luxembourg	0935	5	5	563	201903
Cargolux Airline	London Stansted Apt	Luxembourg	0935	5	4	450.4	201904

Cargolux Airline	London Stansted Apt	Luxembourg	0935	5	5	563	201905
Cargolux Airline	London Stansted Apt	Luxembourg	0935	5	4	450.4	201906
Cargolux Airline	London Stansted Apt	Luxembourg	0935	5	4	450.4	201907
Cargolux Airline	London Stansted Apt	Luxembourg	0935	5	5	563	201908
Cargolux Airline	London Stansted Apt	Luxembourg	0935	5	4	450.4	201909
Cargolux Airline	London Stansted Apt	Luxembourg	0935	5	4	450.4	201910
Cargolux Airline	London Stansted Apt	Luxembourg	0935	5	5	563	201911
Cargolux Airline	London Stansted Apt	Luxembourg	0935	5	4	450.4	201912
Cargolux Airline	London Stansted Apt	Luxembourg	0935	5	5	563	202001
Cargolux Airline	London Stansted Apt	Luxembourg	0935	5	4	450.4	202002
Lufthansa Germ	London Stansted Apt	Frankfurt Internatio	0955	4	1	85	201903
China Southern	London Stansted Apt	Guangzhou	1005	1	4	400	201903
China Southern	London Stansted Apt	Guangzhou	1005	1	5	500	201904
China Southern	London Stansted Apt	Guangzhou	1005	1	4	400	201905
China Southern	London Stansted Apt	Guangzhou	1005	1	4	400	201906
China Southern	London Stansted Apt	Guangzhou	1005	1	5	500	201907
China Southern	London Stansted Apt	Guangzhou	1005	1	4	400	201908
China Southern	London Stansted Apt	Guangzhou	1005	1	5	500	201909
China Southern	London Stansted Apt	Guangzhou	1005	1	4	400	201910
China Southern	London Stansted Apt	Guangzhou	1005	1	4	400	201911
China Southern	London Stansted Apt	Guangzhou	1005	1	5	500	201912
China Southern	London Stansted Apt	Guangzhou	1005	1	4	400	202001
China Southern	London Stansted Apt	Guangzhou	1005	1	4	400	202002
Cargologicair	London Stansted Apt	Frankfurt Internatio	1250	3	4	440	201903
Cargologicair	London Stansted Apt	Frankfurt Internatio	1250	3	4	440	201904
Cargologicair	London Stansted Apt	Frankfurt Internatio	1250	3	5	550	201905
Cargologicair	London Stansted Apt	Frankfurt Internatio	1250	3	4	440	201906
Cargologicair	London Stansted Apt	Frankfurt Internatio	1250	3	5	550	201907
Cargologicair	London Stansted Apt	Frankfurt Internatio	1250	3	4	440	201908
Cargologicair	London Stansted Apt	Frankfurt Internatio	1250	3	4	440	201909
Cargologicair	London Stansted Apt	Frankfurt Internatio	1250	3	5	550	201910
Cargologicair	London Stansted Apt	Frankfurt Internatio	1250	3	4	440	201911
Cargologicair	London Stansted Apt	Frankfurt Internatio	1250	3	4	440	201912
Cargologicair	London Stansted Apt	Frankfurt Internatio	1250	3	5	550	202001
Cargologicair	London Stansted Apt	Frankfurt Internatio	1250	3	4	440	202002
Qatar Airways	London Stansted Apt	Basel	1600	3	4	260	201903
Qatar Airways	London Stansted Apt	Basel	1600	3	4	260	201904
Qatar Airways	London Stansted Apt	Basel	1600	3	5	325	201905
Qatar Airways	London Stansted Apt	Basel	1600	3	4	260	201906
Qatar Airways	London Stansted Apt	Basel	1600	3	5	325	201907
Qatar Airways	London Stansted Apt	Basel	1600	3	4	260	201908
Qatar Airways	London Stansted Apt	Basel	1600	3	4	260	201909
Qatar Airways	London Stansted Apt	Basel	1600	3	5	325	201910
Qatar Airways	London Stansted Apt	Basel	1600	3	4	260	201911
Qatar Airways	London Stansted Apt	Basel	1600	3	4	260	201912
Qatar Airways	London Stansted Apt	Basel	1600	3	5	325	202001
Qatar Airways	London Stansted Apt	Basel	1600	3	4	260	202002
Asiana Airlines	London Stansted Apt	Frankfurt Internatio	1610	2 4 7	13	1300	201903
Asiana Airlines	London Stansted Apt	Frankfurt Internatio	1610	2 4 7	13	1300	201904
Asiana Airlines	London Stansted Apt	Frankfurt Internatio	1610	2 4 7	13	1300	201905
Asiana Airlines	London Stansted Apt	Frankfurt Internatio	1610	2 4 7	13	1300	201906
Asiana Airlines	London Stansted Apt	Frankfurt Internatio	1610	2 4 7	13	1300	201907
Asiana Airlines	London Stansted Apt	Frankfurt Internatio	1610	2 4 7	13	1300	201908
Asiana Airlines	London Stansted Apt	Frankfurt Internatio	1610	2 4 7	13	1300	201909
Asiana Airlines	London Stansted Apt	Frankfurt Internatio	1610	2 4 7	14	1400	201910
Asiana Airlines	London Stansted Apt	Frankfurt Internatio	1610	2 4 7	12	1200	201911
Asiana Airlines	London Stansted Apt	Frankfurt Internatio	1610	2 4 7	14	1400	201912
Asiana Airlines	London Stansted Apt	Frankfurt Internatio	1610	2 4 7	13	1300	202001
Asiana Airlines	London Stansted Apt	Frankfurt Internatio	1610	2 4 7	12	1200	202002
Qatar Airways	London Stansted Apt	Basel	1615	3	4	260	201903
Qatar Airways	London Stansted Apt	Basel	1615	3	4	260	201904

Qatar Airways	London Stansted Apt	Basel	1615	3	5	325	201905
Qatar Airways	London Stansted Apt	Basel	1615	3	4	260	201906
Qatar Airways	London Stansted Apt	Basel	1615	3	5	325	201907
Qatar Airways	London Stansted Apt	Basel	1615	3	4	260	201908
Qatar Airways	London Stansted Apt	Basel	1615	3	4	260	201909
Qatar Airways	London Stansted Apt	Basel	1615	3	5	325	201910
Qatar Airways	London Stansted Apt	Basel	1615	3	4	260	201911
Qatar Airways	London Stansted Apt	Basel	1615	3	4	260	201912
Qatar Airways	London Stansted Apt	Basel	1615	3	5	325	202001
Qatar Airways	London Stansted Apt	Basel	1615	3	4	260	202002
Qatar Airways	London Stansted Apt	Basel	1740	6	5	325	201903
Qatar Airways	London Stansted Apt	Basel	1740	6	4	260	201904
Qatar Airways	London Stansted Apt	Basel	1740	6	4	260	201905
Qatar Airways	London Stansted Apt	Basel	1740	6	5	325	201906
Qatar Airways	London Stansted Apt	Basel	1740	6	4	260	201907
Qatar Airways	London Stansted Apt	Basel	1740	6	5	325	201908
Qatar Airways	London Stansted Apt	Basel	1740	6	4	260	201909
Qatar Airways	London Stansted Apt	Basel	1740	6	4	260	201910
Qatar Airways	London Stansted Apt	Basel	1740	6	5	325	201911
Qatar Airways	London Stansted Apt	Basel	1740	6	4	260	201912
Qatar Airways	London Stansted Apt	Basel	1740	6	4	260	202001
Qatar Airways	London Stansted Apt	Basel	1740	6	5	325	202002
Lufthansa Germ	London Stansted Apt	Frankfurt Internatio	1750	7	1	103.9	201904
Qatar Airways	London Stansted Apt	Basel	1800	6	5	325	201903
Qatar Airways	London Stansted Apt	Basel	1800	6	4	260	201904
Qatar Airways	London Stansted Apt	Basel	1800	6	4	260	201905
Qatar Airways	London Stansted Apt	Basel	1800	6	5	325	201906
Qatar Airways	London Stansted Apt	Basel	1800	6	4	260	201907
Qatar Airways	London Stansted Apt	Basel	1800	6	5	325	201908
Qatar Airways	London Stansted Apt	Basel	1800	6	4	260	201909
Qatar Airways	London Stansted Apt	Basel	1800	6	4	260	201910
Qatar Airways	London Stansted Apt	Basel	1800	6	5	325	201911
Qatar Airways	London Stansted Apt	Basel	1800	6	4	260	201912
Qatar Airways	London Stansted Apt	Basel	1800	6	4	260	202001
Qatar Airways	London Stansted Apt	Basel	1800	6	5	325	202002
Martinair Hollar	London Stansted Apt	Amsterdam	1825	7	5	550	201903
Martinair Hollar	London Stansted Apt	Amsterdam	1825	7	4	440	201904
Martinair Hollar	London Stansted Apt	Amsterdam	1825	7	4	440	201905
Martinair Hollar	London Stansted Apt	Amsterdam	1825	7	5	550	201906
Martinair Hollar	London Stansted Apt	Amsterdam	1825	7	4	440	201907
Martinair Hollar	London Stansted Apt	Amsterdam	1825	7	4	440	201908
Martinair Hollar	London Stansted Apt	Amsterdam	1825	7	5	550	201909
Martinair Hollar	London Stansted Apt	Amsterdam	1825	7	4	440	201910
Martinair Hollar	London Stansted Apt	Amsterdam	1825	7	4	440	201911
Martinair Hollar	London Stansted Apt	Amsterdam	1825	7	5	550	201912
Martinair Hollar	London Stansted Apt	Amsterdam	1825	7	4	440	202001
Martinair Hollar	London Stansted Apt	Amsterdam	1825	7	4	440	202002
Qatar Airways	London Stansted Apt	Brussels Airport	1830	1	4	260	201903
Qatar Airways	London Stansted Apt	Brussels Airport	1830	1	5	325	201904
Qatar Airways	London Stansted Apt	Brussels Airport	1830	1	4	260	201905
Qatar Airways	London Stansted Apt	Brussels Airport	1830	1	4	260	201906
Qatar Airways	London Stansted Apt	Brussels Airport	1830	1	5	325	201907
Qatar Airways	London Stansted Apt	Brussels Airport	1830	1	4	260	201908
Qatar Airways	London Stansted Apt	Brussels Airport	1830	1	5	325	201909
Qatar Airways	London Stansted Apt	Brussels Airport	1830	1	4	260	201910
Qatar Airways	London Stansted Apt	Brussels Airport	1830	1	4	260	201911
Qatar Airways	London Stansted Apt	Brussels Airport	1830	1	5	325	201912
Qatar Airways	London Stansted Apt	Brussels Airport	1830	1	4	260	202001
Qatar Airways	London Stansted Apt	Brussels Airport	1830	1	4	260	202002
Cargologicair	London Stansted Apt	Atlanta Hartsfield-ja	1850	6	5	550	201903
Cargologicair	London Stansted Apt	Atlanta Hartsfield-ja	1850	6	4	440	201904

Cargologicair	London Stansted Apt	Atlanta Hartsfield-ja	1850	6	4	440	201905
Cargologicair	London Stansted Apt	Atlanta Hartsfield-ja	1850	6	5	550	201906
Cargologicair	London Stansted Apt	Atlanta Hartsfield-ja	1850	6	4	440	201907
Cargologicair	London Stansted Apt	Atlanta Hartsfield-ja	1850	6	5	550	201908
Cargologicair	London Stansted Apt	Atlanta Hartsfield-ja	1850	6	4	440	201909
Cargologicair	London Stansted Apt	Atlanta Hartsfield-ja	1850	6	4	440	201910
Cargologicair	London Stansted Apt	Atlanta Hartsfield-ja	1850	6	5	550	201911
Cargologicair	London Stansted Apt	Atlanta Hartsfield-ja	1850	6	4	440	201912
Cargologicair	London Stansted Apt	Atlanta Hartsfield-ja	1850	6	4	440	202001
Cargologicair	London Stansted Apt	Atlanta Hartsfield-ja	1850	6	5	550	202002
Qatar Airways	London Stansted Apt	Brussels Airport	1900	1	4	260	201903
Qatar Airways	London Stansted Apt	Brussels Airport	1900	1	5	325	201904
Qatar Airways	London Stansted Apt	Brussels Airport	1900	1	4	260	201905
Qatar Airways	London Stansted Apt	Brussels Airport	1900	1	4	260	201906
Qatar Airways	London Stansted Apt	Brussels Airport	1900	1	5	325	201907
Qatar Airways	London Stansted Apt	Brussels Airport	1900	1	4	260	201908
Qatar Airways	London Stansted Apt	Brussels Airport	1900	1	5	325	201909
Qatar Airways	London Stansted Apt	Brussels Airport	1900	1	4	260	201910
Qatar Airways	London Stansted Apt	Brussels Airport	1900	1	4	260	201911
Qatar Airways	London Stansted Apt	Brussels Airport	1900	1	5	325	201912
Qatar Airways	London Stansted Apt	Brussels Airport	1900	1	4	260	202001
Qatar Airways	London Stansted Apt	Brussels Airport	1900	1	4	260	202002
AirBridgeCargo	London Stansted Apt	Atlanta Hartsfield-ja	2035	6	5	700	201903
AirBridgeCargo	London Stansted Apt	Atlanta Hartsfield-ja	2035	6	4	560	201904
AirBridgeCargo	London Stansted Apt	Atlanta Hartsfield-ja	2035	6	4	560	201905
AirBridgeCargo	London Stansted Apt	Atlanta Hartsfield-ja	2035	6	5	700	201906
AirBridgeCargo	London Stansted Apt	Atlanta Hartsfield-ja	2035	6	4	560	201907
AirBridgeCargo	London Stansted Apt	Atlanta Hartsfield-ja	2035	6	5	700	201908
AirBridgeCargo	London Stansted Apt	Atlanta Hartsfield-ja	2035	6	4	560	201909
AirBridgeCargo	London Stansted Apt	Atlanta Hartsfield-ja	2035	6	4	560	201910
AirBridgeCargo	London Stansted Apt	Atlanta Hartsfield-ja	2035	6	5	700	201911
AirBridgeCargo	London Stansted Apt	Atlanta Hartsfield-ja	2035	6	4	560	201912
AirBridgeCargo	London Stansted Apt	Atlanta Hartsfield-ja	2035	6	4	560	202001
AirBridgeCargo	London Stansted Apt	Atlanta Hartsfield-ja	2035	6	5	700	202002

Carrier Name	Dep Airport Name	Arr Airport Name	Local Arr Time	Local Days Of Op	Frequency	FreightTons (Total)	Time series	Column1
British Airways	Doha	London Stansted Ap	0310	6	10	1039	201903	
British Airways	Doha	London Stansted Ap	0310	6	8	831.2	201904	
British Airways	Doha	London Stansted Ap	0310	6	8	831.2	201905	
British Airways	Doha	London Stansted Ap	0310	6	10	1039	201906	
British Airways	Doha	London Stansted Ap	0310	6	8	831.2	201907	
British Airways	Doha	London Stansted Ap	0310	6	10	1039	201908	
British Airways	Doha	London Stansted Ap	0310	6	8	831.2	201909	
British Airways	Doha	London Stansted Ap	0310	6	8	831.2	201910	
British Airways	Doha	London Stansted Ap	0310	6	10	1039	201911	
British Airways	Doha	London Stansted Ap	0310	6	8	831.2	201912	
British Airways	Doha	London Stansted Ap	0310	6	8	831.2	202001	
British Airways	Doha	London Stansted Ap	0310	6	10	1039	202002	
Qatar Airways	Doha	London Stansted Ap	0330	6	5	519.5	201903	
Qatar Airways	Doha	London Stansted Ap	0330	6	4	415.6	201904	
Qatar Airways	Doha	London Stansted Ap	0330	6	4	415.6	201905	
Qatar Airways	Doha	London Stansted Ap	0330	6	5	519.5	201906	
Qatar Airways	Doha	London Stansted Ap	0330	6	4	415.6	201907	
Qatar Airways	Doha	London Stansted Ap	0330	6	5	519.5	201908	
Qatar Airways	Doha	London Stansted Ap	0330	6	4	415.6	201909	
Qatar Airways	Doha	London Stansted Ap	0330	6	4	415.6	201910	
Qatar Airways	Doha	London Stansted Ap	0330	6	5	519.5	201911	
Qatar Airways	Doha	London Stansted Ap	0330	6	4	415.6	201912	
Qatar Airways	Doha	London Stansted Ap	0330	6	4	415.6	202001	
Qatar Airways	Doha	London Stansted Ap	0330	6	5	519.5	202002	
Qatar Airways	Doha	London Stansted Ap	0415	4	4	415.6	201903	
Qatar Airways	Doha	London Stansted Ap	0415	4	4	415.6	201904	
Qatar Airways	Doha	London Stansted Ap	0415	4	5	519.5	201905	
Qatar Airways	Doha	London Stansted Ap	0415	4	4	415.6	201906	
Qatar Airways	Doha	London Stansted Ap	0415	4	4	415.6	201907	
Qatar Airways	Doha	London Stansted Ap	0415	4	5	519.5	201908	
Qatar Airways	Doha	London Stansted Ap	0415	4	4	415.6	201909	
Qatar Airways	Doha	London Stansted Ap	0415	4	5	519.5	201910	
Qatar Airways	Doha	London Stansted Ap	0415	4	4	415.6	201911	
Qatar Airways	Doha	London Stansted Ap	0415	4	4	415.6	201912	
Qatar Airways	Doha	London Stansted Ap	0415	4	5	519.5	202001	
Qatar Airways	Doha	London Stansted Ap	0415	4	4	415.6	202002	
China Southern	Guangzhou	London Stansted Ap	0535	2 4 6	13	1300	201903	
China Southern	Guangzhou	London Stansted Ap	0535	1	4	400	201903	
China Southern	Guangzhou	London Stansted Ap	0535	1	5	500	201904	
China Southern	Guangzhou	London Stansted Ap	0535	2 4 6	13	1300	201904	
China Southern	Guangzhou	London Stansted Ap	0535	1	4	400	201905	
China Southern	Guangzhou	London Stansted Ap	0535	2 4 6	13	1300	201905	
China Southern	Guangzhou	London Stansted Ap	0535	2 4 6	13	1300	201906	
China Southern	Guangzhou	London Stansted Ap	0535	1	4	400	201906	
China Southern	Guangzhou	London Stansted Ap	0535	1	5	500	201907	
China Southern	Guangzhou	London Stansted Ap	0535	2 4 6	13	1300	201907	
China Southern	Guangzhou	London Stansted Ap	0535	1	4	400	201908	
China Southern	Guangzhou	London Stansted Ap	0535	2 4 6	14	1400	201908	
China Southern	Guangzhou	London Stansted Ap	0535	1	5	500	201909	
China Southern	Guangzhou	London Stansted Ap	0535	2 4 6	12	1200	201909	
China Southern	Guangzhou	London Stansted Ap	0535	1	4	400	201910	
China Southern	Guangzhou	London Stansted Ap	0535	2 4 6	14	1400	201910	
China Southern	Guangzhou	London Stansted Ap	0535	1	4	400	201911	
China Southern	Guangzhou	London Stansted Ap	0535	2 4 6	13	1300	201911	
China Southern	Guangzhou	London Stansted Ap	0535	2 4 6	13	1300	201912	
China Southern	Guangzhou	London Stansted Ap	0535	1	5	500	201912	
China Southern	Guangzhou	London Stansted Ap	0535	1	4	400	202001	
China Southern	Guangzhou	London Stansted Ap	0535	2 4 6	13	1300	202001	
China Southern	Guangzhou	London Stansted Ap	0535	1	4	400	202002	
China Southern	Guangzhou	London Stansted Ap	0535	2 4 6	13	1300	202002	
Qatar Airways	Doha	London Stansted Ap	0555	4	4	415.6	201903	
Qatar Airways	Doha	London Stansted Ap	0555	4	4	415.6	201904	
Qatar Airways	Doha	London Stansted Ap	0555	4	5	519.5	201905	
Qatar Airways	Doha	London Stansted Ap	0555	4	4	415.6	201906	

Qatar Airways	Doha	London Stansted Ap	0555	4	4	415.6	201907
Qatar Airways	Doha	London Stansted Ap	0555	4	5	519.5	201908
Qatar Airways	Doha	London Stansted Ap	0555	4	4	415.6	201909
Qatar Airways	Doha	London Stansted Ap	0555	4	5	519.5	201910
Qatar Airways	Doha	London Stansted Ap	0555	4	4	415.6	201911
Qatar Airways	Doha	London Stansted Ap	0555	4	4	415.6	201912
Qatar Airways	Doha	London Stansted Ap	0555	4	5	519.5	202001
Qatar Airways	Doha	London Stansted Ap	0555	4	4	415.6	202002
British Airways	Doha	London Stansted Ap	0630	4	4	415.6	201903
British Airways	Doha	London Stansted Ap	0630	4	4	415.6	201904
British Airways	Doha	London Stansted Ap	0630	4	5	519.5	201905
British Airways	Doha	London Stansted Ap	0630	4	4	415.6	201906
British Airways	Doha	London Stansted Ap	0630	4	4	415.6	201907
British Airways	Doha	London Stansted Ap	0630	4	5	519.5	201908
British Airways	Doha	London Stansted Ap	0630	4	4	415.6	201909
British Airways	Doha	London Stansted Ap	0630	4	5	519.5	201910
British Airways	Doha	London Stansted Ap	0630	4	4	415.6	201911
British Airways	Doha	London Stansted Ap	0630	4	4	415.6	201912
British Airways	Doha	London Stansted Ap	0630	4	5	519.5	202001
British Airways	Doha	London Stansted Ap	0630	4	4	415.6	202002
British Airways	Doha	London Stansted Ap	0636	4	4	415.6	201903
British Airways	Doha	London Stansted Ap	0636	4	4	415.6	201904
British Airways	Doha	London Stansted Ap	0636	4	5	519.5	201905
British Airways	Doha	London Stansted Ap	0636	4	4	415.6	201906
British Airways	Doha	London Stansted Ap	0636	4	4	415.6	201907
British Airways	Doha	London Stansted Ap	0636	4	5	519.5	201908
British Airways	Doha	London Stansted Ap	0636	4	4	415.6	201909
British Airways	Doha	London Stansted Ap	0636	4	5	519.5	201910
British Airways	Doha	London Stansted Ap	0636	4	4	415.6	201911
British Airways	Doha	London Stansted Ap	0636	4	4	415.6	201912
British Airways	Doha	London Stansted Ap	0636	4	5	519.5	202001
British Airways	Doha	London Stansted Ap	0636	4	4	415.6	202002
Cargolux Airline	Zhengzhou	London Stansted Ap	0650	3	4	450.4	201903
Cargolux Airline	Zhengzhou	London Stansted Ap	0650	3	4	450.4	201904
Cargolux Airline	Zhengzhou	London Stansted Ap	0650	3	5	563	201905
Cargolux Airline	Zhengzhou	London Stansted Ap	0650	3	4	450.4	201906
Cargolux Airline	Zhengzhou	London Stansted Ap	0650	3	5	563	201907
Cargolux Airline	Zhengzhou	London Stansted Ap	0650	3	4	450.4	201908
Cargolux Airline	Zhengzhou	London Stansted Ap	0650	3	4	450.4	201909
Cargolux Airline	Zhengzhou	London Stansted Ap	0650	3	5	563	201910
Cargolux Airline	Zhengzhou	London Stansted Ap	0650	3	4	450.4	201911
Cargolux Airline	Zhengzhou	London Stansted Ap	0650	3	4	450.4	201912
Cargolux Airline	Zhengzhou	London Stansted Ap	0650	3	5	563	202001
Cargolux Airline	Zhengzhou	London Stansted Ap	0650	3	4	450.4	202002
Cargolux Italia S	Zhengzhou	London Stansted Ap	0650	1	4	436	201903
Cargolux Italia S	Zhengzhou	London Stansted Ap	0650	1	5	545	201904
Cargolux Italia S	Zhengzhou	London Stansted Ap	0650	1	4	436	201905
Cargolux Italia S	Zhengzhou	London Stansted Ap	0650	1	4	436	201906
Cargolux Italia S	Zhengzhou	London Stansted Ap	0650	1	5	545	201907
Cargolux Italia S	Zhengzhou	London Stansted Ap	0650	1	4	436	201908
Cargolux Italia S	Zhengzhou	London Stansted Ap	0650	1	5	545	201909
Cargolux Italia S	Zhengzhou	London Stansted Ap	0650	1	4	436	201910
Cargolux Italia S	Zhengzhou	London Stansted Ap	0650	1	4	436	201911
Cargolux Italia S	Zhengzhou	London Stansted Ap	0650	1	5	545	201912
Cargolux Italia S	Zhengzhou	London Stansted Ap	0650	1	4	436	202001
Cargolux Italia S	Zhengzhou	London Stansted Ap	0650	1	4	436	202002
British Airways	Doha	London Stansted Ap	0700	7	5	519.5	201903
British Airways	Doha	London Stansted Ap	0700	1	4	415.6	201903
British Airways	Doha	London Stansted Ap	0700	7	4	415.6	201904
British Airways	Doha	London Stansted Ap	0700	1	5	519.5	201904
British Airways	Doha	London Stansted Ap	0700	7	4	415.6	201905
British Airways	Doha	London Stansted Ap	0700	1	4	415.6	201905
British Airways	Doha	London Stansted Ap	0700	1	4	415.6	201906
British Airways	Doha	London Stansted Ap	0700	7	5	519.5	201906
British Airways	Doha	London Stansted Ap	0700	1	5	519.5	201907

British Airways	Doha	London Stansted Ap	0700	7	4	415.6	201907
British Airways	Doha	London Stansted Ap	0700	1	4	415.6	201908
British Airways	Doha	London Stansted Ap	0700	7	4	415.6	201908
British Airways	Doha	London Stansted Ap	0700	7	5	519.5	201909
British Airways	Doha	London Stansted Ap	0700	1	5	519.5	201909
British Airways	Doha	London Stansted Ap	0700	7	4	415.6	201910
British Airways	Doha	London Stansted Ap	0700	1	4	415.6	201910
British Airways	Doha	London Stansted Ap	0700	7	4	415.6	201911
British Airways	Doha	London Stansted Ap	0700	1	4	415.6	201911
British Airways	Doha	London Stansted Ap	0700	1	5	519.5	201912
British Airways	Doha	London Stansted Ap	0700	7	5	519.5	201912
British Airways	Doha	London Stansted Ap	0700	7	4	415.6	202001
British Airways	Doha	London Stansted Ap	0700	1	4	415.6	202001
British Airways	Doha	London Stansted Ap	0700	7	4	415.6	202002
British Airways	Doha	London Stansted Ap	0700	1	4	415.6	202002
Safari Express C	Nairobi Jomo Kenyat	London Stansted Ap	0705	3	4	440	201903
Safari Express C	Nairobi Jomo Kenyat	London Stansted Ap	0705	3	4	440	201904
Safari Express C	Nairobi Jomo Kenyat	London Stansted Ap	0705	3	5	550	201905
Safari Express C	Nairobi Jomo Kenyat	London Stansted Ap	0705	3	4	440	201906
Safari Express C	Nairobi Jomo Kenyat	London Stansted Ap	0705	3	5	550	201907
Safari Express C	Nairobi Jomo Kenyat	London Stansted Ap	0705	3	4	440	201908
Safari Express C	Nairobi Jomo Kenyat	London Stansted Ap	0705	3	4	440	201909
Safari Express C	Nairobi Jomo Kenyat	London Stansted Ap	0705	3	5	550	201910
Safari Express C	Nairobi Jomo Kenyat	London Stansted Ap	0705	3	4	440	201911
Safari Express C	Nairobi Jomo Kenyat	London Stansted Ap	0705	3	4	440	201912
Safari Express C	Nairobi Jomo Kenyat	London Stansted Ap	0705	3	5	550	202001
Safari Express C	Nairobi Jomo Kenyat	London Stansted Ap	0705	3	4	440	202002
British Airways	Doha	London Stansted Ap	0725	5	10	1039	201903
British Airways	Doha	London Stansted Ap	0725	5	8	831.2	201904
British Airways	Doha	London Stansted Ap	0725	5	10	1039	201905
British Airways	Doha	London Stansted Ap	0725	5	8	831.2	201906
British Airways	Doha	London Stansted Ap	0725	5	8	831.2	201907
British Airways	Doha	London Stansted Ap	0725	5	10	1039	201908
British Airways	Doha	London Stansted Ap	0725	5	8	831.2	201909
British Airways	Doha	London Stansted Ap	0725	5	8	831.2	201910
British Airways	Doha	London Stansted Ap	0725	5	10	1039	201911
British Airways	Doha	London Stansted Ap	0725	5	8	831.2	201912
British Airways	Doha	London Stansted Ap	0725	5	10	1039	202001
British Airways	Doha	London Stansted Ap	0725	5	8	831.2	202002
Qatar Airways	Doha	London Stansted Ap	0735	1	4	415.6	201903
Qatar Airways	Doha	London Stansted Ap	0735	1	5	519.5	201904
Qatar Airways	Doha	London Stansted Ap	0735	1	4	415.6	201905
Qatar Airways	Doha	London Stansted Ap	0735	1	4	415.6	201906
Qatar Airways	Doha	London Stansted Ap	0735	1	5	519.5	201907
Qatar Airways	Doha	London Stansted Ap	0735	1	4	415.6	201908
Qatar Airways	Doha	London Stansted Ap	0735	1	5	519.5	201909
Qatar Airways	Doha	London Stansted Ap	0735	1	4	415.6	201910
Qatar Airways	Doha	London Stansted Ap	0735	1	4	415.6	201911
Qatar Airways	Doha	London Stansted Ap	0735	1	5	519.5	201912
Qatar Airways	Doha	London Stansted Ap	0735	1	4	415.6	202001
Qatar Airways	Doha	London Stansted Ap	0735	1	4	415.6	202002
Cargolux Airline	Nairobi Jomo Kenyat	London Stansted Ap	0805	5	5	563	201903
Cargolux Airline	Nairobi Jomo Kenyat	London Stansted Ap	0805	5	4	450.4	201904
Cargolux Airline	Nairobi Jomo Kenyat	London Stansted Ap	0805	5	5	563	201905
Cargolux Airline	Nairobi Jomo Kenyat	London Stansted Ap	0805	5	4	450.4	201906
Cargolux Airline	Nairobi Jomo Kenyat	London Stansted Ap	0805	5	4	450.4	201907
Cargolux Airline	Nairobi Jomo Kenyat	London Stansted Ap	0805	5	5	563	201908
Cargolux Airline	Nairobi Jomo Kenyat	London Stansted Ap	0805	5	4	450.4	201909
Cargolux Airline	Nairobi Jomo Kenyat	London Stansted Ap	0805	5	4	450.4	201910
Cargolux Airline	Nairobi Jomo Kenyat	London Stansted Ap	0805	5	5	563	201911
Cargolux Airline	Nairobi Jomo Kenyat	London Stansted Ap	0805	5	4	450.4	201912
Cargolux Airline	Nairobi Jomo Kenyat	London Stansted Ap	0805	5	5	563	202001
Cargolux Airline	Nairobi Jomo Kenyat	London Stansted Ap	0805	5	4	450.4	202002
Lufthansa Germ	Dakar Blaise Diagne I	London Stansted Ap	0825	4	1	85	201903
Cargologicair	Atlanta Hartsfield-jac	London Stansted Ap	1050	2	4	440	201903

Cargologicair	Atlanta Hartsfield-jac	London Stansted Ap	1050	2		5	550	201904
Cargologicair	Atlanta Hartsfield-jac	London Stansted Ap	1050	2		4	440	201905
Cargologicair	Atlanta Hartsfield-jac	London Stansted Ap	1050	2		4	440	201906
Cargologicair	Atlanta Hartsfield-jac	London Stansted Ap	1050	2		5	550	201907
Cargologicair	Atlanta Hartsfield-jac	London Stansted Ap	1050	2		4	440	201908
Cargologicair	Atlanta Hartsfield-jac	London Stansted Ap	1050	2		4	440	201909
Cargologicair	Atlanta Hartsfield-jac	London Stansted Ap	1050	2		5	550	201910
Cargologicair	Atlanta Hartsfield-jac	London Stansted Ap	1050	2		4	440	201911
Cargologicair	Atlanta Hartsfield-jac	London Stansted Ap	1050	2		5	550	201912
Cargologicair	Atlanta Hartsfield-jac	London Stansted Ap	1050	2		4	440	202001
Cargologicair	Atlanta Hartsfield-jac	London Stansted Ap	1050	2		4	440	202002
Asiana Airlines	Moscow Domodedov	London Stansted Ap	1415	4	7	9	900	201903
Asiana Airlines	Moscow Domodedov	London Stansted Ap	1415	2		4	400	201903
Asiana Airlines	Moscow Domodedov	London Stansted Ap	1415	4	7	8	800	201904
Asiana Airlines	Moscow Domodedov	London Stansted Ap	1415	2		5	500	201904
Asiana Airlines	Moscow Domodedov	London Stansted Ap	1415	2		4	400	201905
Asiana Airlines	Moscow Domodedov	London Stansted Ap	1415	4	7	9	900	201905
Asiana Airlines	Moscow Domodedov	London Stansted Ap	1415	4	7	9	900	201906
Asiana Airlines	Moscow Domodedov	London Stansted Ap	1415	2		4	400	201906
Asiana Airlines	Moscow Domodedov	London Stansted Ap	1415	4	7	8	800	201907
Asiana Airlines	Moscow Domodedov	London Stansted Ap	1415	2		5	500	201907
Asiana Airlines	Moscow Domodedov	London Stansted Ap	1415	4	7	9	900	201908
Asiana Airlines	Moscow Domodedov	London Stansted Ap	1415	2		4	400	201908
Asiana Airlines	Moscow Domodedov	London Stansted Ap	1415	4	7	9	900	201909
Asiana Airlines	Moscow Domodedov	London Stansted Ap	1415	2		4	400	201909
Asiana Airlines	Moscow Domodedov	London Stansted Ap	1415	2		5	500	201910
Asiana Airlines	Moscow Domodedov	London Stansted Ap	1415	4	7	9	900	201910
Asiana Airlines	Moscow Domodedov	London Stansted Ap	1415	4	7	8	800	201911
Asiana Airlines	Moscow Domodedov	London Stansted Ap	1415	2		4	400	201911
Asiana Airlines	Moscow Domodedov	London Stansted Ap	1415	2		5	500	201912
Asiana Airlines	Moscow Domodedov	London Stansted Ap	1415	4	7	9	900	201912
Asiana Airlines	Moscow Domodedov	London Stansted Ap	1415	4	7	9	900	202001
Asiana Airlines	Moscow Domodedov	London Stansted Ap	1415	2		4	400	202001
Asiana Airlines	Moscow Domodedov	London Stansted Ap	1415	2		4	400	202002
Asiana Airlines	Moscow Domodedov	London Stansted Ap	1415	4	7	8	800	202002
Qatar Airways	Doha	London Stansted Ap	1445	3		4	260	201903
Qatar Airways	Doha	London Stansted Ap	1445	3		4	260	201904
Qatar Airways	Doha	London Stansted Ap	1445	3		5	325	201905
Qatar Airways	Doha	London Stansted Ap	1445	3		4	260	201906
Qatar Airways	Doha	London Stansted Ap	1445	3		5	325	201907
Qatar Airways	Doha	London Stansted Ap	1445	3		4	260	201908
Qatar Airways	Doha	London Stansted Ap	1445	3		4	260	201909
Qatar Airways	Doha	London Stansted Ap	1445	3		5	325	201910
Qatar Airways	Doha	London Stansted Ap	1445	3		4	260	201911
Qatar Airways	Doha	London Stansted Ap	1445	3		4	260	201912
Qatar Airways	Doha	London Stansted Ap	1445	3		5	325	202001
Qatar Airways	Doha	London Stansted Ap	1445	3		4	260	202002
Lufthansa Germ	Buenos Aires Ministr	London Stansted Ap	1510	6		1	103.9	201904
Cargologicair	Frankfurt Internatior	London Stansted Ap	1610	6		5	550	201903
Cargologicair	Frankfurt Internatior	London Stansted Ap	1610	6		4	440	201904
Cargologicair	Frankfurt Internatior	London Stansted Ap	1610	6		4	440	201905
Cargologicair	Frankfurt Internatior	London Stansted Ap	1610	6		5	550	201906
Cargologicair	Frankfurt Internatior	London Stansted Ap	1610	6		4	440	201907
Cargologicair	Frankfurt Internatior	London Stansted Ap	1610	6		5	550	201908
Cargologicair	Frankfurt Internatior	London Stansted Ap	1610	6		4	440	201909
Cargologicair	Frankfurt Internatior	London Stansted Ap	1610	6		4	440	201910
Cargologicair	Frankfurt Internatior	London Stansted Ap	1610	6		5	550	201911
Cargologicair	Frankfurt Internatior	London Stansted Ap	1610	6		4	440	201912
Cargologicair	Frankfurt Internatior	London Stansted Ap	1610	6		4	440	202001
Cargologicair	Frankfurt Internatior	London Stansted Ap	1610	6		5	550	202002
Qatar Airways	Doha	London Stansted Ap	1610	6		5	325	201903
Qatar Airways	Doha	London Stansted Ap	1610	6		4	260	201904
Qatar Airways	Doha	London Stansted Ap	1610	6		4	260	201905
Qatar Airways	Doha	London Stansted Ap	1610	6		5	325	201906
Qatar Airways	Doha	London Stansted Ap	1610	6		4	260	201907

Qatar Airways	Doha	London Stansted Ap	1610	6	5	325	201908	
Qatar Airways	Doha	London Stansted Ap	1610	6	4	260	201909	
Qatar Airways	Doha	London Stansted Ap	1610	6	4	260	201910	
Qatar Airways	Doha	London Stansted Ap	1610	6	5	325	201911	
Qatar Airways	Doha	London Stansted Ap	1610	6	4	260	201912	
Qatar Airways	Doha	London Stansted Ap	1610	6	4	260	202001	
Qatar Airways	Doha	London Stansted Ap	1610	6	5	325	202002	
Martinair Hollar	Miami International	London Stansted Ap	1655	7	5	550	201903	
Martinair Hollar	Miami International	London Stansted Ap	1655	7	4	440	201904	
Martinair Hollar	Miami International	London Stansted Ap	1655	7	4	440	201905	
Martinair Hollar	Miami International	London Stansted Ap	1655	7	5	550	201906	
Martinair Hollar	Miami International	London Stansted Ap	1655	7	4	440	201907	
Martinair Hollar	Miami International	London Stansted Ap	1655	7	4	440	201908	
Martinair Hollar	Miami International	London Stansted Ap	1655	7	5	550	201909	
Martinair Hollar	Miami International	London Stansted Ap	1655	7	4	440	201910	
Martinair Hollar	Miami International	London Stansted Ap	1655	7	4	440	201911	
Martinair Hollar	Miami International	London Stansted Ap	1655	7	5	550	201912	
Martinair Hollar	Miami International	London Stansted Ap	1655	7	4	440	202001	
Martinair Hollar	Miami International	London Stansted Ap	1655	7	4	440	202002	
Qatar Airways	Doha	London Stansted Ap	1730	1	4	260	201903	
Qatar Airways	Doha	London Stansted Ap	1730	1	5	325	201904	
Qatar Airways	Doha	London Stansted Ap	1730	1	4	260	201905	
Qatar Airways	Doha	London Stansted Ap	1730	1	4	260	201906	
Qatar Airways	Doha	London Stansted Ap	1730	1	5	325	201907	
Qatar Airways	Doha	London Stansted Ap	1730	1	4	260	201908	
Qatar Airways	Doha	London Stansted Ap	1730	1	5	325	201909	
Qatar Airways	Doha	London Stansted Ap	1730	1	4	260	201910	
Qatar Airways	Doha	London Stansted Ap	1730	1	4	260	201911	
Qatar Airways	Doha	London Stansted Ap	1730	1	5	325	201912	
Qatar Airways	Doha	London Stansted Ap	1730	1	4	260	202001	
Qatar Airways	Doha	London Stansted Ap	1730	1	4	260	202002	
AirBridgeCargo	Frankfurt Internatior	London Stansted Ap	1905	6	5	700	201903	
AirBridgeCargo	Frankfurt Internatior	London Stansted Ap	1905	6	4	560	201904	
AirBridgeCargo	Frankfurt Internatior	London Stansted Ap	1905	6	4	560	201905	
AirBridgeCargo	Frankfurt Internatior	London Stansted Ap	1905	6	5	700	201906	
AirBridgeCargo	Frankfurt Internatior	London Stansted Ap	1905	6	4	560	201907	
AirBridgeCargo	Frankfurt Internatior	London Stansted Ap	1905	6	5	700	201908	
AirBridgeCargo	Frankfurt Internatior	London Stansted Ap	1905	6	4	560	201909	
AirBridgeCargo	Frankfurt Internatior	London Stansted Ap	1905	6	4	560	201910	
AirBridgeCargo	Frankfurt Internatior	London Stansted Ap	1905	6	5	700	201911	
AirBridgeCargo	Frankfurt Internatior	London Stansted Ap	1905	6	4	560	201912	
AirBridgeCargo	Frankfurt Internatior	London Stansted Ap	1905	6	4	560	202001	
AirBridgeCargo	Frankfurt Internatior	London Stansted Ap	1905	6	5	700	202002	
British Airways	Doha	London Stansted Ap	2215	5	10	1039	201903	106
British Airways	Doha	London Stansted Ap	2215	5	8	831.2	201904	
British Airways	Doha	London Stansted Ap	2215	5	10	1039	201905	
British Airways	Doha	London Stansted Ap	2215	5	8	831.2	201906	
British Airways	Doha	London Stansted Ap	2215	5	8	831.2	201907	
British Airways	Doha	London Stansted Ap	2215	5	10	1039	201908	
British Airways	Doha	London Stansted Ap	2215	5	8	831.2	201909	
British Airways	Doha	London Stansted Ap	2215	5	8	831.2	201910	
British Airways	Doha	London Stansted Ap	2215	5	10	1039	201911	
British Airways	Doha	London Stansted Ap	2215	5	8	831.2	201912	
British Airways	Doha	London Stansted Ap	2215	5	10	1039	202001	
British Airways	Doha	London Stansted Ap	2215	5	8	831.2	202002	
Qatar Airways	Doha	London Stansted Ap	2330	5	5	519.5	201903	
Qatar Airways	Doha	London Stansted Ap	2330	5	4	415.6	201904	
Qatar Airways	Doha	London Stansted Ap	2330	5	5	519.5	201905	
Qatar Airways	Doha	London Stansted Ap	2330	5	4	415.6	201906	
Qatar Airways	Doha	London Stansted Ap	2330	5	4	415.6	201907	
Qatar Airways	Doha	London Stansted Ap	2330	5	5	519.5	201908	
Qatar Airways	Doha	London Stansted Ap	2330	5	4	415.6	201909	
Qatar Airways	Doha	London Stansted Ap	2330	5	4	415.6	201910	
Qatar Airways	Doha	London Stansted Ap	2330	5	5	519.5	201911	
Qatar Airways	Doha	London Stansted Ap	2330	5	4	415.6	201912	

Qatar Airways	Doha	London Stansted Ap	2330	5	5	519.5	202001
Qatar Airways	Doha	London Stansted Ap	2330	5	4	415.6	202002

Pakistan International Airlines

PIA - Pakistan International Airlines ★
Airline Name

Active
Status

Info | News | Fleet/Bases | Ownership/Partners | Contacts | IT | Financials/Pax | Capacities

Fleet
show complete list

Aircraft Type	Active	Inactive	Total	On Order*	Ø Age	Capacity		
A320-200	10	1	11		13.1	1,914	Routes	Schedule
ATR42-500	4	1	5		12.2	240	Routes	Schedule
ATR72-500	3	2	5		6.8	350	Routes	Schedule
B777-200(ER)	6		6		14.1	1,921	Routes	Schedule
B777-200(LR)	2		2		13.9	620	Routes	Schedule
B777-300(ER)	3	1	4		11.3	1,621	Routes	Schedule
Total	28	5	33	0	12.0	6,666		

* Includes new or used aircraft not yet delivered for which a construction/manufacturer serial number is already known.

Orders

Aircraft Type	Aircraft On Order	As of*
B777-300(ER)	5	31JAN2019
Total	5	

* The data in the table above displays unfilled order data provided by manufacturers as of the date displayed in the As of column. It does not take orders announced after this date into consideration.

Iran Air

Iran Air ★
Airline Name

Active
Status

Info | News | Fleet/Bases | Ownership/Partners | Contacts | IT | Financials/Pax | Capacities

Fleet
show complete list

Aircraft Type	Active	Inactive	Total	On Order*	Ø Age	Capacity		
A300-600R	2	2	4		25.8	1,040	Routes	Schedule
A300B2	1		1		39.1	277	Routes	Schedule
A300B4	1	3	4		35.6	1,089	Routes	Schedule
A300B4(F)		2	2		37.6		Routes	Schedule
A310-300	1	1	2		29.0	385	Routes	Schedule
A319-100		3	3		17.0	414	Routes	Schedule
A320-200	2	4	6		23.4	870	Routes	Schedule
A321-200	1		1		2.3	194	Routes	Schedule
A330-200	2		2		4.5	476	Routes	Schedule
ATR72-600	12	1	13		1.3	910	Routes	Schedule
B747-200C(M)	1		1		30.5		Routes	Schedule
F100	1	8	9		27.2	936	Routes	Schedule
MD-82		1	1		30.5	142	Routes	Schedule
Total	24	25	49	0	19.3	6,733		

* Includes new or used aircraft not yet delivered for which a construction/manufacturer serial number is already known.

Divisions

Cargo

Aircraft Type	Active	Inactive	Total	On Order*	Ø Age	Capacity
A300B4(F)		2	2		37.6	
B747-200C(M)	1		1		30.5	
Total	1	2	3	0	35.2	

* Includes new or used aircraft not yet delivered for which a construction/manufacturer serial number is already known.

Orders

Aircraft Type	Aircraft On Order	As of*
A320-200	6	31JAN2019
A320-200N	32	31JAN2019
A321-200	7	31JAN2019
A330-200	8	31JAN2019
A330-900N	28	31JAN2019
A350-1000	16	31JAN2019
Total	97	

* The data in the table above displays unfilled order data provided by manufacturers as of the date displayed in the As of column. It does not take orders announced after this date into consideration.

Qatar Airways

Qatar Airways
Airline Name

Active
Status

Info | News | Fleet/Bases | Ownership/Partners | Contacts | IT | Financials/Pax | Capacities

Fleet
show complete list

Aircraft Type	Active	Inactive	Total	On Order*	Ø Age	Capacity		
A320-200	32	1	33		7.8	4,812	Routes	Schedule
A321-200	6		6		11.4	1,092	Routes	Schedule
A321-200N				2			Routes	Schedule
A330-200	7		7		13.1	1,832	Routes	Schedule
A330-200F	7		7		4.4		Routes	Schedule
A330-300	13		13		12.7	3,935	Routes	Schedule
A340-600	4		4		12.6	1,488	Routes	Schedule
A350-1000	6		6	17	0.6	1,962	Routes	Schedule
A350-900	32		32	4	2.1	9,168	Routes	Schedule
A380-800	10		10		3.6	5,170	Routes	Schedule
ACJ319-100	2		2		15.6	220	Routes	Schedule
B747-8(F)	2		2		4.0		Routes	Schedule
B777-200(F)	15		15	1	4.3		Routes	Schedule
B777-200(LR)	9		9		9.1	2,344	Routes	Schedule
B777-300(ER)	48		48		5.3	17,806	Routes	Schedule
B787-8	30		30		4.7	7,620	Routes	Schedule
Total	**223**	**1**	**224**	**24**	**6.0**	**57,449**		

* Includes new or used aircraft not yet delivered for which a construction/manufacturer serial number is already known.

Divisions

Cargo

Aircraft Type	Active	Inactive	Total	On Order*	Ø Age	Capacity
A330-200F	7		7		4.4	
B747-8(F)	2		2		4.0	
B777-200(F)	15		15		4.3	
Total	**24**	**0**	**24**	**0**	**4.3**	

* Includes new or used aircraft not yet delivered for which a construction/manufacturer serial number is already known.

Orders

Aircraft Type	Aircraft On Order	As of*
A321-200N	40	31JAN2019
A321-200NX(LR)	10	31JAN2019
A350-1000	36	31JAN2019
A350-900	4	31JAN2019
B777-200(F)	6	31JAN2019
B777-8	10	31JAN2019
B777-9	50	31JAN2019
B787-9	30	31JAN2019
Total	**186**	

* The data in the table above displays unfilled order data provided by manufacturers as of the date displayed in the As of column. It does not take orders announced after this date into consideration.

TAAG Angola

TAAG Angola Airlines
Airline Name

Active
Status

Info | News | Fleet/Bases | Ownership/Partners | Contacts | IT | Financials/Pax | Capacities

Fleet
show complete list

Aircraft Type	Active	Inactive	Total	On Order*	Ø Age	Capacity		
B737-700	4		4		12.5	480	Routes	Schedule
B737-700(QC)	1		1		11.0	120	Routes	Schedule
B777-200(ER)	3		3		12.1	705	Routes	Schedule
B777-300(ER)	5		5		5.3	1,457	Routes	Schedule
Total	**13**	**0**	**13**	**0**	**9.5**	**2,762**		

* Includes new or used aircraft not yet delivered for which a construction/manufacturer serial number is already known.

Annex II – Committee on Climate Change, Sixth Carbon Budget, Aviation Sector Summary

The Sixth Carbon Budget

Aviation

This document contains a summary of content for the aviation sector from the CCC's Sixth Carbon Budget Advice, Methodology and Policy reports.

Introduction

The Committee is advising that the UK set its Sixth Carbon Budget (i.e. the legal limit for UK net emissions of greenhouse gases over the years 2033-37) to require a reduction in UK emissions of 78% by 2035 relative to 1990, a 63% reduction from 2019. This will be a world-leading commitment, placing the UK decisively on the path to Net Zero by 2050 at the latest, with a trajectory that is consistent with the Paris Agreement.

Our advice on the Sixth Carbon Budget, including emissions pathways, details on our analytical approach, and policy recommendations for the aviation sector is presented across three CCC reports, an accompanying dataset, and supporting evidence.

- An Advice report: *The Sixth Carbon Budget – The UK's path to Net Zero*, setting out our recommendations on the Sixth Carbon Budget (2033-37) and the UK's Nationally Determined Contribution (NDC) under the Paris Agreement. This report also presents the overall emissions pathways for the UK and the Devolved Administrations and for each sector of emissions, as well as analysis of the costs, benefits and wider impacts of our recommended pathway, and considerations relating to climate science and international progress towards the Paris Agreement. Section 7 of Chapter 3 of that report contains an overview of the emissions pathways for the aviation sector.
- A Methodology Report: *The Sixth Carbon Budget – Methodology Report*, setting out the approach and assumptions used to inform our advice. Chapter 8 of that report contains a detailed overview of how we conducted our analysis for the aviation sector.
- A Policy Report: *Policies for the Sixth Carbon Budget and Net zero*, setting out the changes to policy that could drive the changes necessary particularly over the 2020s. Chapter 8 of that report contains our policy recommendations for the aviation sector.
- A dataset for the Sixth Carbon Budget scenarios, which sets out more details and data on the pathways than can be included in this report.
- Supporting evidence including our public Call for Evidence, 10 new research projects, three expert advisory groups, and deep dives into the roles of local authorities and businesses.

All outputs are published on our website (www.theccc.org.uk).

For ease, the relevant sections from the three reports for each sector (covering pathways, method and policy advice) are collated into self-standing documents for each sector. A full dataset including key charts is also available alongside this document. This is the self-standing document for the aviation sector. It is set out in three sections:

1) The approach to the Sixth Carbon Budget analysis for the aviation sector
2) Emissions pathways for the aviation sector
3) Policy recommendations for the aviation sector

The approach to the Sixth Carbon Budget analysis for the aviation sector

The following sections are taken directly from Chapter 8 of the CCC's Methodology Report for the Sixth Carbon Budget.[1]

Introduction and key messages

This chapter sets out the method for the aviation sector's Sixth Carbon Budget pathways.

The scenario results of our costed pathways are set out in the accompanying *Advice report*. Policy implications are set out in the accompanying *Policy report*.

For ease, these sections covering pathways, method and policy advice for the aviation sector are collated in *The Sixth Carbon Budget – Aviation*. A full dataset including key charts is also available alongside this document.

The key messages from this chapter are:

- Background. Aviation emissions accounted for 7% of UK GHG emissions in 2018 and were 88% above 1990 levels. Emissions have been relatively flat from 2008-2018, with increasing international travel being offset by some improvements in efficiencies and by falling military and domestic aviation emissions. 2020 has likely seen a drop in GHG emissions of over 60% from 2019, due to the impact of COVID-19, with a return to pre-pandemic passenger levels not expected until 2024.[2]

- Options for reducing emissions. Mitigation options considered include demand management, improvements in aircraft efficiency (including use of hybrid electric aircraft), and use of sustainable aviation fuels (biofuels, biowaste to jet and synthetic jet fuels) to displace fossil jet fuel.

- Analytical approach. Our starting point for this analysis has been the 2019 *Net Zero* report, and the underlying DfT demand, efficiency and emissions modelling.
  - We have adapted and updated this analysis to fit to a new set of demand scenarios (consistent with those considered by the Climate Assembly), before introducing significantly higher shares of sustainable aviation fuels than previously considered.
  - This includes new evidence on the costs and emissions savings of sustainable aviation fuels, fitting with our Fuel Supply analysis, and the added capital costs of efficiency improvements.

- Uncertainty. We have used the scenario framework to test the impacts of uncertainties, to inform our balanced Net Zero Pathway. The key areas of uncertainty we test relate to sustainable aviation fuel supplies and costs of synthetic jet fuel, the mix of SAF options, the profile for expansion in passenger demand over time (with mid-term or no net expansion of airports), and whether there will be long-term structural change in the sector due to COVID-19. Out of all the CCC's sectors, Aviation has been most impacted by COVID-19, and continues to face the highest uncertainties about the future size of the sector.

We set out our analysis in the following sections:

1. Sector emissions
2. Options for reducing emissions
3. Approach to analysis for the Sixth Carbon Budget

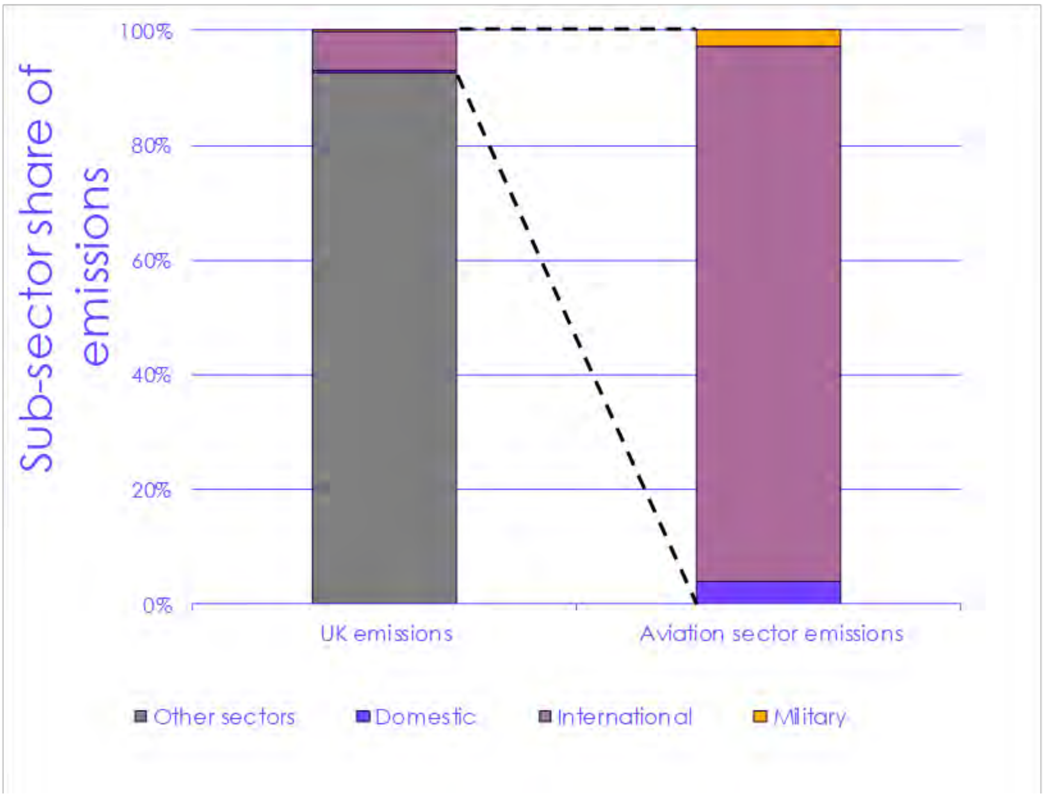
This section outlines the recent trends in aviation emissions and their sources. For more detail, see our 2020 Progress Report to Parliament.[3]

a) Breakdown of current emissions

Based on the most recent official UK emissions data, total UK aviation emissions increased by 0.8% from 2017 levels to 39.3 $MtCO_2e$/year in 2018. Within this, emissions from international flights increased by 1.1% to 36.7 $MtCO_2e$/year, emissions from domestic flights fell by 5.9% to 1.5 $MtCO_2e$/year, and emissions from military aviation fell 0.6% to 1.1 $MtCO_2e$/year. Aviation therefore comprised 7% of UK GHG emissions in 2018, and within this international aviation dominates at 93% of UK aviation emissions (Figure M8.1).

To be consistent with other sectors and the Climate Change Act framework, these GHG emissions do not include non-CO_2 impacts of aviation, which are discussed in Chapter 8, section 4 of the main *Advice Report*.

Figure M8.1 Breakdown of aviation sector emissions (2018)



Source: BEIS (2020) *Final UK greenhouse gas emissions national statistics 2018*.
Notes: Total UK emissions in 2018 were 539 $MtCO_2e$/yr (AR5 basis, peatland revisions and IAS included). UK aviation sector emissions in 2018 were 39.3 MtCO2e/yr.

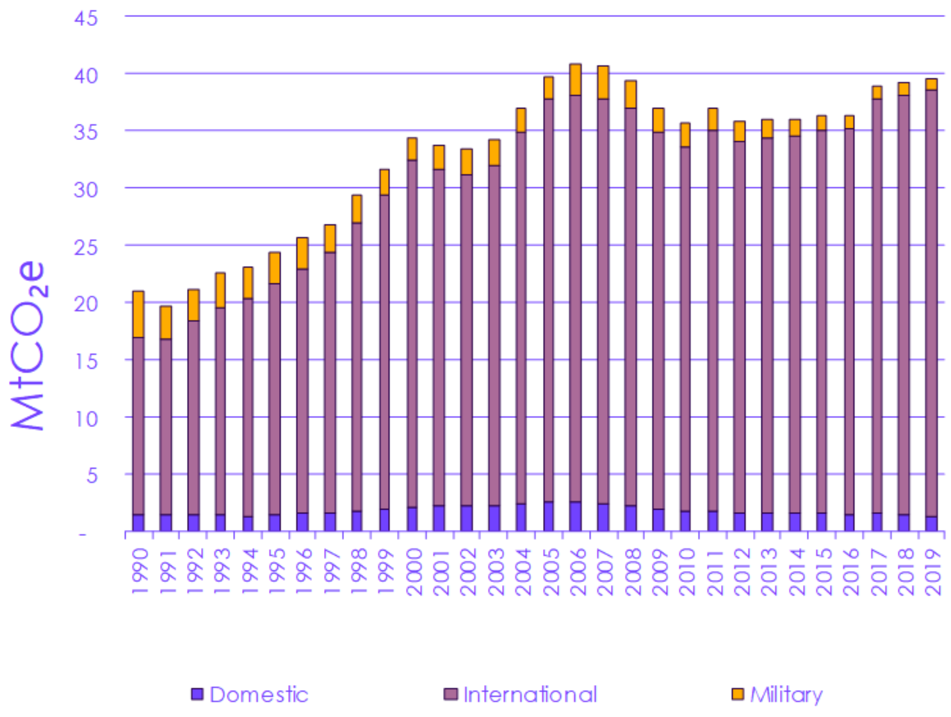
We have also estimated UK aviation emissions for 2019 at 39.6 $MtCO_2e$/year, a 0.9% increase on 2018 levels. This combines 11% falls in domestic and military emissions with a 1.7% increase in international aviation emissions.

However, given the COVID-19 pandemic and its impact on the aviation sector, and the need to reflect this in our analysis in the near-term, we have also estimated a fall in 2020 GHG emissions of over 60% from 2019 levels (and then a recovery to 2024), as detailed below in section 3(e). The emissions estimates from 2019 onwards will revised once official BEIS final GHG emissions data is published.

b) Emissions trends and drivers

The breakdown of aviation emissions since 1990 is shown in Figure M8.2. Overall, emissions from domestic and international aviation in 2018 were 124% above 1990 levels, and military aviation emissions have fallen 71% from 1990 levels.

Figure M8.2 Breakdown of aviation sector emissions (1990-2019)



Source: BEIS (2020) *Final UK greenhouse gas emissions national statistics 2018*; BEIS (2020) *Provisional UK greenhouse gas emissions national statistics 2019*; BEIS (2020) *Energy Trends*; CCC estimates for 2019.

Aviation emissions rose strongly throughout the 1990s and early-to-mid 2000s, due to increasing passenger demand, with only minor falls seen around 1990 and 2000 due to economic down-turns.

Emissions fell significantly during 2007-2010 due to the financial crisis, then stayed relatively flat in the early 2010s, but have been rising again in recent years.

UK aviation emissions in 2018 were therefore the same as in 2008, as falls in domestic and military aviation emissions have been balanced by a rise in UK international aviation emissions. Over the same 2008-2018 period, the total number of UK terminal passengers rose by 24% to reach 292 million in 2018, with a further 2% increase seen in 2019.

The increase in emissions has been more modest than growth in passengers due to increased plane loadings, decreases in average flight distance (due to faster growth in flights to the EU than other international destinations) and some improvements in fleet efficiency.

Several different emissions reduction options have been explored within the Aviation sector. These include:

- Demand management. A reduction in the annual number of passengers versus a counterfactual with unlimited passenger demand growth. Demand management policies could take several forms, either reducing passenger demand for flying through carbon pricing, a frequent flyer levy, fuel duty, VAT or reforms to Air Passenger Duty, and/or restricting the availability of flights through management of airport capacity. Our analysis only assumes a demand profile is achieved, and does not model the policies required to achieve these profiles.

- Aircraft fleet-efficiency improvements, achieved via a combination of airspace modernisation, operational optimisation, aircraft passenger loadings, aircraft design and new engine efficiency improvements, as well as introduction of hybrid electric aircraft (significant falls in jet use, but adding some use of electricity via on-board batteries and motors). Our analysis uses fleet fuel tCO_2/passenger values from DfT modelling, and does not model individual improvements from the list above.

- Sustainable aviation fuels (SAF). These are "drop-in" replacements for fossil jet fuel, meeting international fuel specifications (and currently allowed to be blended at up to 50% by volume), and have nil accounting CO_2 emissions on combustion. SAF production routes considered include:

  - Biomass to Fischer-Tropsch (FT) biojet, with or without CCS;

  - Biogenic waste fats/oils to Hydroprocessed Esters and Fatty Acids (HEFA) biojet;

  - Biogenic fraction of waste* to Fischer-Tropsch (FT) biojet, with or without CCS; and

  - Synthetic jet fuel produced via Direct Air Capture (DAC) of CO_2 and low-carbon H_2.

  Our analysis uses these four SAF options to displace fossil jet fuel, and each SAF option has its own deployment and cost profile, based on the availability of the feedstocks, efficiencies, input energy, capital and operating costs. Each route is discussed in more detail in the Fuel Supply chapter.

* Note that the non-biogenic fraction of waste converted to FT jet will still have fossil accounting CO_2 emissions on combustion in aviation, and so is included within fossil jet fuel figures, not as SAF.

a) Summary of scenario choices

As a reminder from Chapter 3, section 7 of the *Advice Report*, the measures discussed in section 2 above are combined into the different scenarios as set out in Table M8.1.

Table M8.1
Aviation scenario composition

	Passenger demand growth by 2050 from 2018 levels	Average efficiency improvement 2018-2050 (%/year)	Use of biomass FT jet (TWh, % of liquid fuel demand in 2050)	Use of HEFA biojet (TWh, % of liquid fuel demand in 2050)	Use of bio-waste FT jet (TWh, % of liquid fuel demand in 2050)	Use of synthetic jet (TWh, % of liquid fuel demand in 2050)	Use of fossil jet (TWh, % of liquid fuel demand in 2050)
Balanced Net Zero Pathway	+25%, with no net expansion	+1.4%	14 (11%)	8 (6%)	-	10 (8%)	94 (75%)
Headwinds	+25%, with expansion	+1.4%	14 (11%)	11 (9%)	-	-	101 (80%)
Widespread Engagement	-15%, no expansion	+1.6%	14 (16%)	4 (4%)	5 (5%)	-	61 (74%)
Widespread Innovation	+50%, with expansion	+2.1%	23 (19%)	9 (7%)	-	30 (25%)	58 (49%)
Tailwinds	-15%, no expansion	+2.1%	23 (33%)	12 (18%)	-	30 (44%)	4 (5%)
Baseline	+64%, with expansion	+0.7%	-	-	-	-	205 (100%)

Our baseline is taken direct from DfT modelling, with high demand growth (64% growth in passenger number by 2050, from 2018 levels), low efficiency improvement (0.7%/year), no hybrid electric aircraft and no SAF deployment.

The exploratory scenarios use different mixes of the options set out in section 2 to reduce emissions below baseline emissions:

- Headwinds follows the approach in Net Zero 2019, with 25% passenger growth by 2050, 1.4%/year efficiency improvement (in-line with historical averages), and 14 TWh/year of biomass to FT jet. We have also added 11 TWh/year of HEFA biojet, as surface transport shifts to EVs, leaving waste fats/oils resources available to be converted into HEFA biojet instead of biodiesel.
- Widespread Engagement assumes a reduction in aviation demand of 15% from 2018 levels, based on the lowest of the Climate Assembly scenarios. This reflects a scenario in which people are willing to embrace greater changes to behaviour. Efficiencies are marginally higher than in Headwinds. Biomass to FT jet remains at the same level, whereas significantly lower livestock numbers and a phasing out of biofuel imports leads to lower HEFA biojet use. However, in this scenario, residual wastes are assumed to be increasingly diverted from energy-from-waste plants, with 70% of the UK's residual waste converted into 5 TWh/year of biojet (plus a similar fossil fraction) by 2050, thereby contributing an additional 5% of aviation fuel demand from waste biojet.

- Widespread Innovation assumes demand growth of 50% from 2018 levels, based on the highest demand amongst the preferred Climate Assembly scenarios. Efficiencies are much higher, based on the DfT scenario selected. More biomass is assumed to be diverted to FT biojet, along with HEFA biojet making up ~25% of supply, and the other 25% of the fuel mix is assumed to be made up of synthetic jet fuel. We did not increase the blending of synthetic jet fuel above 25% due to the high costs of synthetic jet fuel, and the high penetration of biomass to hydrogen in the Widespread Innovation scenario (where it would be more efficient to make biojet direct from the biomass, rather than via a hydrogen intermediary). However, the overall choices fit with the overall scenario design philosophy of maximal technical change.

- Tailwinds combines the most stretching of the scenarios above – a reduction in demand, high efficiency, and the maximal resource allocations for the biojet and synthetic jet fuel from the other scenarios. Waste to jet has not been included, as the remaining energy-from-waste (EfW) plants in our analysis all retrofit CCS before 2050, ensuring 95% capture of the fossil & biogenic carbon. However, putting the residual waste instead into new jet production plants with CCS would likely lead to a very similar outcome in terms of GHG emissions.*

Our scenario for the Balanced Net Zero Pathway takes elements from each of the above pathways:

- Demand growth: Our demand growth by 2050 matches Headwinds at 25%, although the passenger growth profile is more gradual due to an assumption of no net capacity expansion at UK airports in this scenario. This arises as a function of 2050 passenger numbers (365 million passengers) being within current UK airport capacities (at least 370 million passengers), and the need to ensure the UK achieves Net Zero by 2050 with aviation still one of the largest emitting sectors. We therefore do not assume a surge in emissions occurs in the early 2030s, as happens with the airport expansion modelled in the Headwinds and Widespread Innovation scenarios. Airport expansion could still occur under the Balanced Pathway, but would require capacity restrictions elsewhere in the UK (i.e. effectively a reallocation of airport capacity).

Box M8.1
Climate Assembly scenarios

The Climate Assembly debated five aviation scenarios, with changes in demand from 2018 to 2050 of -15%, +20%, +25%, +50% and +65%. Growth of 65% growth was highly unpopular - a majority wanted to see a 25-50% growth in flights, with the higher end of the range acceptable if technology was developed to mitigate the additional emissions. However, the weighted average of scenario Borda votes was +24% growth, and the report also noted that a majority voted for +25% growth or less. This gives added confidence that the required demand management to keep the Balanced Net Zero Pathway to only 25% growth by 2050 would be acceptable to the UK general public.

Source: Climate Assembly UK (2020); CCC analysis.

* This assumes that jet production is maximised and that other co-products (e.g. diesel, LPG) also still displace fossil fuels (increasingly difficult to 2050 as other sector counterfactuals decarbonise); and that EfW plants with CCS are displacing grid electricity with zero emissions by 2050 (rather than displacing fossil gas with CCS plants).

- Efficiency: The Balanced Net Zero Pathway takes the same efficiency assumptions as in the Headwinds scenario, in line with historical average improvement.

- SAF: Use of SAF matches Headwinds and Widespread Engagement for biomass to FT jet, and similar assumptions are taken on HEFA biojet (with slight differences due to waste fats/oils availability). Our Balanced Net Zero Pathway also assumes some synthetic jet fuels might be available in 2040s, at one third of the level deployed in the Widespread Innovation scenario, due to the higher costs of hydrogen and Direct Air Capture in the Balanced Net Zero Pathway compared to the Widespread Innovation scenario. Similar to the Tailwinds scenario, we have not allocated residual waste to jet fuel in this scenario.

The resulting GHG emissions in the Balanced Pathway grow during 2021-2023 with the return in passenger numbers post-COVID, before flat demand, efficiency measures and the start of SAF deployment lead to falls in emissions to the early 2030s. The more back-ended passenger growth in the Balanced Pathway (compared to Headwinds) has passenger numbers starting to grow from the mid-2030s, meaning that emissions continue to decline to 2040, as this later passenger growth is able to be accommodated by further improvements in efficiency and the continued uptake of SAF (compared to emissions increasing in Headwinds in the early 2030s with earlier passenger growth). The Balanced Pathway therefore only sees growth in passenger numbers towards 2050 once SAF is commercially proven and contributing at scale (in this scenario, there is 8% SAF used in 2035, increasing at slightly above 1 percentage point a year). From 2040, DfT modelling then introduces a new generation of aircraft (including the start of hybrid electric aircraft) that lead to further falls in emissions, with continued SAF uptake and passenger numbers continuing to increase to 2050.

Aviation measures reduce sector emissions to 23 $MtCO_2e$/year by 2050 in the Balanced Pathway, and all scenarios have positive emissions. The aviation sector will therefore require significant amounts of GHG removals to be developed to offset an increasing proportion of the sector's (declining) gross emissions to 2050, and aviation is therefore likely to be a key driving force behind the long-term deployment of engineered removals.

b) Sector classifications

Note that with our current sector classifications, some emissions reduction options have been counted outside of the CCC's Aviation sector, even if these emissions reductions are achieved via aviation policy and could count towards a separate Net Zero goal for the sector. For example:

- Sequestering biogenic CO_2 by installing CCS on UK biojet production facilities is counted within the CCC's engineered GHG removals sector, as a form of bioenergy with CCS (BECCS).

- Airlines paying for Direct Air Capture with CCS (DACCS) in the UK, in order to offset their remaining aviation gross emissions, is also counted within CCC's engineered GHG removals sector.

- Airlines paying for tree planting in the UK, in order to offset their remaining aviation gross emissions, is counted within CCC's Land Use, Land Use Change & Forestry (LULUCF) sinks sector.

These do not constitute recommendations on emissions accounting, merely what we have assumed for this analysis. These 'negative emissions' options are discussed in greater detail in the LULUCF and engineered GHG removals chapters.

This CCC sector classification also means that whilst some SAF fuels can be strongly carbon-negative on a lifecycle basis at the point of use (e.g. if there is upstream biogenic CCS involved in their production), our Aviation sector analysis only considers the direct accounting CO_2 emissions from the use of SAF in the sector, i.e. nil and not negative. If an alternative accounting methodology were followed, the negative emissions from upstream biogenic CCS could be counted within the Aviation sector emissions, but then these upstream negative emissions would have to be excluded from the GHG removals or LULUCF sinks sector to avoid double-counting. Overall, these discussions reflect emissions accounting classifications and do not affect aggregate UK emissions.

The residual aviation emissions in the Widespread Innovation scenario are used to calculate the Direct Air Capture with CCS requirement (14.5 $MtCO_2$/year) in both the Widespread Innovation scenario and the Tailwinds scenario. DACCS costs, energy inputs and deployment profiles are discussed in the GHG removals sector.

c) Analytical steps

The aviation analysis for the Sixth Carbon Budget advice consists of the following steps:

- Coverage.
  - Aviation is split into three sub-sectors: domestic, international and military.
  - Emissions cover CO_2, N_2O and CH_4.
  - Coverage is for UK, Scotland, Wales and Northern Ireland.
- Abatement measures are split into three types: demand, efficiency (including hybrids) and SAF.
  - Domestic and international passenger demand and fuel use trajectories to 2050 are sourced from DfT aviation modelling, thereby incorporating DfT efficiency assumptions.
  - Trajectory start points were adjusted for 2015-2019 actual NAEI[4] and CCA data[5], and estimated COVID-19 impacts in 2020-23 (discussed below), and trajectories then re-scaled to meet passenger growth targets for 2050 (discussed above).
  - The domestic share of DfT fuel use increases from 3.4% today to 3.9% by 2050. Military fuel use is derived separately from NAEI[4] and held fixed to 2050. Freight flights are included within DfT trajectories, so are implicitly assumed to scale with CCC passenger profiles.
  - SAF deployments from the CCC's Fuel Supply sector modelling are used to calculate residual fossil jet demands, with the same SAF % blend assumed to be used in each sub-sector (including in military aviation).
  - Direct accounting CO_2, CH_4 and N_2O emissions are calculated based on fuel use, then split into sub-sectors and DAs (discussed below).

- Energy inflows to the sector (SAF = bioenergy, non-bio waste and hydrogen derived fuels, fossil jet and electricity from hybrid planes) are split into sub-sectors and DAs. It is assumed that 50% of the hybrid aircraft electricity use is in the domestic sub-sector.

- Costs.
  - Re-scaled DfT departing seat-km data is used to calculate operating cost savings from efficiency measures and increased annualised aircraft capital costs (which are de-annualised to in-year investments), based on ATA data which assumes a 20 year economic lifetime, 10% residual value and a 4.5% interest rate[6]. No cost data was available for the military aviation sub-sector. Marginal added costs of SAF above fossil jet are also calculated for all sub-sectors.
  - Costs are then split into sub-sectors and DAs to calculate £/tCO_2e abated by each measure, using CCC's 3.5% social discount rate.

Further assumptions used in the analysis include:

- In 2018, 99.91% of fuel used in the UK aviation sector was aviation turbine fuel (avtur or jet), and 0.09% of fuel used was aviation spirit (avgas). CCC have used the term "jet" or "jet fuel" to include all the fuel used in UK aviation. Our analysis uses the 2018 weighted average of avtur and avgas, with constant fuel density, calorific value and carbon content values from Defra.[7]
- NAEI factors are also applied to scale combustion CO_2 to combustion CH_4 (with separate factors for domestic, international and military sub-sectors), and a constant factor to scale combustion CO_2 to combustion N_2O (applied for all sub-sectors).[8] SAF fuels are assumed to continue to have the same combustion CH_4 and N_2O emissions per kWh as fossil jet (only their accounting CO_2 emissions are reduced).
- Jet fuel costs are not part of the BEIS/HMT Green Book Long-run variable costs of energy supply (LRVCs) dataset. However, based off IATA[9], financial market and refining datasets, the jet crack ($/bbl) above crude oil price is historically very similar to the diesel crack ($/bbl). The Green Book diesel LRVCs (p/litre) were therefore used and converted into p/kWh values for fossil jet fuel.

d) Devolved administrations

The 2018 share of emissions from the NAEI is used to apportion UK emissions to emissions at devolved administration (DA) level. Separate splits are used for domestic, international and military aviation:

- Domestic: 32.8% Scotland, 0.80% Wales, 13.1% NI, 53.2% England
- International: 4.3% Scotland, 0.29% Wales, 0.55% NI, 94.9% England
- Military: 7.4% Scotland, 3.4% Wales, 2.2% NI, 86.9% England

These DA splits are held fixed over time in all scenarios, except for in the Baseline, Headwinds and Widespread Innovation scenarios, where expansion in London airports from 2030 to 2033 is assumed (delayed from DfT modelling which assumes this happens from 2026):

- This expansion leads to domestic DA splits reaching 28.7% Scotland, 0.73% Wales, 10.9% NI, 59.7% England by 2033, before a linear return to 2018 DA splits is assumed by 2050.
- International DA splits reach 3.8% Scotland, 0.27% Wales, 0.48% NI, 95.4% England by 2033, before a linear return to 2018 DA splits is assumed by 2050.
- No change assumed in military aviation DA splits.

As show in Figure M8.3, Welsh aviation emissions to not rebound post-COVID as much as other DAs relative to the 2020 base year, due to the outsized influence of military aviation emissions in Wales, where fuel use has been assumed to be held flat from 2019. Scotland and NI have much smaller military sub-sectors relative to their combined domestic and international emissions, and so their emissions profile matches the UK profile with the COVID-19 recovery.

Figure M8.3 Comparison of emission pathways for the UK, Scotland, Wales, Northern Ireland

Source: CCC analysis.
Notes: Aviation sector GHG emissions for the Balanced Net Zero Pathway, split into DAs, and re-based from 2020 levels (which is at the bottom of the COVID-19 dip, hence strong growth in the following years).

e) Uncertainties

Given aviation will be one of the largest-emitting sectors in 2050 (23 $MtCO_2e$/year in the Balanced Pathway), the following uncertainties could change UK emissions in 2050 by many $MtCO_2e$/year and impact Net Zero:

- COVID-19. Out of all the sectors, aviation has been most impacted by COVID-19, and continues to be severely impacted. There remain major uncertainties as to the size of the aviation industry that will emerge post-COVID, particularly as the pandemic continues to spread globally and many countries return to forms of stricter lockdowns in late 2020. CCC have estimated a drop in UK flights and emissions during 2020-2023 as shown in Table M8.2, with a return to previously projected to demand levels from 2024 in most scenarios.
  - Data for 2020 is based on CAA flight data to date, and OAG scheduling trackers showing UK flights in mid-October at ~30% of last year's levels. We have then assumed flat demand over winter 2020/21, before increases from 2021. Values chosen for 2021-23 are estimates, but align with IATA forecasts for a recovery by 2024, i.e. a return to the chosen pathways from 2024 onwards.
  - In the Widespread Engagement and Tailwinds scenarios we assume a structural shift in demand due to behaviour change (e.g. due to video-conferencing) and have estimated this potential impact via halving business travel (which previously comprised 20% of UK passengers) by 2024. These two pathways ultimately end up at a 15% fall in passenger numbers from 2018 levels by 2050, but most of the change in demand is assumed to happen over the next 4 years.
  - The pandemic may result in a near-term marginal improvement in fleet efficiency, due to earlier retirement of older aircraft (e.g. Boeing 747s), although lower passenger loadings could offset this on a tCO_2/passenger basis, and so has not been modelled. Lower demand could also decrease or delay purchases of newer, more efficient aircraft.

Table M8.2
Aviation COVID-19 impacts, as a % of expected pathway emissions

	2019	2020	2021	2022	2023	2024+	Notes
Headwinds	100%	39%	70%	85%	95%	100%	Recovers to expected pathway
Widespread Engagement	100%	39%	67%	76%	86%	90%	Half of business customers do not return
Widespread Innovation	100%	39%	70%	85%	95%	100%	Recovers to expected pathway
Balanced Net Zero Pathway	100%	39%	70%	85%	95%	100%	Recovers to expected pathway
Tailwinds	100%	39%	67%	76%	86%	90%	Half of business customers do not return
Baseline	100%	39%	70%	85%	95%	100%	Recovers to expected pathway

- GDP/economic outlook. We have not attempted to calculate a long-term reduction in aviation demand due to structural changes to the economy or long-term level of GDP due to COVID-19 (flights have historically correlated to GDP). We have also not considered any reductions in supply via e.g. failures of airports, airlines or engine manufacturers. Lower long-term fossil jet fuel prices and slowed aircraft sales and development cycles could lead to smaller efficiency gains than previously projected, although this has also not been modelled.

- Efficiency measures are expected to be cost saving in all scenarios, and under a range of fossil fuel costs and passenger demands. However, costs have not been modelled by DfT, and the DfT model is not an aircraft stock/sale model.

  We have therefore had to infer added investment costs in each year from representative ATA aircraft Class data, applied to DfT seat-km/year outputs, and de-annualising using annual changes. There are therefore some years with particularly large or small (or even very occasionally negative*) capital costs, due to the limitations of the datasets.

- Future aircraft.

  - The uptake of electric hybrid aircraft in the DfT modelling is relatively modest (around 9% of aircraft kilometres by 2050, consuming 6-7% of jet fuel). The DfT model assumes that full electric planes will not be commercialised by 2050, and it does not have a role for hydrogen turbine or hydrogen fuel cell planes by 2050 either. There could be break-throughs in these aircraft options, although the time taken to design, build, test, scale-up, certify and manufacture new aircraft propulsion systems (and the new aircraft bodies to accommodate them and their energy stores on-board) is significant – at least several decades.

  - Even if one of these options were commercialised in the 2040s, it would be challenging to immediately achieve a large % share of aircraft sales, and given the 20-30 year lifetimes of aircraft, this will not lead to a significant fleet penetration by 2050. These full electric or hydrogen options have energy storage limitations, and would be most suited for domestic or short-haul flights and/or smaller airplane classes, which make up a relatively small share of UK aviation emissions.

  - Combined, these range, aircraft class and development timings mean that 2050 penetrations of these options are likely to be limited, or they could occupy small niches by 2050 – although neither is likely to significantly improve the overall UK emissions profile. Long-haul flights dominate UK aviation emissions and are likely to stay using a hydrocarbon fuel until 2050 or beyond, hence the need for SAF.

* A negative capital cost is possible, and would indicate a net sale of assets in the year. This only occurs where there is a particularly large divergence in demand from the Baseline scenario, at which point the sector may down-size.

- SAF is expected to be an added marginal cost, and this marginal cost will depend heavily on the counterfactual fossil jet cost, the cost of feedstocks (especially for synthetic fuels using hydrogen and DAC CO_2), and the future improvement in processing plant costs (including the addition of CCS to FT routes which will significantly increase fuel GHG savings). Our scenarios explore different hydrogen and DAC costs, but hold costs of biomass, waste and waste fats/oils fixed over time (prices may well rise over time, but CCC analysis is only focused on resource costs). Processing costs are assumed to fall over time (as they are largely determined by global progress in SAF scale-up), and do not vary between scenarios. However, the earliest, high-risk projects, or smaller UK projects, or projects further from feedstocks or CO_2 sequestration sites, might be significantly more expensive than modelled. SAF costs are therefore have some level of uncertainty.

- Impact of demand policies. Although we have assessed how much efficiency and SAF costs would subtract/add to an indicative trans-Atlantic ticket price, our analysis is only taking the outputs of DfT modelling, and we do not have the ability to feed the specific decarbonisation costs back in to the demand framework to calculate the impact on passenger demand. This limitation also applies to demand management policies – DfT modelling internally assumes a rising carbon price, which reduces demand from an original counterfactual scenario, but CCC again only take the outputs after this internal carbon pricing is applied to demand. The particular policies that might be utilised to manage demand could have different impacts on ticket prices (e.g. carbon pricing, frequent flier levy, VAT, fuel duty, APD reform, airport capacity management). CCC analysis has focused on the outcomes (demand, fuel and emissions), rather than prescribing or modelling the policy method for achieving the demand levels required.

- Measure interdependencies. Theoretically, any combination of the mitigation measures discussed in section 2 would be possible, as they separately impact demand, fuel use and fuel accounting emissions. However, scenarios that rely on high amounts of technical change or new expensive fuels will likely either require a profitable sector to fund this RD&D, customers being willing to pay more, and/or more government intervention (regulation or support). Scenarios with negative growth, if repeated globally, are likely to result in a slower uptake of new, more efficient aircraft, and less investment in SAF due to depressed fossil fuel prices. Delivery of the Tailwinds scenario would therefore be particularly challenging – a reduction in demand from 2018 levels, with maximal efficiency and 95% SAF by 2050.

- Non-CO_2 impacts. These impacts are discussed in Chapter 8, section 4 of the Advice Report. There remain significant uncertainties in the science and mitigation options, and therefore uncertainties regarding the policy response and any interactions with sector GHG emissions (e.g. re-routing aircraft around super-saturated atmospheric zones to avoid cirrus cloud formation could increase GHG emissions).

Endnotes

[1] CCC (2020) *The Sixth Carbon Budget – Methodology Report.* Available at: www.theccc.org.uk

[2] IATA (2020) *Recovery Delayed as International Travel Remains Locked Down*

[3] CCC (2020) *2020 Progress Report to Parliament*

[4] National Atmospheric Emissions Inventory (2020) *UK Greenhouse Gas Inventory, 1990 to 2018: Annual Report for submission under the Framework Convention on Climate Change*

[5] Civil Aviation Authority (2020) Airport data 2019

[6] ATA & Ellondee (2018) *Understanding the potential and costs for reducing UK aviation emissions*

[7] Defra (2020) *Greenhouse gas reporting: conversion factors 2020*

[8] All the analysis is conducted on an IPCC AR5 basis with carbon feedbacks, using 34 tCO_2e/tCH_4 and 298 tCO_2e/tN_2O.

[9] IATA (2020) *Jet Fuel Price Monitor*

Chapter 2

Emissions pathways for the aviation sector

The following sections are taken directly from Section 7 of Chapter 3 of the CCC's Advice Report for the Sixth Carbon Budget].[1]

Introduction and key messages

Aviation is one of the sectors in which we expect there to be significant remaining positive emissions by 2050, given the limited set of options for decarbonisation. Remaining residual emissions will need to be offset by greenhouse gas removals (see section 11) for the sector to reach Net Zero.

The evidence base on how to achieve GHG savings in aviation in the UK relies on internal modelling from DfT, Climate Assembly UK demand scenarios and internal CCC analysis of sustainable aviation fuel costs. Further details are provided in the Methodology Report.

We present the scenarios for aviation emissions in three parts:

a) The Balanced Net Zero Pathway for aviation

b) Alternative pathways for aviation emissions

c) Investment requirements and costs

a) The Balanced Net Zero Pathway for aviation

In the Balanced Net Zero Pathway, the aviation sector returns to close to pre-pandemic demand levels by 2024. Thereafter, emissions gradually decline over time (Figure A3.7.a) to reach 23 $MtCO_2e$/year by 2050, despite modest growth in demand.

This gradual reduction in emissions is due to demand management, improvements in efficiency and a modest but increasing share of sustainable aviation fuels:

The Balanced Pathway has 25% growth in demand by 2050 compared to 2018 levels, but with no net expansion of UK airport capacity.

- Demand management. The Balanced Net Zero Pathway does allow for some limited growth in aviation demand over the period to 2050, but considerably less than a 'business as usual' baseline. We allow for a 25% in growth by 2050 compared to 2018 levels, whereas the baseline reflects unconstrained growth of around 65% over the same period. We assume that, unlike in the baseline, this occurs without any net increase in UK airport capacity, so that any expansion is balanced by reductions in capacity elsewhere in the UK.

- Efficiency improvements. The fuel efficiency per passenger of aviation is assumed to improve at 1.4% per annum, compared to 0.7% per annum in the baseline. This includes 9% of total aircraft distance in 2050 being flown by hybrid electric aircraft.

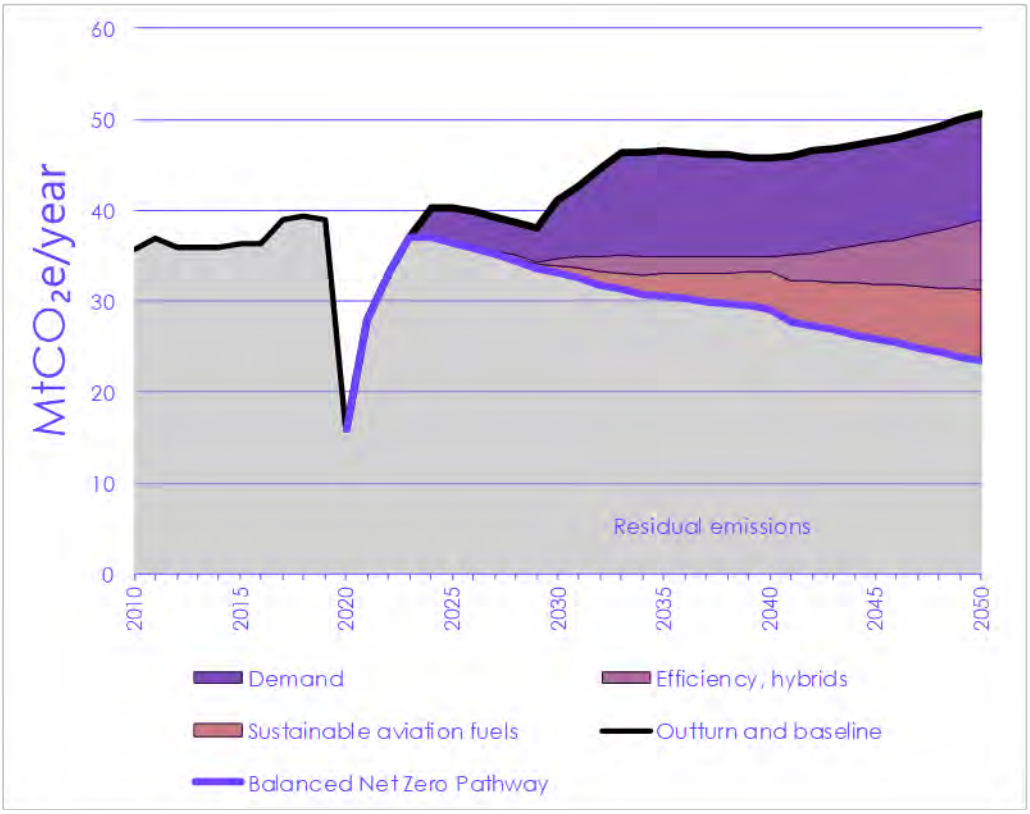
A quarter of jet fuel by 2050 is made from sustainable low-carbon sources.

- Sustainable aviation fuels (SAF) contribute 25% of liquid fuel consumed in 2050, with just over two-thirds of this coming from biofuels[1] and the remainder from carbon-neutral synthetic jet fuel (produced via direct air capture of CO_2 combined with low-carbon hydrogen, with 75% of this synthetic jet fuel assumed to be made in the UK and the rest imported).

[1] Biofuels are assumed to be produced with CCS on the production plant – overall carbon-negative but assumed to have zero direct CO_2 emissions in aviation. Removals are accounted for in section 11.

Demand management plays a critical role in ensuring GHG emissions continue to decrease, particularly while efficiency benefits and SAF take time to scale up.

Figure A3.7.a Sources of abatement in the Balanced Net Zero Pathway for the aviation sector



Source: BEIS (2020) *Provisional UK greenhouse gas emissions national statistics 2019*; CCC analysis.

b) Alternative pathways for aviation emissions

Each of our exploratory scenarios for aviation sees emissions fall from 2018 to 2050 by more than 35% (Figure A3.7.b), though with different contributions from efficiency improvements, sustainable fuels and constraints on demand (Table A3.7):

- Headwinds assumes the same 25% growth in demand from 2018 to 2050 as in the Balanced Pathway, although with higher demand in the 2030s due to a net increase in airport capacity. Improvements in efficiency are as in the Balanced Pathway, while biofuels comprise 20% of the fuel mix by 2050. Emissions are 25 $MtCO_2e$ in 2050, 36% below 2018 levels.

Widespread Engagement assumes lower demand in 2050 than in 2018, due mainly to reduced business travel.

- Widespread Engagement has lower demand, with an overall reduction of 15% on 2018 levels and therefore around half the 2050 demand as in the baseline. This is in line with the Climate Assembly UK's 'flying less' scenario. It includes a substantial reduction in business aviation due to widespread near-term adoption of videoconferencing. Efficiency improvements are slightly faster than those in the Balanced Pathway at 1.6% per annum, while the share of biofuels in 2050 is slightly lower at 20%, with a further 5% contribution from the biogenic fraction of waste-based fuels.[2] Emissions in 2050 are 15 $MtCO_2e$, 62% below 2018 levels.

Widespread Innovation assumes much higher demand growth is possible, due to rapid technology development.

- Widespread Innovation has a greater contribution from technological performance, both in terms of improved efficiency (2.1% per annum) and the contribution of sustainable aviation fuels. By 2050, around a quarter of fuel use is biofuel, with a further quarter carbon-neutral synthetic jet fuel. These technical improvements lead to a lower carbon-intensity and lower cost of aviation, although demand in this scenario is considerably higher, reaching 50% above 2018 levels by 2050 (in line with the Climate Assembly UK's 'technological change' scenario). Emissions in 2050 are 15 $MtCO_2e$, 63% below 2018 levels.

- In Tailwinds, the reductions in demand under Widespread Engagement are combined with the technology improvements in Widespread Innovation. Demand in 2050 is 15% below 2018 levels and efficiency improves at 2.1% per annum. Very similar volumes of sustainable fuels are used as in Widespread Innovation, but when applied to the lower fuel consumption in Tailwinds these comprise a higher combined share of 95% of fuel use. Emissions in 2050 are 1 $MtCO_2e$, 97% below 2018 levels.

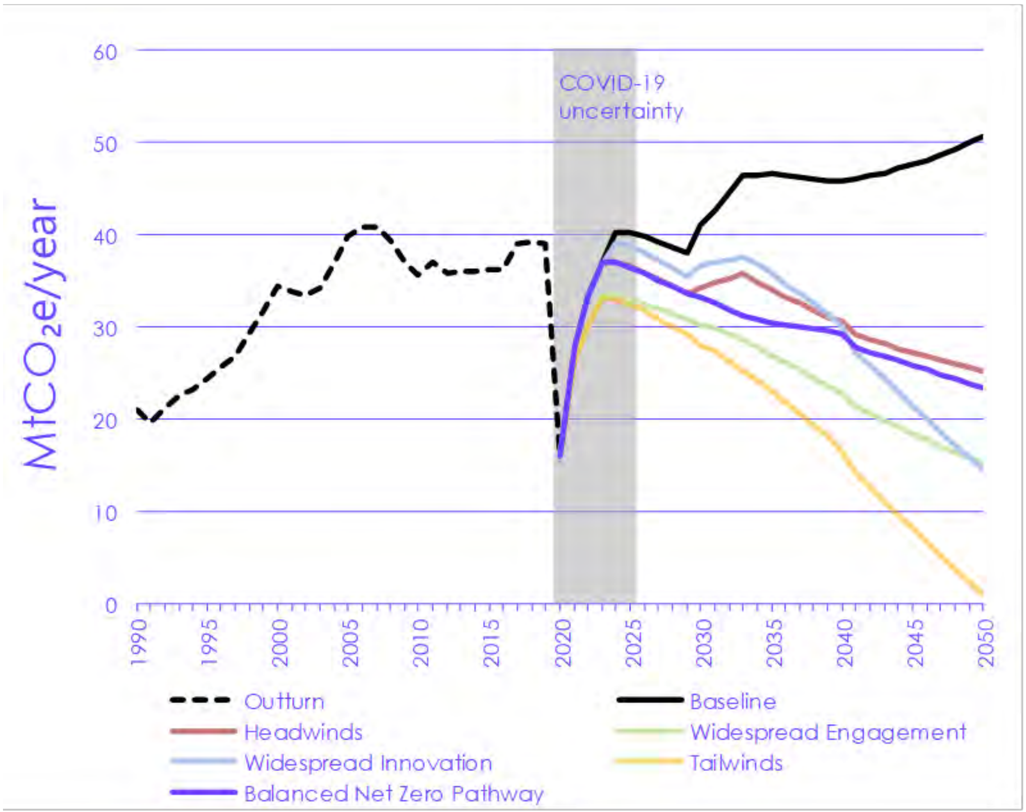
In each case, for the aviation sector to reach Net Zero by 2050, the remaining emissions will need to be offset with greenhouse gas removals (see section 11).

In addition to the GHG emissions presented here, aviation also has non-CO_2 warming impacts due to contrails, NO_x emissions and other factors. While outside of the emissions accounting framework used by UK carbon budgets (see Chapter 10), we estimate the additional warming from these non-CO_2 effects in section 4 of Chapter 8.

[2] Waste-based fuels save less CO_2 than biofuels, due to approximately half of the waste carbon content being of fossil origin. Only the biogenic fraction of wastes save CO_2 compared to fossil jet fuel.

COVID-19 has had a dramatic impact, and all scenarios remain under 2019 emissions levels. Tailwinds is able to almost completely decarbonise by 2050.

Figure A3.7.b Emissions pathways for the aviation sector



Source: BEIS (2020) *Provisional UK greenhouse gas emissions national statistics 2019*; CCC analysis.
Notes: Only direct CO_2, CH_4 and N_2O combustion emissions in aviation are shown. 'Non-CO_2 impacts' are excluded.

Table A3.7
Summary of key differences in the aviation scenarios

	Balanced Pathway	Headwinds	Widespread Engagement	Widespread Innovation	Tailwinds
Demand growth to 2050 (vs. 2018)	+25%	+25%	-15%	+50%	-15%
Efficiency improvements (%/year)	1.4%	1.4%	1.6%	2.1%	2.1%
Biofuel share in 2050	17%	20%	20%	26%	51%
Bio-waste fuel share in 2050	-	-	5%	-	-
Synthetic jet fuel share in 2050	8%	-	-	25%	44%

c) Investment requirements and costs

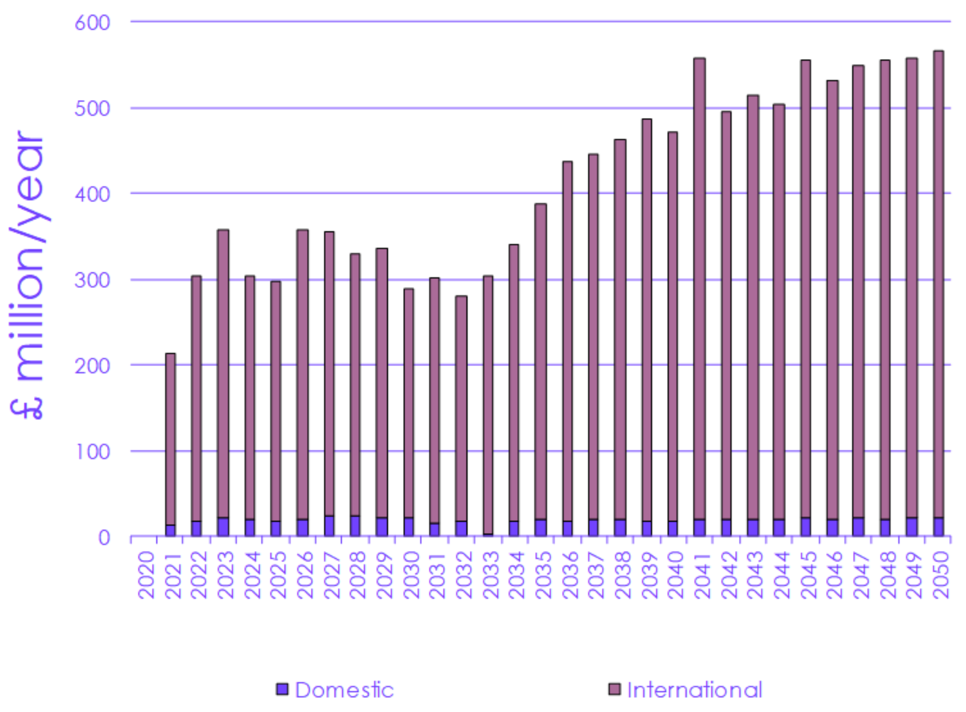
The capital costs of improved aircraft efficiency are more than offset by fuel savings. Sustainable aviation fuels add significant costs.

International aviation dominates UK aviation emissions and investment.

In our 2019 *Net Zero* report, we identified aviation as one of the sectors with cost-effective GHG savings, given that efficiency gains could offset the added costs of sustainable aviation fuels. Our updated Sixth Carbon Budget pathways estimate the full costs and savings involved:

- In the Balanced Net Zero Pathway we estimate total added investment costs above our baseline of around £390 million/year in 2035 and £570 million/year in 2050, for efficiency improvements and hybridisation (Figure A3.7.c).
- However, these added investment costs are offset by operational cost savings of around £1,230 million/year in 2035 and £2,750 million/year in 2050. There are also added operational costs of using sustainable aviation fuels, given their additional cost above fossil jet fuel, of £470 million/year in 2035, and £1,520 million/year in 2050 (Figure A3.7.d). We have not assigned any costs or savings to reductions in demand in our scenarios.

Figure A3.7.c Breakdown of aviation sector additional investment

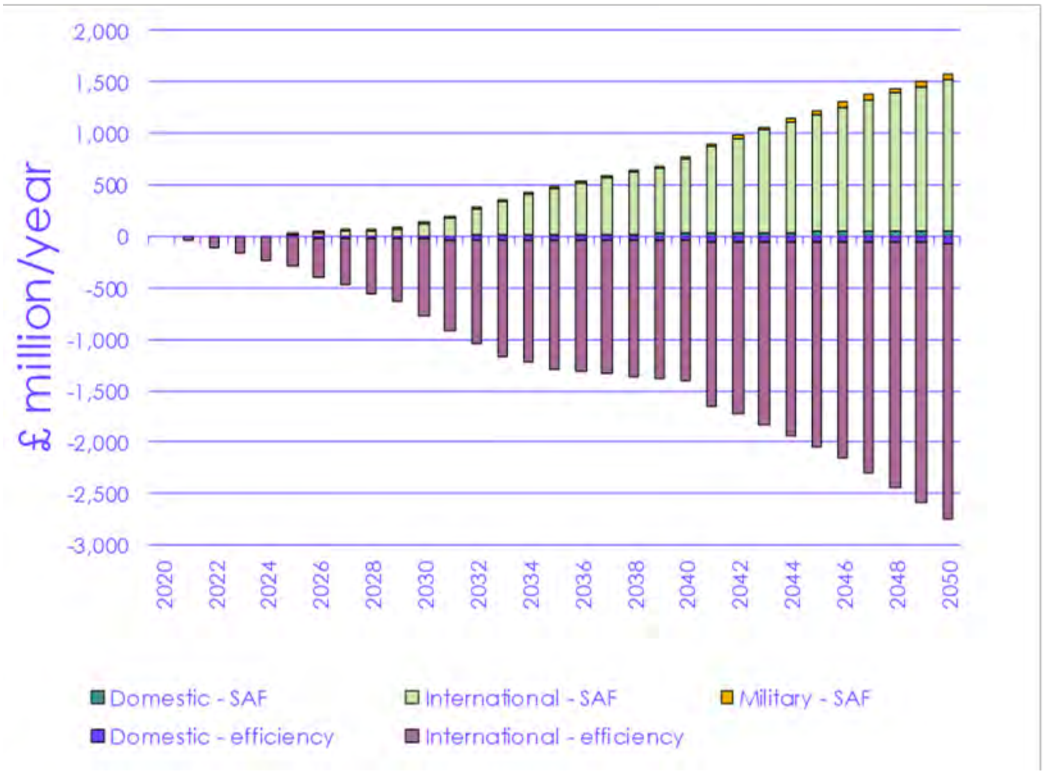


Source: CCC analysis.
Notes: Additional investment in Balanced Net Zero Pathway compared to the baseline, due to higher costs of more efficient aircraft. No costs or savings have been assumed for reductions in demand vs. the baseline trajectory. No military aviation cost data available.

Paying for a fully zero-carbon flight, via the use of GHG removal offsets, will be affordable by 2050.

- Reducing GHG emissions from UK domestic and international aviation is therefore expected to cost between -£90 and -£40/tCO_2e abated in 2035, and between -£30 and +£20/tCO_2e abated by 2050.* There are increases over time due to higher aircraft costs, and the higher share of GHG savings from biofuels and more expensive synthetic jet fuel. In earlier years, efficiency gains significantly outweigh added fuel costs.
- As an example of costs for passengers, sustainable aviation fuels priced with marginal GHG removals might add £35 to a return ticket from London to New York in 2050 in the Balanced Pathway, minus £21 of fuel savings from improved efficiency.[3] If full decarbonisation were paid for using GHG removals to offset residual emissions, this may add a further £41, giving a net added cost of £56.
- The cost of GHG savings in military aviation is based only on the use of biofuels and synthetic jet, and falls to around £110/tCO_2e abated in 2035, staying at around this level to 2050 in the Balanced Pathway.

Figure A3.7.d Breakdown of aviation sector additional costs



Source: CCC analysis.
Notes: Additional operational costs in Balanced Net Zero Pathway compared to the baseline, due to higher costs of sustainable aviation fuels and costs savings from improved efficiency. No costs or savings have been assumed for reductions in demand vs. the baseline trajectory. No military aviation cost data for efficiency savings available.

* International aviation is typically at the lower end of this cost range, and domestic aviation at the upper end. Efficiency costs are -£280 to -£135/tCO_2e, and SAF costs are £110/tCO_2e on average.

3 Based on ICAO (2020) Carbon Emissions Calculator current value of 671 kgCO_2 per passenger, economy return. In 2050, 243 kgCO_2 is saved via efficiency, 108 kgCO_2 directly via sustainable aviation fuels, with 89 kgCO_2 saved upstream from biogenic CO_2 sequestration, leaving a further 230 kgCO_2 to be offset via other GHG removals. £180/tCO_2 is assumed for residual offsetting and marginal SAF costs (based on Direct Air Capture with CCS).

Endnote

[1] CCC (2020) *The Sixth Carbon Budget – Methodology Report.* Available at: www.theccc.org.uk

Chapter 3

Policy recommendations for the aviation sector

The following sections are taken directly from Chapter 8 of the CCC's Policy Report for the Sixth Carbon Budget.[1] Chapter 8 covers aviation & shipping policy recommendations together – we have excluded shipping-only content here.

Table P8.1 Summary of policy recommendations in aviation and shipping	
Aviation	• Formally include International Aviation emissions within UK climate targets when setting the Sixth Carbon Budget. • Work with ICAO to set a long-term goal for aviation consistent with the Paris Agreement, strengthen the CORSIA scheme and align CORSIA to this long-term goal. • Commit to a Net Zero goal for UK aviation as part of the forthcoming Aviation Decarbonisation Strategy, with UK international aviation reaching Net Zero emissions by 2050 at the latest, and domestic aviation potentially earlier. Plan for residual emissions, after efficiency, low-carbon fuels and demand-side measures, to be offset by verifiable greenhouse gas removals, on a sector net emissions trajectory to Net Zero. • There should be no net expansion of UK airport capacity unless the sector is on track to sufficiently outperform its net emissions trajectory and can accommodate the additional demand. • Monitor non-CO_2 effects of aviation, set a minimum goal of no further warming after 2050, research mitigation options, and consider how best to tackle non-CO_2 effects alongside UK climate targets without increasing CO_2 emissions. • Longer-term, support for sustainable aviation fuel (SAF) should transition to a more bespoke policy, such as a blending mandate. However, near-term construction of commercial SAF facilities in the UK still needs to be supported. • Continue innovation and demonstration support for SAF technologies, aircraft efficiency measures, hybrid, full electric and hydrogen aircraft development and airspace modernisation.

Progress in decarbonising aviation and shipping has been slow over the past decade, and changes in emissions have primarily been driven by changes in demands along with some improvements in efficiency. Policy to date has been mainly driven by international fora (negotiations at ICAO and the IMO), although neither organisation has both established ambitious 2050 global goals and a set of policies to meet these goals.

The main policy challenges in aviation and shipping are the international nature of these sectors requiring fuel infrastructure coordination, long asset lifetimes and economic competitiveness concerns.

Aviation policy in the UK has previously focused on aerospace developments, although several announcements have been made in 2020, with an Aviation Decarbonisation Strategy now due in 2021. Funding is still mainly directed at innovation and demonstration activities, rather than long-term market deployment support for sustainable aviation fuels and GHG removals.

Our recommendations are based on an assessment of existing policies and announcements, a review of evidence (including the views of the Climate Assembly) and updating our existing findings set out in our 2020 *Progress Report* and 2019 *International aviation & shipping letter*.[2]

This chapter covers:

1. The respective roles for international and domestic policy
2. Existing UK policy, gaps, and planned publications
3. Key policy changes needed

Inclusion of IAS emissions in UK climate targets does not imply taking a unilateral policy approach for them.

Even with their emissions formally included in UK carbon budgets and the Net Zero target, the primary policy approach to reducing emissions from international aviation and shipping (IAS) should be at the international level. These sectors are global in nature and there are some risks that a unilateral UK approach to reducing these emissions could lead to carbon leakage (under certain policy choices) or competitiveness concerns.

The UK has played a key role in progress by both the International Civil Aviation Organisation (ICAO) and International Maritime Organisation (IMO). In the context of international negotiations at the ICAO and the IMO, inclusion of IAS emissions in the Net Zero target should not be interpreted as a rejection of multi-lateral approaches or as prejudicing discussions on burden sharing.

International approaches are unlikely to overcome all barriers to decarbonising the IAS sectors.

However, international approaches are unlikely to overcome all barriers to decarbonising the IAS sectors. Supplementary domestic policies should also be pursued where these can help overcome UK-specific market barriers, and where these do not lead to adverse impacts on competitiveness and/or carbon leakage.

a) International approaches

At the international level, global policies consistent with the ambition in the Paris Agreement are required to provide a level playing field for airlines and shipping operators, and to guard against the risk of competitive distortions. The international trade bodies for both aviation and shipping have begun to develop their approaches but further progress is required:

- Aviation. The ICAO's current carbon policy to 2035, the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), aims to ensure that most emissions increases above a baseline year are balanced by offsets.
  - In light of COVID-19, ICAO agreed a baseline year change to 2019 (instead of averaging over 2019-2020). This will reduce offset requirements in the initial years of the scheme as the sector recovers. CORSIA's list of eligible emissions reduction measures has also been finalised.
  - A new long-term goal for global international aviation emissions is now required that is consistent with the Paris Agreement. CORSIA then needs to be extended and aligned with this goal, and rules need to be put in place to ensure that CORSIA offsets deliver genuine emission reductions, transitioning to sustainable, well-governed greenhouse gas removals (see Chapter 11).

ICAO needs to set a long-term goal aligned with the Paris Agreement, and strengthen CORSIA.

Domestic policy can focus on supporting low-carbon fuels, managing demand, domestic fleet decarbonisation and developing GHG removals.

b) Supplementary domestic policies

Supplementary domestic policies that have limited competitiveness or carbon leakage risks should be pursued in parallel to international approaches to decarbonisation. These include support for developing alternative fuels and associated infrastructure, managing demand, decarbonising domestic fleets, and kick-starting a UK market for greenhouse gas removals (see Chapter 11). These domestic policy recommendations are discussed in section 3 below.

By taking these domestic and international policy approaches in parallel to including IAS formally within carbon budgets and the Net Zero target, the UK will be contributing fully to the global effort to tackle aviation and shipping emissions.

2. Existing UK policy, gaps, and planned publications

a) Aviation

Aerospace development has been a focus in UK policy, although the RTFO is yet to bring forward renewable jet fuel.

Existing UK policy in Aviation has been focused on match-funding for aircraft technology development (e.g. the £300million Future of Flight Challenge), and traded certificate price support for aviation biofuels and synthetic jet fuels under the Renewable Transport Fuel Obligation (RTFO)'s 'development fuels' sub-mandate. Recent announcements include:

- The Jet Zero Council has also been established as a forum with the ambition for developing zero-emissions commercial flight.
- £15 million has been invested into FlyZero, with the Aerospace Technology Institute looking at design challenges and the market opportunity for zero-emissions aircraft concepts from 2030.
- £15 million will be invested in a new grant-funding competition for SAF production.
- A SAF clearing house will be set up to enable UK to certify new fuels.
- A planned consultation on a SAF blending mandate has been announced, for a potential start in 2025.
- An aviation Net Zero Consultation and following Strategy were planned for 2020. Plans are to now consult on a combined Aviation Decarbonisation Strategy in 2021.

Government announcements and support to date focuses on innovation and demonstration, but long-term deployment policy needs developed.

However, there remain significant gaps within the policy framework for aviation. Government support at present is focused on innovation funding and demonstration activities, but without clear long-term policy mechanisms driving SAF uptake or valuing negative emissions in the UK:

- The RTFO development fuels sub-mandate is unlikely to drive significant development of jet fuels, as it can be met with cheaper fuels.
- There is currently no price signal for GHG removals in the UK.
- There is a lack of larger-scale deployment support and policy frameworks specifically for sustainable aviation fuel and GHG removals.

UK aviation industry has committed to reaching Net Zero by 2050.

Although the UK aviation industry has committed to a Net Zero goal for 2050 (via the Sustainable Aviation coalition),[3] this is not yet a policy goal for Government. Higher-level strategic gaps include the lack of formal inclusion of international emissions in UK carbon budgets and the Net Zero target, and the need for a sector emissions trajectory to inform demand management and airport capacity policies. Further research is also needed on non-CO_2 effects and potential mitigation options.

a) Aviation

International aviation emissions to be included in Carbon Budgets.

The Government should include international aviation emissions within the Sixth Carbon Budget, subsequent carbon budgets and the 2050 Net Zero target.

Government should commit to a 2050 Net Zero goal for UK aviation, with use of verifiable GHG removals.

The forthcoming Aviation Decarbonisation Strategy should commit to a 2050 Net Zero goal for UK aviation, with use of verifiable GHG removals (but with limits), and set out demand management policies to ensure a trajectory to 2050 is achieved and that non-CO_2 effects are addressed.

i) Aviation emissions on the way to Net Zero

The Government should commit to UK international aviation reaching net zero GHG emissions by 2050 at the latest, and UK domestic and military aviation potentially earlier.

An emissions trajectory to 2050 will set expectations for use of GHG removals over time.

This will necessarily entail having a plan for how verifiable greenhouse gas removals will offset residual emissions over time (i.e. after contributions from efficiency improvements, low-carbon fuels and demand-side measures). DfT should set a net emissions trajectory for aviation (net of a constrained level of GHG removals), or as a minimum, interim targets on the way to 2050.

- Following the Balanced Net Zero Pathway, the remaining 23 $MtCO_2e$/year of gross aviation emissions in 2050 would require 40% of total UK engineered greenhouse gas removals to be assigned to the aviation sector to achieve Net Zero within aviation.
- With the ramp-up in GHG removals in the UK over time, Figure P8.1 gives an indicative net aviation emissions trajectory that could be followed if 40% of UK GHG removals were assigned to aviation in all years.
- Interim targets for aviation emissions net of greenhouse gas removals could therefore be 31 $MtCO_2e$/year in 2030, 21 $MtCO_2e$/year in 2035 and 14 $MtCO_2e$/year in 2040.

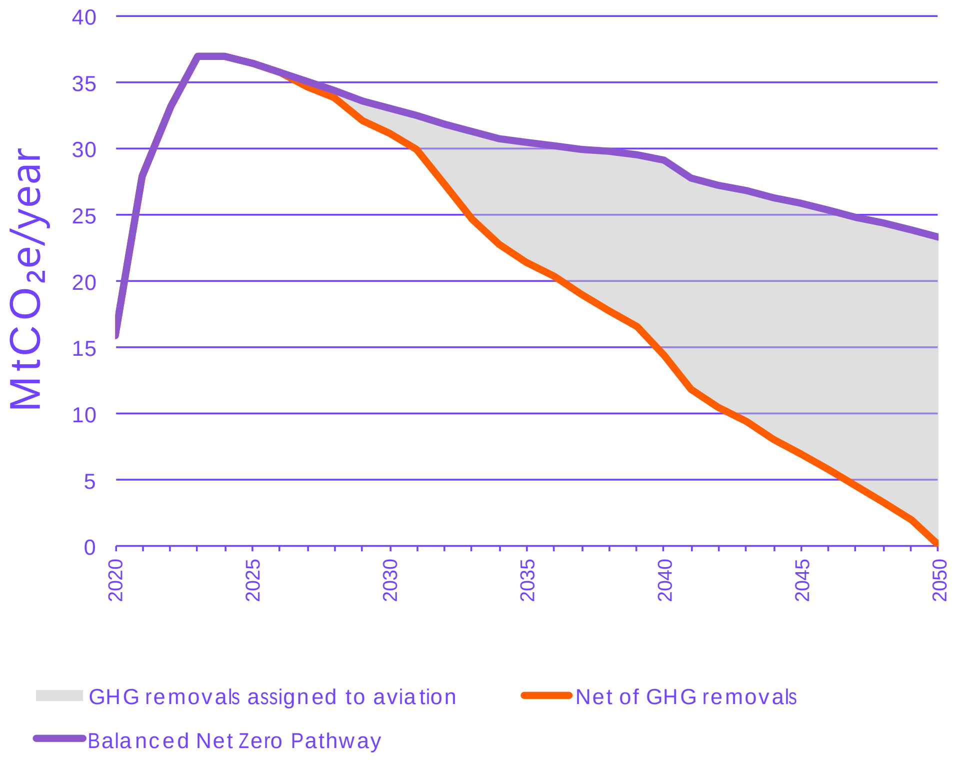
Inclusion of IAS in Carbon Budgets does not diminish the value of a sector target and trajectory.

- Setting an aviation sector net emissions target and trajectory is not obviated by IAS inclusion with carbon budgets. This is more important in aviation than other emitting sectors, given that without policy action aviation emissions could rise significantly (as would non-CO_2 effects) and that, even with appropriate action, residual positive GHG emissions are very likely to remain by 2050 (and need compensating for with greenhouse gas removals). The UK aviation industry has also already committed to a 2050 Net Zero target.

This plan should dovetail with the wider overall strategy for Net Zero, which should set out how this can be achieved with manageable volumes of sustainable greenhouse gas removals.

From the Balanced Net Zero Pathway, aviation emissions net of GHG removals fall relatively smoothly from the mid-2020s to 2050 Net Zero.

Figure P8.1 Indicative UK aviation emissions trajectory to achieve Net Zero with GHG removals



Source: CCC analysis.
Note: Net of GHG removals trajectory assumes that 40% of UK engineered GHG removals are assigned to/bought by the aviation sector. COVID-19 recovery assumed from 2020 to 2024.

ii) Demand management

Demand management policy is required, as demand growth will need significantly constrained from baseline assumptions, and there are non-CO_2 risks.

Demand management policy should be implemented, as given expected developments in efficiency and SAF deployment, demand growth will need to be lower than baseline assumptions, and likely constrained to 25% growth by 2050 from 2018 levels for the sector to contribute to UK Net Zero.

If efficiency or SAF do not develop as expected, further demand management will be required. Conversely, if efficiency and SAF develop quicker, it may be possible for demand growth to rise above 25%, provided that additional non-CO_2 effects are acceptable or can be mitigated.

Demand management needs to act as a back-stop to keep emissions on track to the sector trajectory to Net Zero.

A demand management framework will therefore need to be developed and in place by the mid-2020s to annually assess and, if required, act as a backstop to control sector GHG emissions and non-CO_2 effects.

- There are a number of demand management policies that could be considered, as we outlined in our 2019 *IAS letter*.[2] However, the Climate Assembly has provided valuable evidence that demand management policies will have to be fair and be seen as fair, with a clear preference for any taxes to increase as people fly more and fly further (Box P8.1).

- As part of providing wider information regarding transport choices, Government should also consider the feasibility and benefits of providing flight CO_2 labelling to prospective aviation passengers, building on the work of the Civil Aviation Authority (CAA).

The Government should assess its airport capacity strategy in the context of Net Zero and any lasting impacts on demand from COVID-19. Investments will need to be demonstrated to make economic sense in a Net Zero world and the transition towards it.

- Unless faster than expected progress is made on aircraft technology and SAF deployment, such that the sector is outperforming its trajectory to Net Zero, current planned additional airport capacity would require capacity restrictions placed on other airports.

No net expansion of UK airport capacity unless the sector is on track to sufficiently outperform its trajectory.

- Going forwards, there should be no net expansion of UK airport capacity unless the sector is assessed as being on track to sufficiently outperform a net emissions trajectory that is compatible with achieving Net Zero alongside the rest of the economy, and is able to accommodate the additional demand and still stay on track.

The Climate Assembly stated a clear preference for demand taxes to increase as people fly more and fly further.

Box P8.1
Climate Assembly aviation demand findings

Box 8.1 from the *Methodology Report*, Chapter 8, highlights the Climate Assembly's preferences regarding demand growth. The Assembly recommended 25-50% demand growth by 2050 from 2018, depending on how quickly technology progressed. A weighted average of the scenario votes was a 24% growth.

80% of assembly members 'strongly agreed' or 'agreed' that taxes that increase as people fly more often and as they fly further should be part of how the UK gets to Net Zero. Assembly members saw this as fairer than alternative policy options, such as a carbon tax that would impact all flights.

There were also strong calls for making alternatives to flying cheaper and better, and for the UK to influence the rest of the world in implementing global decarbonisation policies.

Source: Climate Assembly UK (2020).

iii) Wider supporting policies

Alongside the Aviation Decarbonisation Strategy, UK policy should also:

Support is needed for the UK's first commercial SAF plants.

- Set out a policy package for supporting the near-term deployment of commercial sustainable aviation fuel (SAF) facilities in the UK (with carbon capture and storage (CCS) where applicable). This may involve capital or loan guarantee support. In the mid-term, SAF support should transition to a more bespoke policy than the RTFO.
  - The existing RTFO will not be suitable for delivering mass commercial roll-out of SAF, due to decreasing liquid road fuel use. It may also make more sense for long-term SAF deployment to be paid for by the aviation sector rather than road fuel users.

A SAF blending mandate could provide more certainty to SAF plant investors.

  - Government has indicated willingness to consider introducing a SAF blending mandate from 2025,[4] which could ultimately provide more certainty to SAF plant investors than the RTFO. A SAF mandate is likely to be more effective than Contracts for Difference (as the technology maturity of many routes are not high enough and there are variable feedstock costs), inclusion in an Emissions Trading Scheme (likely insufficient and volatile pricing signal) or carbon taxation (would have to be high to incentivise initial SAF deployment, and not perceived as fair by the Climate Assembly).

Many other European countries already have SAF blending mandates, so carbon leakage risks are decreasing.

  - Whether the mandate's added SAF costs then fall to the aviation sector or general taxation will depend on the policy design and any concerns regarding UK operator competitiveness or carbon leakage. Several other European countries already have SAF blending mandates and are introducing ambitious blending trajectories, which suggests the risk of leakage is decreasing (e.g. France is targeting 5% by 2030 & 50% by 2050; Finland & Sweden 30% by 2030; Germany 2% by 2030; with an EU-wide proposal for 1-2% by 2030).[4]
  - Ongoing uncertainty until 2025 about a new UK SAF mandate, and withdrawal of SAF from the RTFO, may risk delaying first commercial SAF projects in the UK reaching financial close for several years. Consideration could be given to either RTFO grandfathering, starting the SAF mandate earlier or running it in parallel to the RTFO.
- Continue innovation and demonstration support for newer SAF technologies, ensuring fuels can meet international standards. The newly announced £15m competition focused only on SAF is welcome, although is smaller than previous competitions.
- Continue RD&D support for aircraft efficiency measures, hybrid, full electric & hydrogen aircraft development and airspace modernisation. Continue to use existing delivery bodies, such as ATI, the Future of Flight Challenge, NATS, and guided by the Jet Zero Council.

Strict sustainability standards will need to be enforced, any double-counting of removals avoided, and SAF plants should be built with CCS.

- Continue to enforce strict sustainability standards, and work to consistently account for fuels produced with biogenic CO_2 capture without allowing double-counting of any GHG removals.

[4] From our analysis, potential UK SAF blending levels could be 1.5-3.5% by 2030, 4-9% by 2035 and 11-17% by 2040, although the top end of these figures could almost be doubled in a Tailwinds scenario, due to faster technology deployment and higher biofuel imports.

– SAF facilities should have to install CCS, or be built CCS ready, in order to maximise GHG savings from any concentrated CO_2 streams or dilute flue gases.* The 2022 Bioenergy Strategy should set a date after which all new build plants must use CCS, and a date after which existing plants should retrofit CCS.

– An accounting choice needs to be made as to whether the consumer of a fuel made with CCS gets to account for the GHG removals (i.e. fuels can be carbon negative, further reducing end-use sector direct emissions),[5] or whether the producer of the fuel gets to account for the GHG removals (and the fuel is carbon neutral).

– Any GHG removals accounted for within a fuel carbon intensity factor or by a producer cannot also be claimed by another actor or sector.

– A clear GHG savings methodology needs to be established for wastes.

- Monitor non-CO_2 effects of aviation, continue to work to reduce scientific uncertainties, and fund research into mitigation options such as SAF benefits and engine design improvements.

  – Once mitigation options are better characterised, consider policy responses as to how best to tackle them alongside UK climate targets without increasing CO_2 emissions.

There should be no additional non-CO_2 warming after 2050.

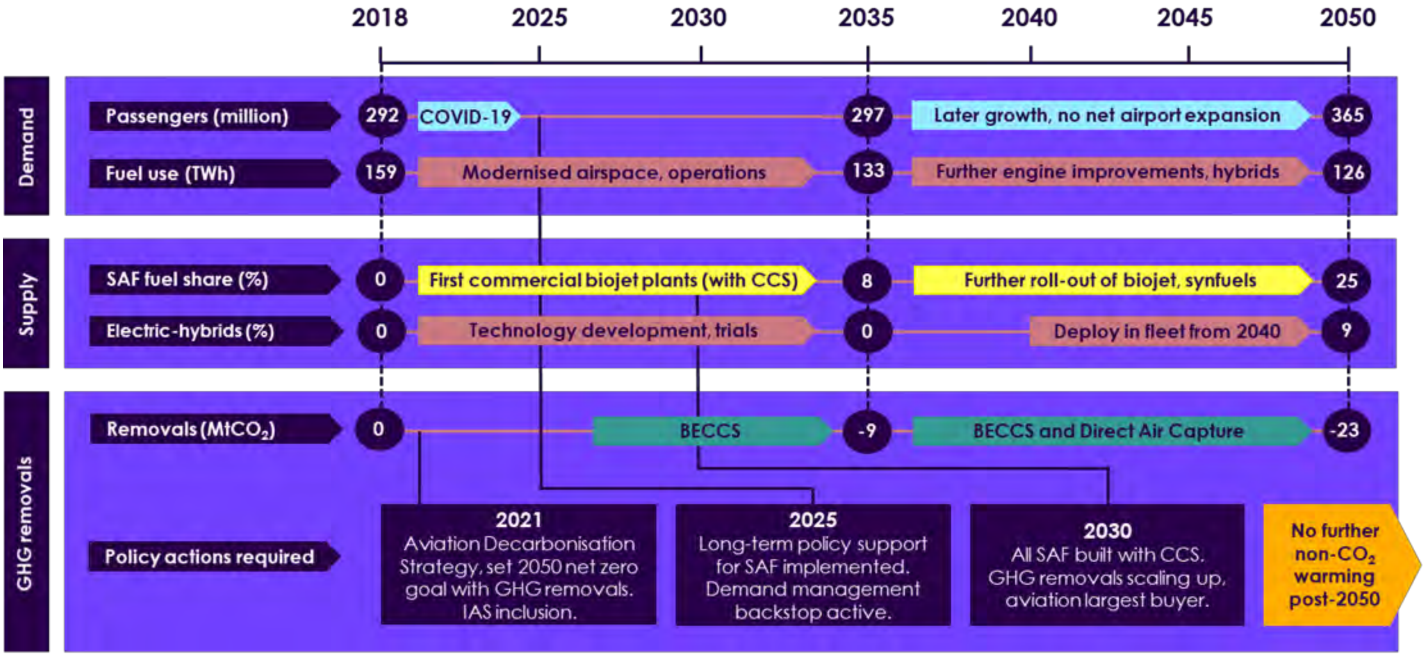
  – As a minimum goal, there should be no additional non-CO_2 warming from aviation after 2050. If mitigation options develop quickly, or new risks are identified, DfT could consider an earlier date, or setting a maximum level of allowable non-CO_2 warming from a base year.

Alongside efforts at ICAO, the Aviation Decarbonisation Strategy and the package of domestic policies, plus parallel progress on a mechanism for deploying GHG removals in the UK (see Chapter 11), should put UK aviation emissions on track to contribute fully to meeting the Sixth Carbon Budget and the Net Zero target. A summary of the required steps in aviation is given in Figure P8.2.

* Some SAF conversion plants do not produce CO_2, and hence these CCS provisions may not apply to them. For example, synthetic jet fuel routes use CO_2 as a feedstock, and waste fats/oils to biojet will produce little CO_2. However, these plants may still have dilute flue gas streams from which CO_2 should still be captured.

[5] UK biofuels policy currently uses GHG emissions thresholds (gCO2e/MJ of fuel) as one set of eligibility criteria for support. Setting a negative GHG emissions threshold may lead to perverse outcomes, where only less efficient plants meet the threshold. Any negative threshold would have to be accompanied by a minimum efficiency and would preclude carbon-neutral fuels. It is likely more appropriate to maintain low positive GHG emissions thresholds for eligibility purposes but allow additional benefits to flow to conversion plants capturing biogenic CO_2 (this may be achieved already by the design of wider GHG removals policies).

Figure P8.2 Timeline of key outcomes and policy requirements under the Balanced Pathway (2020-50)



Source: CCC analysis.
Note: SAF = Sustainable Aviation Fuel. BECCS = Bioenergy with carbon capture and storage

Endnotes

[1] CCC(2020) *Policies for the Sixth Carbon Budget and Net Zero*. Available at: www.theccc.org.uk
[2] CCC (2019) *Net-zero and the approach to international aviation and shipping emissions*
[3] Sustainable Aviation (2020) *UK aviation commits to net zero carbon emissions by 2050*
[4] Argus (2020) *Europe makes legislative push for aviation transition*

Annex III – Committee on Climate Change, Progress in reducing emissions, June 2021

Progress in reducing emissions
2021 Report to Parliament

Climate Change Committee
June 2021

Presented to Parliament pursuant to Section 36(1) and Section 59 (1) of the Climate Change Act 2008. This report is published in two volumes. Volume 1 (Progress in reducing emissions – 2021 Report to Parliament) and Volume 2 (Progress in adapting to climate change – 2021 Report to Parliament)

Both volumes were laid before Parliament on 24 June 2021 and are available online at:
www.theccc.org.uk/publications

Book 1 of 2

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Contents

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The UK's Climate Change Act had extraordinary foresight. It laid the groundwork for the nation's escalating climate ambition. It anticipated, correctly, the need to cajole governments into climate plans that would not otherwise fit the political cycle. It has kept UK climate policies rooted in the scientific realities and the technical feasibilities.

That framework now faces its sternest test, as demand grows to see Net Zero delivered; as the urgency becomes more obvious; and as the inadequacies of our planning for the impacts of climate change become clear.

The rigour of the Climate Change Act helped bring COP26 to the UK, but it is not enough for Ministers to point to the Glasgow summit and hope that this will carry the day with the public. Leadership is required, detail on the steps the UK will take in the coming years, clarity on tax changes and public spending commitments, active engagement with people and businesses across the country. These steps are essential, so people can see opportunity in climate-positive choices. We cannot rely on good will alone.

This demands a step change in Government action, but it is hard to discern any comprehensive strategy in the climate plans we have seen in the last 12 months. There are gaps and ambiguities. Climate resilience remains a second-order issue, if it is considered at all. We continue to blunder into high-carbon choices. Our Planning system and other fundamental structures have not been recast to meet our legal and international climate commitments.

We commend Ministers for accepting our advice on the future path for UK emissions. The setting of the UK's 2030 NDC, the passing into law of the Sixth Carbon Budget, the decision to bring international aviation and shipping emissions within the UK carbon budgets; all were made on the Committee's recommendation. But the Committee's advice to step-up the ambition and resourcing of adaptation continues to go unheeded. And the willingness to set emissions targets of genuine ambition contrasts with a reluctance to implement the realistic policies necessary to achieve them.

It has therefore been a year of climate contradictions. Important statements of ambition, like the agreement to phase out the sale of petrol and diesel cars and vans, have been undermined by delays to essential legislation and much-needed plans to decarbonise buildings and improve their climate resilience. We await a Treasury Net Zero Review, once promised in autumn 2020. The transport decarbonisation plan is still slated, somewhat optimistically, for spring 2021. A pattern has emerged of Government strategies that are later than planned and, when they do emerge, short of the required policy ambition.

There is still time to address this. This Progress Report offers more than 200 policy recommendations, covering every part of Government. The opportunity to implement them is there. Before COP26, a Net Zero Strategy is promised, which will carry the greatest weight if it is accompanied by Treasury's review of funding. The Government's climate change risk assessment, due in early 2022, can change the tone on adaptation and climate risk management. But it is time for the Government to implement these changes with the urgency that the science demands.

COVID-19 casts a long shadow, but there are three broad lessons from the pandemic: first, we have seen the critical importance of effective planning for high-impact eventualities; second, we have experienced the ability of government to act with pace and scale when it is required; and third, we have learned that people are willing to support change when they have the information before them.

These lessons can shape a successful COP26 summit in November. With strong climate plans at home, the UK Presidency can have global influence. Our message to Government is simple: act quickly – be bold and decisive. Your moment has arrived.

Lord Deben
Chairman, Climate Change Committee

Baroness Brown
Chair of the Adaptation Committee

Overall progress in climate policy: Net Zero and adaptation

The 2020s must be a decisive decade for climate action.

We are in the decisive decade for tackling climate change. Global emissions of greenhouse gases are as high as they have ever been. Nevertheless, green shoots of progress suggest this can change. And it must. The 2010s was the hottest decade on record globally, driving dangerous weather patterns and affecting societies and ecosystems around the world. Without a much stronger and urgent effort, we will breach 1.5°C of warming in the early 2030s and remain ill-prepared for the future.

The world needs to cut emissions and adapt to climate risks.

Global emissions must be cut rapidly to Net Zero, integrated with actions to adapt to the climate risks and impacts. Action must occur across the world, with richer countries acting earliest, while offering support for poorer countries. As host of the upcoming UN climate talks ('COP26') the UK has a particular responsibility to implement effective climate action and drive global efforts.

The UK's record to date is strong in parts, but it has fallen behind on adapting to the changing climate and has not yet provided a coherent plan to reduce emissions in the critical decade ahead:

The UK has a strong track record on climate action, but it is incomplete.

- **Statutory framework for climate.** The UK has a strong climate framework under the Climate Change Act (2008), with legally-binding emissions targets, a process to integrate climate risks into policy, and a central role for independent evidence-based advice and monitoring. This model has inspired similar climate legislation across the world.

- **Emissions targets.** The UK has adopted ambitious territorial emissions targets aligned to the Paris Agreement: the Sixth Carbon Budget requires an emissions reduction of 63% from 2019 to 2035, on the way to Net Zero by 2050. These are comprehensive targets covering all greenhouse gases and all sectors, including international aviation and shipping.

- **Emissions reduction.** The UK has a leading record in reducing its own emissions: down by 40% from 1990 to 2019, the largest reduction in the G20, while growing the economy (GDP increased by 78% from 1990 to 2019). The rate of reductions since 2012 (of around 20 $MtCO_2e$ annually) is comparable to that needed in the future.

- **Climate Risk and Adaptation.** The UK has undertaken three comprehensive assessments of the climate risks it faces, and the Government has published plans for adapting to those risks. There have been some actions in response, notably in tackling flooding and water scarcity, but overall progress in planning and delivering adaptation is not keeping up with increasing risk. The UK is less prepared for the changing climate now than it was when the previous risk assessment was published five years ago.

- **Climate finance.** The UK has been a strong contributor to international climate finance, having recently doubled its commitment to £11.6 billion in aggregate over 2021/22 to 2025/26. This spend is split between support for cutting emissions and support for adaptation, which is important given significant underfunding of adaptation globally. However, recent cuts to the UK's overseas aid are undermining these commitments.

The UK's record on climate change compares well with that of other countries. But despite the recent willingness of the Government to raise ambition to cut emissions, delays in policy and implementation continue. Much greater urgency is now required from Ministers:

Delivery must accelerate and broaden.

- **The ambition of the last year must be turned into policy and real-world delivery.** The UK has begun to reinforce its new emissions targets with clear ambition for specific sectors in line with the required path (e.g. 40 GW offshore wind by 2030, phase-out of petrol and diesel cars and vans by 2030, 30,000 hectares annual afforestation by 2025). However, some commitments fall short and key strategies have been delayed, leaving holes in ambition. Policies to deliver on the commitments are mostly still to be developed.

- **Progress must extend across the economy.** The relative success of reducing emissions in the electricity sector to date has not been matched in transport, buildings, industry, or agriculture. Only a few sectors have strong plans to adapt to the current and future climate, leaving key risks to the UK's infrastructure and natural environment. Some government departments are not sufficiently prioritising climate change, and none are yet moving at the pace required.

Adaptation policy needs a step change in ambition and action.

- **A robust plan is needed for adaptation.** The UK does not yet have a vision for successful adaptation to climate change, nor measurable targets to assess progress. Not one of the 34 priority areas assessed in this year's progress report on adaptation is yet demonstrating strong progress in adapting to climate risk. Policies are being developed without sufficient recognition of the need to adapt to the changing climate. This undermines their goals, locks in climate risks, and stores up costs for the future.

- **The climate challenge must be reflected throughout policy and planning.** Climate risks affect all aspects of society, while any new source of emissions could put the Net Zero path at risk. Climate change must therefore be integrated throughout policy and planning decisions, and must be a key consideration in the Government's proposed planning reforms.

As the UK rebuilds after the COVID-19 pandemic, there is an opportunity to make systemic changes that will fill the gaps in the UK's climate response. Now is the time to invest in the UK's future through accelerated action to cut emissions and adapt to the changing climate, while supporting the global transition.

The Net Zero Strategy, due ahead of COP26, should complete the picture on how the UK will cut its emissions.

- **Delivering Net Zero.** The Government has promised a Net Zero Strategy before COP26. It must set clear and integrated ambitions across the economy that will meet the Sixth Carbon Budget, and indicate how they will be funded fairly. Efforts must then shift quickly to focus on implementation and delivery. The pace of policy development must accelerate. Credible policies should be fully functioning and properly funded by the end of the current Parliament (i.e. by 2024) to ensure that almost all investments and purchases are low-carbon by the end of the decade or soon after.

- **Adapting to climate risks.** The Government should set out its vision for a UK that is well-prepared for climate change. It should include clear quantified targets, supported by policies and regulations. Climate adaptation must be embedded in core policies if they are to succeed. Key current and upcoming policies include: the Plan for Growth, the National Infrastructure Strategy, the Environment Bill, the Environmental Land Management

Scheme, the Tree and Peat Action Plans, the Net Zero Strategy, the Planning Bill and developments in energy, housing and health policy.*

Adaptation is vital to achieving society's goals and must be embedded throughout government policies.

- **Integrating climate policy.** Achieving Net Zero will require effective adaptation. The programmes must be properly integrated. For example, as the energy efficiency of buildings is improved, they must also be protected from overheating. The vast carbon stores of the UK's peatlands and soils must be protected. Trees planted to draw CO_2 from the atmosphere and/or to provide timber should be suited to the future climate and, where possible, provide services such as flood defences, enhancing ecosystems, urban cooling, and accessible green space.

- **Embedding climate action across society.** Reducing emissions and adapting to climate change will require a whole-of-society endeavour. Success will require the public to be engaged in the challenge, building public consent for the changes with a broader understanding of what is required and why. Workers will need help to develop the required skills and to fill the jobs created during the transition. Businesses must be encouraged, and in some cases required, to invest in solutions and make low-carbon, climate-resilient choices.

- **Reinstating overseas aid commitments.** Climate challenges are fundamentally integrated with wider challenges for ecosystems and economies. This means climate finance and climate action are not fully isolated from cuts to the UK's Official Development Assistance (ODA) in practice. The Government has said the cut to ODA is temporary; now that the UK's economic recovery is underway, the Government should provide a firm timeline for reinstating its previous commitment.

Government must lead the change. Reducing emissions and adapting to climate change must be embedded throughout policy. All parts of government have a role, requiring strong coordination and an effective devolution of powers and responsibilities to drive delivery. We set out detailed recommendations for each government department and the national Governments of Scotland, Wales and Northern Ireland in an annex of Tables at the end of this report. We will revisit progress against them at our next annual progress report in a year's time. Our next major report will be a thorough appraisal of the UK's Net Zero Strategy.

Reaching Net Zero and addressing climate risks can help to build a better UK.

The transition to Net Zero and the climate adaptation programme offer a positive vision for the UK's future and for the world. They involve an investment boost that can support the economic recovery. This investment will be rewarded with reduced running costs and reduced costs of adapting to climate change in the future. It will support good-quality new jobs across the country, and bring opportunities to enhance our natural environment, our health and our well-being.

The UK can and should be a global leader on climate change.

The challenge of responding to climate change will not end with COP26 in the autumn or with the completion of the UK Presidency a year later. Global commitments are increasingly moving into line with the Paris Agreement, but we have entered a critical decade of action to consolidate and to deliver them. UK action must continue to provide an attractive model of success to maintain our climate leadership in support of a global response that meets the global challenge.

* Some of these UK policies only cover England. Equivalent devolved policies must also reflect climate change.

The Committee

The Rt. Hon John Gummer, Lord Deben, Chairman

Lord Deben was the UK's longest-serving Secretary of State for the Environment (1993 to 1997). He has held several other high-level ministerial posts, including Secretary of State for Agriculture, Fisheries and Food (1989 to 1993). Lord Deben also runs Sancroft, a corporate responsibility consultancy working with blue-chip companies around the world on environmental, social and ethical issues.

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Rebecca Heaton is responsible for Drax Group's efforts to mitigate climate change, ensuring that sound science underpins climate change polices and business strategy. She is also responsible for developing sustainability and climate change research programmes. Rebecca has a 20-year global career working at the interface between business, science and policy.

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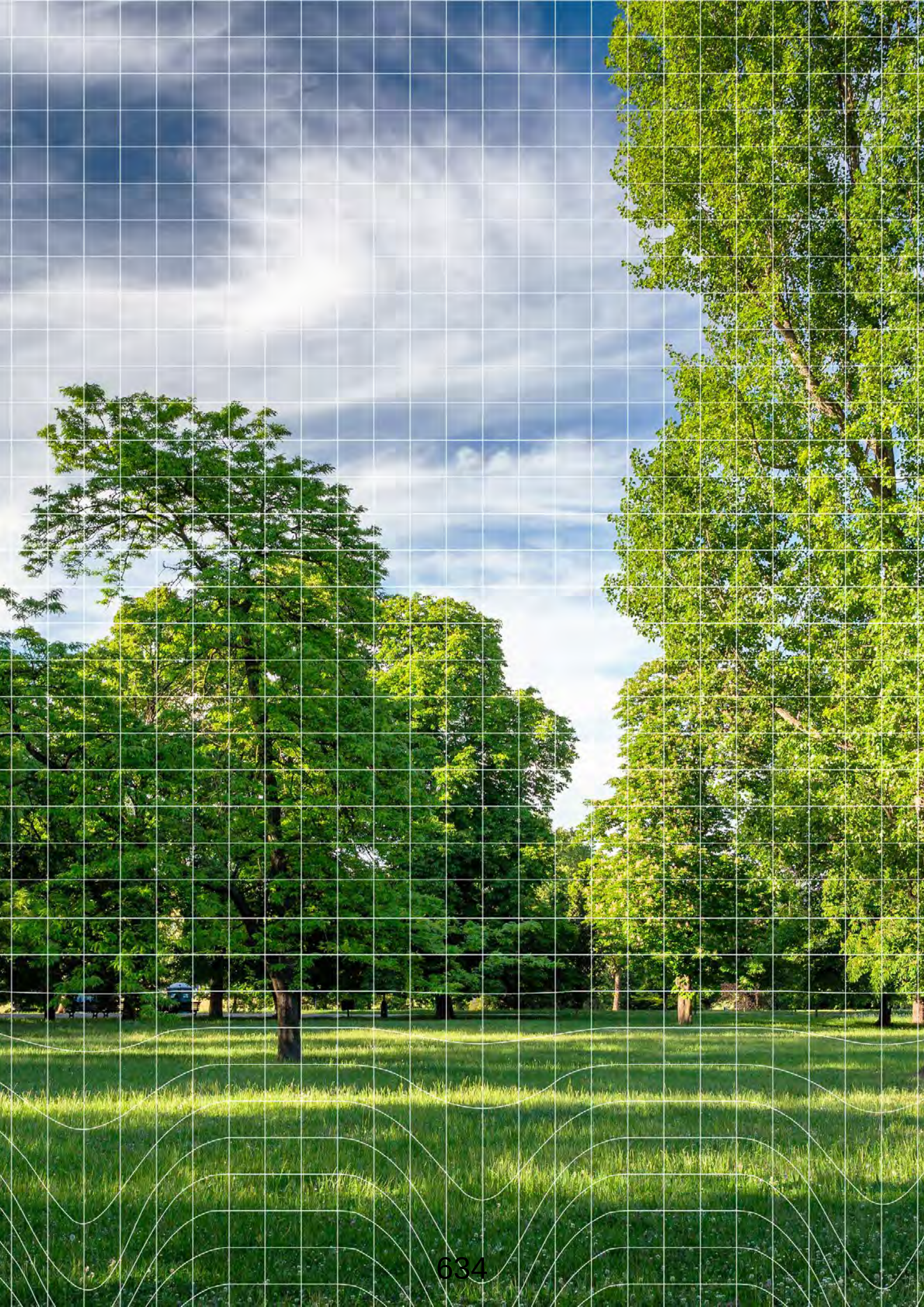
Corinne Le Quéré is a Royal Society Research Professor at the University of East Anglia (UEA), specialising in the interactions between climate change and the carbon cycle. She was lead author of several assessment reports for the UN's Intergovernmental Panel on Climate Change (IPCC) and she currently Chairs the French Haut Conseil pour le Climat.

Pete Betts
Expert Adviser to the Committee

Pete was a career civil servant and until 2018 led UK policy on international climate change and energy. He was also Lead Negotiator for the European Union in the UNFCCC negotiations. His current portfolio includes roles at the European Climate Foundation; Willis Towers Watson; IRENA; Grantham School and Chatham House.

Executive Summary



We welcome the setting of the Sixth Carbon Budget in accordance with our recommendations.

With the adoption of the Sixth Carbon Budget, in accordance with the Committee's recommendations, the UK has committed to an ambitious path to Net Zero. We welcome this decision and the inclusion of emissions from international aviation and international shipping in the legal scope of carbon budgets for the first time. The Sixth Carbon Budget requires a 63% reduction in emissions from 2019 to 2035 (78% relative to 1990).

The challenge has shifted decisively from target-setting to delivery. This decade will be crucial in getting on track to Net Zero.

This is now the foundation for the necessary scale-up of policy action in all sectors. The challenge has shifted decisively from target-setting to delivery. The steps taken during this Parliament, and the action taken in this decade, will be crucial. The Committee's focus must also shift, towards real-world progress and tougher scrutiny of Government plans.

The Net Zero Strategy has huge significance in setting out the UK's vision for meeting its ambitious targets.

The Net Zero Strategy, promised ahead of November's UN climate talks in Glasgow ('COP26'), now has huge significance. It must set out a coherent vision. It must make plans for the jobs transition, and the necessary supply of skills. It will be the basis of the essential public engagement that must take place on the changes ahead. And it must address the unanswered question of how the transition will be funded in a fair way. Effective leadership, coordination and governance across Government has never been more important.

In assessing the UK's progress in the last year, we acknowledge the increase in the scale of Government efforts. But progress is not yet in step with the urgency of the challenge:

- **Effective policies must be developed at greater pace.** The path to Net Zero requires a rapid scale-up in low-carbon investment and low-carbon choices across the economy. Government must lead that change with more urgency than we have seen so far. Many vital and long-promised plans, such as the Heat and Buildings Strategy and the Treasury's Net Zero Review, have been delayed by a year or more. As a result, there is a large ***policy gap***: credible policies for delivery currently cover only around 20% of the required reduction in emissions to meet the Sixth Carbon Budget.

- **The Government has made significant commitments, but there are still important gaps in ambition.** Where ambitions have been set over the last year, they have tended to be a significant step up. Many are now aligned with the path to Net Zero (e.g. 40 GW offshore wind by 2030, phasing out petrol and diesel cars and vans by 2030). However, gaps remain in the Government's stated ambitions (e.g. on diets, aviation demand, waste, low-carbon heat networks), while some announcements fall short of what is likely to be needed (e.g. on peatlands, heat pumps, carbon capture and storage). Together these imply a significant ***ambition gap***: current Government commitments that align to the Committee's published pathways cover less than half of the emissions reductions to 2035.

- **Efforts must be increased markedly, especially in the lagging areas.** There are signs of a multi-speed approach within Government to raising ambition and putting in place effective policies. Some departments (e.g. Defra, MHCLG, but also parts of BEIS and the Treasury) are lagging behind others and appear timid in their approach. The path to Net Zero requires high ambition and an effective policy framework in all areas.

The Net Zero Strategy must set out a coherent vision of how Net Zero and the Sixth Carbon Budget will be met.

The full Net Zero Strategy provides an opportunity for the Government to demonstrate that it means what it says on climate action. It should fill the gaps in ambition, set up a programme of accelerated policy development, tackle the cross-cutting challenges in a joined-up way and ensure alignment of all policy decisions with Net Zero so that the 2020s becomes the decisive decade it must be.

- **The public must be brought along with the transition.** Better public information is needed on the changes that people should expect, and on the timing of their implementation. Meaningful public engagement will help build stronger public consent for the transition, and people should expect to understand the rationale for changes. They should also be able to see a benefit from making low-carbon choices and have easy access to the information and funding required to make changes happen.

- **The Net Zero Strategy must clarify ambition across the economy to match the targets in a credible way.** Quantified, credible pathways for sectoral decarbonisation, technology deployment and behaviour changes must be set out, and backed by specific policies as far as possible. If ambition falls short of the Committee's pathways in some areas the Government must explain how this shortfall will be made up elsewhere. The Net Zero Strategy must include demand-side action, which can come with a range of co-benefits (e.g. healthier diets, more exercise and better air quality), and be backed-up by policies that are carefully designed and implemented.

- **The Treasury must ensure a fair and long-term approach to funding the transition.** The Net Zero Strategy must be underpinned by an approach to funding that distributes the costs, savings and wider benefits of decarbonisation fairly. It must encourage action across society, while protecting vulnerable people and companies at risk of adverse competitiveness impacts. A move to longer-term funding streams and low-risk financing of Net Zero investments will be essential to making sustained progress.

- **The Strategy should set clear timelines for policy development that match the urgency of the challenge.** A strong, coherent and joined-up policy framework is needed. Credible policies to deliver the ambitions of the Net Zero Strategy should be fully in place by the end of the current Parliament at the latest (i.e. by 2024) to ensure that almost all investments and purchases (e.g. cars, heating appliances, new energy supplies) are low-carbon by 2030 or shortly after. All departments must increase their pace.

- **The Strategy should initiate a strengthened role for local delivery.** All levels of government have committed to ambitious climate action: UK, devolved administrations, city regions and local authorities. Better coordination and support is required across these levels, including workable business models, the removal of barriers to action, dedicated funding and an approach that enables sub-national action to complement action at the national level.

The Government should introduce a Net Zero Test to ensure that all policy decisions are compatible with the legislated targets.

- **All policy decisions must be compatible with the Government's climate commitments.** The Net Zero Strategy should set out how the Government will achieve this, for example by introducing an explicit test to ensure compliance. Both the Net Zero Strategy itself and policy more widely must recognise the challenges of adapting as the climate changes. Planning policy (both at UK and devolved level) must also reflect these challenges.

Transport emissions fell sharply in 2020, but will rebound to some degree as we move out of lockdown. Action is required to keep positive changes.

Emissions fell sharply in 2020 (by 13%) to 435 $MtCO_2e$, 48% below 1990 levels. The fall was primarily in transport sectors as a result of the COVID-19 pandemic and lockdowns. Much of the 2020 fall is likely to be temporary, although that partly depends on the Government's choices. Action now can lock in beneficial changes seen on walking, cycling and remote working for those that want it, for example through investment in broadband, active travel and public transport. More widely, there is an opportunity to accelerate low-carbon investments, for example on energy infrastructure, homes and electric vehicles.

An effective Net Zero Strategy will support the UK to genuinely 'build back better' and provide authority on the global stage into COP26 and beyond.

The rest of this executive summary is set out in five sections:

1. Emissions in 2020 and underlying progress on decarbonisation
2. Ambition on the path to Net Zero
3. Policy progress on the path to Net Zero
4. Policy priorities and broadening progress across Government
5. The Committee's changing role

We provide our full recommendations, department by department, covering all aspects of the Net Zero challenge, in an annex at the end of this report.

The COVID-19 pandemic and the resulting restrictions caused a substantial drop in emissions, which fell to a level almost half those of 1990. But lasting changes to UK emissions remain far from certain. The Committee's provisional estimate is that UK emissions fell by around 13% in 2020 to 435 $MtCO_2e$, with the vast majority of the fall associated with reductions in emissions from surface and air transport (Figure 1 and Box 1).

Estimated UK consumption emissions (i.e. the UK's carbon footprint, including emissions embedded in imports) are considerably higher than the UK's 'territorial' emissions. They rose slightly in 2018, the most recent year for which data are available, following a gradual decline over the preceding decade.

The impact of COVID-19 on travel demand led to an unprecedented 29% fall in transport emissions in 2020.

The impact of COVID-19 on travel demand led to an unprecedented 29% fall in transport emissions in 2020. The impact has been particularly pronounced on demand for public transport, which fell more deeply and recovered more slowly than private car travel following lockdowns being lifted. A new challenge for decarbonisation policy is rebuilding the public's confidence in the safety of public transport to avoid a 'car-led' recovery, and providing people with reliable alternatives to car travel.

The huge changes required during this period to how society operates are not a model for the sustained changes needed for Net Zero, but nevertheless have been instructive, across a range of sectors. We have learned that changes to working and travel behaviour can be made rapidly if required. A consensus has developed that the capital investment required for Net Zero can act to boost the economy as it recovers. The importance of good broadband and telecoms provision has become clearer, and we have seen that there is considerable scope to manage offices and other non-residential buildings in a more energy-efficient manner, especially when they are unoccupied.

Emissions in 2021 may well be higher than in 2020, even with positive developments.

As travel returns, we can expect a significant rebound in transport emissions, even if some of the positive behaviour changes (e.g. increased cycling, less business travel) made in response to the pandemic can be locked in through investment in active travel and broadband. But even with progress in reducing emissions from other sectors, UK emissions in 2021 may well be higher than in 2020.

Sustained progress in reducing emissions will need underlying, structural changes.

The focus must be on underlying progress in order to make lasting reductions in territorial and consumption emissions. Underlying progress to date has been insufficient outside electricity generation:

- There has been little of the necessary progress in upgrading the **building stock**. Insulation rates remain well below the peak market delivery achieved up to 2012 before key policies were scrapped, demonstrating clear potential for growth if an effective policy package is put in place. Despite a small improvement in the rates of heat pump installation, these remain far below the levels that are necessary.

- Progress in **agriculture and land use** has repeatedly failed to meet the indicators (e.g. for tree planting and on-farm efficiency measures) outlined in the Committee's progress reports in recent years. There are signs of potential consumer willingness to shift towards less carbon-intensive diets in future, but this has not yet translated to reduced meat consumption or been backed up by policy to support the change.

- Progress in reducing emissions from **waste** has stalled in recent years following a period of steep emissions reduction from the late-1990s caused by the diversion of waste from landfill.

- Deployment of **renewable electricity generation** has scaled up rapidly. Although the increase in 2020 was at a much slower rate than the average achieved over the previous five years, the growing project pipeline means that this slowdown is likely to be temporary.

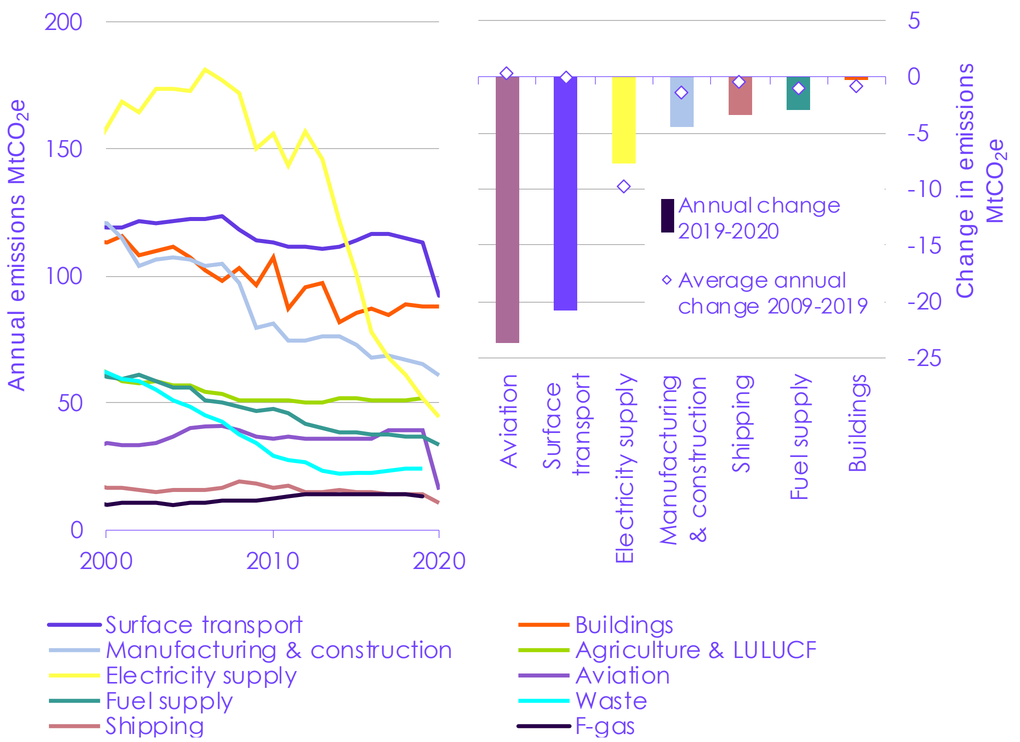
- Sales of **electric vehicles** and the deployment of supporting charging infrastructure have increased considerably in recent years. Policies will be required to drive the accelerated uptake required throughout the 2020s (e.g. a zero-emission vehicle mandate). There are also concerning trends, notably the rapid growth in car and van travel during the past decade.

- Although there have been emissions reductions in **industry**, it is unclear how far this reflects structural changes driven by wider factors or genuine improvements in efficiency and carbon intensity.

UK emissions are nearly 50% below 1990 levels, but the journey to Net Zero is far from half done.

UK emissions are nearly 50% below 1990 levels, but the journey to Net Zero is far from half done. Government must now match its bold statements of ambition with effective policies and implementation, and it must move at pace if it is to deliver against the UK's stretching targets.

Figure 1 Changes in UK emissions by sector



Source: BEIS (2021) *2020 UK Greenhouse Gas Emissions, Provisional Figures.*
Notes: LULUCF = Land use, land-use change and forestry. Estimates of emissions for sectors with large proportions of non-CO_2 emissions are not shown on the right-hand chart. Final estimates of 2020 emissions in these sectors will be published in early 2022. The sectoral emissions for aviation and shipping include the UK's share of international aviation and shipping emissions, and are CCC estimates.

Box 1
Impacts of the COVID-19 pandemic on UK emissions in 2020

Lockdown measures led to a record decrease in UK emissions in 2020 (Figure 1). Emissions fell by around 13% overall with the largest falls in aviation (-60%), shipping (-24%) and surface transport (-18%). Home energy use increased, with residential buildings the only sector to show an overall increase in emissions (+2%).

The fall in emissions in 2020 will have practically zero impact on the UK's past and future contribution to global warming.

Most of the falls in sectoral emissions observed in 2020 are likely to be transient, as they do not reflect structural changes in the underlying economic, social, energy, transportation or land systems. In the absence of these underlying changes, emissions are likely to rebound to some extent in most sectors in 2021.

However, the last year has seen some large changes in patterns of behaviour due to the pandemic. The extent to which these changes will endure is currently unclear. In particular, there is potential for lasting impacts from new working patterns and changes to personal transport choices, with complex and uncertain implications for how our domestic and international transport systems work and the demand for energy in homes and workplaces.

The lasting impacts of the pandemic are still far from certain, but the experience from the last year has shown:

- Emissions fell rapidly, but they can rebound just as quickly. In the absence of underlying structural changes emissions are likely to rebound in most sectors in 2021.
- There is a limited window to change behaviours. If sources of 'behavioural friction' in moving from one pattern of living and working to another can be overcome, people and organisations can often adapt quickly. There are now significant opportunities to lock in and build on positive developments, especially – though not exclusively – regarding travel demand.
- The need for increasingly resilient networks and infrastructure. Our energy (and digital) networks have demonstrated they can be resilient to profound changes in use. The transition towards Net Zero will only increase the challenges of operating an electricity system with high shares of variable and inflexible generation. The non-residential buildings stock can also be improved to respond more efficiently to variations in occupancy.
- Lockdown is not a blueprint for decarbonisation. The fall in UK emissions in 2020 was larger than the annual change needed on the pathway to Net Zero, but did not materially affect the structural changes that are needed to reach Net Zero. Lockdowns heavily restricted movement and had damaging economic and social consequences. This stands in contrast to the fair, well-planned and sustainable transition to Net Zero that is possible. Net Zero should bring improvements to quality of life: new jobs, cleaner air, quieter streets, more green spaces, comfortable homes and healthier lifestyles.

It will be important to sustain climate-positive changes that have developed during the pandemic, but also to act decisively to mitigate the negative changes that could jeopardise efforts towards Net Zero.

The Government has moved to align many of its sectoral commitments with those implied by a Net Zero pathway, significantly strengthening its ambitions since the 2017 Clean Growth Strategy. Individual plans and policies published in recent months have set ambitions closer to those recommended by the Committee. But a notable overall shortfall is now emerging between what has been announced so far and the Committee's detailed recommendations for the Sixth Carbon Budget. The late publication of several strategies is also disappointing and means that we have only a partial picture of ambition:

- A number of the important elements of the overall Net Zero Strategy have been delayed. At the time of finalising this report, a range of strategies expected in 2020 had not yet been published, including the Heat and Buildings Strategy, the Transport Decarbonisation Plan, the Treasury's final Net Zero Review, the Aviation Decarbonisation Strategy and the Nature Strategy. Even with these, there are likely to be gaps. We highlight the need to fill a range of gaps on strategy and policy in section 4.

Announced ambition in many areas is in line with, or close to, the necessary level.

- Announced ambition for electric cars and vans, offshore wind, low-carbon hydrogen production, industrial decarbonisation to 2030 (but not to 2035) and tree planting to 2025 is broadly in line with the Committee's scenarios (Table 1). This is commendable. Together, areas where ambition is beginning to align with the CCC pathway cover almost half of the emissions reduction required for the Sixth Carbon Budget (Figure 2). We expect this to rise further during 2021, as additional strategies are released.
  - These clear commitments have seen responses in the market and from the public. For example, announcements from car manufacturers and increased interest in electric cars have followed the Government's commitment to phase out petrol and diesel cars and vans by 2030. However, clear policies will be required to make this a reality.
  - In other areas, companies are also voicing support for increased ambition, such as for full electricity decarbonisation by 2035, phasing out installation of high-carbon heating systems, rebalancing electricity and gas prices to support electrification, and support for fitting carbon capture, utilisation and storage (CCUS) on Energy from Waste plants.

However, there has been a tendency for ambition to fall short of our recommended pathway to meet the Sixth Carbon Budget.

- However, where ambition has diverged from the CCC pathway to meet the Sixth Carbon Budget, there has been a tendency for ambition to fall short rather than go further (e.g. heat pump deployment that is a third lower in 2028, total CCS ambition that is around half in 2030) (Figure 3).

The Government is not required to commit to the Committee's detailed sectoral pathways, nor to follow our policy advice. But it must set out a credible alternative approach where it chooses not to. Our pathways are designed to be stretching across the economy, so it is difficult to compensate for lower ambition in one area with greater ambition elsewhere. The Net Zero Strategy, released later this year, will have to address the shortfall, strengthening weaker commitments to be closer to the Committee's pathways or setting out how emissions can be cut faster in other areas to compensate.

Important gaps remain in Government ambition, particularly on the demand side, and other ambitions need clarification.

Important gaps also remain in terms of the scale of the Government's ambition in certain sectors, while there is a danger that several of the broad ambitions announced are implemented in a way that would fall short of the CCC scenarios:

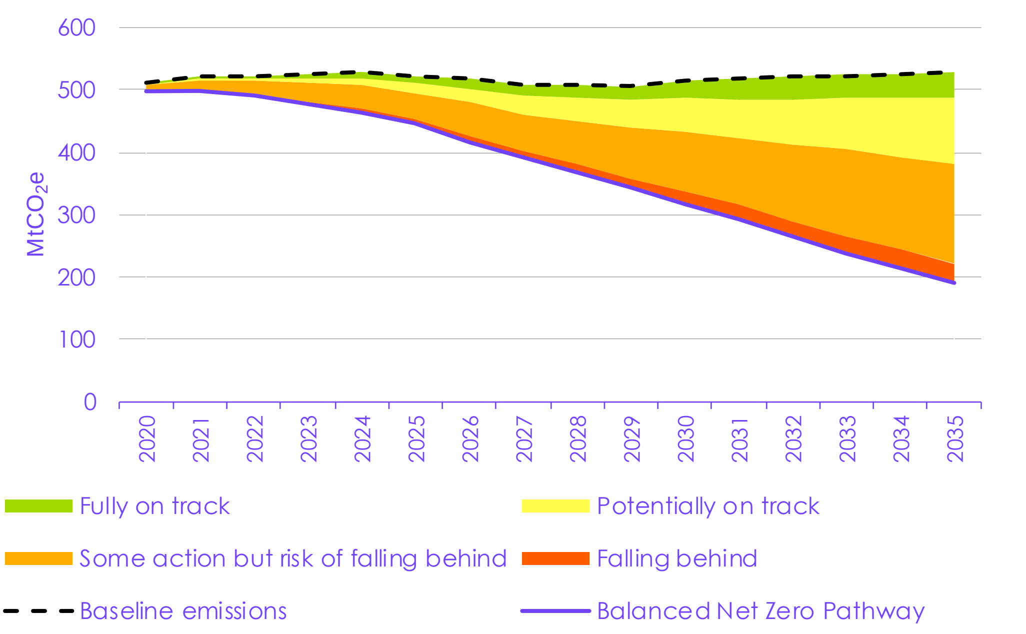
- **Consumer choices.** So far, the Government's announcements have focused on technologies and largely ignored the potential for changes in consumer choices to reduce emissions. These are particularly important to limit emissions in 'hard to abate' sectors, such as aviation and agriculture. We note that there are a wide range of levers available to promote low-carbon choices, including enabling measures and nudges, ensuring supporting infrastructure is available, and more interventionist measures using regulations and the tax system.

- **Ambiguity in ambition.** While some commitments have been made that could be at least as ambitious as our pathways, there remain risks that real-world implementation could fall short. For example, the announced 2030 phase-out date for sale of petrol and diesel cars and vans will allow sale of vehicles with 'significant zero-emission capability' until 2035, well after the 2032 date by which we recommend all such vehicles should be fully zero-emission. The definition of which vehicles can be sold after 2030, currently subject to consultation, will be crucial in ensuring that emissions and motoring costs are kept as low as possible by prioritising fully zero-emission vehicles over hybrids.

The Net Zero Strategy will need to ensure that ambition across the board adds up to a credible approach to meeting the targets.

There also remain a range of issues that have not yet been tackled, and which do not fit neatly into sectoral strategies (see section 4). The Net Zero Strategy will need to fill remaining gaps, clarify existing ambitions, set out a vision for the governance of the transition and ensure that the ambition across the board adds up to a credible and quantified approach to meeting the Sixth Carbon Budget and Net Zero target.

Figure 2 Is Government ambition on track?



Source: CCC analysis; CCC (2020) *The Sixth Carbon budget – The UK's path to Net Zero*

Table 1
Government commitments compared to the CCC Pathway between 2025-2035

Headline actions	Government commitment [1]	CCC pathway
Offshore wind	40 GW by 2030	40 GW by 2030
Electric vehicles	Phase-out of new fossil fuelled vehicle sales by 2030, with allowance for some hybrids out to 2035	Phase-out of all new fossil-fuelled vehicle sales by 2032
Heat pumps in homes	600,000 heat pump installations / year by 2028	900,000 heat pump installations / year by 2028 1.1 million installations / year by 2030
Low-carbon heat networks (all buildings) [2]	2 TWh of low-carbon heat networks by 2030	25 TWh of low-carbon heat networks by 2030
Low-carbon hydrogen	5 GW (up to 42 TWh) by 2030	30 TWh by 2030
Carbon Capture and Storage [3]	10 $MtCO_2$ captured and stored annually by 2030, across four industrial clusters, including at least one power project	22 $MtCO_2$/year captured and stored in 2030, across at least five industrial clusters, including multiple power projects
Emissions reduction in manufacturing and refining	Around two-thirds by 2035, compared to 2018	73% by 2035, compared to 2018
Tree-planting	30,000 hectares / year by 2025	30,000 hectares / year by 2025 50,000 hectares / year by 2035
Peatland restoration [4]	32,700 hectares / year by 2025	67,000 hectares / year by 2025
Greenhouse gas removals	Innovation support provided, in recognition that engineered removals will be needed, but no firm commitment on deployment yet	5 $MtCO_2$/year by 2030
Nuclear power [5]	Final Investment Decision on at least one new nuclear power plant by the end of this Parliament	One new nuclear plant operational by 2030, and a further plant by 2035

Source: CCC analysis.

Notes:

[1] Based on actions in the Ten Point Plan, Energy White Paper, Industrial Decarbonisation Strategy and England Tree and Peat Action Plans between 2025 and 2035 and the CCC's Balanced pathway from the Sixth Carbon Budget.

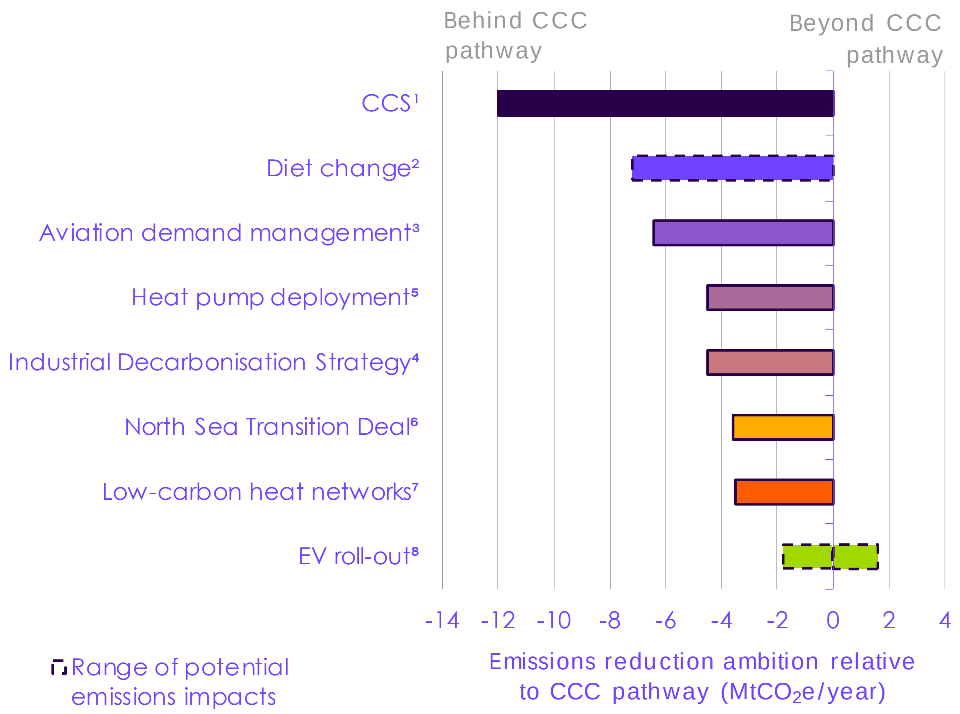
[2] Government commitment on low-carbon heat network deployment is illustrative, and has been inferred from Government spending commitments, using assumptions around expected leveraged investment and the proportion of funding targeted at low-carbon networks.

[3] The difference in carbon captured and stored annually largely comes from projects in the power sector in CCC scenarios, so other technologies could compensate for this shortfall.

[4] Government peatland restoration commitments include Scotland, Wales and England. CCC peatland restoration numbers in 2025 are UK-wide.

[5] The Balanced Pathway produced for the CCC's Sixth Carbon Budget assumed that two new nuclear power stations would be in operation by 2035, in addition to Hinkley Point C.

Figure 3 Differences in stated Government ambition compared to CCC pathway



Notes: Comparisons are against the Balanced Net Zero Pathway ('CCC pathway') published in the Committee's *Sixth Carbon Budget* advice.

[1] Government CCS ambition for is 10 $MtCO_2$/year in 2030, compared to 22 $MtCO_2$/year in the CCC pathway.

[2] The level of diet change without explicit policy to support it is uncertain. Emissions could be up to 7.2 $MtCO_2e$/year higher than the CCC pathway in 2030.

[3] Lack of ambition for aviation demand management would result in higher emissions of 6.4 $MtCO_2e$/year in 2030 relative to the CCC pathway for aviation emissions.

[4] The Industrial Decarbonisation Strategy aims for a 67% reduction by 2035, compared to 73% in the CCC pathway.

[5] Government ambition is for 600,000 installations in homes in 2028, compared to 900,000 in 2028 in the CCC Pathway. The abatement gap in 2030 is inferred, based on an assumed trajectory of uptake to 2028 under the Government's plans, with annual deployment remaining constant to 2030.

[6] The North Sea Transition deal commits to a reduction that falls short of the CCC pathway by 3.7 $MtCO_2e$/year in 2030.

[7] Based on announced Government heat network investment of £0.7 billion (assumed to leverage £2.2 billion, leading to a total investment of £2.9 billion, of which we estimate £1.7 billion will be for low-carbon, with resulting deployment estimated by CCC).

[8] A strict 2030 phase-out of petrol and diesel vehicles would be more ambitious than the CCC pathway, but this depends on the timing of when plug-in hybrid electric vehicles are phased out.

Policy progress is being made, but it is not yet happening at the necessary pace.

Comprehensive policy frameworks are needed to drive the major scale-up in delivery required by the path to Net Zero. Of the 92 recommendations we made in our 2020 progress report, 72 (i.e. over 75%) have been either achieved, partly achieved or are underway. Clearly, policy progress is being made, but it is not yet happening at the necessary pace – only 11 have been achieved in full.

In many cases, a strategic commitment has been made, but details of policy implementation have not yet caught up with the high-level ambition (Figure 4).

- Progress on setting out policies is significantly behind that on ambition, with only one-fifth of the emissions savings for the Sixth Carbon Budget having policies that are 'potentially on track' for full delivery (e.g. renewable electricity generation).

- In many other areas, some policy plans have been set out but these lack detail and/or do not comprehensively cover the necessary set of issues. Together, areas in which policy is in danger of falling behind cover around three-fifths of the emissions reduction required to 2035.

- A further one-fifth of the emissions reductions still have major policy gaps, including on demand-side action and tackling emissions from landfill and waste incineration. We highlight the need to fill a range of policy gaps in section 4.

The Government has recognised the need to extend delivery, and has launched or begun development of a major programme of strategies, consultations and policies covering all the major emitting sectors (i.e. energy supply, industry, transport, buildings, agriculture and land use). That process is ongoing as this report is published (Box 2).

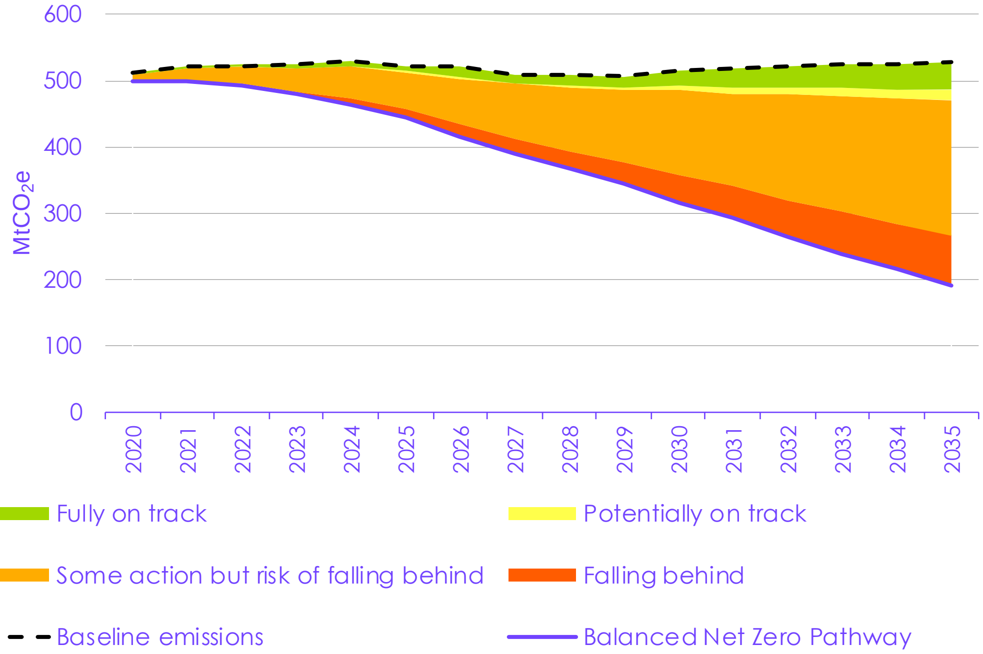
We have also seen, through the failure of the Green Homes Grant, the challenges of real-world implementation and the need for well-designed and well-executed schemes that properly address the barriers to decarbonisation. Failures cannot be avoided completely, but it is critical that effective replacement policies are put in place quickly, drawing on the experience of previous schemes. The Net Zero transition requires a consistent framework that enables supply chains and public buy-in to build over time, without confidence being undermined by sudden policy changes or poor delivery. While the Local Authority Delivery part of the Green Homes Grant scheme has been more successful, there is an urgent need for well-designed, fully-funded policy that works for deployment of energy efficiency improvements and low-carbon heat in the rest of the residential sector.

A coherent approach is needed to achieving Net Zero. All Government policies need to be compatible with the transition to Net Zero and the need to adapt to climate change.

More generally, there is a need for a coherent approach to achieving Net Zero and to ensure that all Government policies are compatible with the transition to Net Zero, together with adapting to climate change. Decisions on road building, planning, fossil fuel production and expansion of waste incineration are not only potentially incompatible with the overall need to reduce emissions but also send mixed messages and could undermine public buy-in to the Net Zero transition. We recommend implementation of a 'Net Zero Test' to ensure that all Government policy decisions are compatible with the legislated emissions targets.

The Government should now focus on delivering their stated policy aims, scaling up the rate of delivery rapidly and putting in place a comprehensive policy framework this Parliament (i.e. to 2024).

Figure 4 Are Government policies on track?



Source: CCC analysis; CCC (2020) *The Sixth Carbon budget – The UK's path to Net Zero.*

Box 2
Highlights of recent and upcoming policy developments

There have been several high-profile policy publications in the last eight months:

- The **Ten Point Plan for a Green Industrial Revolution** and the accompanying **National Infrastructure Strategy** set a series of headline commitments across the economy that could contribute to Net Zero. Key commitments by 2030 include: 40 GW of offshore wind capacity, 5 GW of hydrogen production capacity, phasing out petrol and diesel cars and vans by 2030 (with some hybrids permitted until 2035), four CCS clusters capturing 10 $MtCO_2$ annually and 600,000 heat pumps installed annually (by 2028). The Plan allocated initial funding including a £1 billion **Net Zero Innovation Portfolio** and kicked off processes to support delivery of the headline goals and others such as tree planting, sustainable aviation fuels, low-carbon buses and HGVs, greenhouse gas removals, nuclear power, and green finance. Job creation was a key objective, supported by the launch of a **Green Jobs Taskforce**.
- The **Energy White Paper** took further steps to support the Ten Point Plan. These included consultations and explorations of policy options to support a fairer and more flexible energy system, commitments to support at least one power CCS project by 2030, an aim for a final investment decision on one nuclear power plant this Parliament and additional funding for advanced nuclear innovation, a review of institutional arrangements for the energy system, support for electric vehicle charging, a commitment to phase out installation of fossil gas boilers by the mid-2030s, a commitment to set up a UK ETS and to align its cap to the path to Net Zero, and announcements on hydrogen, CCS, industry and oil and gas extraction.
- The **Industrial Decarbonisation Strategy** set a goal to cut industry emissions by around two-thirds from 2018 to 2035. It committed to several calls for evidence, set out preferred options for some funding mechanisms and allocated some initial funding.

- The **North Sea Transition Deal** set targets to reduce emissions from oil and gas supply by 10% in 2025, 25% in 2027, and 50% in 2030 against a 2018 baseline. In addition, the deal outlined how the oil and gas sector could support the deployment of hydrogen and CCS, as well as help hydrocarbon workers during the energy transition.
- **The Peat and Trees Action Plans** published in May sets out England's ambition for peat restoration (30,000 hectares by 2025) and new woodland (7,000 hectares per year by 2025). The Nature for Climate Fund will be the main source of public funding during this period, providing £50 million for peat and £500 million for trees, with options being developed to leverage private sector finance. There is no stated ambition beyond 2025 for either restoration or tree planting, although there is a commitment in the Plan to consult in 2022 on the long-term woodland creation target.

Other publications that have been promised but not yet delivered (by early June 2021, when this report was finalised) include:

- **Treasury Net Zero Review**. HM Treasury (HMT) released its interim review in December, concluding that reaching Net Zero is essential for long-term prosperity, that the costs of tackling climate change are relatively small and depend on policy choices, that a mix of policy levers will be required, and that well-designed policy can reduce costs and risk for investors as well as supporting innovation and the deployment of new technologies The final report will look at reducing policy uncertainty to encourage innovation, the scope for addressing risks to competitiveness, more detailed analysis of household impacts, and crucially, how HMT can incorporate climate considerations into spending reviews and fiscal events and how to embed the principles of the Net Zero Review into policy making.
- The **Heat and Buildings Strategy** will set out further detail on the Government's plans for decarbonising heating in the UK, along with the 'suite of policy levers' it intends to 'use to encourage consumers and businesses to make the transition'.
- The **Transport Decarbonisation Plan** is the Department's 'plan to decarbonise the UK's entire transport system'. It will cover active travel (i.e. walking and cycling) and public transport; the transition to zero-emission road vehicles (e.g. electric cars) from the perspective of the consumer, suppliers and the energy system; freight and logistics; and aviation and shipping.
- **Net Zero Aviation Strategy**. In light of the UK's new Net Zero target, the Government has committed to a new consultation on aviation decarbonisation in 2021, followed by a Net Zero aviation strategy before COP26.
- The **Hydrogen Strategy** will consider how to support the scale-up of low-carbon hydrogen production, as well as the interaction with storage, distribution and potential end-use demand. It will set out details of hydrogen business models and a revenue mechanism for bringing through private-sector investment, and support for the demand side such as heating trials and support for hydrogen in shipping.
- The **Biomass Strategy** will coordinate across Government departments to assess how biomass should be sourced and used across the economy to contribute best to Net Zero. It will review the UK's current biomass sustainability standards and outline the role of BECCS in delivering greenhouse gas removals.
- **National Food Strategy**. Part Two of the Strategy will cover the environmental impact of our diets (including GHG emissions) and land use.

Alongside these major statements, there have been many smaller, but important, policy developments, including in the buildings sector ahead of the delayed strategy. These are covered in Chapter 4 of this report.

Source: Quotes on future policy plans taken from the Ten Point Plan, Energy White Paper, Net Zero Review: Interim Report, National Infrastructure Strategy, Industrial Decarbonisation Strategy.

There has been important progress in the last year. However, we see evidence of a multi-paced Government.

Overall, there has been important progress in the last year. However, we see evidence of a multi-paced Government, with some departments lagging behind others (Table 2):

- The Ministry of Housing, Communities & Local Government (MHCLG) is not fully supporting local government to play its part in the transition to Net Zero. Progress has fallen short to date on ensuring that building standards are fit for purpose and properly enforced. The current Planning Bill misses the powerful opportunity to ensure that developments and infrastructure are compliant with Net Zero and appropriately resilient to climate change.

- While the Department for Environment, Food & Rural Affairs (Defra) has made important steps forward on ambition for afforestation and peat restoration, progress on agriculture and land use remains slow and partial, and gaps in ambition remain. On waste, large gaps remain both on banning materials from landfill and getting a grip on the rapid expansion of Energy from Waste facilities.

- Even within departments that are performing better overall there are pockets of poor or slow performance. For example, BEIS's Heat and Buildings Strategy has been delayed by almost a year, while the Department for Transport has not set out any plans for limiting growth in aviation demand.

- More generally, Government progress has been slow on overarching challenges towards Net Zero, which has now been law for two years. The most notable delay is to HM Treasury's Net Zero Review, but there are delays and uncertainty to a suite of other challenges: the just transition, jobs and skills, public engagement. In the Spending Review later this year, the Treasury must prioritise Net Zero, ensuring departments are fully equipped to deliver the carbon budgets. There is also a need for strong governance of the transition within Government, including ensuring that wider policy decisions are routinely made compatible with Net Zero.

All parts of Government must play their full role to deliver the path to Net Zero.

For the full programme to align to the challenge, and to provide the leading example that the Government wishes to take to COP26, these failures will have to be addressed.

Table 2 Progress against departmental recommendations in the Committee's 2020 Progress Report to Parliament	
Department	Progress against last year's recommendations
Cabinet Office & No. 10	🟢⚪⚪🟡
FCDO, BEIS & the COP26 Unit	🟢⚪⚪🟡🟡🔴
HM Treasury	🟡🟡🟡🟠🟠🟠🔴
Department for Business, Energy and Industrial Strategy	🟢🟢🟢🟢⚪⚪⚪⚪⚪⚪⚪⚪⚪⚪🟡🟡🟡 🟡🟡🟡🟡🟡🟠🔴🔴🔴
Department for Environment, Food and Rural Affairs	🟢⚪🟡🟡🟡🟡🟠🔴🔴🔴🔴
Department for Transport	🟢🟢🟢⚪⚪⚪⚪🟡🟡🟡🟠🟠🔴🔴
Ministry of Housing, Communities and Local Government	🟡🟡🟡🟡🟡🔴
Department for Education	⚪⚪
Department for International Trade	⚪⚪🟡
Department of Health and Social Care	⚪🟡
Ministry of Defence	🟢⚪⚪
Home Office & Ministry of Justice	⚪⚪
Department for Digital, Culture, Media and Sport	⚪⚪🟡🔴
Department for Work and Pensions	⚪⚪
🟢 = action achieved, ⚪ = underway, 🟡 = partly achieved, 🟠 = overdue, 🔴 = not achieved.	
Notes: Based on recommendations in the CCC's 2020 Progress Report to Parliament. Recommendations for all departments, or those relating to adaptation are not included in this table. Some recommendations apply to more than one department, so the sum of recommendations in this table does not add up to the 92 cited in the text. Tables of recommendations and scores is in the supplementary material published alongside this report.	

Cross-cutting priorities

Cross-cutting issues must be addressed to enable sector-specific strategies and plans to be rolled out effectively.

Several cross-cutting issues must be addressed to enable sectoral strategies and plans to be rolled out effectively. These are essential in calibrating the public's expectations for what lies ahead and building broad public support for the changes:

- A **comprehensive Net Zero strategy** is needed this year to fill gaps in ambition and pull together a coherent story of how sectoral efforts fit together to achieve the Net Zero target and carbon budgets. The inclusion of international aviation and shipping in the Sixth Carbon Budget allows for the first comprehensive look at a pathway to Net Zero covering all sectors. It should also commit to a 'Net Zero Test' to ensure that *all* Government decisions are compatible with the legislated emissions targets.

- **A plan for achieving a just transition** for people, workers, consumers and regions, which ensures that opportunities are taken to create jobs and improve the skills base while maintaining international competitiveness. Alongside this, a credible plan is needed for the fair funding of the transition, starting with completion of the Treasury's Net Zero Review, as well as ensuring that investment is supported by strong financing.

- **Public engagement** around the need for climate action, the health co-benefits of low-carbon choices, information about how individual actions can contribute to reducing emissions and involvement in decisions on how best to achieve the transition.

- **A framework for local delivery** to deliver ambitious climate objectives at different scales (i.e. devolved administrations, regions and local authorities), through workable business models, removal of barriers to action, dedicated resource and an approach that facilitates sub-national action to complement action at the national level.

- **Plans must make climate adaptation an integrated part of the transition to Net Zero.** Across multiple areas, and in particular on buildings and land use, there are benefits to thinking holistically about how policy can reduce emissions, while ensuring it improves resilience to the UK's changing climate. Like Net Zero, climate adaptation will also need to be integrated into core Government policy.

Essential elements of the transition to Net Zero

We have identified seven indispensable elements to the transition, on which it is crucial that good progress is made.

Progress is needed across a wide range of areas in order to get on track to Net Zero. However, there are several indispensable parts to the transition. We have identified seven priority areas for the Government in which it is crucial that good progress is made, covering a subset of the approximately 200 recommendations for UK Government departments and the devolved administrations for the next year. These are primarily focused on delivery:

- Develop and implement a comprehensive policy package to enable the delivery of the 2030 transition to **electric vehicles**, to build on the phase-out announcement and the positive response of automakers and motorists. This should include a full strategy for widespread deployment of charging infrastructure and a mandate requiring manufacturers to sell a rising proportion of zero-emission vehicles.

- Implement a comprehensive policy package for **buildings decarbonisation**, and enshrine the long-term standards framework in regulation and law, to deliver the ambitions of the upcoming Heat and Buildings Strategy and finalise the roadmap for decarbonising the UK building stock.

- Implement comprehensive delivery mechanisms for landscape-scale **land use change for afforestation and peatland restoration** and a high take-up of **low-carbon farming practices**. This should cover mechanisms for private and public financing and a strategy to address non-financial barriers. Interim policies will be needed to avoid a hiatus in action while awaiting the implementation of the new mechanisms.

- Advance policy for **manufacturing decarbonisation** by establishing incentive mechanisms to support fuel switching and implementing CCS proposals. Alongside this, initiate the development of product and construction standards both to improve energy and resource efficiency and to develop the option of managing carbon leakage by applying carbon policy to imports.

- Continue **auctions for low-carbon power generation**, together with supporting actions to enhance system flexibility, to deliver an emissions intensity of 50 gCO_2/kWh or better in electricity generation by 2030.

- Deliver a **Hydrogen Strategy** that sets out a vision of the role of hydrogen on the path to Net Zero and the steps needed to realise it. The strategy should focus on hydrogen use in sectors that cannot decarbonise without it and low-carbon hydrogen production routes to 2035 with aims to start large-scale hydrogen trials in the 2020s.

- **Enable domestic engineered greenhouse gas removals (GGR)** to contribute to UK carbon budgets and Net Zero, and establish GGR support mechanisms and monitoring, verification and reporting (MRV) structures in the UK that ensure that GGR is timely, sustainable and verifiable.

Gaps that must be addressed

There are specific policy gaps that must be addressed on unabated gas generation, demand-side action, waste and aviation demand.

Our assessment of strategies and policies announced to date has identified specific key gaps that need to be addressed by Government policy:

- Commit to **phasing out unabated gas-fired electricity generation** by 2035, subject to ensuring security of supply. Publish a comprehensive long-term strategy for unabated gas phase-out, including ensuring new gas plants are properly CCS- and/or hydrogen-ready as soon as possible and by 2025 at the latest, and thoroughly assessing the market challenges that will emerge as part of the transition to a fully decarbonised electricity system.

- Include contributions in the Net Zero Strategy from **demand-side action**, on aviation, a shift towards healthier diets and a switch away from cars towards active travel and public transport. This should be accompanied by public engagement to explain how low-carbon choices can contribute to Net Zero and wider co-benefits to health, and policy frameworks that seek to encourage and incentivise these changes.

- Address with urgency the rising emissions from, and use of, **Energy from Waste (EfW)**, including by ensuring that the capacity and utilisation of EfW plants is consistent with necessary improvements in recycling and resource efficiency, providing support to enable existing EfW plants to begin to be retrofitted with CCUS from the late 2020s, and introducing policy to ensure that any new EfW plants are built either with CCUS or are 'CCUS ready'.

- The overdue **Net Zero Aviation Strategy** must set out credible pathways and policies to encourage technological development in the sector but also recognise the potential need to manage aviation demand in future, should improvements in sustainable aviation fuels and low-carbon aircraft fall short of Government and industry ambitions. An assessment of the UK's airport capacity strategy and a mechanism for aviation demand management should be part of the aviation strategy.

We make a comprehensive set of recommendations in the Departmental tables at the end of this report.

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As Government makes the shift to focusing on implementation, the Committee's task must also evolve towards a focus on real-world progress and tougher scrutiny of Government plans. Over the coming year the Committee will develop deeper metrics of progress and consider a better dashboard of indicators. We are also broadening our outlook:

- **Broader view of real-world progress.** The transition to Net Zero requires changes that go beyond the deployment-related metrics we have tended to track to date. We will seek to broaden our assessment of real-world progress, including public attitudes, corporate commitments, finance and the green recovery, as well as consumption emissions and the factors affecting them.

- **Governance and enabling delivery.** The challenge of tackling climate change mitigation and adaptation in a joined-up, coherent way requires a governance structure within central Government and at different geographical scales. We will increasingly look at coordination within UK Government and the interactions with action at the devolved government and local levels.

- **Non-government action.** The transition of UK society towards Net Zero must involve a wide range of actors. We will seek to broaden our advice to give more attention to enabling lifestyle changes and low-carbon choices, corporate strategies, local authority action and community action.

- **The UK as part of global action.** We will seek increasingly to locate the UK's transition within the wider international transition, which is set to gain pace, with important implications for technologies, options and costs, and for policy design (e.g. because of carbon-border adjustment mechanisms). We have also been engaging and sharing lessons with similar bodies to the CCC around the world.

- **Fairness and the just transition.** We are focusing more on fairness, jobs, skills and the equitable distribution of costs and benefits over the transition.

The Committee's next major UK report will be an assessment of the Net Zero Strategy.

We look forward to assessing the Government's Net Zero Strategy later this year, and will aim to align our progress metrics and monitoring with the Government's proposals where we consider those to be credible.

The rest of this report is set out in four chapters:

1. The global context

2. UK emissions and drivers

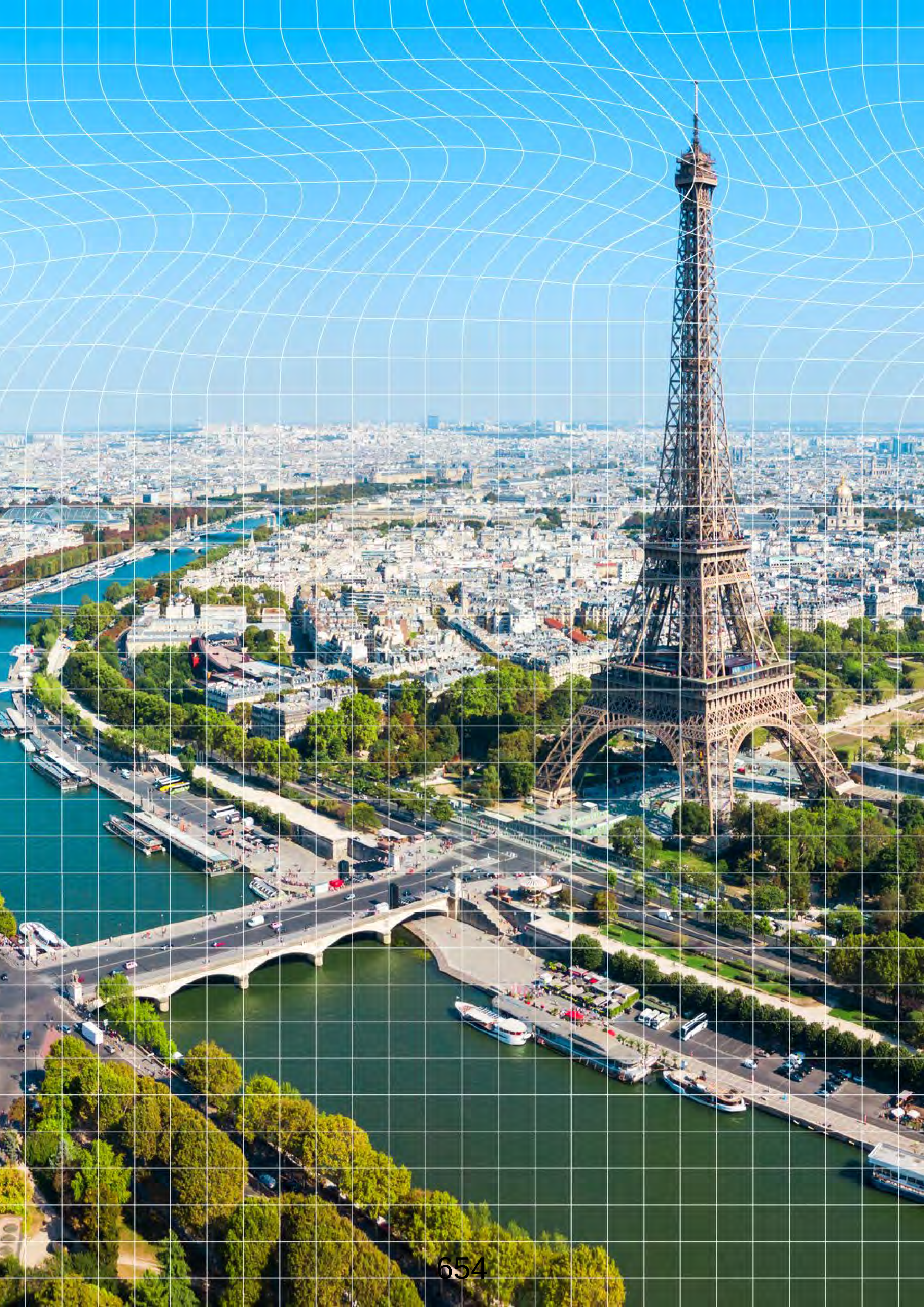
3. Underlying progress and enablers of progress

4. Policy progress and gaps

We then set out detailed recommendations for each UK Government department and the national Governments of Scotland, Wales and Northern Ireland in an annex of tables at the end of this report.

Chapter 1

The global context



Introduction

This chapter summarises global developments in tackling climate change ahead of COP26.

The 26th Conference of Parties (COP26) to the United Nations Framework Convention on Climate Change (UNFCCC), which will take place in Glasgow later this year, was conceived under the Paris Agreement as a key moment to raise global ambition. This chapter outlines global progress in tackling climate change ahead of the COP26 negotiations.

Our conclusions are:

- **COVID-19 related measures had a large, but temporary, impact on global emissions in 2020.** Global emissions fell by 6% in 2020 relative to 2019 levels for the year as a whole, with significantly larger falls in individual countries (particularly developed countries) at the height of lockdowns. These reductions in emissions have proved temporary, with global emissions rates increasing when lockdown measures were lifted. Sustained reductions of similar magnitude to those in 2020 will be required over several decades to achieve the Paris Agreement long-term temperature goal. Fundamentally different ways of reducing emissions to those in 2020 will be required to achieve this, although behavioural changes (e.g. reduced long-haul business travel) could have long-term benefits if maintained.

- **Transitions to low-carbon and low-cost alternatives in electricity and road transport are now underway around the world but need to be scaled up.** Rapid falls in the costs of renewable electricity generation and electric vehicles (EVs) mean that these technologies are now (or very soon will be) at cost-parity with fossil fuel-based alternatives in large parts of the world. In these areas commitments from Governments and companies are being made that would imply a rapid transition. However, commitments need to be delivered and become more global to achieve the emissions reductions over this decade consistent with the Paris Agreement. The provision of supporting infrastructure (e.g. charging points for EVs) will also be necessary to deliver this.

- **There has been a significant increase in global ambition ahead of COP26, but even if met, expected emissions in 2030 would remain well above Paris Agreement compatible pathways.** Most G7 countries have now raised ambition, with pledged decarbonisation pathways from these countries approaching alignment (on aggregate) with those seen in modelled global pathways consistent with the Paris Agreement. Significant additional ambition will be required to close the remaining global 'emissions gap' to pathways expected to keep warming 'well-below' 2°C, or ideally to 1.5°C, above preindustrial levels. These necessitate rapid transitions in developing and emerging economies, that are expected to make up the majority of future emissions. Developed countries have an important role in helping other countries to increase ambition, including through climate finance. Achieving progress on issues of climate finance and adaptation at COP26 will be essential for achieving increases in global ambition on reducing emissions.

Our analysis is summarised in three areas:

1. Global climate, emissions and energy use in 2020
2. Global progress in decarbonisation indicators
3. Progress in international climate policy

2020 was one of the warmest years on record, with climate impacts felt around the world. Global greenhouse gas (GHG) emissions remain high compared to historical levels. This is despite emissions and energy use in 2020 being significantly affected by the measures to combat the global COVID-19 pandemic, with a mixture of short-lived and longer-lasting effects.

This section covers the key indicators of global climate change and its drivers in three subsections:

a) Global climate change

b) Global greenhouse gas emissions

c) Global energy use

a) Global climate change

Global temperatures continue to rise rapidly – with human influence the driver.

Estimated global human-induced warming has now reached around 1.2°C above 1850-1900 (an approximation for preindustrial levels) (Figure 1.1):*

- Global mean surface temperature in 2020 was the joint warmest or second warmest year on record across all prominent global temperature datasets, with the six most recent years being the warmest six-year period in the observational record.†
- All of the present day observed warming is estimated to be due to human activities (+/- 20% uncertainty). Natural climate cycles and events (e.g. volcanic eruptions) are not thought to make a significant contribution to the current level of global temperature above preindustrial levels.
- Human-induced warming is rising at around 0.25°C per decade.‡ At this present rate of increase, human-induced warming would exceed 1.5°C above preindustrial levels (the lowest level referred to in the Paris Agreement long-term temperature goal) by the early 2030s.

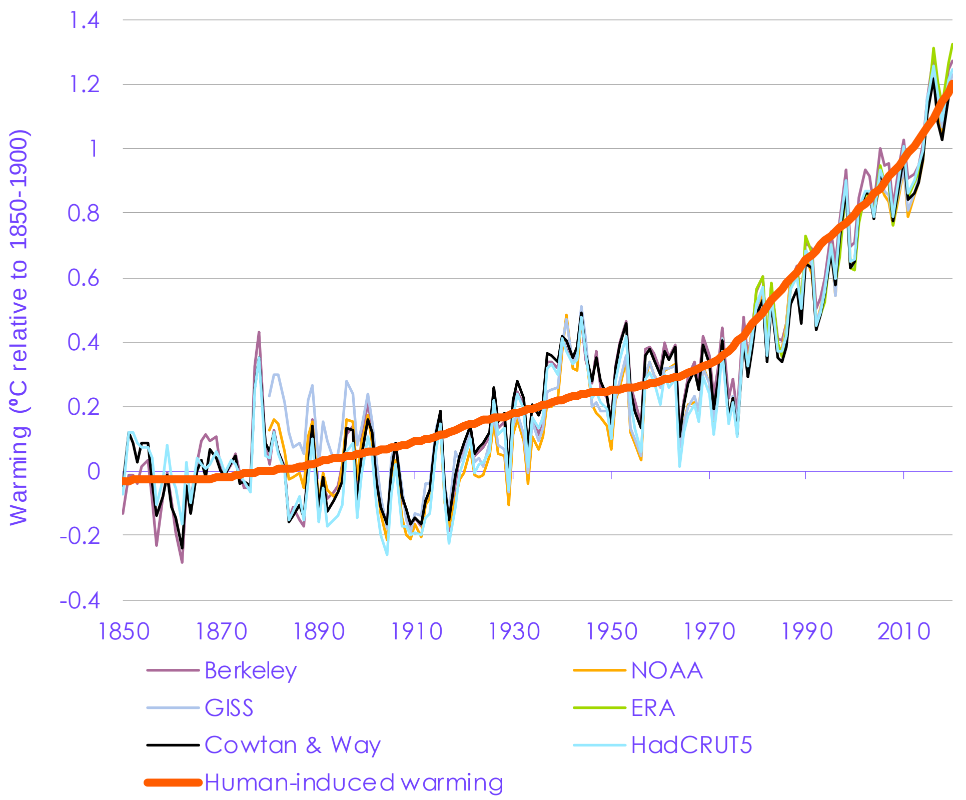
The temporary falls in global CO_2 emissions in 2020 associated with measures to address COVID-19 (section b) did not significantly affect the evolution of atmospheric carbon dioxide concentrations, global temperature or climate hazards, all of which continued to increase as they are primarily determined by cumulative global CO_2 emissions over time.

* Revisions to UK Met Office dataset (HadCRUT), including providing more spatially complete estimates of global temperature have contributed to higher levels of warming above 1850 – 1900 and therefore contributed somewhat to increases in the estimate human-induced warming compared to previous years.

† The direct observational record of global temperature extends back to the mid-nineteenth century. In some records 2020 was the joint warmest year (with 2016) and in some the second warmest.

‡ This rate of increase in human-induced warming is based on a linear trend over the past decade.

Figure 1.1 Global average surface air temperature change



Source: CCC analysis
Notes: Each thin line represents a different global temperature dataset. The NOAA, GISS and ERA datasets are expressed relative to 1850 - 1900 using the offset over the 1981-2000 period from the HadCRUT5 dataset. Human-induced warming is taken from globalwarmingindex.org.

b) Global greenhouse gas emissions

COVID-19-related measures had a large impact on global emissions in 2020 – particularly in developed countries and the transport sector.

For the year as a whole, global CO_2 emissions from energy fell by around 6% in 2020 (relative to 2019 levels), largely resulting from the effects of measures to address COVID-19.[1] This drop in global emissions varied significantly across different regions, sectors and GHGs:

- Sectors. Transport emissions displayed the biggest fall of all sectors through 2020 as it was most affected by the COVID-19 lockdowns. Around half of all global emissions reductions came from transport. This reduction comes largely from road transport emissions but aviation emissions were particularly affected in proportional terms – falling around 50% below 2019 levels.

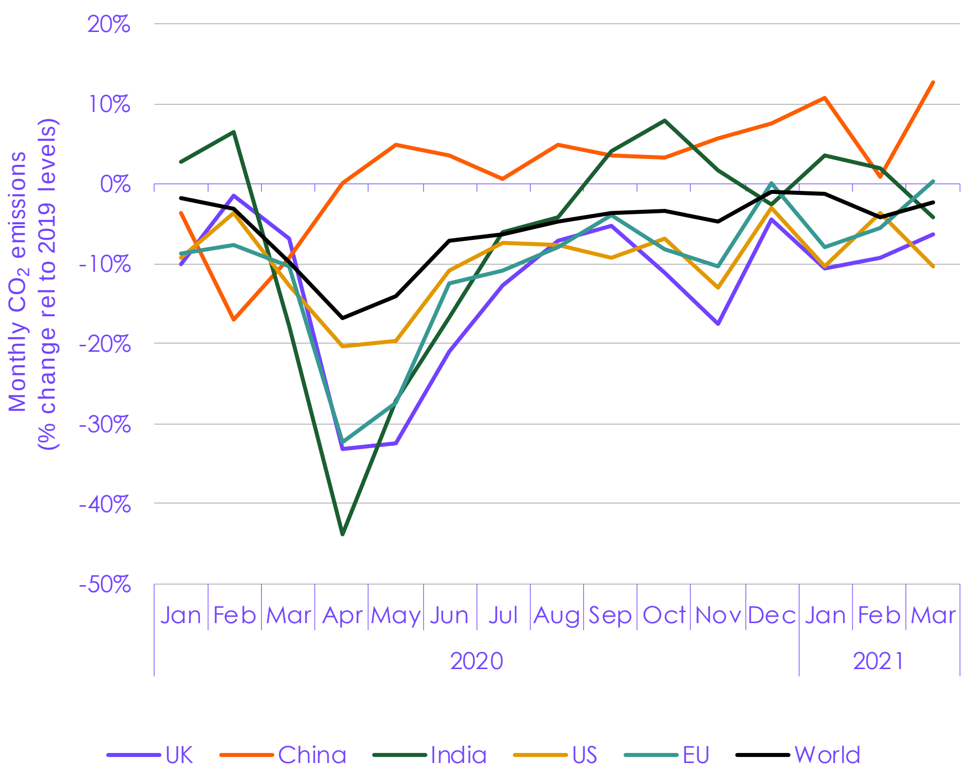
- Regions. The largest falls in emissions came from developed countries (e.g. the United States and the European Union) where sectors that were particularly impacted by COVID-19 lockdowns (such as transport) make up a large share of emissions. China's 2020 CO_2 emissions increased by around 1% over 2019 levels – this was in part due to the earlier impact of COVID-19 in China giving more time for economic stimulus to drive up emissions.

- Greenhouse gases. Accurate global data on GHG emissions from non-energy sectors and for other GHGs is not yet available. It is expected that there would be much more limited COVID-19-related impacts on these emissions than energy related CO_2 emissions as the industries responsible for non-CO_2 emissions (e.g. agriculture) were generally less disrupted.

Emissions rates around the world have now significantly recovered.

Temporary reductions due to COVID-19-related measures have now mostly recovered as restrictions have been relaxed. Where significant restrictions are in place emissions remain somewhat supressed below 2019 levels (Figure 1.2).

Figure 1.2 Monthly CO_2 emissions from the UK and large emitters over the COVID-19 pandemic



Source: Carbon Monitor

c) Global energy use and economic growth

Global GDP decreased in 2020 with knock-on impacts on energy use.

Global GDP is estimated to have fallen by around 3.3% from 2019 levels in 2020 as a result of the pandemic.[2] Contractions in GDP were generally larger in advanced economies than developing ones, but with significant variation across countries (e.g. India saw GDP decline by around 7% relative to 2019 levels).

This large fall in economic activity had large impacts on the patterns of energy use in 2020: [3]

- **Global energy use** fell by 4% in 2020, with the largest and most sustained reductions occurring in advanced economies.

Fossil fuel use was more affected than energy use overall and global electricity use only declined slightly.

- **Fossil fuel use** fell, with particularly large falls in oil use (9%) due to the large curtailment in transport activity. Coal use fell by 4% primarily due to lower electricity demand and the prioritisation of generation with low marginal costs (e.g. renewables). Gas use was less affected than other fossil fuels, only falling by 2% relative to 2019 levels, in part due to increased switching to gas use in the power sector.

- Electricity demand fell by 1% in 2020 relative to 2019 levels largely due to curtailment of industrial and commercial use in the first half of 2020. Generation from renewable sources grew at the largest rate ever – they now generate 29% of total electricity, up from 27% in 2019 (with the total low-carbon generation share now at 39%).

Global emissions are expected to grow in 2021, but will likely remain below 2019 levels.

Current expectations are for a large rebound in 2021 in global GDP (~6% above 2020 levels, 3% above 2019 levels), energy use (~4.5% above 2020 levels, 0.5% above 2019 levels) and CO_2 emissions (~5% above 2020 levels, 1% below 2019 levels).[3] This would see annual global CO_2 emissions rise back to close to (but still slightly below) 2019 levels in 2021. Significant uncertainty remains regarding the level of global emissions in 2021, which will be affected by both the continuing course of the pandemic and the effects of the economic recovery efforts underway around the world.

2. Global progress in decarbonisation indicators

This section looks at progress in the development and deployment of decarbonisation options around the world.

The previous section described the considerable reductions in global energy use and GHG emissions that occurred in 2020 as a result of measures to address the COVID-19 pandemic. Although the impacts on global emissions were large, they are proving temporary as economic activity recovers.

Achieving the global emissions pathways expected to be consistent with the Paris Agreement long-term temperature goal requires rates of emissions reduction nearly as large as those seen in 2020 to be sustained over several decades.* This will need a rapid and sustained transformation towards a global economy without GHG emissions – very different from the lockdown-related causes of emissions reduction in 2020.

This section describes progress across several leading indicators of the global transition towards Net Zero emissions. This is summarised in three sub-sections:

a) Transitions with emerging low or no cost low-carbon alternatives

b) Deep decarbonisation transitions needed for global Net Zero

c) Transitions in global land-use

a) Transitions with emerging low or no cost low-carbon alternatives

Cost reductions means that low-carbon alternatives in power and road transport now have no or limited additional costs.

Significant progress has been made in reducing the cost of several key low-carbon technologies particularly driven through learning-by-doing following large-scale deployment over the last decade.[4] In two areas critical to rapid global emissions reductions this decade, low-carbon technologies are now, or soon to be, as or more cost-effective than high-carbon alternatives:

- **Renewable electricity generation.** Analysis from the International Renewable Energy Agency (IRENA) indicates that more than half of installed renewable electricity generation capacity in 2019 was cheaper than new coal plant alternatives.[5] IRENA estimated that over half of existing coal capacity in 2020 would produce more expensive electricity than replacement with new utility-scale solar PV generation. Renewables are also now increasingly cost-competitive with gas-fired generation with some solar generation sources now producing the cheapest electricity in history.[6]

- **Electric Vehicles.** Analysis from Bloomberg New Energy Finance indicates that the cost of batteries (the most expensive part of an EV) has fallen by nearly 90% over the last decade and EVs are expected to be cheaper than fossil fuel vehicles by the mid-2020s across a range of different vehicle types.[7]

The emerging cost-competitiveness of low-carbon options in these two areas supports the prospect of a rapid global shift towards these technologies to meet demand for new investments in electricity generation and road transport. A large and rapid increase in the market penetration of these technologies is key to

* Global annual CO_2 emissions fell by around 2.5 $GtCO_2$ in 2020, with falls of around 1 – 2 $GtCO_2$ per year in the global emissions rate required each year over the 2020s and beyond to keep warming to the Paris Agreement long-term temperature goal. Le Quéré, C, et al. (2021) Fossil CO_2 emissions in the post-COVID-19 era. *Nature Climate Change*, 11, 197–199.

supporting the large reductions in global emissions by 2030 required in global pathways expected to be consistent with the Paris Agreement long-term temperature goal.

Momentum is gathering behind accelerated deployment in these sectors.

Commitments and intentions from major markets suggest momentum is gathering behind a transition in several areas, but further and faster progress is still needed to make a big impact on global emissions:

- **Major car manufacturers are committing to a transition to EVs.** A growing number of car manufacturers are making commitments to end sales of internal combustion engine cars. For example, Jaguar has committed to only selling EVs from 2025, Volvo has committed to becoming an electric only retailer by 2030, General Motors by 2035, and Honda by 2040 (including fuel-cell vehicles). These manufacturer commitments support end dates for new international combustion engine cars targeted by several large car markets such as Japan (2035 date for ending petrol and diesel sales), California (2035 phase-out date) and the UK (2030).

- **EVs are rapidly growing as a market share of new car sales, but these growth rates need to be sustained.** In 2020, the EV share of new sales in some large regions reached new highs (e.g. 10% in Europe and 6% in China). Despite the overall decline in passenger car sales these increased shares correspond to increased numbers of EVs sold, but the impact of COVID-19 on the global car market creates uncertainty about how the EV sales share will change over the coming years. Most major car markets will need to see battery EVs reach 100% of new sales by 2030 – 2040 under pathways expected to keep warming well-below 2ºC.

- **Large electricity markets are signalling a shift to low-carbon sources.** The USA (the world's second largest electricity producer) has stated its intention to achieve a carbon-free electricity grid by 2035. Pathways to achieve this target require a large scale-up of low-carbon sources with the share of US electricity generation coming from low-carbon sources (mainly renewables) increasing from 37% today to 70-85% by 2030.[8] China, the world's largest electricity producer, has recently raised its target for the non-fossil electricity generation share for 2030 from 20% to 25%.

- **Projections for renewable deployment are being revised upwards, but investment needs to scale up faster.** More than 80% of new electricity capacity added in 2020 came from renewable sources.[9] The International Energy Agency (IEA) recently increased their forecast for capacity installations for wind and solar electricity generation over the coming years by around 40% relative to a year ago.[10]

Accelerating global deployment significantly this decade will require that other barriers are also addressed.

Other factors will also be important for supporting a rapid increase in the market penetration of these technologies. This includes adapting electricity systems for increasing generation shares from variable renewable sources and ensuring that sustainable supply chains, charging infrastructure, and recycling for the key mineral resources are in place to support a widespread, rapid scale-up in global EV sales.

The existing coal plants in the global power system must also be tackled.

Achieving rapid global emissions reduction this decade will also require addressing the trends that are opposing emissions reduction (e.g. increasing sales of large sports utility vehicles around the world) and tackling the existing high-carbon capital stock in the global power sector which needs to be rapidly retired and replaced (Box 1.1).

Box 1.1
Emissions from coal-fired power generation

Rapidly reducing global CO_2 emissions from coal electricity generation is one of the key elements to rapid global emissions reductions consistent with the Paris Agreement. The IEA Net Zero by 2050 pathway requires no new coal-fired power plants from today with unabated coal generation eliminated from developed countries by 2030 and all countries by 2040.

Current trends are far from consistent with a rapid reduction pathway:

- The global pipeline for planned new coal power plants held constant in 2020 (following falls each year since 2015). This was almost entirely due to expansion in China (which was the location for 76% of new capacity commissioned) as part of stimulus measures related to COVID-19. New Chinese plants completed in 2020 more than offset the net retirements in the rest of the world, increasing the global coal generation capacity by 12.5 GW.
- Net retirements in coal capacity have thus far largely occurred in developed regions with older coal fleets. Today around 60% of the current global coal capacity is under 20 years old (typical lifetimes can be 40 years or more) and is concentrated in emerging and developing economies. If current plants are run to the end of their natural economic lifetimes, then they will account for a large fraction of the total cumulative CO_2 emissions consistent with keeping warming to the Paris Agreement long-term temperature goal.
- Projections for global coal-fired generation over the coming years indicate an expected plateau, as opposed to a significant decrease. Early retirement and retrofitting with carbon capture and storage on large fractions of the young-life global goal fleet will be needed to achieve emission reductions consistent with the Paris Agreement.

Although the vast majority of young-life and planned coal-fired power plants are in emerging and developing countries, financial institutions in developed countries still play an important role in supporting the planned coal pipeline. A study estimates that developed countries are linked with financing for nearly 40% of cumulative emissions from the existing global coal pipeline on a 'financed-emissions' basis.[11] Action from developed countries to end support for coal finance from public sources (as recently pledged by the G7 countries) and to create frameworks for similar action from the private sector can therefore contribute to a more rapid global coal phase-out.

Source: Global Energy Monitor (2021) *Boom and Bust: Tracking the global coal plant pipeline*; IEA (2020) *World Energy Outlook 2020*; Manych, N. et al. (2021) Finance-based accounting of coal emissions. *Environmental Research Letters*, 16, 044028.

b) Deep decarbonisation transitions needed for global Net Zero

Other technologies outside of power and road transport need to be developed further this decade to enable an at-scale global roll-out towards Net Zero.

A pathway to global Net Zero emissions around or soon after mid-century will require large-scale global deployment of decarbonisation options beyond the power and road transport sectors. Unlike in electricity generation and road transport, low-carbon alternatives in these sectors generally have a cost premium associated with them today, although costs are falling in many areas. Development and deployment of decarbonisation options in these areas this decade will be important for enabling a rapid large-scale global deployment in the following decade.

Around the world there are relevant initiatives underway in several areas:

- **Carbon capture and storage (CCS).** There are presently 65 CCS projects on power and industry in operation or in development globally.[12] Most operating facilities are in North America, supported through tax incentives and in most cases income from use of the captured CO_2 for enhanced oil recovery. In Europe, a handful of projects based around using CO_2 storage under the North Sea are in advanced stages of planning.

- **Greenhouse Gas Removals (GGR).** There is growing international research and development into engineered GGRs, with a small number of test facilities in operation globally. Additionally, several major global companies have recently made commitments to purchase GGRs to compliment the use of renewables and improved resource efficiency to meet their Net Zero targets. Although small at present, corporate commitments such as these, if replicated more widely, could provide an early market for dedicated GGR credits – helping to facilitate the development and cost discovery needed for engineered removals to play a role in reaching Net Zero.

- **Hydrogen.** By 2030, significant electrolyser capacity (for hydrogen production) is being planned for in France, Germany and the Netherlands (5 GW, 6.5 GW and 3-4 GW respectively) and the European Commission has recently released a new hydrogen strategy aiming to reach 40 GW of electrolyser capacity across the EU.

Rapidly moving from demonstration projections towards constructing clear business models to help support wider deployment will be important to enable global use at scale over the coming decades. Behavioural changes will also be an important complement to moving towards global Net Zero. The IEA recently published a roadmap for how these key pillars of decarbonisation can be deployed together to reach global Net Zero CO_2 emissions by 2050. This roadmap can act as a global guide to investment decisions that may (or may not) be aligned with the more ambitious end (i.e. 1.5ºC) of the Paris Agreement long-term temperature goal (Box 1.2).

Box 1.2
International Energy Agency Net Zero Energy 2050 pathway

In May 2021 the International Energy Agency (IEA) published ***Net Zero by 2050 A Roadmap for the Global Energy Sector*** (NZE2050). This set out a comprehensive pathway to global Net Zero CO_2 energy and industry emissions (around three-quarters of global GHG emissions) consistent with limiting peak warming to 1.5°C (~50% probability).

The scenario keeps biomass use, residual fossil fuel use, and engineered greenhouse gas removals to the low end of the range from global pathways assessed by the IPCC, and does not use offsetting removals in the land sector. The pathway also involves rapid and deep reductions in methane emissions from the energy sector (falling by 75% by 2030).

Rapid transitions to low-carbon options are required in all energy sectors in the IEA roadmap, with many parallels with the CCC pathway for the UK:

- **Power sector**: Rapid build-out of renewables (particularly solar and wind) enables Net Zero emissions from the power sector to be reached by 2035 in advanced economies, and by around 2040 in developing economies. In 2050 nearly 90% of global power generation is from renewable sources (solar, wind, hydro and bioenergy), with nuclear contributing most of the remainder.
- **Transport**: CO_2 emissions from transport fall 90% by 2050 (from today's levels) despite global passenger demand doubling by 2050 and freight transport increasing by two and a half times. Globally, almost all new light duty vehicle sales are zero emissions vehicles (mostly battery electric) by 2035, and nearly all heavy-duty vehicle sales are fuel cell or electric by 2050. Low-carbon fuels and behaviour change help reduce emissions from aviation and shipping.
- **Buildings**: Widespread retrofitting of existing buildings and requiring all new builds across the world by 2030 to be zero-carbon-ready leads to emissions falling by 40% by 2030 and more than 95% by 2050 relative to today. From 2025, oil and coal boiler

sales end and all new gas boilers installed are hydrogen-ready. Heat pumps become the main space heating technology worldwide from around 2045.

- **Industry**: Fuel-switching to hydrogen and carbon capture both play a major role in decarbonising emissions from industry, which fall 20% by 2030 and 90% by 2050. Key technologies are demonstrated during the 2020s such that from 2030 all new industrial facilities are near-zero emissions.

- **Fuel supply**: No new oil and gas fields and coal mines are approved for development (beyond already committed projects) in the IEA pathway. Low-carbon hydrogen is produced from both natural gas with CCS and electrolysis.

Behaviour change plays a role in almost two thirds of the emissions reductions. Most of this comes through consumer adoption of low-carbon technologies such as electric cars, but 8% of total emissions reductions come from directly changing practices such as reduced business flights.

The IEA estimate that all the technologies required to achieve deep reductions in global emissions by 2030 exist today, with real-world examples of policies to drive their adoption. Sustaining the required rates of decarbonisation after 2030 will require further commercialisation and development this decade of additional options for deeper decarbonisation. The investment for the transition could bring significant additional benefits to global GDP (additional 4% increase in 2030), global energy sector jobs (9 million net increase in employment in 2030) and development (universal access to clean energy by 2030 and major air quality improvements for millions across the world).

Source: International Energy Agency (2021) *Net Zero by 2050 A Roadmap for the Global Energy Sector*.

c) Land-use transitions

Reducing emissions from global land use change is a key part of pathways towards Net Zero.

CO_2 emissions from land-use change and forestry are about 13% of total global GHG emissions, arising primarily from tropical deforestation of land with very high carbon content, often associated with agricultural expansion.* Many global pathways consistent with the long-term temperature goal of the Paris Agreement transform this net source of emissions into a net sink over the next few decades.

The world is not on track to achieve its deforestation reduction targets – although some progress has been made.

There has been some progress towards reversing global forest loss (Figure 1.3) but the world is not on track to achieve the UN Strategic Plan for Forests target to increase the global forest area by 3% by 2030 (relative to 2015 levels). Forest cover is still being lost overall as deforestation more than offsets forest expansion:

- **Deforestation.** Around 95% of deforestation occurs within the tropics – 17% of global deforestation occurs within Brazil alone (by area).[13] Around 10-15% of global deforestation is driven by demand for agricultural and food products (e.g. beef) for export to developed countries.[14]

- **Forest expansion.** Forest expansion is comprised of afforestation (intentional creation of new forests) and natural forest expansion (return of forest to previously forested land). Afforestation rates are highest in China where over one million hectares per year are being planted. Natural regeneration contributes another one million hectares per year of increasing forest cover in China – meaning that over 40% of global forest expansion is located there. Net loss of forest is largely concentrated in South America and Africa.

Rapidly reducing tropical deforestation is essential to significantly reducing global land-use change emissions.

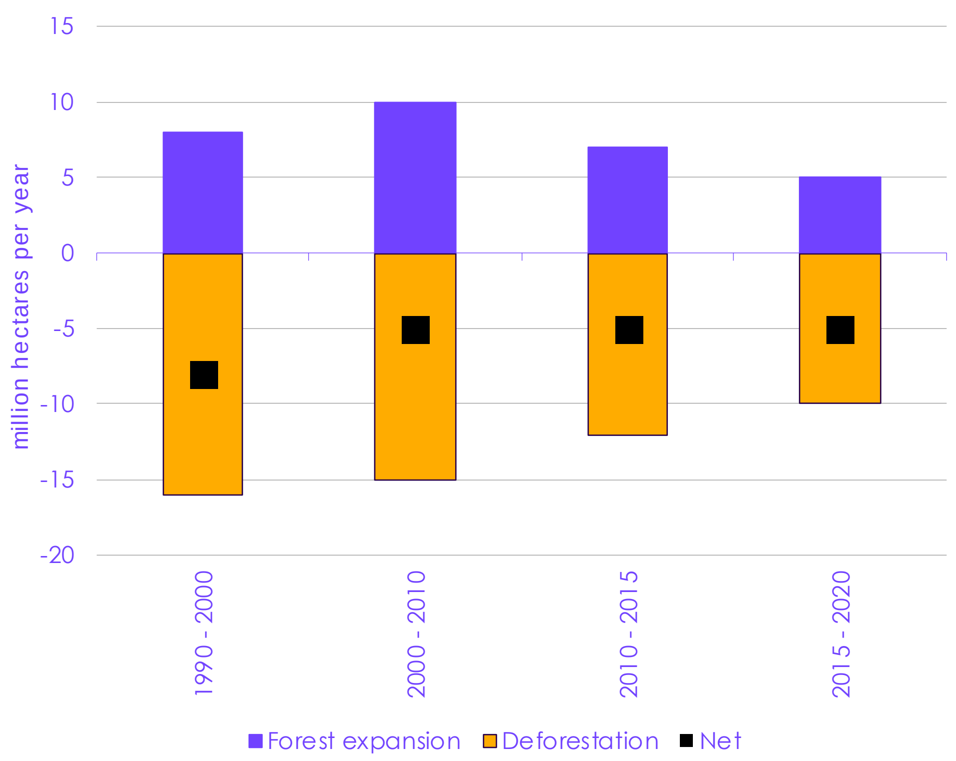
Reducing global emissions from land-use change requires a focus on ending tropical deforestation. This is because deforestation in this part of the world is primarily removing very high-carbon stock primary forest that has never been cut

* Including agricultural emissions around 25% of total global GHG emissions come from the agricultural and land-use sectors. IPCC (2019) *Special Report on Climate Change and Land*.

before, leading to very large carbon losses into the atmosphere. Emissions from tropical deforestation cannot be compensated with equal areas of afforestation in other parts of the world, although afforestation efforts elsewhere in the world are also important levers for the global effort to reduce emissions and restore biodiversity.

Tropical deforestation is primarily driven by agricultural expansion (for both domestic consumption and export). Developed countries can support ending tropical deforestation by improving corporate supply chain standards to provide incentives for tropical exporters to avoid deforestation, and capacity building to improve agricultural yields in tropical countries to reduce the pressure to convert forested land.

Figure 1.3 Trends in global forest cover



Source: FAO (2021) *State of the World's Forests 2020.*
Notes: Forest expansion is a combination of intentional afforestation and natural forest regeneration.

3. Progress in international climate policy

This section looks at progress in all aspects of the Paris Agreement long-term goal.

The Paris Agreement has three aspects to its long-term goal:

1. **Mitigation.** Holding warming to 'well below' 2°C above preindustrial levels and 'pursuing efforts' to limit it to 1.5°C above preindustrial levels.

2. **Adaptation.** Enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change.

3. **Finance.** Aligning financial flows with a pathway towards low greenhouse gas emissions and climate-resilient development.

COP26, to be held in Glasgow in November 2021, is an opportunity to assess progress and raise global ambition across all three aspects of the Paris Agreement long-term goal.

This section looks at progress in all three aspects in turn, before summarising the path to COP26 and the UK's role as the COP26 president.

a) Progress in mitigation policy

Countries were expected to 're-communicate' their Nationally Determined Contributions (NDCs) including emissions reduction commitments for the period to 2030, by the end of 2020. Countries were also asked to submit mid-century long-term low GHG emission development strategies by the same date. There is an expectation from many parties that NDC ambition should be raised as parties re-submit their plans, consistent with the ambition 'ratchet' mechanism envisaged under the Paris Agreement.

Countries have been submitting strengthened emissions reduction pledges ahead of COP26.

Strengthening of national emissions reduction targets has focused on two separate time horizons:

- **Mid-century.** More global Net Zero commitments are being made with dates of Net Zero around the middle of the century. Several large emitters including China, USA, EU and Japan have Net Zero commitments for mid-century (2050 – generally including all GHGs – except for China, which has a 2060 commitment). It is estimated that 68% of GDP and 61% of global GHG emissions are now covered by some kind of national Net Zero commitment for mid-century.[15*] The stringency of these Net Zero commitments varies, with most coverage being from 'aspirational' targets that aren't backed up by law or official policy documents.

- **Near-term.** There has been less commitment for enhanced emissions reduction for the period to 2030 (the period for the first NDCs). The UNFCCC estimated that 40% of countries had submitted revised 2030 NDCs by end of 2020. Significant increases in ambition have been adopted by large G7 emitters over recent months (including the USA, EU, Japan, UK and Canada), aligning their NDC commitments with mid-century Net Zero targets. Under current pledges for 2030, emissions are expected to be

[*] These Net Zero targets are of variable stringency, with a wide range of standards applied. Corporate action, including the UN sponsored 'Race to Zero', have also significantly expanded over recent years with even greater variation in the associated conditions.

around 15% lower than 2019 levels (around 5% lower than 2010 levels).[16] It remains unclear whether a significant increase in ambition from China (~25% of global emissions) will be seen ahead of COP26.

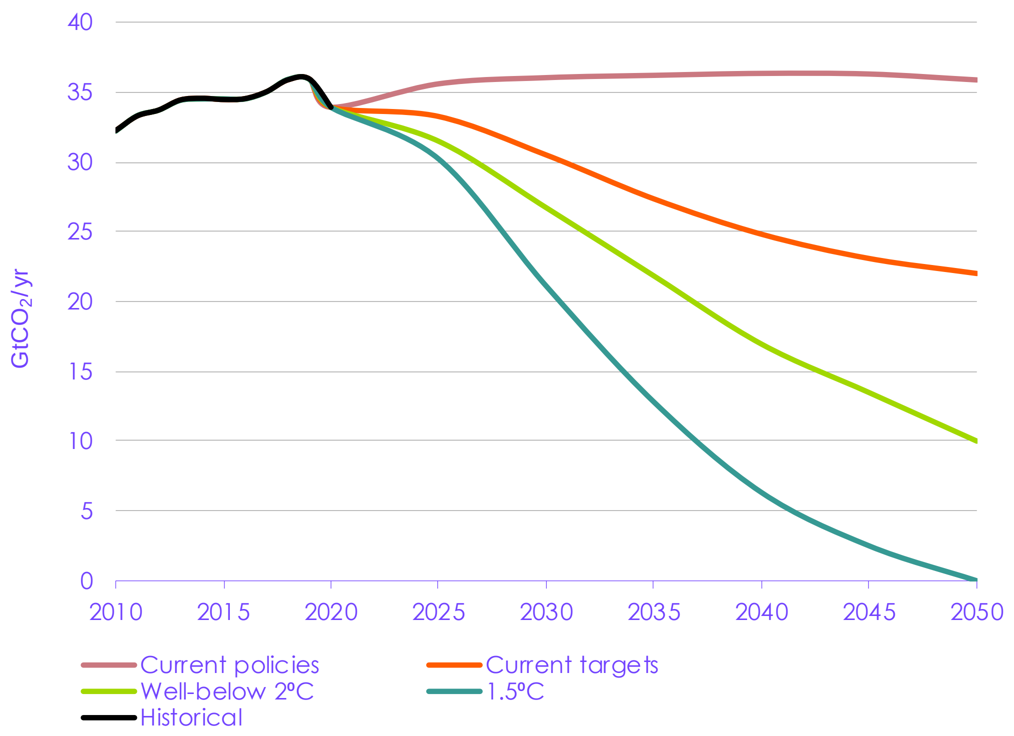
Current trajectories indicate a plateau for global emissions over the coming decade, with a significant gap to Paris Agreement consistent pathways.

If achieved, current commitments (both for 2030 and mid-century), could be consistent with pathways keeping expected (central estimate) warming by 2100 to around 2°C above preindustrial levels. However, global emissions in 2030 would be far above emissions in pathways expected to keep warming to 'well-below' 2°C or 1.5°C (Figure 1.4). Significant increases in Chinese ambition to 2030 will be essential to any efforts to close this gap alongside enhanced commitments from other large emitters that have yet to strengthen their 2030 commitments.

In nearly all cases significant strengthening of climate policies will be required to deliver on the pledged emissions reduction commitments. Current policies imply emissions continuing at recent levels, which would lead to expected warming by 2030 of around 3°C above preindustrial levels.

There is an increasing prevalence of 'framework' climate laws around the world alongside an increasing number of expert climate advisory bodies. These can help provide a structure to support delivery of NDCs and long-term targets if they are designed with robust governance standards to hold Governments effectively to account on delivery over both the long- and short-terms.[17]

Figure 1.4 Global emissions gaps to Paris Agreement consistent pathways



Source: IEA (2021) *Net Zero By 2050: A roadmap for the Global Energy Sector*: IEA (2020) *World Energy Outlook 2020*.
Notes: 'Current policies' uses the IEA Stated Policies Scenario (STEPS), 'Current targets' the IEA Announced Pledges Case, the 'Well-below 2°C' the IEA Sustainable Development Scenario (SDS) and '1.5°C' the IEA Net Zero Emissions 2050 scenario. Emissions are CO_2 only emissions from energy and industrial process emissions.

b) Progress in adaptation

Making progress on adaptation is a key priority for COP26.

Climate impacts are already being experienced around the world at today's level of warming and will increasingly make the achievement of some of the global Sustainable Development Goals (SDGs) more challenging. 81% of developing countries are taking steps to develop National Adaptation Plans, while 20 countries have submitted full plans.* Around 70% of countries have adopted at least one national-level adaptation planning instrument, but with large variation in their detail.[18] Making progress on the global adaptation goal has been signalled as one of the key priorities for COP26 by the incoming UK Presidency.

Countries can support the raised adaptation ambition across at least three areas:

All countries can do more to mainstream adaptation considerations into policy making.

- **Embedding adaptation in national policy making.** Adaptation considerations need to be mainstreamed across national policy to properly help limit future climate risks. Integration into planning systems will be particularly important to reduce the risks of locking in climate exposure through long-lived infrastructure under construction around the world today. Similarly, adaptation considerations need to be integrated better with mitigation plans to ensure that efforts to achieve NDC and mid-century targets are not compromised by climate risks and that co-benefits for reducing climate risks are maximised.

- **International collaboration.** Building capacity around the world is key to improving resilience to climate impacts. Collaboration between countries to share best practices, technical expertise and policy structure can help accelerate this. New international alliances such as the Climate Adaptation Alliance – launched by the UK and others at the end of 2020 – can help facilitate these collaborations and skill-sharing.

Better evidence bases – particularly in developing countries – will be key to improving resilience to climate risks.

- **Improving the evidence base for effective adaption.** In many parts of the world taking evidence-based actions to improve climate resilience is hampered by a lack of good data sources on past and present local weather hazards and their impacts. For example, there is a lack of documented data on the history of heatwaves impacts across Africa, making it harder to construct effective early warning systems and heat action plans.[19] The evidence base for assessing the effectiveness of adaptation interventions for reducing climate risks also needs to be improved across the world. The global research capacity can be directed to help close these important evidence gaps.

A successful COP26 outcome will not be possible without significant progress on issues related to global adaptation to climate impacts being experienced today and expected for the future. Developed countries also have a key role to play through the provision of climate finance, and technology/knowledge transfer.

c) Progress in finance

Delivering the rapid reductions in global emissions needed to restrict warming to the Paris Agreement long-term temperature goal, while building resilience to climate impacts, requires a large shift in global investment patterns. Access to capital sources for this investment is key to realising this, particularly in developing countries.

* 14 countries have submitted Adaptation Communications (detailing the action that they are taking on adaptation) to the UNFCC as requested under Article 7 of the Paris Agreement.

Developed countries are not on track to deliver the $100 billion per year climate finance goal pledged for 2020.

Prior to the Paris Agreement, parties to the UNFCCC adopted a goal of reaching a $100 billion per year flow of climate finance from developed to developing countries by 2020. Indications are that this commitment has not been met:

- There is currently no agreed way to measure these climate finance flows, but a report by the UN indicated that it was highly unlikely that the $100 billion per year commitment was achieved in 2020.[20] The OECD estimates that $78 billion was mobilised by developed countries in 2018 (Figure 1.5).

- The $100 billion per year in mobilised climate finance is itself a small fraction of the global investments needed to transform the global economy but has large political significance. Many developing countries see it as a key test of whether developed countries will take their commitments seriously. Many 'conditional' NDCs from developing countries explicitly mention needing climate finance to deliver on the higher level of ambition.

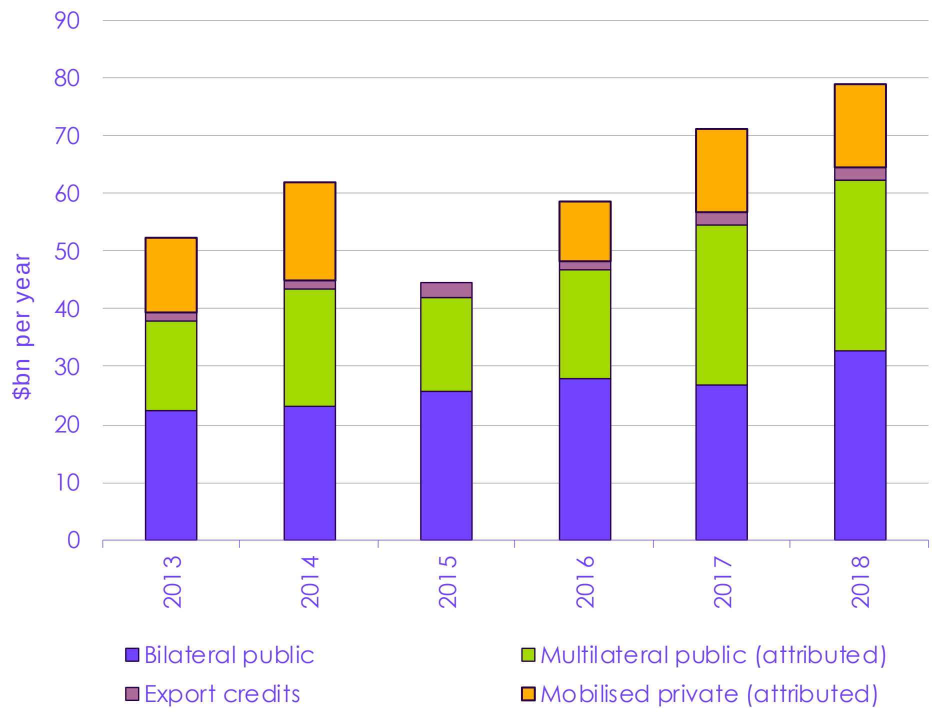
A more equal split between mitigation and adaptation climate finance is needed.

- Due to the effects of COVID-19, spending on emergency healthcare investments and economic relief has restricted many developing countries' capacity for financing adaptation and resilience. Investment in adaptation fell globally in 2020 despite a record number of floods, droughts, wildfires and storms affecting more than 50 million people worldwide.[21] The vast majority (~80%) of adaptation finance is from public sources, but adaptation finance is only around 20% of total climate finance mobilised by developed countries. Developed countries can improve the access to finance for adaptation by allocating it a much larger share of their climate finance spending and by supporting private sector investment.*

Meeting this commitment is a key expectation from developing countries ahead of COP26. Countries have also agreed that $100 billion per year in mobilised climate finance should be a floor level for beyond 2020 with an expectation for a new higher goal to be set by 2025. Negotiations on this are expected to start at COP26.

* For example the UN has launched a 'Race to Resilience' initiative to involve non-state actors (including companies) to reduce vulnerability to climate impacts.

Figure 1.5 Progress towards the $100 billion per year climate finance goal from developed countries



Source: OECD (2020) *Climate Finance Provided and Mobilised by Developed Countries in 2013-18.*
Notes: In 2015 there was no data available for mobilised private finance.

d) The path to COP26 and beyond

The period ahead of COP26 is critical for a successful outcome in Glasgow.

The coming months contain several events which will lay the groundwork for a successful COP26. These include important multilateral forums (such as the G20) which present key opportunities for countries to bring forward new commitments on climate finance and emissions reductions from large economies. UNFCCC negotiations sessions in June and at the pre-COP in October will also be critical for securing the negotiated outcome at COP26 itself in Glasgow.

The UK has an important role in ensuring sufficient progress is being made over the months before COP26 as incoming COP president.

The UK has now submitted a full set of commitments to the UNFCCC as required under its international obligations (Box 1.3). Its focus now should be on best utilising the COP26 presidency to secure a genuinely beneficial outcome (Box 1.4).

Box 1.3
The UK's submissions to the UNFCCC in 2020

In December 2020, the UK submitted a set of documents to the UNFCCC in accordance with its international obligations.

- **The UK's first NDC.** The NDC submission contained a target to reduce aggregated GHG emissions by at least 68% in 2030 (relative to 1990 levels) in accordance with the Committee's advice. This headline target does not include the UK's share of emissions from international aviation and shipping – as advised by the Committee. A commitment to include these emissions within the Sixth Carbon Budget has now been made by the Government. The NDC document specified that the Government intends to achieve the target through domestic emissions reductions.
- **Adaptation Communication.** The Government submitted an Adaptation Communication, separate to the UK's NDC. This document summarises the climate risks facing the UK and actions being taken to address them – including the National Adaptation Programme. Progress on adapting to climate change in the UK is assessed in the companion report to this one which finds that, despite progress, significant gaps remain to deliver improved resilience to climate impacts in the UK. No new commitments to raise UK adaptation ambition beyond the actions and policies already being implemented were provided in either the NDC or Adaptation Communication.
- **Finance Biennial Communication.** The document provided a summary of the activities that the UK has supported through its climate finance provision. It also mentions the UK's 2019 commitment to provide £11.6 billion in dedicated climate finance over the 2021/22 – 2025/26 period. This is double the level of support over the previous five-year period and is protected at this level against the announced temporary cuts in UK Official Development Assistance (ODA) from 0.7% to 0.5% of Gross National Income. The £11.6 billion funding is additional to the UK's contribution to the 'core' budget of large multi-lateral development banks, some of which will be used to support climate-related projects. The UK has also committed to align the full extent of its ODA spend with the Paris Agreement and has implemented an end to export finance for overseas fossil fuel investments. The communication also reiterated the UK's commitment to maintaining an approximately equal split between mitigation and adaptation projects in its climate finance.

These documents, together with the legislation of the UK's Sixth Carbon Budget, represent a full summary of the UK's current level of ambition in tackling climate change. The UK should update its mid-century long-term low greenhouse gas emission development strategy with the UNFCCC (currently the *Clean Growth Plan* - targeting the previous long-term target of an 80% reduction in emissions by 2050) with its new Net Zero Strategy when it is published ahead of COP26, This will provide a vision of the actions and policies that will be brought forward to achieve the domestic carbon budgets and Net Zero target.

Box 1.4
The UK's role in delivering a COP26 with global climate benefits

The UK will have an important role in delivering a successful COP26 outcome as the COP President (in partnership with Italy), alongside its presidency of the G7 group of countries this year. Updated NDCs are expected from all countries ahead of the main COP26 negotiations and will not be negotiated directly at the conference.

There are several aspects where the UK will be required to play an important role:

- **Continuing to support increases in ambition and implementation.** Several large emitter nations have now updated their 2030 NDCs. However, other large emitters (including China) have yet to update their headline ambition. The UK will need to continue to champion increased NDC ambition through to COP26 and should also bring focus to improving implementation plans to achieve these strengthened targets. Internationally agreed commitments on key aspects of delivery (e.g. ending coal fired power generation) could help facilitate this.
- **Securing buy-in from all countries for a COP26 outcome.** UNFCCC outcomes need to be unanimously agreed by all parties. The UK presidency has a critical role in building support across all countries ahead of the conference. This will mean giving issues of adaptation, climate finance, and loss and damage prominence in the negotiations. The UK can support this by providing a clear commitment ahead of COP26 on the timetable by which the UK's ODA contribution will return to 0.7% of Gross National Income, and by helping to leverage additional finance commitments from other developed countries to demonstrate a clear pathway to achieving and exceeding the $100 billion per year goal.
- **Championing a 'climate-aligned' recovery from COVID-19.** The global aggregate effects of economic recovery measures resulting from the ongoing COVID-19 pandemic are not consistent with the investment profile needed to sustain continued declines in global emissions this decade.[22] These investments are critical for the trajectory of global emissions this decade and keeping the Paris Agreement long-term temperature goal in reach. Having taken on leadership of UN work on 'Recovering Better For Sustainability', the UK should use its presidency to support a step up in efforts on this front globally. The UK should also be sensitive to the wider challenges facing developing countries emerging from the COVID-19 pandemic and contribute actively to international efforts to address this.
- **Carbon markets and the Paris Agreement rulebook.** A major focus of the negotiations is expected to be finalising the outstanding aspects of the rulebook for the Paris Agreement, including rules on carbon markets and transparency of NDCs under the Agreement. As COP President, the UK has an essential role to ensure that any new rules for international carbon markets have the highest standards, ensuring that they are genuinely supportive of efforts to reduce global emissions. Postponing agreement on market rules at COP26 (as at COP25) would still be preferable to a compromised deal that could lock in a system which may undermine global ambition and accountability. The UK presidency can also champion high-integrity standards in voluntary carbon markets through its COP26 Finance workstream.

Action in these areas, alongside the recommendations to align domestic policy ambition with the UK's Net Zero target, NDC and Sixth Carbon Budget elsewhere in this report, can help the UK maximise the chances of delivering a successful COP26 with genuine benefits for the global effort to address climate change.

The UK should prioritise maintaining international momentum for tackling climate change over the period between COP26 and the global stocktake in 2023.

After COP26 the next significant moment in the Paris Agreement cycle is anticipated to be the first global stocktake in 2023. The UK can help maintain international momentum for the post-COP26 period by championing longer-term initiatives that can help ensure activities and outcomes feeding into COP26 (such as the COP26 campaigns) are maintained and lead to long-term benefits for global efforts to tackle climate change.

As part of this, the UK should publish a new strategy for its international climate policy during its COP26 presidency (which extends for a year after COP26) to refresh its strategy and signal its commitment to supporting international climate action over the long term.* This should include a recognition of the need for countries to produce credible plans now to deliver on strengthened emissions reduction commitments. The UK's recent commitment to include international aviation and shipping emissions within the Sixth Carbon Budget can also be leveraged internationally, including through international forums to agree a Paris Agreement compatible emissions target for international aviation and a mechanism to deliver it that is fit for purpose.

* This strategy should flesh out the UK's commitment to place climate change as the number one priority in the recent Integrated Review of foreign and defence policy and ensure that a joined-up perspective is maintained on how the UK's climate finance is spent.

Endnotes

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Chapter 2

UK emissions and drivers


1981

Introduction

This chapter outlines UK progress towards reducing the UK's greenhouse gas emissions, including the UK's share of international aviation and shipping emissions as covered by the Sixth Carbon Budget.

UK emissions have reduced consistently since 1990, with average annual falls of around 18 $MtCO_2e$ since 2012, similar to those needed to meet the Sixth Carbon Budget. However, progress so far has been dominated by the power sector, while progress in future will need to cover the whole economy.

The pandemic and resulting restrictions have caused sharp falls in economic activity, energy demand and emissions in 2020.* UK emissions and output will almost certainly increase as lockdown restrictions are lifted, but the permanent impact of the pandemic on UK emissions and economic activity is still unclear.

Our key messages are:

- **UK greenhouse gas emissions were 499 $MtCO_2e$ in 2019.** This includes the UK's share of international aviation and shipping emissions.
- **Our greenhouse gas consumption footprint was 703 $MtCO_2e$ in 2018.** This includes emissions embedded in the goods and services consumed in the UK even if they are produced overseas. Consumption emissions were 37% higher than production emissions in 2018. Data for 2019 will be published next year.
- **From 1990 to 2019, UK emissions fell by 40%, while the economy grew by 78%.** The UK's consumption footprint has fallen at a comparable rate since 2007, but by less (29%) since 1990 (Figure 2.1).
- **UK emissions fell by a record 13% in 2020 to 435 $MtCO_2e$**, 48% below 1990 levels. The fall in 2020 was almost entirely due to the impacts of the pandemic, particularly reductions in road and air travel, as well as lower overall energy demands.
- **It is unclear how far the impacts of the pandemic on emissions will persist** in future, but transport emissions are likely to rebound to some extent in 2021 as lockdown measures are lifted.
- **Progress outside the power sector has been limited.** If annual changes in emissions return to the same per-sector trend as the previous decade, the Sixth Carbon Budget will be missed by a huge margin. Now is the time to extend progress across all sectors of the economy.

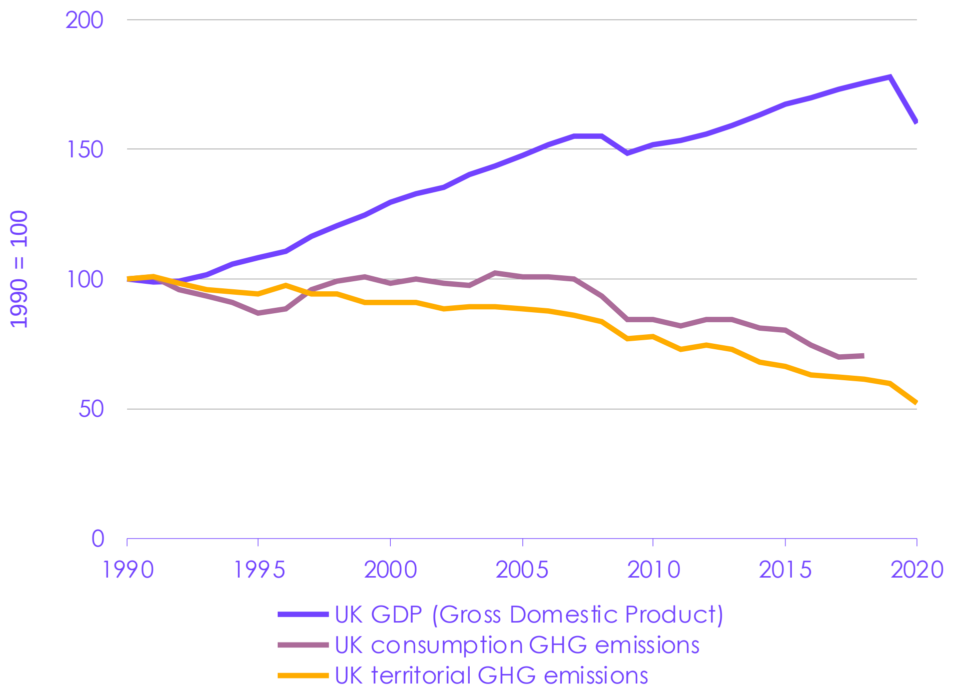
We set out our analysis in the following three sections:

1. Progress reducing UK emissions
2. Impacts of COVID-19 on emissions and behaviours in 2020
3. Progress reducing the UK's carbon footprint

* Estimates of the UK consumption footprint for 2020 are not yet published, but they will certainly be lower than in 2019 due to both lower territorial emissions and a fall in goods imported to the UK in 2020.

The UK economy has grown by nearly 80% from 1990 to 2019 while both territorial and consumption emissions have fallen.

Figure 2.1 The UK economy has grown while territorial and consumption emissions have fallen



Source: BEIS (2021) *2020 UK Greenhouse Gas Emissions, Provisional Figures*; ONS (2020) *Gross Domestic Product: chained volume measures: Seasonally adjusted £m*; Defra (2019) *UK's carbon footprint*; CCC analysis.
Notes: The UK's share of International aviation and shipping emissions is included in both the territorial and consumption emissions statistics.

This section reviews trends in UK emissions in the decade up to 2019, and the change in emissions in 2020 during the pandemic.

In 2020 emissions fell at a record rate, almost entirely due to the COVID-19 lockdowns and the resulting reduced demand for energy, particularly for travel.* Without action now to lock in beneficial changes to the way people work and travel, these factors are likely to be mostly temporary and will not significantly contribute to the fundamental changes that will be needed to achieve Net Zero, which must be more structural in nature (see Chapter 3).

To meet the Sixth Carbon Budget, UK emissions outside of the power sector must fall by an average of around 17 $MtCO_2e$ over the next fifteen years – compared to an average fall of just 5 $MtCO_2e$ per year from 2009 to 2019 – and emissions in the power sector must continue to fall in the context of growing demand.

a) UK greenhouse gas emissions before 2020

Prior to 2020, electricity decarbonisation was a major success story, but other sectors including surface transport, buildings, agriculture and land use had made little progress in reducing emissions.

Emissions reductions varied significantly across sectors in the ten years before 2020 (Figure 2.2). Our 2020 Progress report set out a detailed breakdown of progress in reducing emissions in each sector since 2008. The key trends in sectoral emissions prior to the pandemic were:

- **Electricity supply was the major success story** of the past decade. Emissions decreased by 65% over the period 2009-2019, while the carbon intensity of the grid fell from nearly 500 gCO_2/kWh in 2009 to 200 gCO_2/kWh in 2019. Electricity generated from variable renewables was 9 TWh in 2009 (3% of total generation), and rose to 73 TWh in 2019 (26%).

- **Surface transport is off track**, and since 2015 has been the highest-emitting sector in the UK. Emissions have been broadly flat over the past decade, falling only 1% between 2009 and 2019. Improvements to the efficiency of cars have been lost to a trend towards both driving larger vehicles and driving more miles.

- **Industry saw significant reductions in emissions**, largely resulting from a combination of the changing structure of the UK's manufacturing sector (responsible for around 20% of the fall), improved energy intensity (40%) and a shift to lower-carbon fuels (40%), while overall output has grown.†

- **Buildings saw some progress** from policy-driven action in the first half of the past decade. Temperature-adjusted emissions fell by 7% between 2009 and 2016, but have risen since. The overall efficiency of the boiler stock has improved, but there has been minimal progress on improving insulation or switching to low-carbon heating in recent years.

* This fall in emissions was also due to warmer than average temperatures, which tend to suppress heating demand, increase cooling demand and on balance decrease overall energy demand, particularly in homes.

† A decomposition analysis covering the period 2012-2017 shows that UK industrial output grew 14%. The 12% fall in direct CO_2 emissions across that period can be attributed to a structural movement towards a less carbon-intensive mix of industrial output (accounting for 20% of the change), improvements in energy intensity (40%) and changes in fuel mix (40%). It is not clear whether these reductions were driven by policy.

- **Agriculture and land use emissions were broadly flat**, increasing by 2% over the period 2009-2019. These sectors repeatedly failed to meet the indicators outlined in the Committee's progress reports (e.g. for tree planting and on-farm efficiency measures).

- **Aviation emissions and passenger numbers were increasing.** Over the 2009-2019 period, the total number of UK terminal passengers rose by 36% to nearly 300 million in 2019. Efficiency improvements were not enough to offset this rise in demand, with emissions up 7% from 2009 levels to 40 $MtCO_2e$ in 2019.

- **Shipping emissions fell**, mostly due to reductions in domestic shipping along coasts and in international export shipping. In particular, fewer tonnes of dry and liquid bulk (including coal and crude oil) were transported by ship, although container and roll-on/roll-off freight increased. Emissions in 2019 were 24% lower than in 2009.

- **Waste sector falls were driven exclusively by reductions in landfill emissions.** Waste emissions fell by 28% from 2009 to 2019, but this was primarily due to the landfill tax diverting biodegradable waste away from landfill to other waste treatment, particularly Energy from Waste (EfW) incineration. Recycling rates plateaued, and more local authority waste is now processed by EfW than is recycled or composted in England.

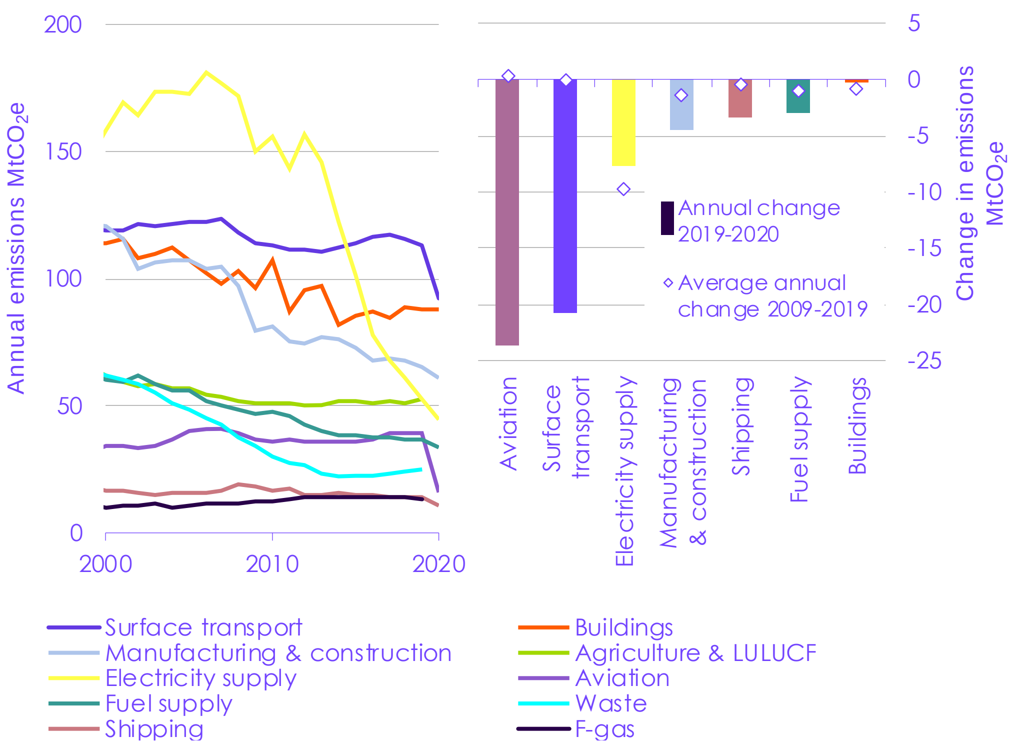
- **F-gas emissions increased, but began to fall towards the end of the 2010s** as new regulations restricting the use of the most harmful gases took effect. Emissions increased by 20% from 2009 to 2017, but fell by 7% in two years to 13.4 $MtCO_2e$ in 2019.

If progress does not extend outside the power sector, the Sixth Carbon Budget will be missed by a huge margin.

To meet the Sixth Carbon Budget and to deliver the UK's 2030 Nationally Determined Contribution to the Paris Agreement, progress will have to extend quickly beyond the power sector. If annual changes in emissions return to the same per-sector trend as the previous decade, the Sixth Carbon Budget will be missed by a huge margin (Figure 2.3).

Progress has been uneven among sectors in the last decade.

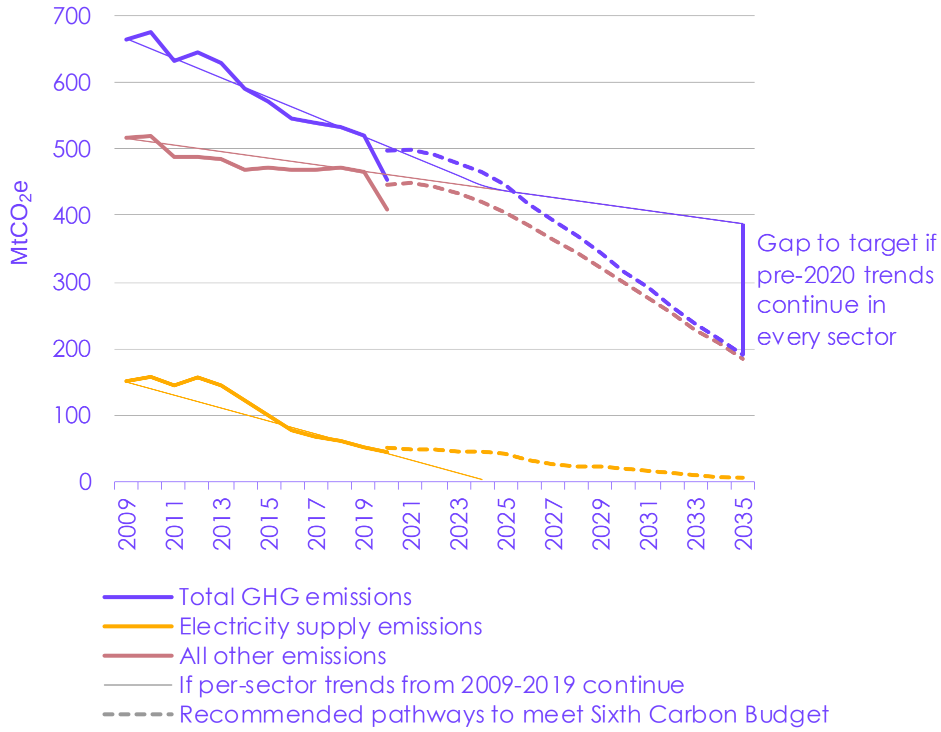
Figure 2.2 Changes in UK emissions by sector



Source: BEIS (2021) *2020 UK Greenhouse Gas Emissions, Provisional Figures.*
Notes: LULUCF = Land use, land-use change and forestry. Estimates of emissions for sectors with large proportions of non-CO_2 emissions are not shown on the right-hand chart. Final estimates of emissions in these sectors will be published in early 2022. Aviation and shipping include the UK's share of international aviation and shipping emissions.

If individual sectoral emissions stay on the same trend as the last decade, the Sixth Carbon Budget will be missed by a huge margin.

Figure 2.3 Concerted action is required beyond electricity to meet the Sixth Carbon Budget



Source: BEIS (2021) *2020 UK Greenhouse Gas Emissions, Provisional Figures*; CCC analysis.
Notes: Emissions in this chart are adjusted for future increases to the Global Warming Potentials (GWPs) of non-CO_2 gases, and therefore do not match the total published in the latest greenhouse gas inventory. The Sixth Carbon Budget target was recommended on this basis (see Box 2.2).

b) UK greenhouse gas emissions in 2020

The COVID-19 pandemic and the resulting restrictions caused a substantial drop in emissions, but the lasting changes on UK emissions remain far from certain. Section 2 of this Chapter explores the short-term impacts of COVID-19 on UK emissions in more detail.

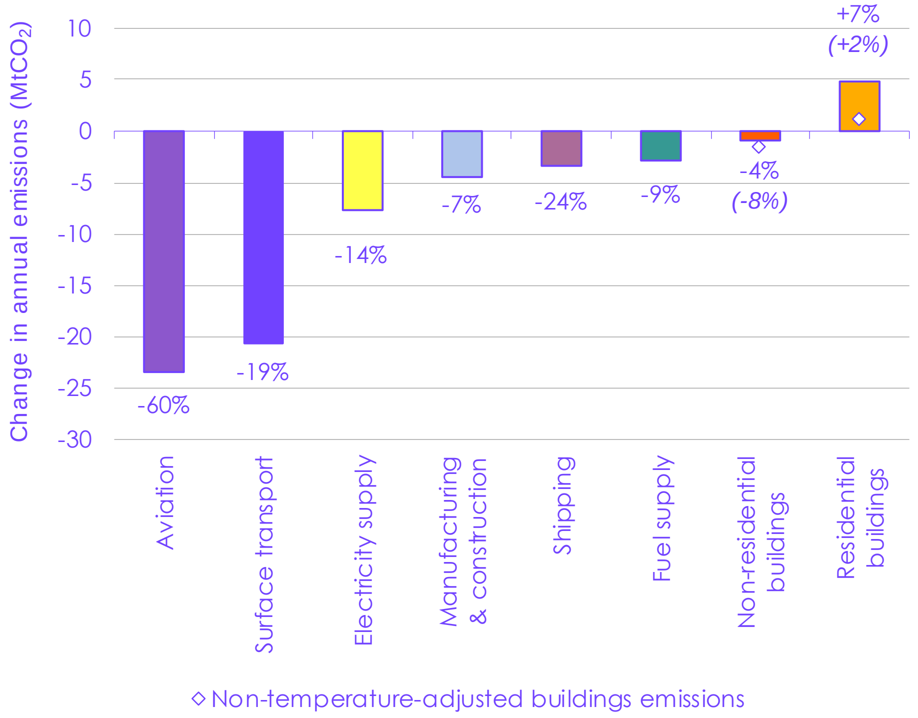
Emissions fell by 13% in 2020, almost entirely due to the impacts of lockdown measures.

The Committee's provisional estimate (Box 2.1) shows that UK emissions fell by around 13% in 2020, with the vast majority of the fall associated with reductions in emissions from transport (Figure 2.4).

2020 was the UK's third warmest year on record. Warmer temperatures, particularly during winter months, led to reduced demand for heating and lower greenhouse gas emissions. The temperature-adjusted emissions data presented in Figure 2.4 shows the 'true' underlying change in emissions (i.e. a bigger increase) from 2019 to 2020 if temperatures had instead been average. The temperature effect alone, which has its biggest impact in the residential buildings sector, caused around a 5% fall in UK emissions.

Milder winter temperatures mean that emissions were lower than they would have been in a year of average temperatures.

Figure 2.4 Change in UK CO_2 emissions 2019-2020



Source: BEIS (2021) *2020 UK Greenhouse Gas Emissions, Provisional Figures*; CCC analysis.
Notes: The bar for change in emissions from residential and non-residential buildings shows the temperature-adjusted data, which adjusts emissions for warmer average temperatures in 2020. The change in actual buildings emissions in 2020 is shown in brackets.

Estimates of all sources of emissions in 2020 are available, but some (particularly non-CO_2) estimates are less reliable.

Box 2.1
The provisional estimate of UK emissions in 2020

BEIS have published a provisional estimate of emissions for 2020 that covers most sources, based on various analytical approaches. To produce a complete estimate of UK emissions, the Committee has added its own estimate for international transport emissions that is based on official statistics:

- **CO_2 emissions in the major 'energy system' sectors** are based on fuel consumption data, and therefore account for the impacts of the pandemic (electricity supply, buildings, manufacturing and construction, fuel supply, surface transport and domestic aviation & shipping).
- **CO_2 emissions from other sectors** – particularly CO_2 emissions that are not associated with the combustion of fossil fuels – are held constant from their final estimates for 2019 (mostly in waste, agriculture, LULUCF).
- **Non-CO_2 emissions** are assumed to fall in line with the latest BEIS emissions forecasts for 2019 to 2020. This simple approach does not capture any impact of the pandemic, although we can expect these emissions to be less affected by lockdowns than emissions related to energy use.[*]
- BEIS do not publish a provisional estimate of **international aviation and shipping (IAS)** emissions. This year, the Committee has produced a provisional independent estimate of the UK's share of international aviation and shipping emissions based on fuel sales data in 2020.[†]

These estimates for 2020 are all provisional and will vary to some extent from the final BEIS data for 2020, which will be published in 2022.

Previous large annual falls in emissions were very different to those in 2020, and were driven by cold winter temperatures, recession and/or genuine underlying progress in the electricity sector.

Other years that saw large falls in emissions often reflected temporary factors that saw emissions rebound the following year. While the fall in emissions in 2020 is structurally different (Figure 2.5) to previous falls, it is likely to be largely temporary. There are likely to be lasting, but highly uncertain, changes in behaviour (see section 2) that will have consequences for UK emissions in the future:

- In 2009, the global financial crisis hit multiple sectors, most notably manufacturing and construction, electricity supply, and surface transport. Emissions rebounded in 2010 as the economy began to recover.
- 2011 saw a significant fall of just over 20% in emissions from residential buildings. This was almost entirely driven by milder winter temperatures and lower demand for gas compared to the previous year. The underlying changes were far less significant, with temperature-adjusted emissions actually increasing by around 2% in residential buildings in 2011. Emissions from buildings increased in the following year as temperatures fell relative to 2011.
- In 2014, there was another 17% fall in emissions in residential buildings, again driven by milder winter temperatures, and equivalent to a 1% rise in emissions from residential buildings when temperature-adjusted. That year did, however, see the acceleration of a major success story in electricity generation, with a 16% fall in power sector emissions. This was driven by structural changes in the GB electricity market, and emissions from this sector have continued to fall in every year since.

[*] For example, emissions from landfills, livestock or forest growth were less affected by lockdown restrictions than fuel consumption for travel or manufacturing.

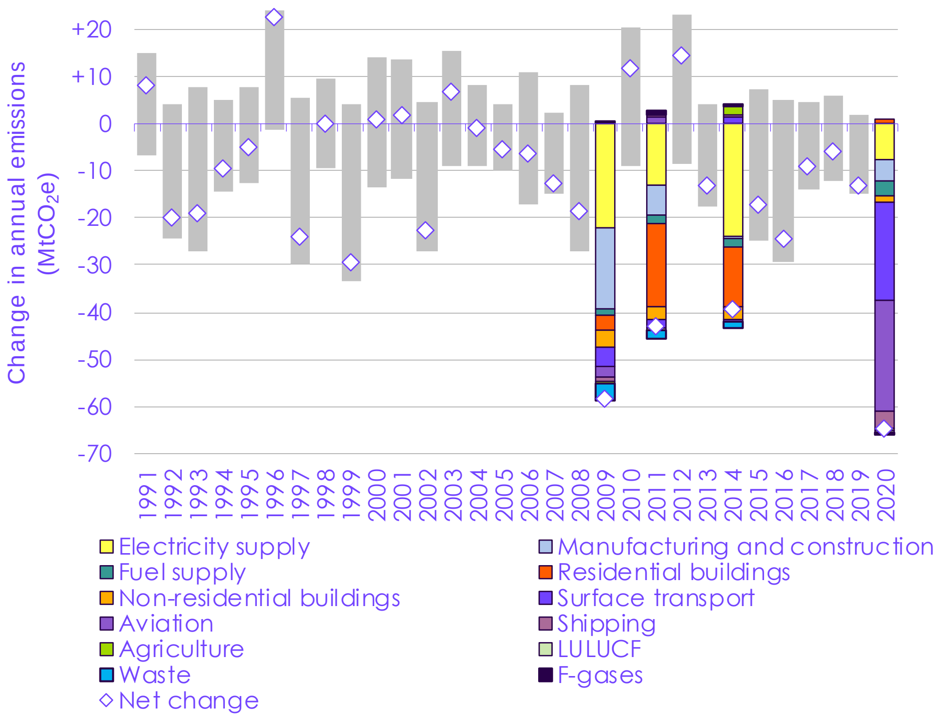
[†] This is a change from our approach in previous reports, where IAS emissions were held constant at the previous year's level. The pandemic means that this approach would not have produced a valid estimate of IAS emissions in 2020.

- In 2020, the vast majority (74%) of the total fall in emissions was associated with unprecedented pandemic-related reductions in air, sea and land travel. The pandemic also led to falls in emissions from fuel supply and manufacturing and construction (-7%), of a scale that would have been seen as significant in a 'normal' year.

It therefore seems likely that at least some of the fall in emissions made in 2020 will be reversed in 2021, with some increase in transport emissions to be expected. We explore this risk further in the next section and in Chapter 3 seek to identify underlying progress that could underpin sustained progress.

Emissions reductions in 2020 were largely due to pandemic-related restrictions, with little contribution from underlying structural progress.

Figure 2.5 Annual change in UK emissions, 1990 to 2020



Source: BEIS (2021) *2020 UK Greenhouse Gas Emissions, Provisional Figures*; CCC analysis.
Notes: The years containing the most significant annual fall in emissions have been highlighted by sector.

c) Changes to the UK inventory

Every year, the inventory is updated to reflect the best available evidence and latest IPCC guidance.

The UK produces an annual greenhouse gas inventory, a consistent time series of all estimated sources and sinks of UK greenhouse gas emissions from 1990 onwards.

Each year, the UK greenhouse gas inventory is updated to include emission estimates for any new sources identified in the UK, revised estimates for sources where there is an improved understanding of emissions (i.e. new data sources or a more accurate estimation methodology), and data revisions (for example to energy statistics) (Box 2.1).

The most significant change to the UK inventory this year was due to large revisions in the land use, land-use change and forestry (LULUCF) sector (Figure 2.6). These result from new estimates for peatlands emissions consistent with the 2013 IPCC Wetlands Supplement.[1] There were also revisions of around -1.5 $MtCO_2e$ to the estimation of annual wastewater methane emissions compared to the previous inventory.

Our Sixth Carbon Budget recommendation anticipated an increase in the estimate of UK emissions due to peatlands of between 17 and 21 $MtCO_2e$ in 2018. The published revision in UK peatland emissions in the latest inventory is similar to, though marginally smaller than, the range assessed in the Sixth Carbon Budget report, and does not affect the recommended level of the target (Box 2.2).

Box 2.2
Recent and future changes to the UK inventory

Methodology changes to the UK inventory are designed to increase the transparency, accuracy, consistency, comparability, and completeness of the inventory. There are three primary sources of uncertainty in the UK inventory:

- **Changes to the scope of the inventory.** Certain sources of emissions and activities can be added to or removed from the scope of the UK inventory – adding to (or reducing) overall GHG estimates.

  – **Peatlands.** The most significant change to the UK inventory this year is due to a change of scope, with large revisions to the land use, land-use change and forestry (LULUCF) sector. These result from new estimates for peatlands emissions consistent with the 2013 IPCC Wetlands Supplement. This change added around 15 $MtCO_2e$ to the UK inventory in 2018 (Figure 2.6) and has turned the LULUCF sector from a net sink (of around 10 $MtCO_2e$) to a net source of GHG emissions of almost 6 $MtCO_2e$ in 2019.

  – **Blue Carbon.** The term 'Blue Carbon' refers to the carbon stored in coastal and marine habitats such as salt marsh, mangroves, and sea grasses. These have had an increasingly important role in both climate change mitigation and adaptation. Chapter 4 of the Wetlands Supplement (Coastal Wetlands) has not yet been adopted in the UK inventory, and uncertainties remain. More research is needed to better understand how much carbon is stored in coastal and marine eco-systems, the annual flux of carbon release and rate of sequestration, and the impact on these of habitat restoration. Government should set out a comprehensive plan to assess the latest science and research gaps with a view to developing measurement protocols to enable emissions impacts of these habitats to be included in the GHG inventory.

- **Changes to Global Warming Potentials (GWPs)** assigned to GHGs. GWPs are used to convert emissions from different gases into a single comparable metric (tonnes of CO_2-equivalent, or tCO_2e), and are agreed internationally. There have been multiple changes to the GWP estimates used for CH_4, N_2O and F-gases since the inception of the inventory.

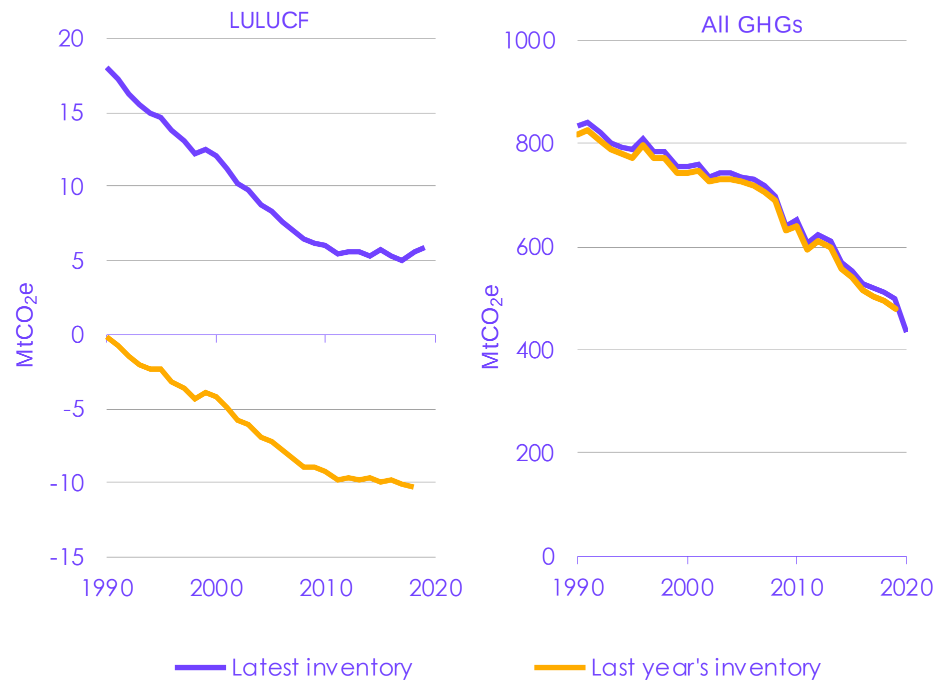
The UK inventory will update its GWPs before 2024, adding between 3 and 20 $MtCO_2e$ to the latest estimate of UK emissions, depending on the methodology that is used.* We expect further updates when available when the IPCC AR6 (Working Group 1) report is published in August 2021.

- **Uncertainty in the current GHG inventory.** This comprises the statistical uncertainty in emission factors and activity data used in estimating emissions. It is internal to the inventory, is well quantified, and it is possible to formally assess the probability of errors through methods set out in IPCC guidelines. For the most recent inventory publication, the uncertainty was estimated as ±3% with 95% confidence for the UK as a whole. At sector level, land use emissions estimates have the highest uncertainty, followed by waste management and agriculture.

The UK inventory will continue to be updated each year in line with the latest IPCC guidance and to include the most up to date statistics and estimation methodologies.

The land use, land-use change and forestry (LULUCF) sector has seen the biggest changes in emissions. Around 15 $MtCO_2e$ of annual emissions from UK peatlands have now been included in the scope of the inventory. This change was expected.

Figure 2.6 Changes to the UK greenhouse gas inventory



Source: BEIS (2021) *Provisional UK greenhouse gas emissions national statistics 2020*; CCC analysis.
Notes: LULUCF = Land use, land-use change and forestry.

* At COP24 in December 2018 the international community decided to standardise reporting under the Paris Agreement transparency framework using the GWP100 metric (the GWP evaluated over a 100-year time frame). The values to be used are those from the IPCC 5th Assessment Report (AR5). There are two methodologies presented in AR5, with different GWPs, and it is not yet clear which will be used.

d) Emissions in Scotland, Wales and Northern Ireland

The governments of Scotland, Wales and Northern Ireland will have an increasingly important role to play in tackling climate change as progress extends beyond the power sector and into sectors where key powers are devolved.

Emissions data for the devolved administrations are only available up to 2018 (Figure 2.7). New data for 2019 were due to be published in June 2021, but this was too late for inclusion in this report. The Committee will comment in more detail on 2019 emissions in our annual Scottish Progress Report later this year.

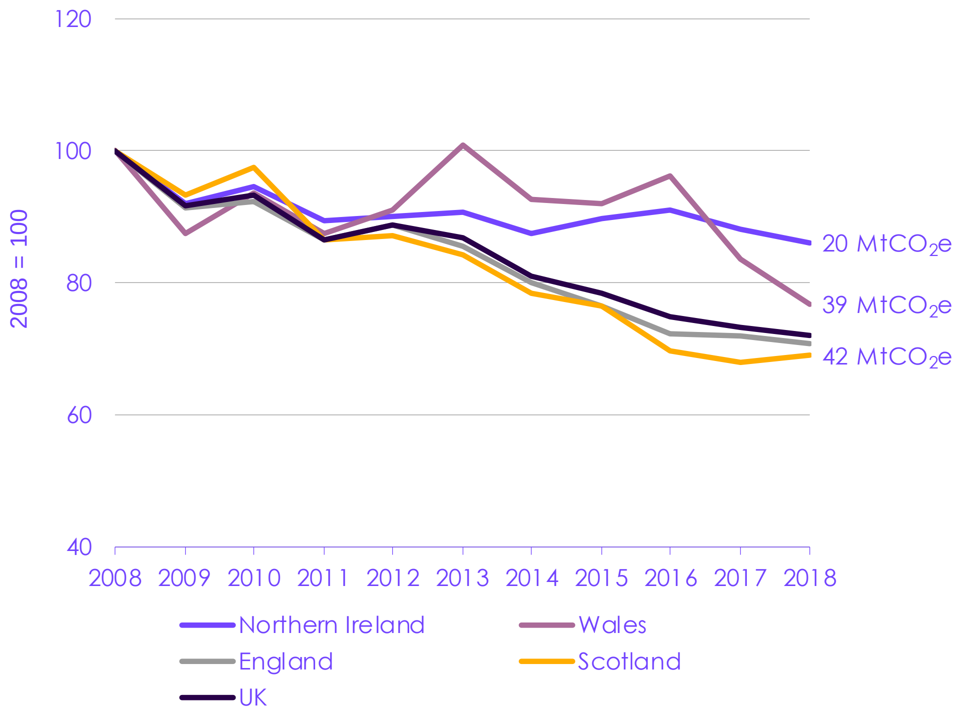
Emissions data for Scotland, Wales and Northern Ireland lags the UK data by more than a year.

Scotland has decarbonised faster than the UK average, while Wales and Northern Ireland have been slower. The most significant factor determining the relative rates of decarbonisation in Scotland, Wales and Northern Ireland compared to the UK average has been the speed and scale of power sector decarbonisation (Figure 2.8).

Emissions data up to 2018 shows that the power sector was the biggest driver of changes in emissions.

As UK-wide emissions reductions extend beyond the power sector, the next decade presents an opportunity for Scotland, Wales and Northern Ireland to match or exceed UK Government action in key devolved areas such as agriculture, tree planting, waste management, buildings efficiency, and public transport.

Figure 2.7 Greenhouse gas emissions in Scotland, Wales, Northern Ireland and England 2008-2018



Source: NAEI (2020) *Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2018.*

Figure 2.8 Sectoral emissions in Scotland, Wales and Northern Ireland, 2008-2018

Source: NAEI (2020) *Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2018.*
Notes: M&C = manufacturing and construction, LULUCF = land use, land-use change and forestry.

2. Impacts of COVID-19 on emissions and behaviours in 2020

In this section, we analyse the major changes that caused the sharp drop in emissions in 2020, and identify how lasting changes in behaviour could affect UK emissions in future.

Lockdown measures led to a record decrease in UK emissions in 2020. Most of the falls in sectoral emissions observed in 2020 are likely to be temporary.

Lockdown measures led to a record decrease in UK emissions in 2020. Most of the falls in sectoral emissions observed in 2020 are likely to be transient, as they do not reflect structural changes in the underlying economic, social, energy, transportation or land systems. In the absence of underlying changes, emissions are likely to rebound in most sectors in 2021.

The temporary fall in emissions in 2020 will have practically zero impact on the UK's past and future contribution to global warming. Sustained reductions are needed.

However, the last year has seen some large changes in patterns of behaviour due to the pandemic, and it is currently unclear the extent to which these changes will endure (Table 2.1). It is important to sustain some of the climate-positive changes that have developed during the pandemic, and important to act decisively to mitigate the negative changes that could jeopardise efforts towards Net Zero (Chapter 4).

Some behavioural changes could last that would have a significant impact on decarbonisation – particularly home-working and travel choices.

There is potential for longer-lasting impacts brought about by permanent changes in working and transport behaviour in some sectors, particularly surface transport, buildings and aviation:

- Working patterns are likely to be affected long term – people want to continue working from home to some degree,[2] many can continue to do so effectively[3] and many employers are already adapting to this new reality.[4]
  - Business travel demand may fall, with a shift to remote working and video conferencing during the pandemic enabling a longer-term reduction in business travel emissions, in both surface transport and aviation. Corporate travel budgets may also be constrained due to increased financial pressures even as the global economy recovers. Business travellers accounted for a significant proportion (25% at Heathrow, and around 15% at other major UK airports) of all UK passengers prior to the pandemic.[5]
  - Home-working is likely to affect energy demand in homes and workplaces, while changes to commuting patterns will affect emissions from transport. Around 25% of typical annual car mileage is due to commuting,[6] so reducing this could offer significant scope for reducing these emissions. However, estimating the net impact on UK emissions is complex and far from certain, as increases in emissions from residential buildings could exceed savings in non-residential buildings. Potential lasting effects also include workers moving out of cities, and undertaking less frequent but longer commutes.
- Personal transport choices may see enduring changes that could affect travel behaviour, demand and emissions in the future:

– **Decreases in non-business flying.** Aviation demand may be supressed in the medium term, especially if COVID-19 transmission continues worldwide to some degree. Survey data show that people intend to fly less after lockdowns are lifted.[7] Government should not plan for unconstrained leisure flying at or beyond pre-pandemic levels in its strategy for airport capacity and demand management.

– **Increases in cycling and walking** could be sustained. Nearly 95% of people said they were likely to continue walking and cycling more after the pandemic.[8] Sustained Government investment in infrastructure to support walking and cycling can help encourage these positive changes.

– **Decreases in public transport use.** Hesitancy to use public transport may continue in the medium term. Around half of people surveyed said they will rethink how they use public transport in the future, reducing use compared to before the pandemic.[9] Shifting private car travel to public transport is important for decarbonisation and brings significant co-benefits for air quality, reduced congestion and public health. Government must act to address concerns about safety that could deter use of public transport.

Table 2.1
Potential short- and long-term impacts of COVID-19 by sector

Sector	Average annual change required for CB6	Emissions change 2018-19	Emissions change 2019-20	Shorter-term COVID impacts	Medium- / longer-term COVID impacts
Aviation	+6%	+1%	-60%	Passenger numbers 78% lower in August 2020 compared to 2019.[9] Travel restrictions and concerns around safety likely to result in lower passenger numbers compared to pre-pandemic levels over the next year.[10]	Impact on business travel is uncertain – the shift to remote working and videoconferencing during the pandemic may result in a lasting reduction in business travel, especially aviation.[11,12] Leisure travel may also be impacted – survey data suggest some people intend to fly less than they did before the pandemic.[13] The size of the aviation sector that will emerge post-pandemic is still unclear.
Shipping	0%	-2%	-24%	9% drop in global maritime trade in 2020 and comparable fall in tonnes of goods traded in the UK.[14,15] Lower trade than pre-pandemic levels expected in 2021.[16]	Rebound likely – though economic scarring could have permanent reduction in shipping volume in some sectors.

Surface transport	-5%	-2%	-18%	Demand for travel dropped considerably across all transport modes except walking and cycling during periods of national lockdown. Demand rebounded during the period between lockdowns, but the extent of this varied across modes, with car demand recovering more quickly. Public transport use remains far below pre-pandemic levels, with safety concerns remaining for many.[17] Record falls in new car purchases.	Substantial uncertainty around how the impact of COVID-19 will influence the transport system in the longer term. Some of the increase in home-working seen during the pandemic is likely to remain, which could result in fewer (but potentially longer distance) commuting trips.[18] Increases in walking and cycling could last, especially if support for necessary infrastructure is maintained and enhanced. Reduced use of public transport may endure – 32% of people said they will reduce use compared to before the pandemic.[19]
Residential buildings	-3%	-1%*	+7%*	Changing patterns of occupancy and energy use due to the pandemic response meant direct emissions from homes increased by 7%* and fell by 4% from non-residential buildings.[20]	Home-working may be sustained over the long term which would have consequences for occupancy of workplaces and energy use in homes and in non-residential buildings.
Non-residential buildings	-3%	-1%*	-4%*		
Electricity supply	-6%	-14%	-15%	Reduction in non-domestic electricity use resulting in a 4.7% drop in total consumption in 2020, with domestic energy consumption up by 2%.[21]	Possible changes in profile of electricity demand, depending on extent of structural shifts such as more flexible working patterns.
Fuel supply	-5%	-1%	-8%	Low oil and gas prices resulted from worldwide lockdowns and associated falls in demand. Output in the UK oil and gas sector also fell as a result. Global oil and gas demand partially recovered since the beginning of the pandemic. Prices are close to pre-pandemic levels.[22]	Assessments of long-term impacts of COVID-19 on oil and gas markets vary, with some expecting demand to reach 2019 levels by 2021-22[23] and others suggesting peak oil will be reached earlier than previously expected.[24]
Manufacturing & construction	-5%	-3%	-7%	Short-term fall due to national lockdowns, manufacturing revenues temporarily fell to 65-70% of pre-COVID level, and largely recovered.	Rebound likely – though economic scarring could have permanent reduction on emissions in some sectors.

Notes: *Based on temperature-adjusted emissions.

a) Aviation (60% fall in emissions in 2020)

Aviation emissions have been most heavily impacted by COVID-19 and continue to face the greatest uncertainties.

We estimate that total emissions from aviation fell by 60% between 2019 and 2020 to 16 $MtCO_2e$.

Of all emitting sectors, aviation emissions have been most impacted by COVID-19 and continue to face the greatest uncertainties. We estimate that total emissions from aviation fell by 60% between 2019 and 2020 to 16 $MtCO_2e$.

International aviation is likely to continue to be constrained in the medium term, as the UK implements restrictions on international travel and concerns around the safety of international and domestic air travel continue. Longer-term impacts are harder to assess:

- The easing of restrictions during summer 2020 resulted in an increase in flights between June and September, although flights remained far below pre-pandemic levels – air passenger numbers in August were only at 22% of August 2019 levels. Between June and July 2020, the number of passengers departing and arriving in UK airports went from 2% to 12% of 2019 levels.[25] This suggests that pent-up demand may result in surges in flight bookings as travel restrictions are eased.

- The International Air Transport Association (IATA) forecasts a recovery in air passenger numbers to pre-pandemic levels by 2024 and sustained average growth of 2.2% per year to 2030 in all European markets.[26] Their new outlook for the global airline industry points to lower passenger numbers in 2021 than their forecast made in 2020, due to a new surge in virus cases and associated increase in global travel restrictions. The result has been a significant increase in airline debt in 2020,[27] which could impact the longer-term viability of some airlines.

- Health concerns around flying also remain – 88% of people taking part in the National Travel Survey still had concerns with taking flights in August and September 2020, and 55% of respondents said they did not intend to plan an overseas holiday by plane within the next year.[28]

While it is unclear what the combined impact of these factors will be on the size of the sector in the longer term, this year should be used as an opportunity to develop a strategy for managing aviation demand.

This should be based on a reasonable level of international aviation for the UK, consistent with a Net Zero by 2050 target for the sector, and include an assessment of the UK's airport capacity. Government must recognise that planning for an ever-growing aviation sector is not consistent with the UK's Net Zero target as part of its aviation decarbonisation consultation and strategy, due to be published ahead of COP26.

See Chapter 4 for further details on next steps for aviation policy.

b) Shipping (24% fall in emissions in 2020)

Shipping saw the second-largest sectoral fall in emissions in terms of percentage change. Uncertainties remain around the future level of shipping activity.

Our estimates suggest UK emissions from shipping fell by 24% between 2019 and 2020, to 11 $MtCO_2e$. Proportionately, this was the second-largest sectoral fall in emissions. Uncertainties also remain around the future level of shipping activity, especially while COVID-19 remains widespread globally. The World Trade Organisation's latest forecasts suggest a 9.2% decline in the volume of world goods traded in 2020 followed by a 7.2% rise in 2021, while highlighting the high degree of uncertainty surrounding these forecasts as they depend on the pandemic and global responses to it.[29]

Provisional 2020 data show that total freight shipped through the UK's major ports fell by 10% in 2020,[30] largely due to the impacts of the COVID-19 pandemic:

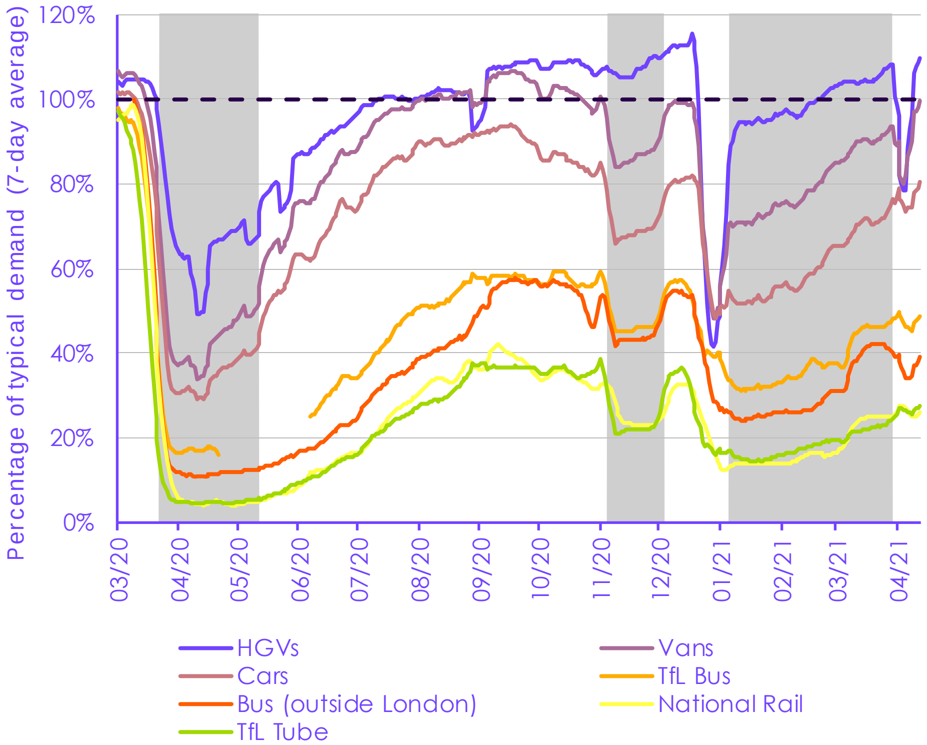
- This effect was particularly pronounced in Quarter 2 of 2020, when freight volumes were 18% lower than normal.
- We expect the impacts to continue to be felt in 2021 as the UK comes out of lockdown, but volumes are expected to return to normal levels of demand by 2022. However, the long-term impacts of COVID-19 on the global shipping sector are uncertain.
- The shipping sector has also been impacted by the uncertainty surrounding the UK's exit from the European Union. This may have caused some part of the reduction in demand seen during 2020.

c) Surface transport (18% fall in emissions in 2020)

Emissions from surface transport fell by 18% due to lockdown restrictions.

Emissions from the surface transport sector fell by 18% in 2020. This is almost entirely due to the impacts of the COVID-19 pandemic and the resulting restrictions on travel, which have lowered demand across modes (Figure 2.9). There is substantial uncertainty around how the impact of COVID-19 will influence the transport system in the longer-term.

Figure 2.9 Travel demand by mode during the COVID-19 pandemic



Source: DfT (2021) *Transport use during the coronavirus (COVID-19) pandemic*; CCC analysis.
Notes: Figure shows travel relative to typical demand on an equivalent day. For rail and TfL data, this equivalent day is the same week in 2019, whereas for road transport and non-London bus travel, it is a day in early 2020. Therefore, these road and bus figures have not been normalised for any seasonality. The shaded regions represent the periods of national lockdown in England. TfL = Transport for London.

Impacts were different across different travel modes. Cycling increased dramatically, public transport use remains very low, and car, van and HGV use seem to be moving back towards pre-pandemic levels.

During the periods of national lockdown* (shown by the shaded regions in Figure 2.9), demand for travel dropped considerably across all transport modes, except cycling and walking. Demand rebounded during the period between lockdowns, but the extent of this varied across modes.

- Travel by public transport both fell more deeply during the lockdown periods than private car demand and rebounded more slowly following the first lockdown. As of April 2021, public transport usage remained 50-80% lower than pre-pandemic levels, and car travel around 20% lower.

- Van and HGV travel fell slightly less sharply than car travel in the first lockdown, but levels are now similar to those pre-COVID-19.

* The shaded regions show the lockdown periods for England. Those in Scotland, Wales and Northern Ireland will vary.

- Cycling rates rose dramatically during the first lockdown and into the summer 2020, but then declined back close to normal during the second half of 2020. Cycling rates are now around pre-pandemic levels, but these may increase again as commuting resumes and the weather improves.

- Walking is the only way of getting around that people are now doing more regularly. Survey evidence shows that 56% of people are walking three times a week or more, compared with 36% before the pandemic.[31]

The impacts on travel behaviour are currently uncertain, but there is likely to be some lasting impact of the pandemic in the medium to long term.

Underpinning these trends are significant changes people have made in their normal way of life and the development of new social behaviours and values. For travel patterns, key changes have been observed in the car market, attitudes towards public transport, increased home-working and online shopping.

Working from home increased sharply and is likely to stay. This will have implications for commuting patterns as well as home and workplace energy consumption.

- **Home-working and avoiding non-essential travel.** Periods of lockdown and guidance on avoiding non-essential journeys led to lower travel demand, including a significant reduction in commuting as home-working increased dramatically. This led to large reductions in emissions from surface transport, although the overall emissions impacts are complex and uncertain (Box 2.3). It is likely that some of this shift will be retained beyond the pandemic.

Public transport use remains much lower than pre-pandemic levels.

- **Public transport use.** The reduction in public transport use was driven by restrictions on travel, social distancing rules and the perception of it being unsafe. Research shows that the pandemic has had a negative impact on people's attitudes towards public transport use, but that there is a gap between perception and experience.

  - In a survey conducted in February 2021,[32] half of respondents said they will rethink how they use public transport in the future, with 32% reporting they are expecting to reduce use compared to before the pandemic. This was more marked for people with disabilities, and less likely for younger people.

  - Nearly 40% of people were concerned about their financial circumstances in the future, which could impact on public transport use. This was higher for ethnic minorities, households with children and younger age groups. Similar concerns could apply to ride-sharing and car-pooling schemes, which could hinder progress in increasing average car occupancy.

  - These results suggest that there are risks that public transport use will take time to recover, particularly as most people report having alternative travel choices. It is likely to be a difficult transition period for operators as social distancing rules reduce capacity and they need to regain trust in services.

New car sales have fallen to the lowest level since 1992.

- Total **new car sales** in 2020 fell by 30% in 2020 to 1.6 million, the lowest level since 1992.[33] Sales in the second-hand market fell by 15%.[34] However, the car market began to rebound during late-2020 and evidence[35] suggests that consumer purchasing confidence is rebuilding. Where new vehicles are purchased, the Government and vehicle manufacturers should look to prioritise electric vehicle sales wherever possible (see Chapter 4).

– Overall, recent research[36] suggests that the pandemic has been reported as being a greater factor in reducing car ownership than it has been in increasing it to date, with one-quarter of those choosing to give up their car citing a change in work situation or not needing the car as much as before.

– Going forward, the market is likely to be affected by economic considerations, perceptions of safety of public transport and environmental decisions.

- The increased priority consumers are now placing on health considerations may further stimulate the recovery of this market, although economic factors such as affordability may hinder this.

- Potential changes in consumer purchasing power as a result of COVID-19 could risk further progress if more affordable EVs, appropriate purchase incentives and a robust second-hand market are not made available.

Box 2.3
The potential impact of increased levels of working from home on transport demand and emissions

The number of people who work at home has generally increased over time, but this shifted dramatically during the COVD-19 pandemic.

- Before the pandemic, around 5% of people in employment worked mainly from home, while a further 12% did so occasionally.[37] As a result of the COVID-19 pandemic, levels of home-working have risen substantially, with an average of around 30% of the workforce working exclusively from home each week between May and December 2020.[38]
  – Both before and during the pandemic, those with higher-skilled occupations* were more likely to work from home than lower-skilled workers. Those working in administrative and secretarial occupations saw an increase in home-working from 37% to 57% between 2019 and 2020.[39,40]
  – In April 2020, levels of home-working were highest in London, with 57% of workers doing some work from home – 92% of these people citing COVID-19 as the main reason why. Home-working levels were lowest in the West Midlands, with 35% of workers doing some work from home, compared to the UK average of 47%.[41]
- A recent study[42] found that if people continue to work from home at least two days per week in the future, then the number of commuting trips by car would fall by 14%.
  – Our analysis suggests that this could lead to an overall reduction of 15 billion car-kilometres each year, potentially avoiding over 2 $MtCO_2e$ of emissions per year. For comparison, the abatement delivered by reducing car travel and modal shift in our Balanced Pathway in 2030 is around 7 $MtCO_2e$/year.
  – Around a quarter of workers surveyed said that they would work from home a little or much more in the future, with 23% saying they would conduct business meetings online that they would have previously travelled for.
  – Major companies have responded by allowing for more flexible working, with some expecting that employees will work from home for around two days per week.
- The overall impacts of home-working are uncertain and complex.
  – At the household level, working from home increases residential energy demand for heating and electricity in homes and reduces transport energy demand for commuting.

* Professional, associate professional, technical occupations and managers, directors and senior officials.

A study by the IEA[43] suggests that the net impact of these is a reduction in overall energy consumption where private vehicles are the main means of commuting. The impact may increase emissions, however, where people normally walk, cycle or use public transport.

- There is likely to be reduced energy consumption from office buildings, with the net impact being context-specific. In the UK, offices include a greater share of electric heating suggesting they could also be lower-emission.
- A review of 30 studies[44] suggested that in most cases there was some improvement in energy use and emissions from home-working.
- Wider and potential rebound impacts, such as changing consumption patterns and where people choose to live and work, are also important and add to the uncertainty.

d) Buildings (4% increase in temperature-adjusted emissions in 2020)

Emissions from homes increased and emissions from non-residential buildings decreased due to changes in occupancy.

Temperature-adjusted buildings emissions in 2020 were 96 $MtCO_2e$ – an increase of 4% on 2019. Changes to emissions were driven by shifting patterns of occupancy due to the pandemic response:

- Temperature-adjusted emissions from homes increased by 7% due to increased occupancy.
- Temperature-adjusted emissions from non-residential buildings fell by 4%: commercial buildings fell by around 8%, while those from public buildings increased slightly by 1%.

There is potential to improve the design and operation of buildings and their systems to better respond to variations in occupancy.

The net effects of the pandemic on emissions from public buildings appear to have been relatively insignificant, in part expected to be associated with the diverse nature of public buildings, which include hospitals and schools.

Despite dramatic reductions in occupancy,[45] the reduction in emissions from commercial buildings was limited. Analysis suggests that savings achieved across the stock vary widely, but are constrained by limits on adjusting levels of heating and ventilation – particularly in buildings which remain partially occupied, or have older plant and controls.[46] There is scope to enhance the design and operation of buildings and their mechanical and electrical systems, to better respond to variations in occupancy.

It is unclear to what extent shifts in occupancy patterns and behaviour brought about by the COVID-19 pandemic will persist; the impacts of such changes on emissions are uncertain and complex. The overall effects will depend on the levels of increases in energy consumption in residential buildings and decreases in non-residential buildings, and their relative efficiencies, as well as secondary impacts on patterns of living and travel.[47,48]

e) Manufacturing, construction, fuel supply and electricity generation (average 10% fall in emissions in 2020)

Emissions across these sectors fell by an average of 10% between 2019 and 2020. This was primarily driven by a short-term fall in economic activity and energy demand due to UK and international lockdowns:

Manufacturing and construction revenues and emissions fell temporarily, but are likely to recover as lockdown measures are lifted.

- Manufacturing revenues temporarily fell by 30-35%, and have since largely recovered to pre-COVID levels.[49] Manufacturing emissions fell by around 7% across the year.
- Emissions in fossil fuel production in the UK fell by 8% in 2020, as production fell in response to low prices resulting from low global demand for oil.
  - UK demand fell for road fuels (-20%) and jet fuels (-60%) compared to 2019. Global demand for petroleum products was also down by around 9%.[50] This was a driving force for lower production of petroleum products in the UK, which was down by 17%.[51]
  - UK demand for gas decreased by 6% compared to 2019 levels, reflecting lower demand particularly for electricity generation. Gas production in the UK was stable, while imports were down 6% and exports increased by 17%. The UK remains a significant net importer of natural gas, importing around five times more than was exported in the last five years.[52]

Fossil fuel demand fell worldwide, with impacts on the volume of oil produced in the UK. It is unclear how long these changes in demand will last and the impacts on the UK market.

  - Assessments of the long-term impacts of COVID-19 on oil and gas markets vary,[53] but it is expected that demand could potentially return to 2019 levels as early as 2021-22.[54] Sustained impacts on fossil fuel demand largely depend on potential sustained changes in travel patterns (see earlier subsections). Recovery plans that accelerate the pace of a transition for transport towards electrification could contribute to reducing oil demand and reaching peak oil earlier than previously expected.
- Lockdown restrictions had a significant impact on the electricity system over the course of 2020. Lower electricity demand, coupled with higher renewables output, highlighted some of the challenges that will need to be overcome in future for Net Zero (Box 2.4).

The medium- to long-term impacts in these sectors will depend on UK and international economic recoveries post-COVID. A rebound is likely, although economic scarring or sustained low oil and gas prices could lead to a permanent reduction in emissions in some sectors.

The electricity system was tested under large changes in demand and high levels of variable renewables on the grid.

Box 2.4
Impacts of COVID-19 on the UK electricity system in 2020

Restrictions that were put in place during 2020 had a significant impact on the electricity system, with reduced demand during lockdown periods. Combined with higher renewable output, this highlighted some of the challenges that will need to be overcome in the future as electricity generation decarbonises.

- Electricity demand fell significantly during the lockdown periods in 2020, but was similar to previous years outside those periods.
  - Electricity demand in 2020 as a whole was only 5% lower than in 2019.
  - The biggest COVID-19 impacts were felt in the lockdown periods, particularly in the second quarter where demand was 12% lower than the same period in 2019.
  - During the lockdown periods, the profile of demand was flatter as well as being lower in aggregate, with within-day peaks much less pronounced (particularly for the morning peak) and differences being smaller between weekdays and weekends.
- The carbon intensity of electricity generation fell, through a combination of higher renewables output and lower demand.
  - Renewables output was 15% higher in 2020 compared to 2019, due to exceptionally windy and sunny conditions early in the year.
  - To compensate for lower demand and higher renewables output, the share of fossil generation fell from 43% in 2019 to 38% in 2020. The country set a record 67-day period without using coal between April and June 2020.
- The combination of lower demand and higher renewables output had implications for the running of the electricity system, and led to lower wholesale prices and rising costs of running the network.
  - The wholesale cost of electricity was 42% lower in the second quarter of 2020 compared to the same period in 2019, reflecting both lower demand and the higher share of zero-marginal-cost generation in the mix. Periods of negative prices were common.
  - The electricity system was able to remain balanced even with lower demand and with record-breaking levels of intermittent renewable generation (e.g. wind generation set new daily records in 2020 for both level of power – 17 GW, and for share of generation – 60%). However, keeping the electricity system balanced was more challenging. Balancing costs rose by 50%, and curtailment costs (paying generators to switch off or reduce their output) doubled.

The challenges of operating with high shares of variable and inflexible generation are likely to be increasingly felt over the coming decade as the electricity system decarbonises. They highlight the importance of a system that is more flexible and provides adequate dispatchable low-carbon generation, and the need for market arrangements which enable that.

Sources: Drax (2020, 2021) *Electric Insights Q1, Q2, Q4 2020*, UKERC (2020) *Electricity demand during week one of COVID-19 lockdown*, National Grid ESO (12 January 2021) *2020 greenest year on record for Britain.*

f) Other impacts and lessons learned

Estimates of emissions from other sectors in 2020, including agriculture, land use and waste have not yet been produced, though emissions in these sectors are less linked to energy demands and therefore the impacts of lockdown are less certain. However, there are several impacts are notable outside those outlined in previous subsections:

There is some evidence that less food was wasted during lockdown, and some of those effects remained when restrictions were eased.

- **Reduced food waste.** A survey of over 4,000 people undertaken by WRAP on how the pandemic had impacted people's relationship with food revealed that during the first lockdown, people adopted behaviours to better manage food, including freezing, batch cooking and using up leftovers. It is estimated that levels of food waste declined by 43% between November 2019 and April 2020. Even with the easing of lockdown, some of these behaviours persisted and by November 2020, the amount of food wasted was over a fifth less compared to November 2019. Centre for Climate Change and Social Transformations (CAST) survey data also suggest people reduced their food waste during the pandemic, although some of this progress may have reversed between the first lockdown and third lockdowns – 89% of people said they threw away at least some food in October 2020, compared to 84% in May, and 92% before the pandemic.[55]

Support for climate action remains high.

- **Climate change attitudes.** Concern over the pandemic does not seem to have dampened concern with climate change and other environmental issues. 74% of people surveyed by CAST agreed that tackling climate change was urgent in separate surveys carried out in May and October 2020, compared to 62% in August 2019. Support for measures to tackle climate change (e.g. walking and cycling more, reducing meat and dairy consumption, replacing gas boilers) was high throughout the pandemic (with different measures receiving different levels of support), increasing between May and October 2020.[56]

There is a renewed focus on inequalities. The need for a just transition is arguably greater than ever.

- **Just transition and inequality.** The pandemic has affected all people in the UK negatively, but has harmed some groups more than others. Inequality has been highlighted – and in many cases increased – across multiple demographic groups, including by age, income, ethnicity, employment type, and geography. Mortality rates from COVID-19 in the most deprived areas in England are double those in the least deprived[57] and were higher in both Black and South Asian ethnic groups than the national average.[58] The lowest-earning 10% of workers were much more likely to work in sectors that closed during lockdown, and less likely to be able to work from home.[59] At the same time, others have been able to work from home and accumulate savings due to reduced opportunities to spend. The need to ensure the transition to Net Zero is a fair and equitable one is arguably even greater now that than before the pandemic (see Chapter 3).

- **Air quality.** Positive air quality outcomes can be linked to virtually all of the changes needed to get to Net Zero, and is likely to be amplified further if similar strategies are adopted neighbouring countries.[60] The most pronounced changes in UK air quality during lockdown were in the urban environment, notably for nitrogen oxides (NO_x) as emissions from vehicles fell. Urban NO_x concentrations over the lockdown period up to 30 April 2020 were typically 30-40% lower than average. Impacts of lockdown on exposure to other pollutants were not necessarily positive – particulate matter ($PM_{2.5}$) concentrations increased but this was largely due to weather effects, and urban ozone (O_3) concentrations increased due to secondary air chemistry effects caused by the fall in nitric oxide (NO) emissions.[61]

The experience from 2020 has highlighted several key lessons for decarbonisation. We have considered these in our policy advice and reflected them where possible (Chapter 4):

There are new lessons we can draw from the experience in 2020 to sustain climate-positive changes that have developed and mitigate the negative changes that could jeopardise efforts towards Net Zero.

- **Emissions fell rapidly, but they can rebound just as quickly.** Across several sectors, including manufacturing & construction, surface transport and freight, activities are beginning to return to near pre-pandemic levels. In general, this should be welcomed as a positive return to economic activity as lockdowns are eased. However, there are some instances where beneficial changes could be lost unless action is taken to support them.

- **There is a limited window to change behaviours.** There are behavioural sources of 'friction' in moving from one pattern of living and working to another, but if those frictions can be overcome, people and organisations can often adapt quickly.[62] In the light of the changes in response to COVID-19, there are now significant opportunities to lock in and build on positive developments, especially – though not exclusively – regarding levels of demand for transport. This includes:

  – Sustaining increases in 'active travel' by providing support for walking, cycling and e-bikes.

  – The possible need for active measures to encourage people back onto public transport, where there has been a shift to car travel.

  – The opportunity to change the narrative on the need for an ever-increasing number of flights and accompanying airport expansion.

- **The need for increasingly resilient networks and infrastructure.** Our energy (and digital) networks have demonstrated they can be resilient to profound changes in use. The transition towards Net Zero will only increase the challenges of operating an electricity system with high shares of variable and inflexible generation. The non-residential buildings stock can be improved to respond more efficiently to variations in occupancy. Our systems need to be more flexible as well as low-carbon, and that can be delivered through long-term planning and clear market mechanisms that incentivise flexibility.

- **Lockdown is not a blueprint for decarbonisation.** The fall in UK emissions in 2020 was much larger than the annual change needed on the pathway to Net Zero. However, it did not materially affect the structural changes that are needed in our underlying economic, social, energy, transportation or land systems to reach Net Zero. In order to combat COVID-19, people in the UK have heavily restricted their movement with damaging economic and social consequences. This stands in contrast to the fair, well-planned and sustainable transition to Net Zero that is possible. It can bring improvements to our quality of lives: new jobs, cleaner air, quieter streets, more green spaces, comfortable homes and healthier lifestyles.

The pandemic has also demonstrated the importance of preparing for known risks and the value of scientific advice, which will both be vital in successfully confronting the climate challenge. It will be important to sustain the beneficial changes that have developed during the pandemic, but also to act decisively to mitigate the negative changes that could jeopardise efforts towards Net Zero.

Under the UK carbon budgets and the Paris Agreement, the UK's greenhouse gas (GHG) emissions reduction targets are based on the UK territorial emissions (i.e. emissions physical occurring within the boundaries of the UK), in accordance with internationally agreed rules for emissions accounting.*

Tracking the UK's carbon footprint can help us identify actions to reduce emissions from our supply chains and the goods and services we consume.

It is also important to examine the UK's total carbon footprint which allocates GHG emissions along economic supply chains, no matter where in the world they occur. This method allocates emissions to the country where the consumer of the final good or service is based. This is known as ***consumption-based accounting*** or as the ***carbon footprint*** of a country. Tracking the UK's consumption emissions footprint is important to consider alongside the legally binding targets set out for UK territorial emissions as it can help identify additional actions that UK consumers and companies can take to help reduce the emissions along their supply chains (such as using low-carbon suppliers) that are not covered within the UK's territorial emissions targets.

Our consumption emissions footprint has fallen over the last decade.

Our 2020 Progress Report showed a sustained decline in the UK's consumption emissions footprint over the last decade (Figure 2.10). Over the period 2009 to 2017, the UK's consumption emissions footprint fell by around 2% per year on average, driven by improvements in the energy- and carbon-intensity of the UK and global economy outweighing the effect of increased overall consumption and changes in the structure of the global economy. This fall in the UK's consumption emissions is slower than for territorial emissions, but there is little evidence that this is associated with 'offshoring' UK territorial emissions as part of decarbonisation efforts over the last decade.

Updated data are now available for the UK's consumption emissions footprint in 2018, showing a 1% increase in emissions relative to 2017 levels.† This small change is likely to be well within the estimated margin of uncertainty for the UK's consumption emissions account (previously estimated to be 3.5-5.5%,[63] although this may have reduced with recent improvement to the methodology). As such, analysing the breakdown underpinning this change is not useful for identifying robust underlying changes in actions that create emissions at home and abroad.‡

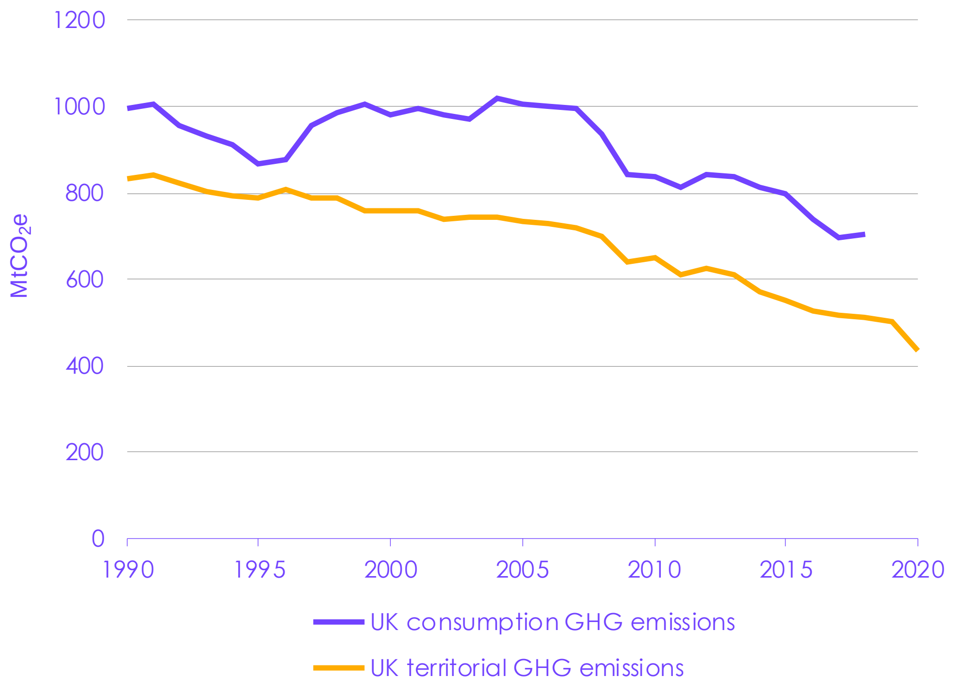
As consumption emissions accounts are generally more variable year-to-year than territorial emissions accounts, looking at the trend over several years is likely to be a more representative picture of underlying trends than year-to-year changes.

* Emissions from international aviation and shipping are included for the Sixth Carbon Budget.

† F-Gases are included within the UK's carbon footprint statistics for the first time this year.

‡ The consumption emissions statistics suggest this increase was a combination of an increase in UK-sourced emissions and overseas emissions, in particular those arising from the European Union and other OECD countries. On a source basis, increases in emissions from domestic heating (2018 contained a cold winter with the 'Beast from the East' cold snap) and (non-household) transport outweighing decreases from electricity generation and agriculture.

Figure 2.10 Changes in UK consumption and territorial emissions since 1990



Source: Defra (2021) *The UK's carbon footprint;* BEIS (2021) *Final UK greenhouse gas emissions national statistics*.
Notes: Emissions from international aviation and shipping are included within both the UK's consumption and territorial emissions accounts in this figure. Emissions from land-use, land-use change and forestry (LULUCF) are not currently included within the UK's consumption emissions accounts.

We outlined exploratory future scenarios for the UK's carbon footprint in our advice on the UK's Sixth Carbon Budget report. These scenarios showed 3-7% average annual reductions between now and 2050 could be possible, depending on UK actions and the degree of global decarbonisation.

Nearly half (45%) of the UK carbon footprint emissions occurring outside the UK are associated with the production of inputs for a domestic economic activity (e.g. imported raw materials or parts, as opposed to finished products or services for an end user).

In our Sixth Carbon Budget Advice Report we highlighted corporate action to reduce emissions along their supply chain as one of the levers that could help reduce this part of the UK's carbon footprint. Recent estimates indicate that around 75% of FTSE100 companies disclose some information related to their Scope 3 emissions (share of emissions arising from the upstream and downstream supply chains), with around one-third having a target to reduce their Scope 3 emissions.[64]

Changing trade patterns present both a risk and opportunity for the UK's consumption emissions and support of global decarbonisation efforts.

Recent context changes will affect estimated UK consumption emissions – the UK's trade patterns have been changing due to the end of the transition period for exiting the European Union and have been disrupted due to the COVID-19 pandemic, which has also changed UK consumption patterns. The effects of these changes will not be apparent within the UK's consumption emissions accounts until 2023-2024. The climate considerations in the UK's new trade agreement (including with the EU) are summarised in Box 2.5.

As the UK's trade relationships continue to change, this presents for risks and opportunities for further decreasing the UK's consumption emissions. Increased trade with high-carbon producers could lead to increased overseas supply-chain emissions, while also potentially undermining domestic decarbonisation efforts through increased availability of low-cost imported products with a high carbon footprint.

Conversely, new trade deals and/or implementation of carbon-border policies could help support global decarbonisation. The UK should explicitly consider climate-related issues when agreeing trade deals and consider supporting trade-related measures such as carbon border adjustments and product standards, to help minimise the global emissions footprint of its international trade.

Box 2.5
Climate considerations in the UK's trade agreements

Since deciding to leave the European Union, the UK has been working to put in place a number of bilateral trade deals to cover trade flows that were previously covered under the European Union's agreements.

The most significant commitments regarding climate change within these trade deals is contained within the UK-EU Trade and Cooperation Agreement:

- Commitment to the Paris Agreement. The Cooperation Agreement reaffirms both parties' commitment to achieving the goals of the Paris Agreement. Efforts to tackle climate change under the Paris Agreement is referenced as an 'essential element' of the Agreement, violations of which by either side could lead to the Agreement being suspended.
- Maintaining domestic ambition on climate change. Commitments are included that both sides will maintain and strive to improve their 'climate level of protection' (which refers to their emissions reductions targets for 2030). The Agreement specifically refers to the EU's previous 40% reduction NDC (relative to 1990 levels) and the UK's share of this target (which the Committee previously estimated to be around a 57% reduction in emissions). This has now been superseded by increased emissions reduction ambition for both the EU (55% reduction relative to 1990 levels) and the UK (a 68% reduction relative to 1990 levels).
- Cooperation on climate change. Climate change and emissions reduction is explicitly highlighted as an area for cooperation between the UK and EU, alongside the role of trade as a relevant driver of GHG emissions. The UK is no longer part of the European Energy Union or EU Emissions Trading Scheme (EU ETS). The Agreement commits both parties to work together to find a system for sharing electricity through interconnectors and to 'give serious consideration' to the possibility of linking the new UK ETS to the EU ETS. No decision on whether the UK ETS will be linked with the EU ETS has yet been made.

Aside from the UK-EU Cooperation Agreement there is limited concrete detail related to climate change in other UK trade deals. The need for new trade deals not to contradict existing ones means that the climate commitments within the UK-EU deal could be used more widely as a template for other trade deals agreed by the UK in the future.

Source: HMG (2020) *Trade And Cooperation Agreement Between The European Union And The European Atomic Energy Community, Of The One Part, And The United Kingdom Of Great Britain And Northern Ireland, Of The Other Part*.

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Chapter 3

Underlying progress and enablers of progress

Introduction

Delivering the Sixth Carbon Budget will require an immediate scale-up in action across the economy, building an annual investment programme reaching around £50 billion per year by 2030, up from around £10 billion per year today. This must be accompanied by significant changes in individual and organisational behaviours, alongside major changes in the way we farm and use our land.

This chapter sets up (but does not conclude) a discussion of how to monitor Government progress towards the Sixth Carbon Budget.

The transformation presents a major policy challenge for Government and a delivery challenge for UK business. Both Government and businesses have signalled their commitment to meeting these challenges, but much remains to be done. Now that the Net Zero target and Sixth Carbon Budget have been set, focus must switch to delivery.

In this new context, the Committee's role must also evolve. This chapter sets up (but does not conclude) the discussion of metrics of progress and the right way to monitor Government action.

We look forward to assessing the Government's full Net Zero Strategy later this year, and will aim to align our progress metrics and monitoring with the Government's proposals where we consider those to be credible.

The key messages of this chapter are:

- **Focus on delivery.** Our Sixth Carbon Budget advice identified and quantified many of the changes that need to happen in the next three decades. Now that the target has been set, focus must switch to delivery.
  - Decreases in non-business flying. Aviation demand may be supressed in the medium term, especially if COVID-19 transmission continues worldwide to some degree. Survey data show that people intend to fly less after lockdowns are lifted.[1] Government should not plan for unconstrained leisure flying at or beyond pre-pandemic levels in its strategy for airport capacity and demand management.
- **There are some signs of progress on key enablers of the path to Net Zero.**
  - The transition to Net Zero requires changes that go beyond the deployment-related metrics we have tended to track to date. We will seek to broaden our assessment of real-world progress, including governance, public attitudes, corporate commitments, finance, just transition and the green recovery, as well as consumption emissions and the factors affecting them.
  - Early signs of progress on key enablers include two Cabinet Committees, the UK Climate Assembly, Scotland's Just Transition Commission, publication of the interim report of the HM Treasury Net Zero Review, and a rapid increase in climate commitments and action from UK businesses.
- **The pace of progress varies across sectors.** Some sectors of the economy are making strong progress towards Net Zero, while others are lagging behind:

– Sales of **electric vehicles** and the deployment of supporting charging infrastructure have increased considerably in recent years. Policies will be required to drive the accelerated uptake required throughout the 2020s (e.g. a zero-emission vehicle mandate). There are also concerning trends, notably the rapid growth in car and van travel and shift towards larger vehicles during the past decade.

– There has been almost none of the necessary progress in upgrading the **building stock**. Despite a small improvement in rates of heat pump installation, these remain far below levels that are necessary. Insulation rates remain well below the peak market delivery achieved up to 2012 before key policies were scrapped, demonstrating clear potential for growth if an effective policy package is in place.

– Deployment of **renewable electricity generation** has scaled up rapidly. The increase in 2020 was at a much slower rate than the average achieved over the previous five years, however, the growing project pipeline means that this slowdown is likely to be temporary.

– Progress in **agriculture and land use** has repeatedly failed to meet the indicators (e.g. for tree planting and on-farm efficiency measures) outlined in the Committee's progress reports in recent years. There are signs of potential consumer willingness to shift towards less carbon-intensive diets, but this has not yet translated to reduced meat consumption or been backed up by policy to support the change.

– Progress in reducing **emissions from waste** have stalled in recent years following a period of steep emissions reductions from the late 1990s caused by the diversion of waste from landfill.

– In the decade prior to 2020, **air passenger** demand increased by 36%. Efficiency improvements were not enough to offset this rise in demand, leading to a rise in emissions.

– Although there have been emissions reductions in **industry**, it is unclear how far this reflects structural changes driven by wider factors or genuine improvements in efficiency and carbon intensity. Tracking progress against our recommended pathway for manufacturing and construction is currently challenging because of a lack of data, which in some cases is because the technologies or approaches are still at an early stage of deployment.

This Chapter is set out in three sections:

1. Tracking underlying progress
2. Underlying progress on key enablers of the path to Net Zero
3. Underlying progress by sector

a) Why we care about underlying progress

Tracking underlying progress is important, to understand whether lasting changes are being put in place that will lead to the necessary emissions reductions later on.

The end goal of domestic emissions reduction policy is to reduce UK greenhouse gas emissions to Net Zero by 2050. Reporting changes in annual greenhouse gas (GHG) emissions and setting targets to reduce those emissions is a fundamental element of monitoring the UK's progress on tackling climate change.

However, reporting annual GHG reductions does not tell the complete story. Chapter 2 sets out how the largest changes in annual emissions in the last decade were driven not only by reductions in the power sector, but also by external factors including winter temperatures, economic recessions, and most recently by lockdown measures during the pandemic (Figure 2.5).

Tracking underlying progress is therefore crucial to understanding what is driving current and future trends in UK emissions, and for identifying areas where the UK is performing well or falling behind.

In particular, we are interested in identifying a sustained shift towards low-carbon investments and behaviours (e.g. an expansion of renewable electricity generation, an increase in the share of electric cars being bought, higher rates of planting trees, a shift from car use towards walking/cycling).

b) Our basis for monitoring underlying progress in future

In December 2020 the Committee published a Balanced Pathway to Net Zero as the basis for the recommended Sixth Carbon Budget, along with a range of alternative pathways to Net Zero. These pathways identify the changes in investments, choices and behaviours that would deliver the budget and put the UK on track to Net Zero. They give us a reasonable basis against which progress can be measured.

We can compare real-world deployment to the CCC pathway to see whether things are on track.

We recognise that there are options and uncertainties associated with pathways to meet the Net Zero 2050 target and the Sixth Carbon Budget. While the Balanced Pathway – referred to in this report simply as the 'CCC pathway' – sets a basis for the budget, it is not intended to be prescriptive. Rather it is illustrative of what a broadly sensible path without extreme assumptions would look like. A little more or a little less may be achieved in any given area, or alternative low-carbon solutions could be used, but the overall level of ambition and delivery must match. Since the pathway is, by design, stretching in all areas there is only limited scope to diverge significantly in any one area, as credible options to go significantly further in others are limited.

Our pathway modelling approach for the Sixth Carbon Budget was rooted in the technologies, investments and behaviours that are needed to decarbonise. This approach allows us to produce a large range of quantitative metrics of what is needed to achieve Net Zero. These are referenced throughout this chapter.

We will extend our progress reporting in the next year to cover a wider set of underlying drivers of emissions reductions

However, we have not fully quantified all the leading indicators and enablers needed to deliver them, such as strengthening of supply chains, expansions of the skilled workforce, or changes in public attitudes. Over the next year, the Committee will work towards a more complete set of indicators that also aim to track those real-world drivers of underlying progress.

Where we assess them to be credible, we will aim to align our progress monitoring to the Government's plans and proposals.

The Committee's ability to monitor Government performance on climate change also rests heavily on publication of the UK's Net Zero strategy, anticipated later this year. This publication will raise two key questions that will guide the Committee's scrutiny of underlying Government progress in future reports:

- Does the Net Zero Strategy set out a credible pathway to the Sixth Carbon Budget and Net Zero targets?
- Is the Government on track to deliver what was promised in its own Net Zero strategy?

We will aim to align our progress metrics and monitoring with the Government's proposals where we consider those to be credible and practical.

2. Underlying progress on key enablers of the path to Net Zero

This section reviews some of the key cross-cutting enablers for delivering Net Zero, and identifies underlying progress in each theme. Our future work will expand on each of these themes in more detail.

a) Governance and delivery

Government will need to work together effectively at all levels to deliver the pathway to Net Zero.

Good governance will be crucial in enabling delivery of the path to Net Zero. Mitigating and adapting to climate change are challenges that cut across the entire economy, requiring Government to work together at all levels. There has been some activity on this challenge in the last year:

- There are now two Cabinet sub-committees (for Climate Action Strategy, chaired by the Prime Minister, and Climate Action Implementation, chaired by the Secretary of State for Business, Energy and Industrial Strategy). The Government does not report on the content or frequency of these meetings, but it is clear from the increased policy activity and the Committee's own experience that they are being used.

- The Government has recently separated the roles of Secretary of State for Business, Energy and Industrial Strategy and President of COP26.

- At senior official level there is a Climate Change National Strategy Implementation Group, a Net Zero Steering Board and various coordinating working groups. The Business and Energy Secretary has also recently convened a new Net Zero Expert Group as part of Task Force Net Zero, which aims to adopt a whole-system approach to decarbonising the UK economy.

- The Government has set the Bank of England a new mandate to support the Net Zero transition.[2] It has also established a Net Zero Business Champion (see part e) of this section).

- In the past year, parliamentary Select Committees have opened at least 20 inquiries into aspects of the UK's path to Net Zero.

- Both the National Audit Office (NAO) and the Institute for Government (IfG) have made recommendations[3,4] based on their assessments of what structures and approaches would be best within the centre to coordinate the work that is required across all areas of Government business. The recent Dasgupta Review[5] suggested including natural capital within an 'inclusive wealth' approach to national accounting systems to appropriately value sustainable economic growth and development.

This process of embedding Net Zero throughout Government departments must continue through the 2021 Spending Review, for which plans to contribute to Net Zero should be a key criterion.

Government must set a clear strategy for how Net Zero will be delivered across the whole system.

There are further challenges beyond central Government. There will need to be a strong, clear strategy set from the centre, with clear lines of responsibility and accountability alongside appropriate empowerment of those tasked with delivery. The UK Government must coordinate effectively with devolved governments and there must be a clear expectation of, and support for, local government.

- Net Zero and the recent legislation of the Sixth Carbon Budget set a clear direction, but these now need to be developed into a full strategy for delivering the necessary decarbonisation. The build-up to COP26 provides an opportunity for the UK to show leadership in setting out ambitious decarbonisation plans and a roadmap for delivering these. This momentum and Government ambition must be sustained and built upon beyond COP26.

- Each of the devolved administrations contributes to the UK's overall Net Zero target, while Scotland and Wales each have their own Net Zero targets. As such, each devolved administration is developing and implementing policy to reduce emissions – this presents both challenges in terms of aligning policy signals and outcomes, and also opportunities to learn from best practice.

Much of the activity that is required to deliver Net Zero will be carried out at the local level. Therefore, it is vital that local actors are properly empowered and supported to deliver these actions.

- A lot of the delivery required for Net Zero is inherently local in nature, but local actors (including local authorities, sectoral bodies and business groups) are frequently not properly empowered and supported to deliver the actions required.

    – Nearly three-quarters of local authorities have declared a climate emergency. However, there can be uncertainty around what actions they should take to address this, and delivery of Net Zero can be a challenge in the context of funding shortfalls and competing needs to deliver statutory obligations.

    – As part of our advice on the Sixth Carbon Budget, we commissioned an assessment of the role of local government.[6] This produced several recommendations for how to enable collaborative delivery, including the need for an agreed framework incorporating local and national action, the importance of aligning policy and local powers with ambition and the requirement for appropriate long-term programmatic funding.

We intend to consider the governance challenges further during the 2021-22 year, including the work of other organisations and potential lessons from other delivery challenges. We will report back on our findings in our 2022 Progress Report.

b) People and public engagement

Meeting the Sixth Carbon Budget and the Net Zero target will require increased action from people, as consumers, workers, households, businesses and citizens. Our analysis shows that over half the emissions reductions needed to meet the Sixth Carbon Budget involve people making low-carbon choices, whether adjusting to the different characteristics of low-carbon technologies (e.g. electric cars), or by changing their current consumption patterns (e.g. by eating less meat).

The Climate Assembly UK was an important start in engaging the public more in climate policy decisions.

The experience of the Climate Assembly UK shows that people will support the transition to Net Zero if they understand what is needed and why, if they have options and can be involved in decision-making processes. However, for wider society in general, while there is an increased awareness of the need for climate action, there is still a gap in understanding what this means for them. For example, while 80% of people are concerned about climate change, only half are aware that their gas boiler produces emissions.[7] Climate Assembly UK also demonstrated that there is much that government can learn from citizens' lived experience and values that can help in formulating better policy.

There is a clear requirement for the Government to tell a better story on how people can engage in the transition, while also learning from people's experiences. The need for a Government public engagement strategy was identified as a key policy priority area in our Sixth Carbon Budget advice.

Our future work will include looking at 'what works' for public engagement, further analysing what meeting the Sixth Carbon Budget means for individual choices, and assessing the Government's own public engagement plans.

The Committee will be undertaking further work on how people can be engaged effectively on this path, with a view to making more detailed recommendations to Government in 2022. The work will be informed by stakeholder engagement, literature review, survey data and work with the Climate Citizens project at Lancaster University. It will cover:

- Establishing the principles of what good public engagement for Net Zero looks like. This will include a synthesis of the main findings of different public engagement strategies and models used in the UK and overseas, both within climate change and other policy areas, in order to demonstrate what works and what we can learn from successful engagement.
- Unpacking the key Sixth Carbon Budget actions that actively involve people changing how they do things. This will allow us to identify:
  - Priority areas for engagement.
  - The most appropriate engagement model(s), policies and key delivery partners, drawing on evidence from case studies.
  - The key indicators and survey data with which to track progress against and identify key data gaps.
- Assessing the public engagement aspects of the Government's Net Zero Strategy.

c) Just Transition – who pays and who gains?

The costs and the benefits must be shared in a way that is fair and is perceived to be fair.

A key challenge on the path to Net Zero is how to spread the costs and benefits of the transition across the economy: for households, businesses and the Exchequer.

The Treasury published their initial findings on this challenge in December, in the interim report of their Net Zero Review. Its conclusions echoed the Committee's in our Net Zero report and in the Sixth Carbon Budget, as well as the conclusions of our Expert Advisory Group on the costs and benefits of Net Zero.[8] Conclusions include that the effects of decarbonisation on economic growth are likely to be small and that the costs of the transition are uncertain but can be minimised with good policy, which should rely on a range of levers (Box 3.1).

There is currently an imbalance between gas and electricity prices. This does not fairly spread the costs of polluting nor incentivise the right decarbonisation decisions.

In the long term, the transition should result in lower energy costs and energy bills, but in the coming decade our scenarios involve further increases in electricity costs before these begin to fall. To date, climate policy costs have been primarily added to electricity prices rather than to gas prices. This has adversely affected particular groups (those with electric heating, who are often fuel poor) and had a distortionary effect by undermining the case for electrification, which should play a major role in meeting the Sixth Carbon Budget both in homes and in industry.

There is growing consensus on the need to tackle the imbalance between electricity and gas prices. For example:

- Public First, supported by five major energy companies, produced an assessment of policy options for energy bill reform that would remove the running cost disincentive on electrified heating, while maintaining affordability of heating for average households across the country, not substantially increasing costs for the fuel poor and without putting an undue fiscal burden on public finances.[9] The 750,000 electrically-heated fuel poor households would benefit. Particular issues include how better to target fuel-poor households and impacts on people moving in and out of fuel poverty (fuel poverty 'churn'), who would be hit by a large bill increase under their proposals.
- In their Fourth Annual Report, the Committee on Fuel Poverty (CFP) recognised the adverse incentives under the current system, which discourage the necessary move away from gas or oil to electricity. The CFP's preference is that climate policy costs are not passed on to consumers via bills but rather recovered in income taxation. However, in the short term they support a shift of policy costs to gas bills, as long as measures are taken to protect fuel-poor households against any resulting bill increases.[10]

Reaching Net Zero will bring tangible benefits to people's lives that overwhelmingly outweigh the negatives. These benefits should be shared as widely as possible.

Alongside the benefits in mitigating climate change, and the potential for lower energy prices in the long term and economic benefits, there are additional benefits on the path to Net Zero. These include significant, tangible improvements to public health, the environment and biodiversity:

- Chapter 5 of the Sixth Carbon Budget set out in detail the range of co-impacts that are likely to arise from decarbonising our economy. The Committee appointed an expert advisory group on health to support our advice on the Sixth Carbon Budget, which concurred strongly with our previous assessment that climate action could bring significant benefits to health, including through healthier diets, more exercise and better air quality.

- We concluded in the Sixth Carbon budget that the positive co-impacts of reaching Net Zero overwhelmingly outweigh the negatives, especially if supported by the right policy decisions from the Government to maximise societal benefits and minimise the risks.

HM Treasury's Net Zero Review final report is now two years in the making and has many questions still to answer.

The final report of the Treasury's Net Zero Review, which was planned for Spring 2021, has been delayed and is now expected later this year – over two years since the Committee recommended it. We expect the Review to address many of the issues around who pays and who gains from a transition to Net Zero, including:

- Developing a plan for funding decarbonisation and reviewing the distribution of costs for businesses, households and the Exchequer. This should set out the main areas where action and funding will be required, the principles on which the distribution of costs should be determined and clarity over how costs will be allocated.
- Considering near-term as well as long-term decarbonisation funding needs and policy implications. One Government cannot make funding commitments that bind future Governments, but the review can set out principles to inform the scale and nature of long-term Government funding and make concrete proposals for action and funding over the next five to ten years, or at least be accompanied by a spending review or budget which does the same.
- Reforming price signals, including the potential to raise offsetting revenues by greater use of carbon taxes (e.g. for sectors like aviation that are currently under-taxed and where equity concerns are less present) and the need to rebalance policy costs between gas and electricity to ensure the take-up of low-carbon electricity solutions is not hindered.

For climate action to be effective, it must reduce global emissions, not just UK territorial emissions. Emissions reductions from UK industry must result from reduced UK consumption and from decarbonising the UK's own industries, rather than 'offshoring' production to other countries (i.e. 'carbon leakage'). It is vital therefore to consider competitiveness as part of the just transition.

Emissions can be reduced while maintaining competitiveness, but this will require policy to support UK industries.

Our advice on the Sixth Carbon Budget identified how emissions can be reduced while managing competitiveness. Government has also set out a vision of how this can be achieved, through strategies including the Industrial Decarbonisation Strategy. The Strategy stated that 'In the immediate future, government's preferred method for mitigating the risk of carbon leakage will continue to be free allocation of UK ETS emissions allowances, which will be decreasing throughout the 2020s.' The Government is consulting on the future of free allocation.

Going forward, we will monitor progress on the development of these policies and consider indicators to track progress on managing competitiveness. We will also consider how policies to manage competitiveness can be designed to reduce the embodied emissions of UK imports.

Managing the transition fairly will be an ongoing process and must continue beyond the publication of the final report of the Treasury's Net Zero Review. We will continue to monitor the Government's progress in delivering a transition that shares costs and benefits fairly across different groups. Our further work on this theme, in addition to tracking government progress, will depend on the findings of the Net Zero Review.

Box 3.1
Findings of the interim report of HM Treasury's Net Zero Review

In May 2019 the Committee's Net Zero report recommended that the Treasury undertake a review of how the costs of achieving Net Zero emissions should be distributed and the benefits returned. The Treasury agreed to undertake the review and published its interim report in December 2020. Key findings of the interim report include:

- **Reaching Net Zero is essential for long-term prosperity.** Global action to limit greenhouse gas emissions is needed to avoid catastrophic climate change with almost unimaginable consequences for societies across the world. But this transformation will also create opportunities for the UK economy, like new industries and jobs that emerge as existing sectors decarbonise or give way to low-carbon equivalents.
- **The effect of UK and global climate action on UK economic growth is likely to be relatively small.** The scale, distribution and balance of new growth opportunities and challenges will depend on how the economy and policy respond to the changes required.
- **The costs of the transition to Net Zero are uncertain and depend on policy choices.** Investment requirements to reach Net Zero and impacts on operating costs are affected by a range of factors which are subject to significant uncertainty (e.g. the precise path of the transition, changes in behaviour and the rate at which technology costs fall and efficiency gains are made).
- **Government needs to use a mix of policy levers to address multiple market failures and support decarbonisation.** Government policy should seek to target market failures directly where possible, subject to distributional and international competitiveness impacts. Carbon pricing is an important lever in addressing the negative externality problem but should be supplemented by other policies.
- **Well-designed policy can reduce costs and risk for investors, support innovation and the deployment of new technologies.** A clear policy framework setting out the government's approach at different levels of technological development can help address uncertainties. Where uncertainty is at its greatest, government may need to provide more direct support.
- **The risk of carbon leakage will increase with efforts to reduce emissions.** Changes required for the transition could lead to carbon leakage if policies achieve their goal of lowering emissions in one jurisdiction but inadvertently increase emissions elsewhere. The size of the risk depends on each sector's costs of decarbonising, their trade exposure and international policies. The government has a number of ways to seek to mitigate this risk, including through its climate diplomacy and the design of policies to support the transition.
- **Government needs to consider household exposure to the transition through their consumption, labour market participation and asset holdings in designing policies.** Different types of household will have different levels of exposure to the transition. Where costs fall will depend on a range of factors, including the cost of decarbonising each sector, the availability of alternative low-carbon products and the distribution of new green jobs in the economy. Government will need to be mindful of these issues as they consider the best way to design policy to support the transition.

Source: HM Treasury (2020) *Net Zero Review: Interim Report.*

d) Just Transition – workers and skills

There is a transition risk to employment, as high-carbon activity declines and new low-carbon industries are created.

The transition to Net Zero will need more of some jobs and fewer of others. There is no reason to think that the total number of jobs should be any lower than in a high-carbon world – a recent report by the Confederation of British Industry set out the potential for the transition to Net Zero to create 240,000 new green jobs by 2030 across the UK,[11] and the International Energy Agency's Roadmap for the Global Energy Sector results in 14 million jobs created globally by 2030.[12] But the shift in jobs from some areas to others brings a significant transition risk.

A strategy is needed to ensure a just transition for workers.

The transition will affect the whole of the UK, with impacts differing across regions, sectors and workers. Risks of negative localised impacts must be a particular focus for policy. The deindustrialisation that has occurred in the UK to date has already left some regions disproportionately worse off, with previous efforts in the UK to transition workers in declining industries to new jobs achieving limited success.[13] A strategy for the just transition is required to ensure no group is left behind.

Key developments over the last year include publication of the final report of the Scottish Just Transition Commission, establishment of the Green Jobs Taskforce and the Government's plans for a Skills and Post-16 Education Bill:

- The Scottish Just Transition Commission published its final report in March 2021.[14] The report acknowledged that transitioning to Net Zero means a fundamental transformation of the nation's economy, which offers great opportunities, but must be implemented fairly. It made 24 recommendations to ensure the transition is made "by the people of Scotland, not done to the people of Scotland", including four practical recommendations to equip people with the skills and education they need to transition to Net Zero:
  - A flexible and accessible skills and education system.
  - A skills guarantee for workers in carbon-intensive sectors.
  - Support for small and medium enterprises to invest in their workforces.
  - Equipping farmers and land managers with the skills, training and advice they need.
- The Green Jobs Taskforce was convened by BEIS to focus on both immediate and longer-term challenges of delivering skilled workers for the transition to Net Zero. It will produce a Green Jobs Action Plan with solutions and recommendations. These documents had not been published as this year's Progress Report was being finalised and its recommendations were not considered as part of our assessment of progress.
- The 2021 Queen's Speech set out plans for the Government's Lifetime Skills Guarantee, which will offer adults loans to retrain in later life and help them "to gain in-demand skills and open up further job opportunities", as part of the Skills and Post-16 Education Bill. The Bill will also aim to realign the education system around the needs of employers to fill skills gaps in sectors including construction, digital, clean energy and manufacturing.[15]

We will continue our work in this area, drawing on existing external research and analysis and identifying knowledge gaps which the Committee could help to fill.

We will draw on the pathways we developed for the Sixth Carbon Budget and consider in particular the implications for employment and skills policy, and consider what indicators could be used to track success in ensuring a just transition.

e) Other key drivers of progress

We will continue to develop our understanding of what progress towards Net Zero looks like for businesses, the financial system, UK innovation, carbon pricing, international engagement, and more.

Further enabling actions will be required to meet Net Zero. The Committee's future work on cross-cutting areas will build on previous reports and explore new areas. As with policy development more generally (see Chapter 4), there has been progress in these areas in the last year.

- **Business action.** While the UK government must set the frameworks for the transition and citizens must make low-carbon choices, the private sector must invest and transform their business models. This will often be driven and supported by the third sector. Increasingly, businesses are delivering on these ambitions, by procuring low-carbon electricity, switching to electric vehicles and decarbonising their own operations. Our future work will aim to help businesses make informed decisions that are in line with Net Zero (see Box 3.2) and track how corporate commitments are progressing in the UK. Key developments in the past year include:
  - The UK had the largest share of companies (94 out of 300) in the Financial Times' Europe's Climate Leaders list of companies that have achieved the greatest reduction in greenhouse gas (GHG) emissions intensity* since 2014.[16]
  - The BSI Net Zero Barometer found that 7 out of 10 businesses in the UK have made or are considering making a commitment to Net Zero, but the vast majority (82%) require more guidance if they are to achieve the target, with cost cited as the biggest barrier.[17]
  - Nearly one in three FTSE100 companies have signed up to the UN's Race to Zero campaign.[18] Small and micro businesses are now also being encouraged to commit to cutting their emissions (in half by 2030 and to Net Zero by 2050 or sooner) through the Together for our Planet campaign and newly-established UK Business Climate Hub.
  - The Government has established a Net Zero Business Champion with direct responsibility to support as many UK businesses as possible to commit to net-zero emissions targets.

Investment and finance. The Committee's Expert Advisory Group on Net Zero finance concluded that the investment programme required for the Sixth Carbon Budget is deliverable, but that delivering at the lowest overall cost is dependent on policy in both the 'real' and 'financial' economies. The Group highlighted the need for a regular assessment of investment needs and financial flows for climate action in the UK. Such an assessment would consider the level and sufficiency of capital investment flows made by households, firms and public authorities to achieve the UK's climate goals of Net Zero, adaptation and a just transition. It would also aim to assess the overall alignment of the UK's stock of financial assets with the Paris Agreement and for Net Zero and resilience at both a UK and global scale. Key recent developments in low-carbon finance include:

* This ranking covers only Scope 1 and Scope 2 emissions, and does not cover Scope 3 emissions from companies' supply chains and the end-use of their products and services.

– London remained top of the Global Green Finance Index (GGFI).[19] The index ranks cities based on the quality and depth of their green finance offerings, capabilities and mechanisms. Ratings rose in almost all centres globally, but Western Europe continues to be the most mature market, accounting for nine of the top 10 and 12 places across the respective rankings.

– From May 2019 to May 2021, the UK climbed from eight to fourth in EY's rankings for international attractiveness of renewable energy investment and deployment opportunities.[20]

– The UK has announced its intention to make Task Force on Climate-related Financial Disclosures (TCFD) aligned disclosures mandatory across the economy by 2025, with a significant portion of mandatory requirements in place by 2023.

– The UK Government announced at least £15 billion of 'green gilts' sovereign bonds for this financial year, and the Bank of England's climate change stress test will be published in June 2021.

– The remits of the Bank of England's Monetary Policy Committee (MPC) and Financial Policy Committee (FPC) were updated to reflect the Government's economic strategy to achieve economic growth that is consistent with Net Zero.

– The Prime Minister's Finance Adviser for COP26 has published a Private Finance Strategy for climate change.

- Innovation and infrastructure have played a critical role in driving down the costs and improving the efficiencies of the low-carbon technologies we use today. Sustained support for innovation – at all stages of the technology life cycle, including deployment – can ensure costs and efficiencies continue to improve in the future. Scaling up low-carbon technologies will rely on new infrastructure (e.g. electric vehicle charging points, electricity network upgrades and new CO_2 storage and hydrogen networks). This must be reflected in infrastructure decisions in the 2020s and be resilient to a changing climate. Monitoring progress will involve tracking technology costs and uptake, funding available for Net Zero research and innovation, as well as whether the necessary infrastructure is being built. Key recent developments include:

  – HM Treasury confirmed a new Net Zero Innovation Portfolio (NZIP) with funding totalling £1 billion. Funding will be allocated on a competitive basis to sectors including long-duration energy storage; floating offshore wind; biomass and regenerative agriculture.

  – Progress has been made on plans and funding for infrastructure, including the National Infrastructure Strategy, Plan for Growth, and the establishment of the UK Infrastructure Bank.

- Cross-economy carbon pricing and obligations. To incentivise the transition to Net Zero, prices will need to reflect carbon content sufficiently to favour low-carbon options over high-carbon options. That can be achieved through explicit carbon pricing or other financial levers, although these will not be sufficient by themselves and must be backed up by other policy. In principle, all sectors of the economy could be exposed to carbon pricing, although care must be taken in managing impacts when doing so.

Monitoring the impact of carbon pricing will involve tracking the price of emitting (or removing) carbon in the UK, the scope of emissions that is covered by such a scheme, and the impact it is having on real-world decisions. The UK Emissions Trading System (UK ETS) launched at the start of the year. The Government has committed to consulting by September 2021 on a cap for the UK ETS consistent with the Sixth Carbon Budget.

- **International / engagement with other 'Climate Councils' worldwide.** The Committee is working with over 20 other climate councils from around the world to share knowledge and insights, recognising the significant common ground and importance of independent, evidence-led advice in implementing the Paris Agreement. This is being taken forward as a formal international network with events planned around the COP and in future years.

Box 3.2
The role of business in delivering the Sixth Carbon Budget

Corporate action is already driving significant change across the UK and internationally, and accelerating this action will enable the policy, technological, behavioural, and business model changes needed for a zero-carbon society. Yet many businesses within the UK are increasingly looking for information and a better understanding of the future context in which they will operate.

Alongside our advice on the Sixth Carbon Budget we developed a briefing note on how businesses in the UK can act to support the UK's transition to Net Zero. This suggests the following principles to guide business ambition in the UK:

- **Do the basics well – measure, disclose, target, act, adjust.** Companies should account for, and take action on, all emissions they are responsible for and be transparent about their objectives to reduce emissions, and how they plan to do it.
- **Adopt the highest possible ambition**, acknowledging that some, particularly large, businesses may be able to achieve Net Zero earlier than the UK's national objective.
- **Address all emissions, and go beyond.** In particular companies should look at the emissions that occur in their supply chains ('Scope 3' emissions), and go beyond this. In particular we identify two areas to advance progress:
  - Companies can lead the transition to electric vehicles in the UK, and should switch their vehicle fleets to EVs over the 2020s
  - Companies should ensure corporate renewables procurement pays for new low-carbon electricity to be installed, rather than just purchasing existing renewables.
- **Ensure Climate Change is addressed at the highest levels** of corporate leadership, including ensuring climate action is given board level and CEO responsibility.
- **Minimise offsets, phase them out, and ensure only permanent emissions removals remain**, in line with our recommendations around how the UK should meet its national carbon budgets.

Source: CCC (2020) *The role of business in delivering the UK's Net Zero ambition.*

This section assesses underlying progress by sector, showing changes in the 'key metrics' that could be used to track progress against our recommended pathway to Net Zero and discussing broader underlying developments that are likely to affect technology deployment, changes in individual and business behaviours, and ultimately UK emissions in future years.

These key metrics are not yet a full indicator framework, but many of these metrics will continue into future progress reports.

a) Surface transport (113 $MtCO_2e$, 23% of UK emissions in 2019)

Surface transport remains the UK's highest-emitting sector. Delivery of the Balanced Net Zero Pathway ('CCC pathway') from our 2020 Sixth Carbon Budget Report will require substantial progress over the coming years:

During the 2020s, we need to see rapid uptake of EVs, supported by widespread deployment of charging infrastructure.

- Rapid ramp-up of sales of fully electric cars and vans through the 2020s, reaching almost 50% of all new sales by 2025 and 100% by 2030.
- This will need to be supported by the deployment of almost 280,000 public charge points across the country by 2030.
- Trials of zero-emission HGVs to commence in the early 2020s, alongside logistics and efficiency improvements for existing HGV fleets.

Government needs to invest in attractive alternatives to car travel, to reduce the use of high-carbon transport.

- Investment in high-quality public transport and active travel infrastructure, to support a 6% reduction in demand for car travel by 2030 relative to baseline forecasts.

Key surface transport indicators cover emissions intensity, new vehicle efficiency, electric vehicle (EV) take-up, biofuels and travel demand (Table 3.1).

Table 3.1
Key metrics for surface transport in the CCC Pathway to meet the Sixth Carbon Budget

		Latest Indicator			Milestones in the CCC pathway				
Metric		Year	Annual change	Value	2025	2030	2035	2050	Trend
Intensity	BEV car registrations (thousands)	2020	+184%	108	1,290	2,750	2,960	3,360	
	Market share (%)	2020		6.5%	48%	97%	100%	100%	
	PHEV car registrations (thousands)	2020	+92%	67	698	0	0	0	
	Market share (%)	2020		4.1%	26%	0%	0%	0%	
	Electric van registrations (thousands)	2020	+64%	6	237	439	460	502	
	Market share (%)	2020		2.0%	56%	99%	100%	100%	
	New car CO_2 emissions (gCO_2/km)	2020	-12%	113.0	51.4	3.3	0.0	0.0	
	New van CO_2 emissions (gCO_2/km)	2020	-2%	163.0	74.7	0.1	0.0	0.0	
	HGV emissions intensity (gCO_2/km)	2020	-12%	592.0	537.0	450.0	246.0	8.1	
	Biofuel uptake (% fuel sales by energy)	2020	+16%	4.7%	4.2%	4.7%	6.3%	17.0%	
Demand	Car-km per driver (km)	2020	-25%	10,000	12,500	12,300	12,100	11,100	
	Car distance driven (billion kms)	2020	-25%	351	441	453	466	483	
	Van distance driven (billion kms)	2020	-9%	84	92	99	107	122	
	HGV distance driven (billion kms)	2020	-6%	28	26	25	26	28	

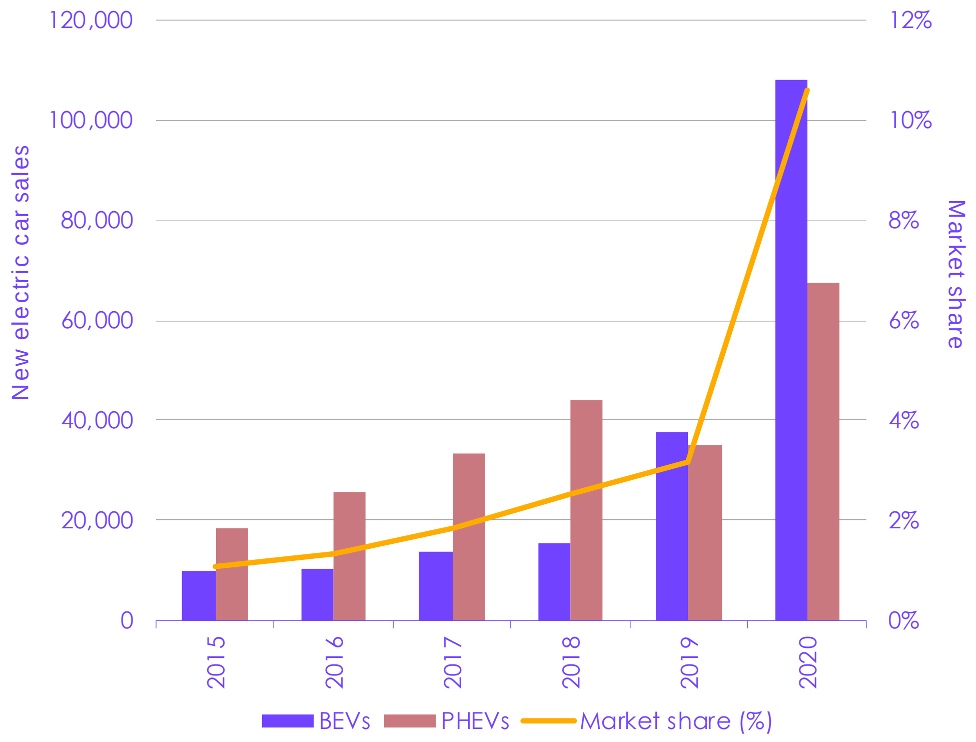
Source: DfT, SMMT and HMRC (2021); CCC analysis
Notes: 1. New car CO_2 figures are calculated on an NEDC test-cycle basis, to enable comparison with previous years. 2. While indicators that are calculated using travel demand (car-km per driver, car distance driven, van distance driven and HGV distance driven) currently look on track to meet or ahead of CCC Pathway milestones, it is important to note that travel demand in 2020 was significantly lower compared to previous years as a result of COVID-19.

Sales of EVs and the deployment of supporting charging infrastructure have increased considerably in recent years. This will need to accelerate throughout the 2020s. However, there are also concerning trends, notably the rapid growth in car and van travel during the past decade.

EV sales rose to record levels during 2020. Manufacturers are increasingly scaling up their EV offerings.

- While total car sales fell 30% in 2020, sales of EVs more than doubled, to 175,000 vehicles or 10.6% of all new car sales (Figure 3.1). There has also been a shift towards battery-electric vehicles (BEVs) from plug-in hybrids (PHEVs) – BEVs now represent over 60% of EV sales, from around 50% in 2019.
  - Manufacturers are increasingly scaling up their EV offerings. There are now around 45 BEV car models on the market, with at least a further 3 expected over the remainder of 2021.
  - Advancing EV technologies are lengthening driving ranges and cutting prices.[21] Research shows that battery prices have fallen by 13% from 2019 to 2020[22], and popular EV manufacturers[23] have been reducing prices in 2021.
  - Evidence[24] suggests consumers are giving increasing consideration to environmental issues as part of their purchasing decisions.

Figure 3.1 Number of UK new electric car sales and market share of total car sales

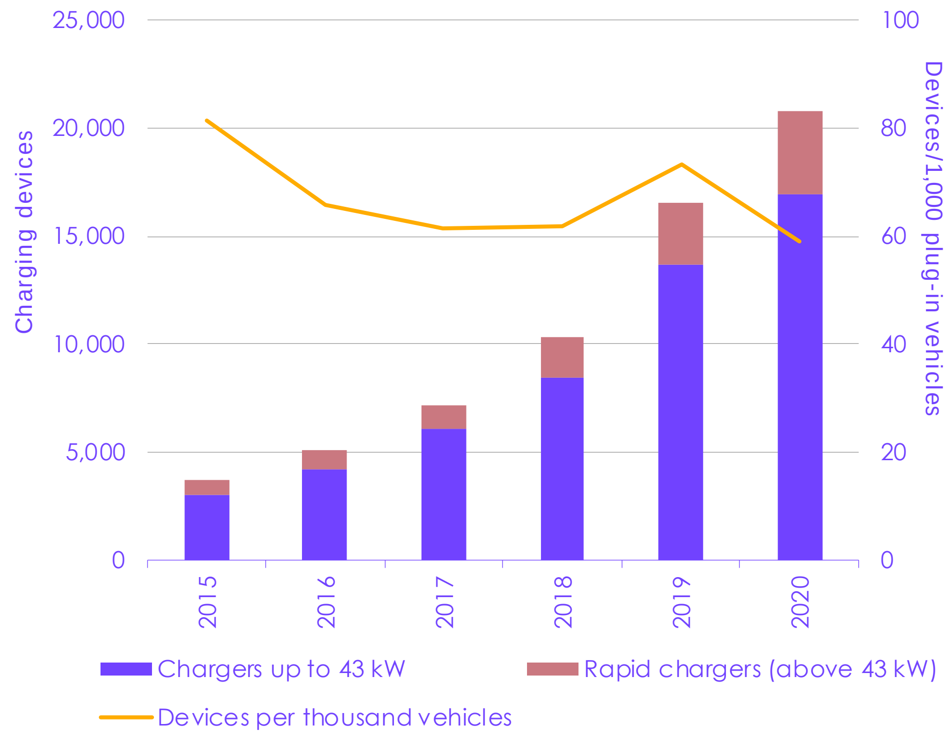


Source: DfT (2021); CCC analysis
Notes: Market share, shown on the right-hand axis, represents the combined sales of BEVs and PHEVs as a proportion of all new car sales in the given year.

There are now over 20,000 public EV chargers in the UK. Deployment needs to continue to accelerate to make charging readily available across all areas of the country.

- The UK's public charge point network is expanding quickly (Figure 3.2), and there are now 20,800 public EV charge points across the UK, up from 16,500 at the end of 2019.[25] This provision is inconsistent across the country. On a per-capita basis, charge points in England and Northern Ireland are lower than in Scotland and Wales. A disproportionate share of public charge points in England are located in London and other urban areas in the South East.

Figure 3.2 Total publicly accessible charging devices installed across the UK, and ratio of devices to the number of plug-in vehicles



Source: DfT, OZEV and ZapMap (2021); CCC analysis.
Notes: Includes all publicly accessible charge points across the UK at the end of October in the given year. The ratio, displayed on the right-hand axis, is over all plug-in vehicles operating at the end of Q3 in the given year.

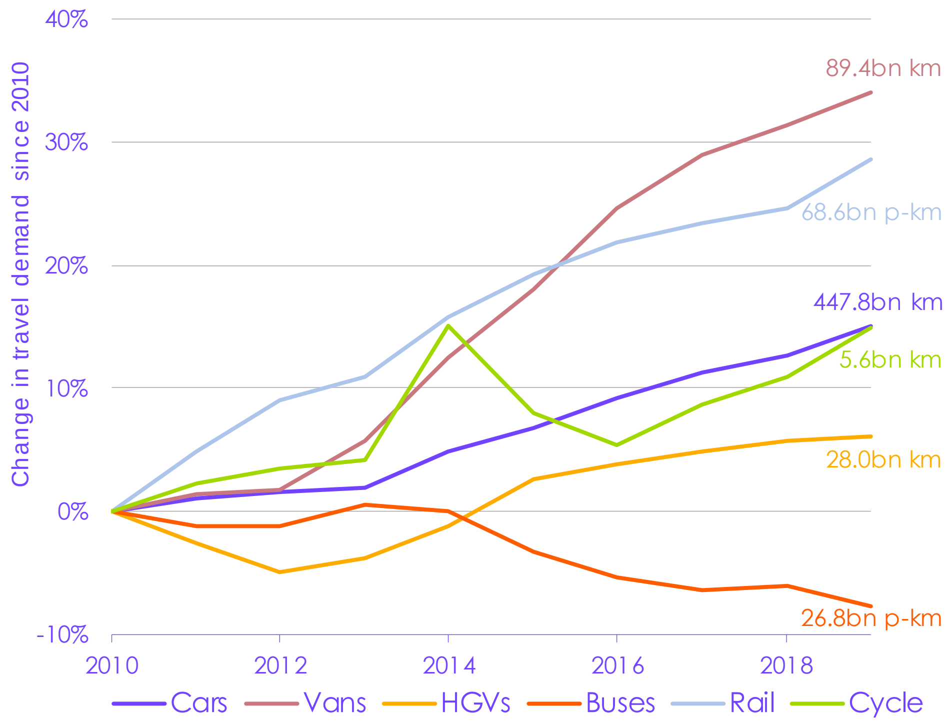
New car CO_2 intensities have risen in recent years, driven by the high proportion of large SUVs purchased.

- Between 2007 and 2016, the average CO_2 emissions of a new car decreased by 27%. This trend reversed between 2017 and 2019, mainly due to increasing sales of higher emitting SUVs. Efficiency improved again in 2020 by 12%[26], but this was almost entirely due to record sales of electric vehicles (EVs). The high proportion of SUVs, representing one in four new car sales, remains a concern.

Demand for road transport has continually grown year-on-year in recent decades. This is partly due to the falling real-terms cost of driving.

- Road transport demand has risen markedly over the past decade*, which continued with a 2% increase in 2019 (Figure 3.3). The falling real cost of driving, a large increase in van travel (due in part to the growth in online shopping[27]) and slower growth in HGV demand are key contributors.
  - Over the past decade, the average cost of driving has risen by less than average wages and the cost of living, whereas rail and bus fares have increased more steeply.[28] A recent study[29] linked the freeze in fuel duty since 2011 to a 4% increase in traffic levels, 60 million fewer rail journeys, 200 million fewer bus journeys and 4.5 MtCO2 of emissions in 2017.
  - From 2021 to 2022, rail fares will increase by the Retail Price Index (RPI) plus 1%, a 2.6% rise.[30] In contrast, the long-haul rates of Air Passenger Duty will increase in line with RPI and short-haul rates will not rise.[31]

Figure 3.3 Changes in travel demand by mode since 2010



Source: DfT, ORR (2021); CCC analysis.
Notes: The chart shows the percentage change in the number of kilometres travelled by each type of transport (total kilometres driven for cars, vans, HGVs, and cycles; total passenger-kilometres for buses and rail) in each year, compared to levels in 2010. The data labels show the absolute levels of demand for each mode in 2019.

The Committee intends to continue tracking these key indicators of EV uptake, charging infrastructure deployment, vehicle efficiency and travel demand by mode, for the Sixth Carbon Budget pathway, in future progress reports. We will also explore opportunities to monitor other key enablers of the transition, including public attitudes to various modes of travel, the scaling-up of EV supply chains and the availability of safe, reliable and attractive alternatives to car travel.

* The reductions in travel demand seen in 2020 were due to the impacts of the COVID-19 pandemic, and not reflective of the underlying trends observed over recent years.

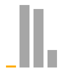
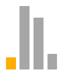
b) Buildings (88 $MtCO_2e$, 18% of UK emissions in 2019)

The path to Net Zero set out in our advice on the Sixth Carbon Budget sees substantial near-term growth in the deployment of energy efficiency measures and heat pumps as two of four priority areas over the next decade, alongside roll-out of low-carbon heat networks and hydrogen trials. We should not delay on heat pumps or low-carbon heat networks as viable solutions for most of the country – hydrogen can be part of the mix but has not yet been proven at scale and should not be a cause to delay other options.

Substantial near-term growth is needed in the deployment of energy efficiency measures and heat pumps, but delivery rates have continued to stagnate.

Despite this, progress in upgrading the building stock with the necessary measures over the last decade has been very poor. Underlying delivery rates continued to stagnate, with a small improvement in heat pump delivery rates driven by retrofit installations under the Renewable Heat Incentive (RHI) (Table 3.2).[32]

Table 3.2
Key metrics for buildings in the CCC Pathway to meet the Sixth Carbon Budget

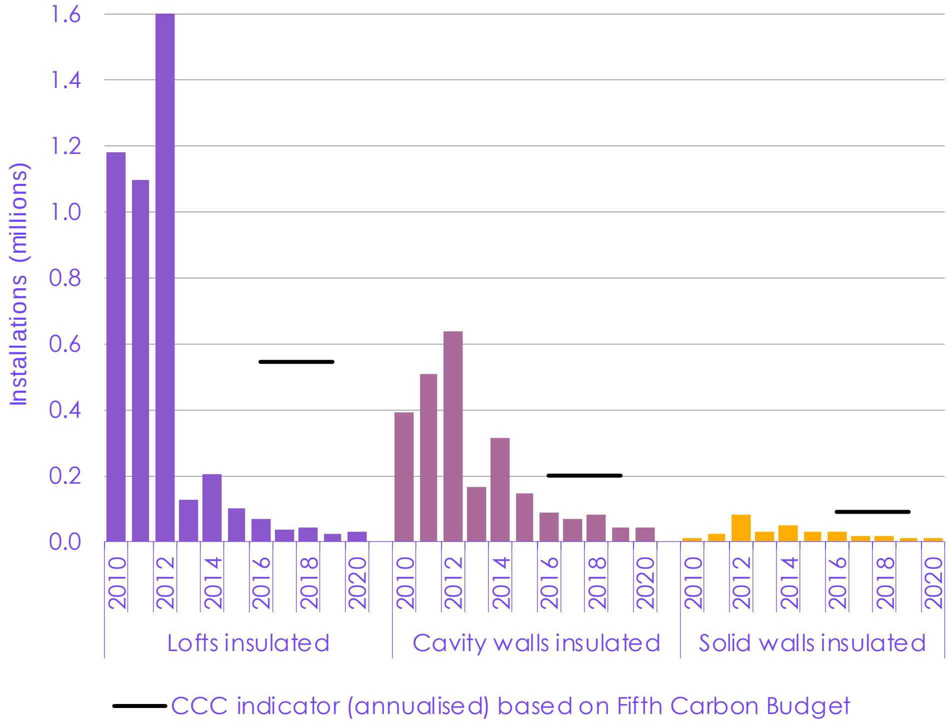
	Latest Indicator			Milestones in the CCC pathway				
Metric	Year	Annual change	Value	2025	2030	2035	2050	Trend
Heat pump installations (thousand per year)	2020	9%	36	415	1,075	1,435	1,525	
Lofts insulated (thousand per year)	2020	26%	32	710	675	200	0	
Cavity walls insulated (thousand per year)	2020	-3%	40	215	175	55	0	
Solid walls insulated (thousand per year)	2020	-22%	10	255	245	45	0	

Source: CCC analysis; BSRIA (2021) *Heat pumps market analysis 2020: United Kingdom, BSRIA World Market Intelligence*; BEIS (2021) *Household Energy Efficiency Statistics: Headline Tables.*

Notes: Our scenarios deploy the majority of domestic energy efficiency measures in the 2020s, given the carbon, bill and health benefits, and the need to prepare the stock for widespread low-carbon heat uptake in the 2030s. For this reason, in-year energy efficiency deployment declines in later years relative to deployment levels in the coming decade. Out-turn data for heat pump installations may include some installations which serve multiple dwellings, slightly underestimating the number of homes heated by heat pumps relative to the milestones.

Insulation rates remain well below the peak market delivery achieved up to 2012 (the point at which the Carbon Emissions Reduction Target and the Community Energy Saving Programme ended), which illustrate the growth potential where an effective policy package is in place (Figure 3.4).

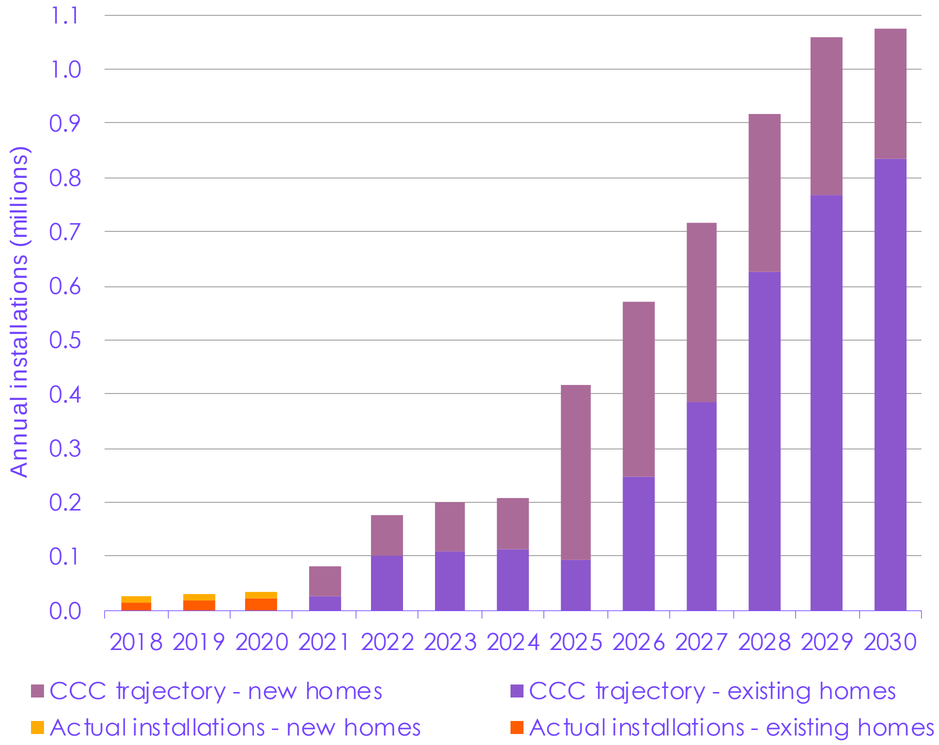
Figure 3.4 Home insulation rates by measure and year



Source: DECC (2014) *Data tables: Green Deal, ECO and Insulation Levels, up to March 2014, Green Deal, Energy Company Obligation (ECO) and Insulation Levels in Great Britain*; BEIS (2021) *Household Energy Efficiency Statistics: Headline Tables*; CCC analysis.
Notes: The CCC indicator shown represents the annualised rates of installation based on the Committee's 2015 advice on the Fifth Carbon Budget, which we judged to be a realistic and appropriate annualised installation rate at that time.

Annual heat pump installations in homes rose slightly from 33,000 in 2019 to 36,000 in 2020, driven mainly by an increase in retrofit installations to just under 23,000. This remains significantly below the rates needed over the next few years, which require just over 400,000 heat pump installations per year by 2025, rising to just over 900,000 per year by 2028 (Figure 3.5). These deployment rates remain a fraction of current annual boiler sales of around 1.8 million per year. Deployment in non-domestic buildings also remains very limited, with installations (for systems <50 kW) currently running at less than 1000 per year.

Figure 3.5 Current heat pump installation rates in homes set against the CCC's Balanced Pathway



Source: CCC analysis; BSRIA (2021) *Heat pumps market analysis 2020: United Kingdom, BSRIA World Market Intelligence.*

We will be developing a new indicator framework over the coming year. There is a need for public statistics to evolve to better support monitoring of the low-carbon transition.

We are developing a new indicator framework over the coming year, consistent with the path to Net Zero and the Sixth Carbon Budget:

- We will continue to monitor key areas including heat pump sales and insulation installations alongside biomethane injection. There is substantial scope for publicly available statistics here to be improved to consolidate data on the quantity and nature of UK heat pump and insulation installations, including those outside of government schemes.

- In two key areas there are no annual public statistics: on low-carbon heat networks and on insulation rates in public and commercial buildings. Government should prioritise annual reporting on total heat delivered through heat networks, split by heating technology. We will set out our indicators for public and commercial buildings next year.

- We will also be considering what new indicators may be appropriate, for instance on consumer attitudes, building performance, measures to address overheating and ventilation, building level flexibility, supply chain development and skills.

- Finally, we will put in place a set of policy milestones which factor in Government ambition in the forthcoming Heat and Buildings Strategy, Net Zero Strategy, Hydrogen Strategy, buildings regulations and heat networks policy developments, along with the key phase-out dates from the Sixth Carbon Budget.

c) Manufacturing and construction (65 $MtCO_2e$, 13% of UK emissions in 2019)

The recommended pathway set out in our advice on the Sixth Carbon Budget sees emissions from manufacturing and construction reduce by 43% by 2030 and 71% by 2035 from 2018 levels.

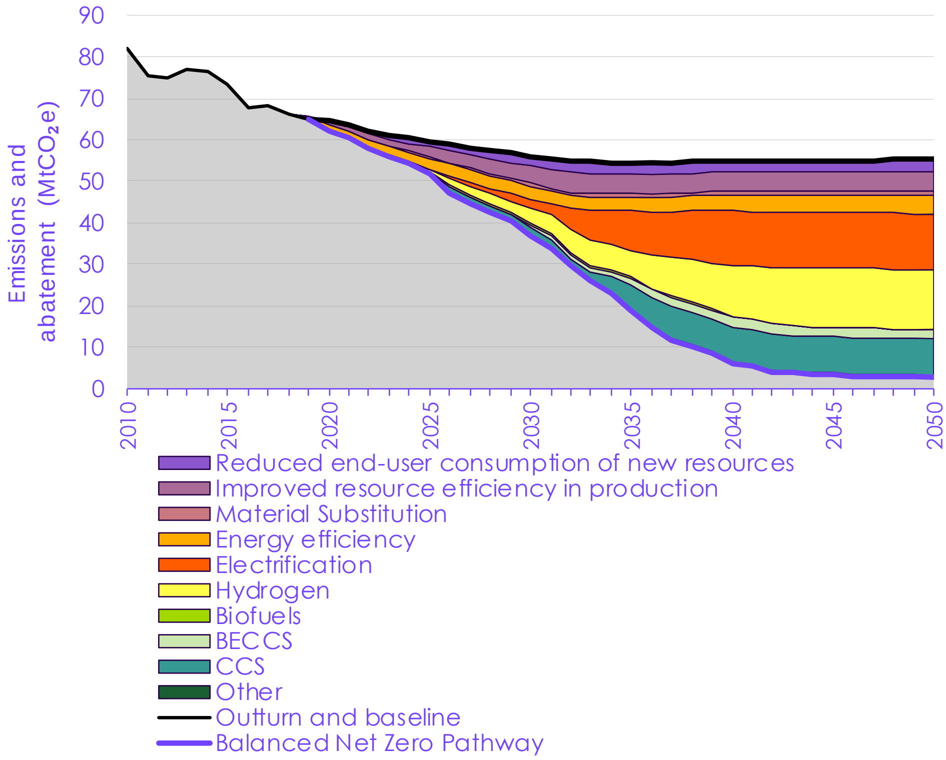
The path to Net Zero set out in our advice on the Sixth Carbon Budget sees emissions from manufacturing and construction reduce by 43% by 2030 and 71% by 2035 from 2018 levels, through improved resource and energy efficiency, material substitution, fuel switching and CCS, as set out in Table 3.3 and Figure 3.6. In addition, supply chains scale up at pace in the pathway, more workers acquire skills to implement low-carbon measures, and the availability of finance increases. The Government's Industrial Decarbonisation Strategy set out a similar pathway, with slightly lower ambition due to lower levels of electrification (see Chapter 4).

Table 3.3
Key metrics for manufacturing and construction in the CCC Pathway to meet the Sixth Carbon Budget

		Latest indicator			Milestones in the CCC pathway				
Metric		Year	Annual change	Value	2025	2030	2035	2050	Trend
Efficiency	Increase in longevity of electronics vs 2019	2019	-	0%	30%	80%	120%	120%	
Electrification, hydrogen and carbon capture and storage	Manufacturing energy use from electricity or hydrogen	2019	+2% points (+8%)	27%	27%	37%	52%	76%	
	CCS in manufacturing ($MtCO_2$)	2020	-	0	0.2	2	6	9	

Source: CCC analysis; BEIS (2020) *Digest of UK Energy Statistics (DUKES) 2020*

Figure 3.6 Source of abatement in the CCC Pathway for the manufacturing and construction sector



Source: CCC analysis, BEIS (2020) *Provisional UK greenhouse gas emissions national statistics 2019.*
Notes: The abatement from BECCS in this graph does not include the carbon captured, which is accounted for in the removals subsection of Chapter 3.

Tracking progress against our pathway for manufacturing and construction is currently challenging because of a lack of data, which in some cases is because the technologies or approaches are still at an early stage of deployment.

The limited current data indicate that energy efficiency in manufacturing may have improved and there are examples of early developments with fuel switching and CCS.

The limited current data indicate that energy efficiency in manufacturing may have improved, and there are examples of early developments with fuel switching and CCS.

- The energy intensity of manufacturing output fell from 1,120 GWh/£bnGVA in 2010 to 837 GWh/£bnGVA in 2018 and further to 747 GWh/£bnGVA in 2019. However, this partly reflects shifts of GVA from more-energy-intensive subsectors to less-energy-intensive subsectors rather than energy efficiency improvements. At a subsector level (Figure 3.7), energy intensity of manufacturing output has fallen in the 2010-19 period in seven subsectors but risen in four. Within these sectors, this could still reflect shifts from higher-energy-intensity operations to lower-energy-intensity operations, rather than energy efficiency – the available data are not clear.

- However, Government estimate that existing energy efficiency policies[33] in industry have led to abatement of at least 1.1 $MtCO_2e$ in 2019, up from 0.9 $MtCO_2e$ in 2018, according to BEIS Energy and Emissions Projections.[34]

- The UK's household recycling rate has plateaued at 44% from 2012 to 2018, indicating that progress on this aspect of resource efficiency has stalled. It will be important for recycling rates to rise to at least 68% by 2030, together with actions to reduce material inputs and increase product longevity, reuse and sharing in order for resource efficiency to contribute fully to achieving the emissions reductions necessary for the Sixth Carbon Budget.

- The carbon intensity of energy use in manufacturing has fallen more slowly than energy intensity, from 155 gCO_2e/kWh in 2010 to 129 g/kWh in 2018, with no change between 2018 and 2019. The long-term reduction is a result of falling shares from coal and petroleum products, and rising relative contributions from natural gas, bioenergy and waste, and electricity. At a subsector level (Figure 3.7), the emissions intensity of energy in manufacturing has fallen in the 2010-19 period in six subsectors (including paper and pulp, mineral products, and textiles), but risen in five (including non-ferrous metals, construction and mechanical engineering).

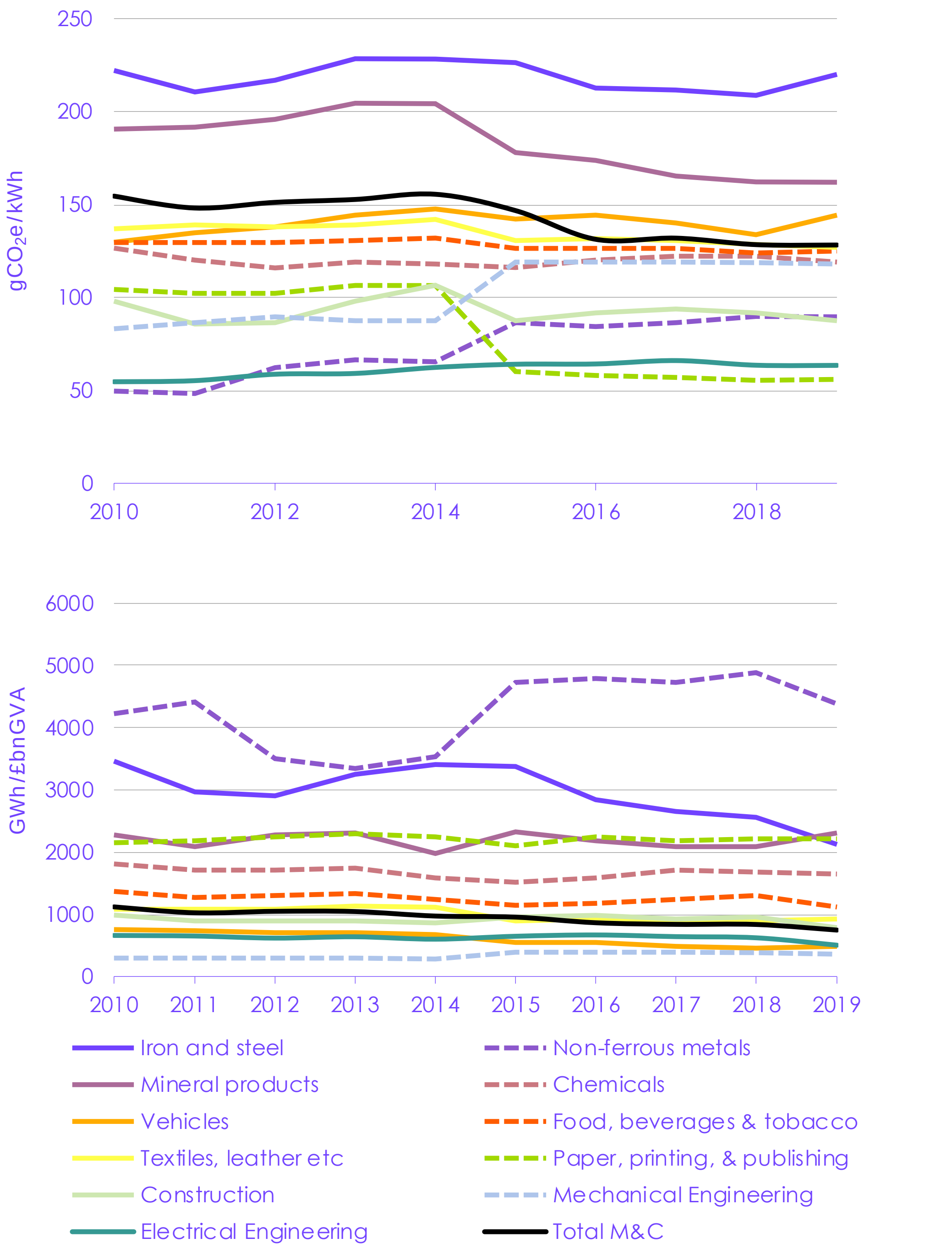
- Fuel-switching pilots, such as a commercial-scale biodiesel trial for glass manufacturing, have begun under the Government's Industrial Fuel Switching competition, with the intention of assessing the merits of different low-carbon fuels. CCS pilots are supported under the Carbon Capture and Utilisation Demonstration competition. Some (low) levels of fuel switching for heating in manufacturing have also been supported by the Renewable Heat Incentive, which Government estimate to have contributed 1.9 $MtCO_2e$ of emissions abatement in 2019, up from 1.7 $MtCO_2e$ in 2018.[35] This abatement is largely due to uptake of bioenergy supported by the Renewable Heat Incentive.[36]

- The Renewable Transport Fuels Obligation incentivises fuel suppliers for transport and off-road mobile machinery to provide a certain level of biofuels – currently set at 9.75% in 2020 and increasing to 12.4% by 2032.

We will develop an indicator framework for the M&C sector and will monitor progress against this framework beginning with next year's Progress Report.

The Committee will develop an indicator framework based on available data for the manufacturing and construction sector and will monitor progress against this framework beginning with next year's Progress Report. The Government should seek to improve collection and reporting of relevant data to allow for progress to be monitored more effectively.

Figure 3.7 Energy intensity of GVA and direct emissions intensity of energy in manufacturing and construction: 2010 - 2019



Source: DUKES, ONS - GDP low-level aggregates; CCC Analysis
Notes: Unclassified and Other Industry are not shown. In the lower plot, only direct emissions are considered, i.e. not including emissions from electricity production or upstream fuel production.

d) Agriculture and LULUCF (52 $MtCO_2e$, 10% of UK emissions in 2020)

Reaching the Sixth Carbon Budget will mean taking action to reduce emissions on farms, removing emissions from the atmosphere using natural land sinks, shifting to lower-carbon diets and reducing food waste.

The path to meeting the Sixth Carbon Budget and the Net Zero target in 2050 requires a reduction in agricultural emissions of around 30% from 2019 to 2035, and a reversal of the land use sector from a net source currently to a net sink by the mid-2030s. Delivery will require substantial action over the coming years:

- A high take-up of farming practices and technologies to reduce non-CO_2 emissions from managing soils and livestock, and a switch away from fossil fuel use in agricultural machinery to low-carbon alternatives such as electricity.

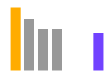
- Sustainable improvements in agricultural productivity to deliver higher crop yields and increased livestock stocking rates on grassland.

- A significant release of land out of agricultural production (9% by 2035) to enable an acceleration in the planting of trees, hedges, energy crops and the restoration of degraded peatland, all of which can be achieved while delivering other essential functions of land, including maintaining food production and adapting to climate impacts. Other measures include sustainable management of existing broadleaf woodlands and lowland agricultural peat.

- A significant shift in behaviours by 2030, with 20% less meat and dairy consumed on average, and the volume of food waste falling by half.

Key land-based indicators cover agricultural and land use emissions, agricultural productivity, societal behaviour change, and land use change (Table 3.4)

Table 3.4
Key metrics for agriculture and LULUCF in the CCC Pathway to meet the Sixth Carbon Budget

Metric		Latest Indicator: Year	Latest Indicator: Annual change	Latest Indicator: Value	Milestones in the CCC pathway: 2025	2030	2035	2050	Trend
Agriculture and land use - GHG emissions	Agriculture ($MtCO_2e$)	2019	+1%	55.4	48.6	41.5	39.3	34.9	
	Land use, forestry and peat sector[1] ($MtCO_2e$)	2019	+3%	12.9	10.4	6.5	0.9	-19	
Agricultural practices	Crop yields (wheat t/ha), equivalent increases for other crops	Average 2017-19	0	8.2	8.6	9.1	9.5	11.0	
	Livestock numbers[2] (million)	2019	-1%	48	46	41	39	35	
Demand reduction	Weekly meat consumption[3] (g/person) (includes fresh and processed meat)	2020	0	1,045	950	840	800	680	
	Food waste (edible) (million tonnes)	2018	-	8.0	6.5	5.3	5.2	4.7	
Land use	Afforestation (000 hectares/year)	2019 / 2020	+1%	13.7	30	30	50	50	
	Energy crops (000 hectares/year)[4]	2018	0	10	6	27	30	30	
	Peat area restored (000 hectares/year)[5]	2020	-	8.5	67	67	67	9	
	Active broadleaf woodland management (%)	2020	0	20%	40%	80%	80%	80%	

Source: CCC analysis
Notes: 1. Land use net GHG emissions for 2019 is based on the high forestry peat estimate; 2. Covers cattle, sheep and pigs; 3. Per person. 2020 value is an estimate based on the average of the two previous years; 4. 2018 value is total area of SRC and miscanthus in England only; 5. Restoration in 2020 funded by the National Peatlands Action Programme, 2020 (Wales), the £10m Peat Capital Grant Scheme, 2019/20 (England) and Scottish Government funding, 2020.

Underlying progress to reduce emissions from agriculture and land is currently falling behind.

Underlying progress to meet our ambition remains short in most of these areas:

- Releasing land out of agriculture requires an improvement in agricultural productivity. Cereal crop yields have largely plateaued in the last two decades, but better agronomic practices coupled with advances in crop breeding are required to deliver sustainable yield increases. Increasing the utilisation of grassland area by grazing livestock from around 50% currently could allow for increases in stocking rates without impacting feed requirements (quantity and quality), thereby allowing some grassland area to switch to other uses.

- Current rates of UK afforestation of over 13,000 hectares/year in 2018/19 and 2019/20 remain well below the level required to meet the Government's commitment (as set out in the England *Tree Strategy consultation* (2020)), which matches the Sixth Carbon Budget recommendation of 30,000 hectares/year in 2025 (Figure 3.8).

- Peat restoration has been focused on the uplands to date, but meeting the Sixth Carbon Budget pathway will require both an acceleration in the levels of upland restoration to 50,000 hectares/year, and extending activity to lowland peat, which can emit ten times more emissions per hectare compared to the uplands. Options to sustainably manage the area of lowland peat that remains in agricultural production need to be developed.

- The area planted with perennial energy crops (miscanthus and short rotation coppice) totals 10,000 hectares (England only),[37] which has fallen by over a quarter since 2008. The planting of short rotation forestry for bioenergy is non-existent. Combined annual planting rates of all three biomass types need to ramp up to over 25,000 hectares by 2030.

- Take-up of on-farm practices to reduce soil, livestock and waste emissions needs to increase significantly; emissions in agriculture have remained flat for the last ten years. Agricultural survey data reveal more farmers are considering emissions when making decisions on land, with 64% reporting that it was 'very' or 'fairly' important in 2020,[38] increasing from the 49% surveyed in 2017. The same survey found that 66% of farmers were taking actions to reduce emissions, up from 56% in 2017.

- Decarbonising agricultural vehicles will require the market commercialisation of low-carbon solutions beyond the current use of biofuels, including electrification of large machinery (e.g. tractors), which is still at the proto-type stage.

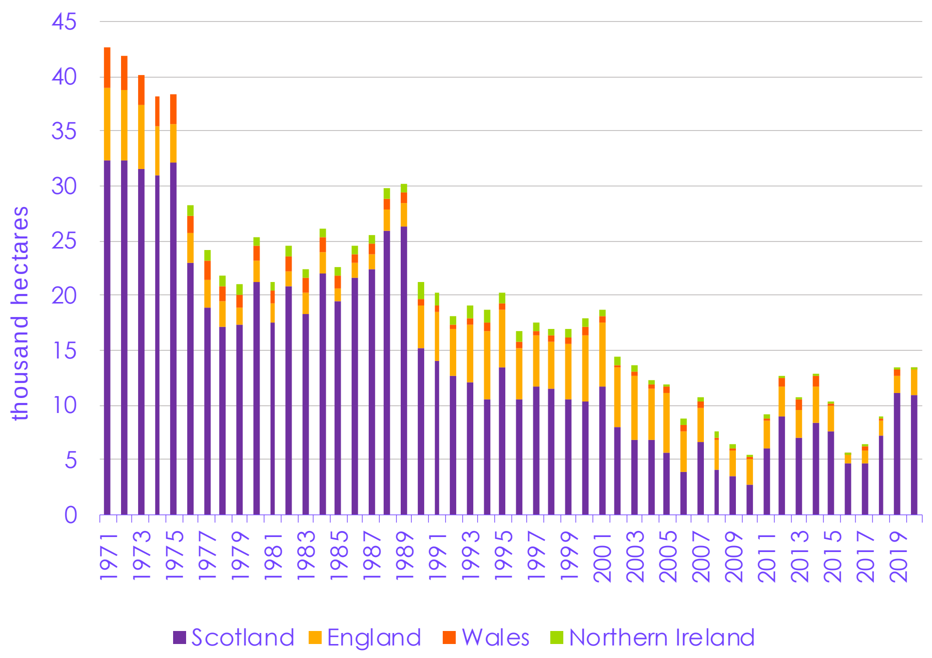
- Official data show that consumption of meat and meat products rose 3% between 2015/16 and 2018/19.[39] There has been a reduction in fresh meat products, but this is more than offset by a rise in processed meat. More recent survey data suggests an increased willingness to eat less meat in the future, with 65% of over 2,000 people surveyed stating that more knowledge on how to plan and cook less meat dishes would help them to cut back.[40]

- Reducing food waste is resource efficient and could free up agricultural land for natural sequestration options. The Waste Reduction Action Programme (WRAP) announced last year that the UK was halfway to achieving the UN's Sustainable Development Goal 12.3 to cut post-farm gate food waste in half by 2030. As of September 2020, around 260 organisations, including 16 retailers and 162 producers/manufacturers had signed up to the Road Map.

The measures outlined above to meet the Sixth Carbon Budget pathway will deliver wider benefits to the natural environment critical to all other economic activity and human well-being. These include flood protection, improved air quality, health and recreation benefits of woodlands, water regulating services as well as improving the natural environment's ability to adapt to climate impacts.

Current levels of tree planting are well below where they need to be. The majority of all UK tree planting in the last five years has happened in Scotland.

Figure 3.8 UK Afforestation rates (1971-2020)



Source: Forestry Commission, Natural Resources Wales, Forest Service and Forestry Commission statistics.
Notes: Planting year ends end March. Data not available for Northern Ireland from 1971-1975.

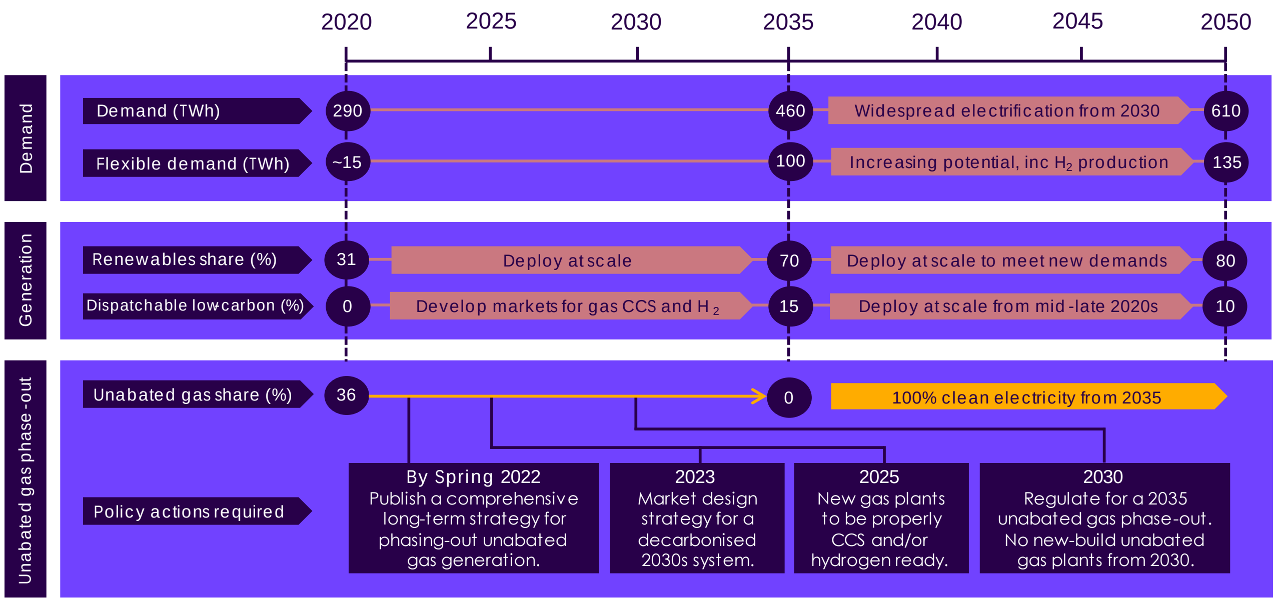
To allow the Committee to track progress against the Sixth Carbon Budget Pathway, we will be developing a comprehensive indicator framework for the agriculture and land use sectors to be included in next year's Progress Report. Key indicators that we will be developing include: agricultural emissions by source (e.g. soils, enteric fermentation) and GHG type; take-up of particular low-carbon farming practices and measures; planting rates of trees on-farm; peat restoration by type (e.g. lowland, upland and forestry); attitudes to diet change and reducing food waste; and the impact of non-financial barriers to changes in land.

e) Electricity supply (52 MtCO2e, 10% of UK emissions in 2019)

Electricity generation should be fully decarbonised by 2035, to enable full benefits to be drawn from the widespread electrification that is needed for Net Zero.

Electricity generation should be fully decarbonised by 2035, while meeting a 50% increase in annual demand. This will require large-scale deployment of new low-carbon generating capacity that is resilient to a changing climate, phasing out unabated gas-fired generation, action on contracting models and on planning and consenting regimes, as well as ensuring networks are ready to accommodate new demands and generation (Figure 3.9).

Figure 3.9 Timeline of key outcomes and policy requirements for electricity generation under the CCC Pathway (2020-50)



Source: CCC (2020) *Policies for the Sixth Carbon Budget and Net Zero*.
Notes: Renewables share includes wind and solar. Dispatchable low-carbon generation includes gas CCS, BECCS, and hydrogen plants. Demand is lower than generation, accounting for losses, flexibility services, and interconnection.

The reductions seen in the power sector in the past five years reflect genuine underlying progress.

Power sector emissions fell by 15% in 2020, in line with the average rate over the preceding five years. That reflects an increase in the capacity and utilisation of low-carbon generation, together with lower demand due to the COVID-19 pandemic that reduced required fossil generation (Table 3.5):

- **Installed capacity of variable renewables** increased in 2020 by 0.8 GW. This is a much slower rate than the average of 3.8 GW achieved over the previous 5 years, although the slowdown is likely to be temporary.
  - Half of the increase in capacity was offshore wind increasing to 10.4 GW of operational capacity. The 0.4 GW increase compares to a minimum growth of 4 GW required per year from the mid-2020s onwards in order to meet the Government's target for 40 GW installed capacity in 2030.
  - This slowdown is likely to be temporary, given the pipeline of new offshore wind projects underway:
    - Offshore wind capacity under construction increased by 60% in 2020 to 7.2 GW, with a further 2.6 GW having secured Government contracts.

- 20 GW of capacity is in development and/or pre-planning.
- In February 2021 the Crown Estate auctioned seabed leases for an additional 8 GW of capacity.

Low-carbon generation increased 5% in 2020. Offshore wind generation increased by 26% due to particularly windy conditions early in the year.

- **Low-carbon generation** increased by 5% in 2020 compared to 2019, against a backdrop of lower overall demand due to COVID-19 restrictions.
  - The majority of that increase was accounted for by offshore wind generation, which rose by 26% due to particularly windy conditions early in the year.
  - As a result, low-carbon generation increased to 62% of total electricity generation in 2020, up from 57% in 2019. The share of variable renewables in total generation increased from 26% to 31%.

Fossil generation fell by 17% in 2020, as unabated gas was squeezed out by higher renewables output, lower demand, and the continued decline of coal.

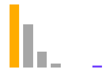
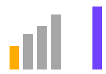
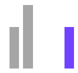
- **Fossil generation** decreased by 17% in 2020, the largest annual percentage fall in the last 20 years. The reduction was primarily in gas-fired generation, but coal use also continued to decline.
  - Unabated gas generation fell by 17%, as it was squeezed out by a combination of increased renewables output and lower overall demand. As a result, unabated gas comprised 36% of the overall generation mix. This needs to continue to fall, to zero by the mid-2030s, in order to meet the Sixth Carbon Budget.
  - Coal generation fell by 21% in 2020, as further coal plants were closed at Aberthaw and Fiddlers Ferry. This meant coal-fired generation only comprised 2% of total generation in 2020, continuing the long-term decline towards the Government's target of phasing out coal use in the power sector by 2024.

Emissions intensity fell 10% in 2020, reflecting lower demand, higher renewables output and reduced fossil generation.

- **Grid intensity.** The combination of lower demand, increased renewables output, and reduced fossil generation meant the carbon intensity of electricity fell by 10% in 2020 to 182 gCO_2/kWh. This needs to continue to fall substantially over the 2020s, to less than 50 gCO_2/kWh in 2030 and around 10 gCO_2/kWh in 2035.*

* Our recommendation is for a fully decarbonised electricity generation sector by 2035. That is consistent with a small positive emissions intensity, which reflects some residual emissions (e.g. from gas CCS) and that negative emissions from use of bioenergy with carbon capture and storage (BECCS) are accounted for separately.

Table 3.5
Key metrics for electricity supply in the CCC Pathway to meet the Sixth Carbon Budget

	Latest Indicator			Milestones in the CCC pathway				
Metric	Year	Annual change	Value	2025	2030	2035	2050	Trend
Grid intensity (gCO_2/kWh)	2020	-20	182	125	45	10	2	
Offshore wind capacity (GW)	2020	+0.4 GW	10.4	25	40	50	95	
Variable renewable generation (%) *	2020	+5% points	31%	45%	55%	70%	80%	
Dispatchable low-carbon generation (%)**	2020	0	0	0	10%	15%	10%	
Unabated gas generation (%)	2020	-5% points	36%	30%	10%	0	0	

Source: CCC analysis based on BEIS (2021) *Energy Trends*.
Notes: *Wind and solar generation. **Includes gas with carbon capture and storage, hydrogen and bioenergy with carbon capture and storage.

We will continue to track these milestones over the coming year, while developing additional indicators for assessing the use of flexibility on the demand-side (e.g. through heat pumps and electric vehicles).

f) Aviation (40 $MtCO_2e$, 8% of UK emissions in 2019)

Air passenger demand saw annual growth of around 1.5% per year before 2020. The size of the sector that will emerge post-pandemic is uncertain.

While aviation emissions fell significantly in 2020 this reduction was not driven by underlying progress in decarbonising the sector but rather was a result of the pandemic and associated restrictions.

While there is still uncertainty around the size of the sector that will emerge post-pandemic (see Chapter 2), passenger demand is expected to increase again after travel restrictions are eased, potentially recovering to close to pre-pandemic levels by the mid-2020s. Action to accelerate efficiency improvements and some demand management will therefore be needed to drive emissions gradually down to 2035:

- The pathway used to determine the Sixth Carbon Budget includes an increase in aviation emissions out to 2024 as travel restrictions are eased. Emissions reduce gradually thereafter due to efficiency improvements, demand management and a modest contribution from sustainable aviation fuels (SAF) starting in the mid-2020s. Emissions fall by 16% and 23% to 2030 and 2035 respectively, from 2019 levels.

Improvements in flight efficiency must be sustained to meet the Sixth Carbon Budget.

- Efficiency, as measured by fuel consumption per passenger-kilometre, improved by 1.5% between 2018 and 2019, following on from an average annual improvement of 2.1% between 2008 and 2018. Progress will need to continue at pace to meet the Sixth Carbon Budget – in our pathway fuel efficiency improves by 1.7% each year between 2020 and 2050, reaching 0.25 kWh/passenger-km by 2050, from 0.44 kWh/passenger-km in 2019.

- Demand, as measured by plane-km flown per person, increased by 1.9% between 2018 and 2019, following on from an average annual increase of 1.5% between 2008 and 2018. The pandemic and related restriction led to a major reduction in demand in 2020. Our pathway assumes some recovery in demand over the first half of the 2020s, to close to pre-pandemic levels, and assumes a modest increase in plane-km per person thereafter (0.3% each year). This growth is considerably less than a 'business as usual' baseline, though clearly what happens next is highly uncertain. Some moderation of demand growth is likely to be required to meet the legislated emissions targets, as pre-pandemic trends in demand growth exceed what we expect can be accommodated in a Net Zero world.

Table 3.6
Key metrics for aviation in the CCC Pathway to meet the Sixth Carbon Budget

		Latest indicator			Milestones in the CCC pathway				
Metric		Year	Annual change	Value	2025	2030	2035	2050	Trend
Demand	Passenger-km per person	2019	+2.0%	5,400	5,500	5,500	5,700	6,800	
Efficiency and hybrids	Fuel consumption (kWh of fuel used per passenger-km)	2019	-1.5%	0.41	0.39	0.36	0.33	0.25	
	Electric-hybrids (% of km flown)	2020	-	-	-	-	-	9	
Sustainable aviation fuels	SAF fuel share (%)	2020	-	-	0.1	2	8	25	

Source: CCC analysis and Department for Transport analysis of Civil Aviation Authority passenger-km data.
Notes: the demand milestone corresponds to passenger-km from departing flights only, which is the convention when measuring aviation demand. This differs to the aviation demand milestones reported in the Sixth Carbon Budget report (Table 2, p27 of the main report), which relate to both departing and arriving flights; CO_2 emissions are from fossil fuel sources only. Fuel efficiency improvements also differ to those cited in the Sixth Carbon Budget (Table 8.1, p261 of the methodology report) as they are based on fuel consumption per passenger-km, and Sixth Carbon Budget figures are based on CO_2/passenger.

g) Fuel supply (37 $MtCO_2e$, 7% of UK emissions in 2019)

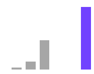
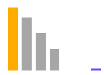
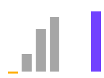
The fuel supply sector covers fossil fuel*, hydrogen, and bioenergy supply. While new emissions could arise from the production of low-carbon hydrogen in the future, current emissions in the sector come from fossil fuel supply only. In future, we will include in this sector any emissions associated with hydrogen production for use as a fuel in the energy end-use sectors (but not hydrogen produced for other uses, such as fertiliser production).

Fossil fuel supply is currently the only source of emissions in fuel supply.

Emissions associated with hydrogen and bioenergy are currently accounted for in other sectors of the UK inventory and other sections of this chapter.

- Section d) of this chapter covers emissions associated with the cultivation of energy crops and UK forestry.
- Section c) accounts for emissions from current UK high-carbon hydrogen and ammonia production (e.g. for use in industry and agriculture) as well as bioenergy conversion.
- Sections a) f) and i) include emissions from transporting fuels and biomass by land, air and sea.

Table 3.7
Key metrics for fuel supply in the CCC Pathway to meet the Sixth Carbon Budget

		Latest Indicator			Milestones in the CCC pathway				
		Year	Annual change	Value	2025	2030	2035	2050	Trend
Hydrogen	Low-carbon hydrogen production (TWh)	2020	-	-	1	30	105	225	
Fossil fuel production	Demand for unabated oil and gas (TWh)	2019	-1%	1750	1500	1050	665	110	
	Fall in emissions from 2018 levels - fossil fuel supply (%)[1]	2019	1% point fall	-1%	-22%	-54%	-77%	-97%	
	Fall in emissions from 2018 levels - oil and gas production and processing (%)[2]	2019	1% point increase	+1%	-28%	-68%	-87%	-98%	

Source: CCC analysis; BEIS (2020) *2020 UK Greenhouse Gas Emissions, Provisional Figures*; BEIS (2020) *Digest of UK Energy Statistics (DUKES)*
Notes: All figures in TWh have been rounded to the nearest 5. 1. Abatement from fossil fuel supply is relative to 2018 levels. This category refers to emissions associated with oil refining, oil and gas production, oil and gas production terminals (including compression stations and LNG terminals), gas distribution networks, and open and closed coal. 2. Abatement from offshore oil and gas production is relative to 2018 levels. This category comprises emissions from oil and gas platforms and terminals in line with the scope of the North Sea Transition Deal.

* Fossil fuel supply covers oil refining, oil and gas production, oil and gas processing terminals, gas transmission and distribution networks and open and closed coal mines.

There have been limited emissions reductions resulting from active efforts to decarbonise the sector. Emissions will need to fall sharply across the sector to align to our Sixth Carbon Budget advice, in which emissions reduce by around 75% by 2035.

There have not yet been strong efforts to decarbonise fossil fuel supply

- **Coal production.** The use of coal across the economy has decreased notably due to reduced demand associated with the phase out of coal in electricity supply. In addition, the closure of the last deep coal mine in 2016, and recent closures of surface mines in England have contributed to reducing emissions from 22 $MtCO_2e$ in 1990 to less than 1 $MtCO_2e$ in 2020. Around 75% of remaining emissions can be attributed to the leakage of methane from closed coal mines.

- **Electrification and reduced methane flaring and venting** in oil and gas production is limited. There will need to be a rapid ramp up to achieve the required 68% emissions reductions from oil and gas production by 2030 underlying the path to the Sixth Carbon Budget (Table 3.7).

- **Methane leakage** has reduced due to the Iron Mains Risk Reduction Programme, which has contributed to reducing emissions. However, it is unclear whether this policy alone is sufficient to achieve the additional 2.3 $MtCO_2e$ of abatement required in our analysis by 2030, particularly in the context of possible network decommissioning due to reduced use of natural gas.

Emissions reductions in fossil fuel supply will need to increase rapidly to align to UK targets

- **Carbon capture and storage** can be used in refineries to reduce emissions in the sector, especially in clusters around other manufacturing and power generation sites (see section c)). Our scenarios for the Sixth Carbon Budget advice included use of CCS to reduce emissions by 1.3 $MtCO_2e$ in 2030. This will require wider deployment of CCS infrastructure to support decarbonisation of industry and electricity generation as well as contributing to Net Zero through hydrogen production and greenhouse gas removals.

The Committee will develop a new set of indicators to track progress in fuel supply in next year's Progress Report, potentially including indicators on the early-stage developments in hydrogen production, the emissions intensity of oil and gas production, private sector plans/commitments, and the monitoring of methane leakage from gas networks.

Government should seek to improve collection and reporting of relevant data to allow for progress to be monitored more effectively.

h) Waste (25 $MtCO_2e$, 5% of UK emissions in 2019)

The path to Net Zero set out in our Sixth Carbon Budget advice sees emissions in the waste sector reduce by 78% compared to today's levels by 2050.

To align to our recommended Net Zero pathway urgent action is needed to address emissions from landfill and Energy from Waste plants, primarily through improvements to recycling and waste prevention.

To get on track, urgent action is needed to reduce methane emissions from landfill, alongside improvements to recycling and resource efficiency, with minimisation of the quantity of waste going to Energy from Waste (EfW) and the emissions from those plants:

- The UK's combined recycling rate* needs to increase from 52% to at least 59% by 2025 (45% to 50% for household waste), from which point key bio-degradable waste streams should be banned from going to landfill.

- Energy from Waste (EfW) emissions, which have been rising rapidly, need to be constrained at approximately today's levels through increased waste prevention, re-use and recycling, and policy to enable EfW plants to be fitted with CCS from the late 2020s.

- Methane capture rates need to increase from 55% to 80% by 2050 to address fugitive emissions from landfill, while further actions are needed to reduce methane emissions from composting and wastewater treatment.

Table 3.8
Key metrics for waste in the CCC Pathway to meet the Sixth Carbon Budget

		Latest Indicator			Milestones in the CCC pathway				
		Year	Annual change	Value	2025	2030	2035	2050	Trend
Resource Efficiency	Residual waste per capita (kg/yr)	2018	+2%	490	400	310	280	300	
Recycling	Combined (Household + C&I) Recycling Rate for UK (%)[1]	2018	+1% point	52	59	68	68	68	
	Household Recycling Rate for UK (%)	2018	-0.5% point	45	50	56	56	56	
Landfill	Biodegradable Waste Sent to Landfill in UK (Million tonnes)	2018	-3%	7.2	1.2	0.9	0.9	0	
	Landfill Methane Capture Rate (%)[2]	2019	-1% point	55	60	64	68	80	
Energy from Waste	Energy from Waste Emissions ($MtCO_2e$)	2019	+12%	5.5	6.5	5.0	5.1	0.4	

Source: Milestones: CCC analysis, Methane Capture Rates: NAEI UK GHG Inventory 2019, Household Recycling Rate and Biogenic Municipal Waste to Landfill: DEFRA UK Waste Statistics Publication 2018
Notes: 1. There are inconsistencies in the way waste arisings and recycling data are reported across the UK, and significant data gaps remain – most notably around the availability of recycling data for Commercial and Industrial waste (C&I). Our Balanced Pathway for Waste uses a 'Combined' Recycling Rate for the UK, comprised of Household (approximately equivalent to Waste from Household statistics) and C&I (municipal and non-municipal). The C&I portion of this indicator and associated milestones are based on assumptions of C&I recycling rates. 2. Currently DEFRA only publishes statistics on municipal biodegradable waste to landfill, which is a reasonable proxy for overall biodegradable waste to landfill.

We understand DEFRA is in the process of developing new waste and recycling indicators and statistics, including for municipal and C&I recycling, and biodegradable waste to landfill, which we will seek to reflect in future iterations of this indicator framework.

* The CCC Pathway for Waste uses a 'Combined' Recycling Rate for the UK, comprised of Household (approximately equivalent to Waste from Household statistics) and C&I (municipal and non-municipal).

Progress in reducing emissions from landfill and in improving recycling have stalled in recent years, while emissions from Energy from Waste plants have risen sharply.

Progress in reducing emissions from waste at a UK level has stalled in recent years as reductions in landfilling of biodegradable municipal waste and improvements to recycling rates have slowed, and landfill methane capture rates have declined.

- The amount of biodegradable municipal waste being sent to landfill in 2019 was around 80% lower than 1995 levels but has plateaued at between 7-8 million tonnes a year since 2015 (Figure 3.10)
- Following rapid improvements through the 2000s* UK recycling rates have remained at around 44% since 2012 and the EU-derived target of achieving 50% recycling by 2020 looks almost certain to have been missed.
- Landfill methane capture rates peaked at over 74% in 2016 but have since declined to 55%.
- Wales continues to outperform the rest of the UK in terms of recycling, with a 'waste from households'† rate of well over 50%, and a municipal recycling rate of 65% in 2019 (Figure 3.11).

Meanwhile, recent years have seen sharp increases in emissions from EfW which has become an increasingly popular waste treatment solution for Local Authorities.[41]

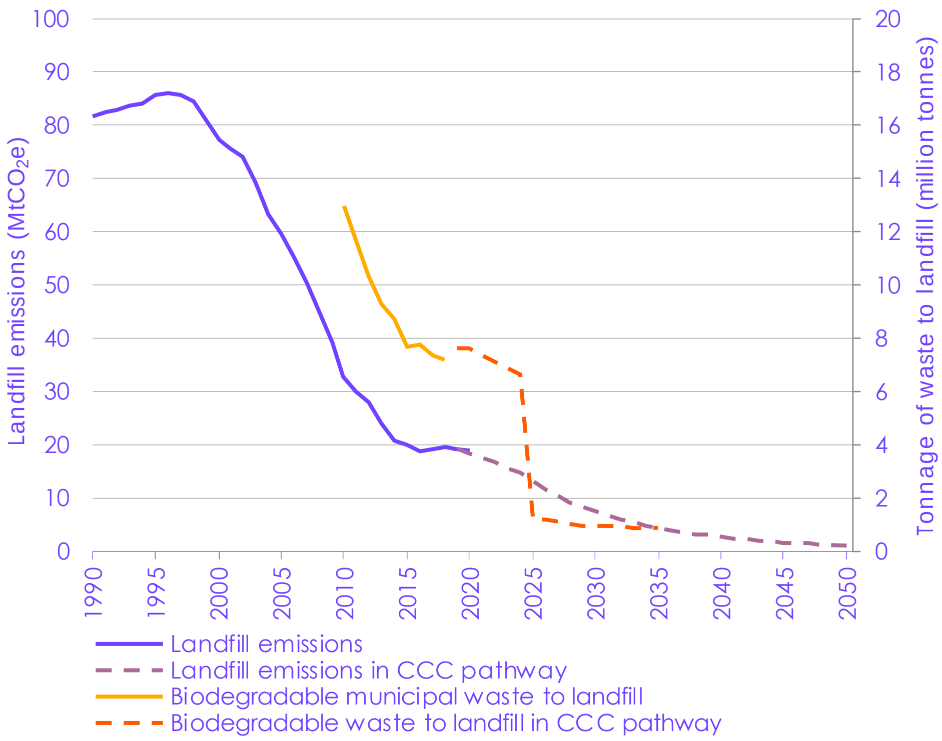
- In 2019, the latest year for which emissions data is available, emissions from EfW increased by over 10% on 2018, putting it on course to overtake emissions from coal power in 2020.
- If EfW usage continues to rise unchecked, then its emissions will exceed the CCC pathway while potentially undermining recycling and re-use efforts.

We are in the process of developing our indicator framework for the waste sector with a view to reporting on this from 2022. This will seek to provide better alignment to UK waste reporting statistics, greater granularity at a devolved administration level and improved coverage of resource efficiency.

* England's Local Authority Combined Recycling Rate increased from 12% in 2000 to 40% in 2020.

† 'Waste from Households (WfH)' is the agreed harmonised UK measure that was previously used to report household recycling to comply with the Waste Framework Directive (2008/98/EC). Under this Directive the UK was required to meet a target to recycle 50% of household waste by 2020.

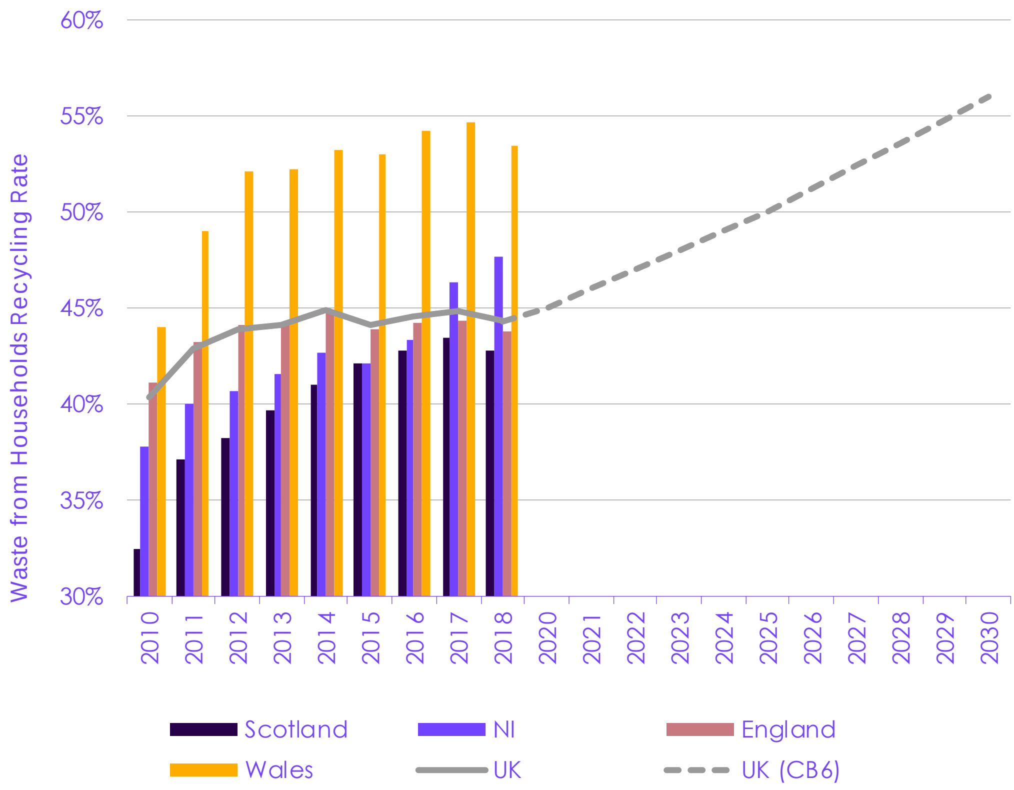
Figure 3.10 UK emissions from Landfill and tonnages of Biodegradable Waste to Landfill



Source: Defra (2018) *UK Statistics on Waste;* BEIS (2021) *Provisional UK greenhouse gas emissions national statistics 2020.*

Notes: 'CCC pathway' is the Balanced Net Zero Pathway published in our December 2020 advice on the Sixth Carbon Budget. Emissions in this chart are adjusted for future changes to the Global Warming Potentials (GWPs) of non-CO_2 greenhouse gases.

Figure 3.11 Waste from Household Recycling Rates across the UK



Source: Defra (2020) *UK Statistics on Waste* (2018).
Notes: UK (CB6) is the 'Balanced' pathway for household recycling rates set out in our Sixth Carbon Budget Report.

Welsh progress on recycling and resource efficiency is an example to the rest of the UK. Statutory requirements and sustained investment have been key factors to its success to date.

Box 3.3
Welsh Progress on Recycling and Resource Efficiency

Wales continues to lead by example on waste prevention, re-use and recycling, driven by ambitious targets, continued investment in infrastructure and services, and a holistic approach to resource efficiency policy.

- 2019 again saw improvements in recycling, with municipal recycling rates up to 65% from 63% in the previous year – one of the highest recycling rates in the world.
- Key measures to boost recycling have included the setting of statutory Local Authority recycling targets, over £1 billion of investment in recycling services and the provision of separate food waste collections.
- By 2025, Wales has set ambitious targets to reach a 70% recycling rate, and send zero waste to landfill, alongside a 50% reduction in avoidable food waste arisings.
- In March 2021, the Welsh Government published 'Beyond Recycling' – its updated circular economy strategy. This includes a commitment to become zero-waste by 2050 and to make resource efficiency part of Welsh culture.
- The Welsh Government has provided funding and set out robust policy measures to follow through on their commitments, including through an £80m Circular Economy Fund, requirements for non-domestic recycling and Extended Producer Responsibility.
- The Strategy demonstrates an understanding of the need to take a systems approach to resource efficiency, including measures to prevent recyclable materials being diverted to Energy from Waste, efforts to tackle all unnecessary

single-use items (as opposed to just plastics) and consideration of a technical standard for embodied carbon in buildings.

If the activities and commitments set out in the 'Beyond Recycling' strategy are successfully delivered, they would significantly reduce Wales' emissions from waste. The UK Government and other Devolved Administrations should seek to replicate the strong progress made by the Welsh Government in this area, including by learning from the Welsh approach.

Source: Welsh Government (2021) *Beyond recycling.*

i) Shipping (14 $MtCO_2e$, 3% of UK emissions in 2019)

Low-carbon fuels make up the large majority of shipping emissions savings in our CCC Pathway. This will require investment and R&D during the 2020s.

Within the path to Net Zero set out in our Sixth Carbon Budget advice, over 80% of shipping abatement is due to the transition to low-carbon fuels, such as ammonia (Table 3.9). This will require important enabling actions over the coming years:

- While uptake of these fuels in volume is not expected until the 2030s, investment and research and development should ramp-up during the 2020s to showcase proof-of-concept and develop an early market.

Global shipping emissions are still rising – the UK should lead in working internationally to reverse this.

- Global shipping emissions have risen by 7% over the decade to 2019. The UK should lead in working with the International Maritime Organisation (IMO) and other willing partners to strengthen international targets and policy mechanisms to meet them.

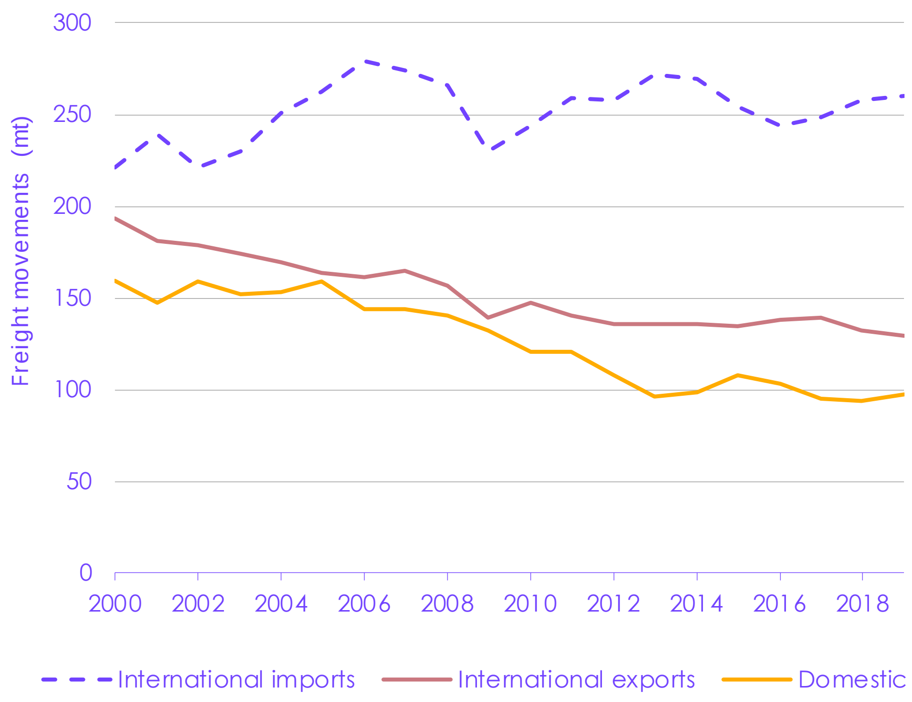
Table 3.9
Key metrics for shipping in the CCC Pathway to meet the Sixth Carbon Budget

	Latest Indicator			Milestones in the CCC pathway				
	Year	Annual change	Value	2025	2030	2035	2050	Trend
Use of low-carbon fuels (% of demand)	2020	-	0.0%	0.0%	0.2%	34%	91%	
Use of electricity (% of demand)	2020	-	0.0%	0.2%	1%	2%	4%	

Source: CCC analysis.
Notes: Low-carbon fuels comprise the large majority of the emissions savings from shipping within our Balanced Pathway. Deployment of these fuels is expected to ramp up mainly during the 2030s – R&D and market development, alongside progress on vessel efficiency and shore-side electrification, are needed during the 2020s.

Over the decade to 2019, domestic shipping activity fell by 26% and outbound international freight shipping reduced by 7% (Figure 3.12).[42] Overall freight tonnages have fallen by 3%,[43] driven by substantial reductions in imports of oil and coal.

Figure 3.12 UK international and domestic total port traffic, by freight volume



Source: DfT (2020) *Port and domestic waterborne freight statistics.*
Notes: Domestic figures include both coastwise and one-port shipping. International imports are shown with a dashed line since they will typically refuel outside the UK and are thus not included within our UK emissions inventory. See the Section 3 of Chapter 2 on consumption emissions for further discussion.

Global shipping carbon intensities have improved by around 30% over 2008-2018.[44] The IMO has recently introduced new binding energy efficiency and carbon intensity indicators which will increase this to a 40% improvement by 2030. However, there are concerns[45] that this may be insufficient to drive emissions reductions across the sector.

Increasing investment in and use of low-carbon energy and improvements to vessel efficiency will be key indicators of progress in this sector.

In future Progress Reports, we will seek to monitor progress in the enabling actions required to increase availability of low-carbon fuels and vessel efficiency in the shipping sector.

- Government's March 2021 consultation on the future of the Renewable Transport Fuel Obligation (RTFO) proposes to extend the scope of the RTFO to make renewable fuels of non-biological origin (RFNBOs; including hydrogen, ammonia and methanol) for use in the shipping sector eligible for support. We will monitor the levels of investment and production that result from this change.

- Clean maritime clusters and other innovative trials, such as the proposed hydrogen transport hub in Tees Valley, will be important in stimulating the emergence of a market for low-carbon shipping.

- Further improvements could be delivered through shore-side electrification (which could also offer strong air quality benefits[46] by avoiding the use of fossil-fuelled engines in ports, but will require action to surmount barriers to its deployment), provision of the requisite supporting infrastructure and smart efficiency measures, which are all included within the recently launched Clean Maritime Demonstration Competition.

The Committee will seek to monitor progress in each of these areas as part of a fuller indicator framework, which will be used to monitor progress from next year's Progress Report, in 2022.

j) F-gas emissions (13 $MtCO_2e$, 3% of UK emissions in 2019)

The majority of the required fall in emissions of F-gases is expected to fall under strict existing regulations. Our 'baseline' scenario for emissions sees existing regulations drive F-gas emissions down by 75% from current levels by the time of the Sixth Carbon Budget period.

There is some limited evidence that underlying progress is being made against the additional measures we have identified outside the baseline.

- Enforcing regulations. Regulations are only as good the rate of compliance. The Environment Audit Committee has reported evidence of suspected non-compliance, especially as the EU F-Gas Regulation increases demand for refrigerants with lower Global Warming Potential (GWP), and a lack of resources for the Environment Agency to carry out adequate inspections.[47]

- Inhalers. High GWP metered dose inhalers (MDIs) are still the main type of inhaler used in the UK.

  - NHS England's Long Term Plan has set targets to deliver significant and accelerated reductions in the total emissions from the NHS by moving to lower-carbon inhalers, such as dry powder inhalers (DPIs) that are used widely in Europe.

  - Two major pharmaceutical suppliers to the NHS have committed to action on reducing the carbon impact of their MDIs and, from 2025, reformulating their inhalers so they can be used with low-GWP propellants.

- Alternative refrigerants. There is some potential for the low-GWP HFC-32 to be replaced by an ultra-low-GWP alternative. Doing so could reduce F-gas emissions below the level in our Sixth Carbon Budget pathway. Preliminary research is being done into the technical capacity for hydrocarbons to replace HFC-32.

k) Greenhouse gas removals

Our assessment is that both engineered Greenhouse Gas Removals (GGR) and land-based removals (such as tree planting and peatland restoration - see section d) above), will be essential for reaching Net Zero.

Engineered Greenhouse Gas Removal technologies, presently in early stages of development, will need to make a key contribution to reaching Net Zero.

Engineered removals via Bioenergy with Carbon Capture and Storage (BECCS) applied in a variety of sectors, and Direct Air Capture with Carbon Capture and Storage (DACCS) are at an early stage of development. A small number of BECCS and DACCS test facilities are presently in operation worldwide. Investment in research and development needs to be complemented with policy design to support engineered GGR scale-up during the mid-to-late 2020s.

Table 3.10
Key metrics for greenhouse gas removals in the CCC Pathway to meet the Sixth Carbon Budget

		Latest indicator		Milestones in the CCC pathway				
		Year	Value	2025	2030	2035	2050	Trend
Removals (all values in $MtCO_2$)	Total	2020	-	<1	-4.8	-22.5	-58.3	
	BECCS	2020	-	-	-4.6	-22.3	-52.9	
	DACCS	2020	-	-	-	-	-5	
	Wood in Construction	2020	-	-0.1	-0.2	-0.2	-0.4	

Source: CCC analysis.
Notes: Present usage of wood in construction is included in land use, land use change and forestry (LULUCF) inventory account.

A key milestone on the Sixth Carbon Budget pathway is progress towards the commissioning of the first commercial-scale BECCS plant in the late 2020s. This will need to be underpinned by the construction of CO_2 pipeline and storage infrastructures as part of the wider establishment of CCS in the early 2020s, which are capable of timely expansion to accommodate CO_2 from BECCS or DACCS. Progress towards this underpinning infrastructure delivery and the development of support policies for GGR deployment will be considered in next year's Progress Report, in 2022.

Endnotes

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[30] Department for Transport (2020) *Rail fare rise to be delayed.*

[31] HM Revenue & Customs (2020) *Changes to Air Passenger Duty rates from 1 April 2021.*

[32] BSRIA (2021) *'Heat pumps market analysis 2020: United Kingdom', BSRIA World Market Intelligence.*

[33] This includes estimated abatement from the following policies: Building regulations part L 2010 and 2013; CRC-ees; ESOS; Industrial Heat Recovery Support; Products policy, PRS Regulations and Streamlined energy and carbon reporting framework for business (SECR). It does not include any estimate of abatement from carbon pricing policies or Climate Change Agreements, which will have also contributed to improving energy efficiency.

[34] BEIS (2020) *Updated energy and emissions projections: 2019.*

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Chapter 4

Policy progress and gaps

Introduction

Two years ago, the UK was aiming to reduce emissions to at least 80% below 1990 levels, by 2050 (from 48% below 1990 levels in 2020*).As of 2019, the emissions reduction goal for 2050 is now at least 100% ('Net Zero') and the Government has committed to a reduction in emissions of 78% by 2035, based on the Committee's 2020 advice on the Sixth Carbon Budget.

Having set the level of the Sixth Carbon Budget, the Government must develop a comprehensive set of policies to ensure that it is met. Importantly, the Sixth Carbon Budget will be the first to include emissions from international aviation and shipping (IAS). This ensures that, from now on, the Government's emissions reductions strategies have a formal requirement to cover all areas of the economy, rather than merely leaving 'headroom' for IAS emissions as in previous strategies.

This year is the start of a new era of UK climate action, with the Sixth Carbon Budget legislated, the publication of new evidence for the third Climate Change Risk Assessment (CCRA3) and the UK's hosting of the 26th United Nations Framework Convention on Climate Change (UNFCCC) Conference of the Parties (COP26) in Glasgow in November. Government policy needs to ramp up to match. We expect the Government's forthcoming Net Zero Strategy, ahead of COP26, to provide a blueprint for action over the coming decades.

As part of our advice on the Sixth Carbon Budget, we published a report on *Policies for the Sixth Carbon Budget and Net Zero*. This set out potential ways to address what needs to be done in each emitting sector and an overview of the policy challenges. With Net Zero by 2050 in mind, policy needs to enable a scale-up and roll-out of low-carbon technologies and behaviours, so that by the early 2030s nearly every new investment and purchase is low-carbon.

Our policy report is still the most current overview of the policy challenge for the Sixth Carbon Budget. This chapter recaps the main aspects of that report and covers key developments since. It also offers an appraisal of the Government's current plans, looks back on progress departments have made on last year's recommendations and identifies priority policy recommendations and gaps that need to be addressed.

The key messages in this chapter are:

- **The early foundations for a decade of delivery are being put into place.** The Government is starting to demonstrate that it is taking the Net Zero challenge seriously. It has set up climate action committees on strategy and delivery in Cabinet, it has published a Ten Point Plan for a Green Industrial Revolution, an Energy White Paper, an Industrial Decarbonisation Strategy, an interim Net Zero Review from HM Treasury on the fair allocation of costs during the transition and launched a new UK Emissions Trading Scheme.

- **However, several key strategies and plans are not yet published,** or have been delayed. At the time of finalising this report at the start of June, the Heat and Buildings Strategy, the Transport Decarbonisation Plan, the final HM Treasury Net Zero review, the Net Zero Aviation Strategy and the Nature Strategy had not yet been published. These are needed in order to extend

* This reduction reflects the impact COVID-19 had on emissions in 2020, much of which is not expected to be permanent. The fall in emissions between 2019 and 1990 was 40%.

action to reduce emissions into all areas of the economy, within a portfolio of policy that accelerates a fair and just transition to Net Zero.

- **The Government has made significant commitments, but there are still significant gaps in ambition.** Where ambitions have been set over the last year, they have tended to be a significant step up. Many are now aligned with the path to Net Zero (e.g. 40 GW of offshore wind, phasing out petrol and diesel cars and vans by 2030). However, gaps remain in the Government's stated ambitions (e.g. on diets, aviation demand, waste, and low-carbon heat networks), while some announcements fall short of what is likely to be needed (e.g. on peatlands, heat pumps, and carbon capture and storage). Together these imply a significant ambition gap: current Government commitments that align to the Committee's published pathways cover less than half of the path to Net Zero.

- **Efforts must be increased markedly, especially in the lagging areas.** There are signs of a multi-speed approach within Government to raising ambition and putting in place effective policies. Some departments (e.g. Defra, MHCLG, but also parts of BEIS and HM Treasury) are lagging behind others, and appear timid in their approach. The path to Net Zero requires high ambition and an effective policy framework in all areas.

- **A major delivery challenge will remain** even once the Net Zero Strategy sets out how the Government intends to drive the transition. Of the 92 recommendations from last year's Progress Report, just 11 have been achieved in full, with 29 partly achieved and 34 underway. Translating strategy into effective policy across the wide range of emitting sectors will require continued focus across Government over the rest of this Parliament and beyond. We set out several priority areas for action as well as approximately 200 recommendations for UK Government departments and the devolved administrations.

This chapter is set out in four sections:

1. The delivery challenge
2. Stated ambition and policy progress
3. Policy priorities and gaps
4. Sectoral progress and next steps for policy

1. The delivery challenge

Achieving Net Zero and the Sixth Carbon Budget will require a significant scale-up in delivery of low-carbon policies and actions.

The Committee's December 2020 advice on the Sixth Carbon Budget set out a pathway to achieving the UK's Net Zero 2050 target, based on a comprehensive programme of delivery in the 2020s that covers all areas of decarbonisation. If the required scale-up over the coming decade is to occur, the key building blocks of policy must be introduced in the coming months and developed over the next few years (Figure 4.1, Table 4.1). This Government must be the one to shift the UK decisively onto the path that ends its contribution to global warming.

The Government has committed to set out its plans in the Net Zero Strategy, required by the Climate Change Act and due ahead of the COP26 UN climate talks in Glasgow in November this year. COP26 gives the Net Zero Strategy added significance. Setting out a strong and credible policy package to deliver the scale-up over the next decade would put the UK firmly on track to Net Zero, greatly strengthening its credibility as a climate leader.

The transformational change required means Net Zero and climate adaptation must be integrated into all policymaking.

The Government has accepted the overall challenge by setting the UK's Nationally Determined Contribution (NDC) to the Paris Agreement for 2030 and legislating the Sixth Carbon Budget for 2033-37. Given the scale of the challenge and the often-complex interactions involved, a piecemeal or sector-specific approach will not be enough. Net Zero should be integrated into all policymaking, as should climate adaptation.

a) Scaling up and rolling out low-carbon technologies and behaviours

The next decade is critical for building supply chains, with policy focussing on widespread roll-out of measures thereafter.

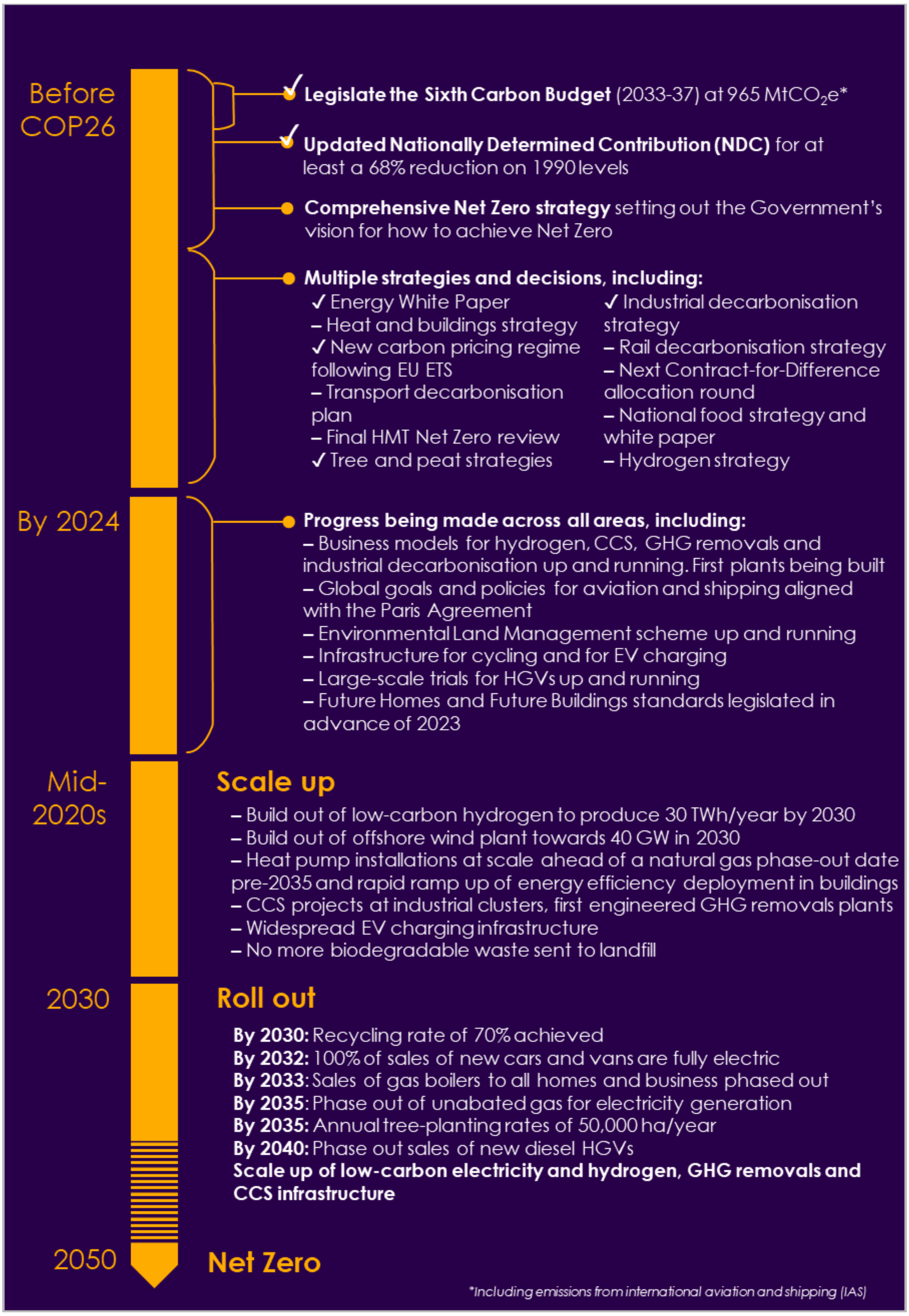
Accompanying our advice on the Sixth Carbon Budget was a report on *Policies for the Sixth Carbon Budget and Net Zero* ('the Sixth Carbon Budget policy report'), which provides recommendations on how to achieve a transition that involves two distinct phases for UK climate policy, with the next decade being vital:

- **The 2020s: scale-up.** The UK must build supply chains and new markets for low-carbon consumer offerings (e.g. electric cars and heat pumps) so that these can scale from being niche offerings to dominating the market and fully pushing out sales of high-carbon alternatives by 2030, or soon after. Alongside this, new options must be developed and scaled up for industrial decarbonisation such as carbon capture and storage (CCS), low-carbon hydrogen and engineered emissions removals, while finishing the job of power sector decarbonisation. Annual tree-planting rates must increase from 13,000 hectares per year today to 30,000 by 2025 in line with the Government's commitment – and continue to rise to 50,000 year by 2035.

- **From the early 2030s to 2050: roll-out.** Having scaled up the required markets for low-carbon technology sales, these will then take around 15 years to flow through the stock of vehicles and buildings as high-carbon assets reach the end of their lives. Mechanisms driving implementation in industry and land use should be well developed and continue to drive roll-out at similar rates. Policy will be less about aiming to scale up markets, instead focusing on continuing achieved rates of roll-out, tackling emerging barriers and systems challenges and ensuring fairness across society.

Most of the recommendations in our Sixth Carbon Budget policy report still stand. What follows in this chapter are the priorities already set out in that report and updates where recent policy developments have occurred. Government progress on tackling the delivery challenge to date is also addressed. Key milestones for policy and delivery are set out in Table 4.1 and Figure 4.1.

Figure 4.1 Timeline for the decade of delivery, and beyond



Source: CCC analysis based on the Sixth Carbon Budget and HMG (2020) *The Government Response to the Committee on Climate Change's 2020 Progress Report to Parliament*.
Notes: Table 4.1 has a complete list of the milestones and targets to be reached on the path to 2050.

Table 4.1
Key outcomes to target over the next few years, and milestones towards 2050

Date	Outcomes and Milestones	
Before COP26	✓ Legislate the Sixth Carbon Budget at 965 MtCO2e, including emissions from international aviation and shipping • Net Zero Strategy, setting out how the Sixth Carbon Budget and Net Zero are to be met ✓ Energy White Paper • Heat and Buildings Strategy ✓ New carbon pricing regime following EU ETS • Transport Decarbonisation Plan • Final HMT Net Zero Review ✓ England Trees Action Plan ✓ England Peat Action Plan, including an end to rotational burning of certain upland peat sites • Hydrogen Strategy, and consultation on hydrogen business models • Governance framework and timeline for decisions on the conversion to hydrogen of the gas transmission and distribution networks • Rail Decarbonisation Strategy ✓ Industrial Decarbonisation Strategy • Net Zero carbon hospital standard, and further commitments towards delivering a Net Zero NHS • Publication of Greening Government Commitments • Ofgem's final business model approvals for the RIIO-ED2 period should accommodate network upgrades for EVs and heat pumps • Next Contract-for-Difference allocation round, targeting large volumes of renewables, towards 40 GW offshore wind by 2030	✓ Updated Nationally Determined Contribution (NDC) for at least a 68% reduction on 1990 levels (excl. IAS) ✓ Build on the UK's NDC to increase global climate ambition in the run up to COP26 • Strengthened UK Adaptation Plans ✓ Updated Green Book guidance on climate change ✓ Decision on funding model for CCS infrastructure • Ministry of Defence review of climate change and defence ✓ Call for evidence on policy for GHG Removals (GGRs) ✓ Consultation on Waste Prevention Programme for England and associated consultations on recycling collections, Extended Producer Responsibility and Deposit Return Scheme. • Consultation on mandatory food waste reporting • Consultation on including maritime in the Road Transport Fuel Obligation (RTFO) ✓ Scottish Government updated Climate Change plan • Conclusion of Green Jobs Taskforce and publication of Green Jobs Action Plan ✓ Environmental Land Management pilots • Implementation of minimum device standards for EV chargers • National Food Strategy and white paper • Welsh Government to publish a plan for meeting the second carbon budget • Net Zero Aviation Strategy ✓ North Sea Transition Deal
By the end of 2022	• Carbon capture, utilisation and storage (CCUS) business models decided for power, hydrogen and manufacturing and construction • 3rd Climate Change Risk Assessment published by Government (CCRA3) • Cross-Government Bioenergy Strategy	• Defra to publish a Nature Strategy for England • ICAO negotiations to set long-term Paris-compatible target for global aviation (align & strengthen CORSIA in 2023) • Strategy for shipping (including international shipping) that reflects UK Net Zero

By 2024	• Business models for hydrogen, CCS, GHG removals and industrial decarbonisation up and running. First plants being built. • Environmental Land Management (ELM) scheme up and running in England • Universal waste collections and recycling facilities in place across England • Implement a trading or auctioning system to deliver private sector investment in tree planting • IMO negotiations revise 2050 target for global shipping in 2023, set new policies • Coal phased out of the power system • Legislation for the Future Homes and Future Buildings Standards introduced ahead of 2023, and should come into force by 2025 at the latest • Large-scale trials for HGVs in place
Mid-2020s	• Demonstrate low-carbon hydrogen at scale via 1 GW of hydrogen production capacity by 2025 • Strategic decisions on the future of the gas grid, including the extent of zoning for heat networks, electrification and any planned conversions of the gas grid to hydrogen • All new boilers 'hydrogen-ready' by 2025 at the latest • CO_2 transport and storage infrastructure operational • Annual tree-planting rates of at least 30,000 hectares / year • First UK sustainable aviation plants operational, policy support in force • Main biodegradable municipal and non-municipal waste streams banned from landfill from 2025
By 2030	• Nearly 100% of new cars and van sales are battery-electric (or other zero-emission) vehicles • Heat pump installations at scale (1 million / year) ahead of a natural gas boiler installation phase-out date pre-2035 • All buildings except owner-occupied non-fuel poor homes achieve Energy Performance Certificate (EPC) C • Sales of oil and coal heating in homes phased out (2028) • Rented homes achieve EPC C and homes for sale achieve EPC C (2028) • Phase-out of the most harmful F-gases and restricting the use of all F-gases by 80% • CCS and low-carbon hydrogen across 5 industrial clusters, capturing and storing 10 $MtCO_2$ per year and producing 25 TWh/year of low-carbon hydrogen • 40 GW of offshore wind installed in UK waters, reducing emissions from electricity generation to less than 50 gCO_2/kWh • Commercial roll-out of low-carbon ammonia and hydrogen starts in shipping, with at least one cluster (>2 TWh/year) • Recycling rate of at least 68% achieved across the UK, food waste 50% reduction • Commercial scale engineered GHG removals plants operational
Over the 2030s	• Sales of gas boilers to all homes and business phased out (by 2033) • Phase-out of sales of new diesel HGVs (by 2040) • All diesel trains removed from passenger rail operations (by 2040) • All ore-based steel-making near-zero emissions (by 2035) • Phase-out of unabated combustion of fossil gas for electricity generation (by 2035) • Widespread roll-out of CCS, including on Energy from Waste plants • Annual tree planting rates of at least 50 kha/year (by 2035)
By 2050	Any residual sources of emissions are offset through emissions removals in the UK. Low-carbon electricity, hydrogen and bioenergy provide all the UK's energy, in combination with CCS. Low-carbon technologies and behaviours continue to roll out at scale and all asset replacements continue to be low-carbon.

Source: CCC analysis based on the milestones to delivering the Sixth Carbon Budget pathway, and HMG (2020) *The Government Response to the Committee on Climate Change's 2020 Progress Report to Parliament*, Policy Exchange (2020) *UK Energy & environment policy timeline.*
Notes: Ticks mark refer to actions that have been concluded.

Material progress has been made since our last Progress Report to Parliament in June 2020. The Government has accepted the Committee's advice on the level of the Sixth Carbon Budget, and the level of the UK's NDC for 2030, setting the UK on an ambitious decarbonisation pathway towards 2050.

Setting the level of the Sixth Carbon Budget and the UK's 2030 NDC are significant steps in the last year and Government is starting to develop policy across all areas.

The Government has also recognised the need for extensive policy strengthening and has started to develop plans in all areas of UK emissions, with significant policy announcements having been set out in the Ten Point Plan for a Green Industrial Revolution, Energy White Paper, Industrial Decarbonisation Strategy and England Trees and Peat Action Plans (Table 4.2).

These publications have significantly strengthened commitments, with many headline ambitions now aligned to the CCC pathway (e.g. 40 GW offshore wind by 2030, phase-out of conventional petrol and diesel cars by 2030, 30,000 hectares afforestation annually by 2025). However, some of the specific targets in these announcements, while improvements on previous commitments, fall short of those in the CCC pathway (e.g. heat pump deployment that is a third lower in 2028, total carbon capture and storage ambition in 2030 that is around half of what we set out) – see Figure 4.2.

There are still gaps and ambiguity in government ambition, including around influencing consumer choices on issues like aviation and diets.

Some important ambition gaps remain in certain sectors, while there is a danger that several of the broad ambitions announced are implemented in a way that would fall short of the CCC scenarios:

- Consumer choices. So far, the Government's announcements have focused on technologies and largely ignored the potential for changes in consumer choices to reduce emissions. These are particularly important to limit emissions in 'hard to abate' sectors, such as aviation and agriculture. There are a wide range of levers available to promote low-carbon choices, including enabling measures and nudges, ensuring supporting infrastructure is available, as well as more interventionist measures using regulations and the tax system.

- Ambiguity in ambition. While some commitments have been made that could be at least as ambitious as our pathways, there remain risks that real-world implementation could fall short. For example, the announced 2030 phase-out date for sale of petrol and diesel cars and vans will allow sale of hybrid vehicles with "significant zero-emission capability" until 2035, well after the 2032 date by which we recommend all such vehicles should be fully zero-emission. The definition of which vehicles can be sold after 2030, currently subject to consultation, will be crucial in ensuring that emissions and motoring costs are kept as low as possible by prioritising fully zero-emissions vehicles over hybrids.

The Net Zero Strategy will have to make up for emerging shortfalls in ambition and bring together action across every sector.

We expect the Government's forthcoming Net Zero Strategy, promised for this year, to provide a blueprint for action over the coming decades. The Net Zero Strategy will need to make up for the shortfalls in ambition illustrated in Figure 4.2 and Table 4.2 and clarify policy mechanisms to meet that ambition:

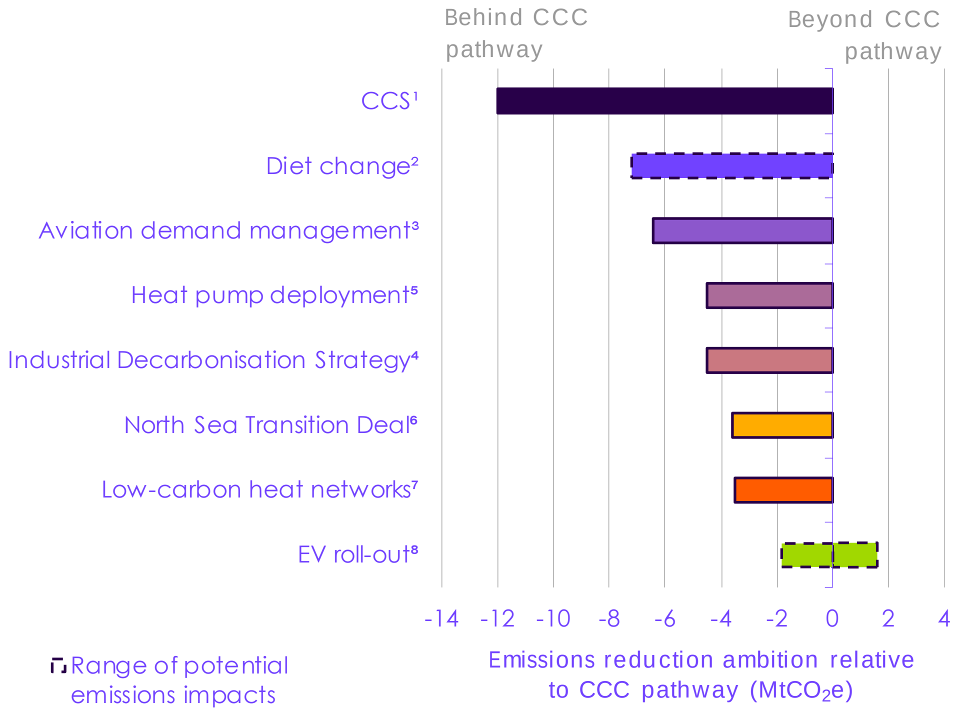
- The Government is not required to commit to the Committee's detailed sectoral pathways, nor our policy advice. But it must set out a credible alternative approach where it chooses not to.

Our pathways are designed to be stretching across the economy, so it is difficult to compensate for lower ambition in one area with greater ambition elsewhere.

- The Net Zero Strategy, released later this year, will have to address the shortfall, strengthening weaker commitments to be closer to the Committee's pathways or setting out how emissions can be cut faster in other areas to compensate.

- With the path to 2050 becoming clearer, plans must translate into near-term action and Government must organise for the major delivery challenge of Net Zero.

Figure 4.2 Differences in stated Government ambition compared to CCC Pathway



Notes: Comparisons are against the Balanced Net Zero Pathway ('CCC pathway') published in the Committee's *Sixth Carbon Budget* advice.
[1] Government CCS ambition for is 10 $MtCO_2$/year in 2030, compared to 22 $MtCO_2$/year in the CCC pathway.
[2] The level of diet change without explicit policy to support it is uncertain. Annual emissions could be up to 7.2 $MtCO_2e$ higher than the CCC pathway in 2030.
[3] Lack of ambition for aviation demand management would result in higher annual emissions of 6.4 $MtCO_2e$ in 2030 relative to the CCC pathway for aviation emissions.
[4] The Industrial Decarbonisation Strategy aims for a 67% reduction by 2035, compared to 73% in the CCC pathway.
[5] Government ambition is for 600,000 installations in homes in 2028, compared to 900,000 in 2028 in the CCC Pathway. The abatement gap in 2030 is inferred, based on an assumed trajectory of uptake to 2028 under the Government's plans, with annual deployment remaining constant to 2030.
[6] The North Sea Transition deal commits to a reduction that falls short of the CCC pathway by 3.7 $MtCO_2e$ in 2030.
[7] Based on announced Government heat network investment of £0.7 billion (assumed to leverage £2.2 billion, leading to a total investment of £2.9 billion, of which we estimate £1.7 billion will be for low-carbon, with resulting deployment estimated by CCC).
[8] A strict 2030 phase-out of petrol and diesel vehicles would be more ambitious than the CCC pathway, but this depends on the timing of when plug-in hybrid electric vehicles are phased out.

Table 4.2
Government commitments compared to the CCC Pathway between 2025-2035

Headline actions	Government commitment [1]	CCC pathway
Offshore wind	40 GW by 2030	40 GW by 2030
Electric vehicles	Phase-out of new fossil fuelled vehicle sales by 2030, with allowance for some hybrids out to 2035	Phase-out of all new fossil fuelled vehicle sales by 2032
Heat pumps in homes	600,000 heat pump installations / year by 2028	900,000 heat pump installations / year by 2028 1.1 million installations / year by 2030
Low-carbon heat networks (all buildings) [2]	2 TWh of low-carbon heat networks by 2030	25 TWh of low-carbon heat networks by 2030
Low-carbon hydrogen	5 GW (up to 42 TWh) by 2030	30 TWh by 2030
Carbon Capture and Storage [3]	10 $MtCO_2$ / year captured and stored by 2030, across 4 industrial clusters, including at least one power project	22 $MtCO_2$ / year captured and stored by 2030, across at least 5 industrial clusters, including multiple power projects
Emissions reduction in manufacturing and refining	Around two-thirds by 2035, compared to 2018	73% by 2035, compared to 2018
Tree-planting	30,000 hectares / year by 2025	30,000 hectares / year by 2025 50,000 hectares / year by 2035
Peatland restoration [4]	32,700 hectares / year by 2025	67,000 hectares / year by 2025
Greenhouse gas removals	Innovation support provided, in recognition that engineered removals will be needed, but no firm commitment on deployment yet	5 $MtCO_2$ / year by 2030
Nuclear power [5]	Final Investment Decision on at least one new nuclear power plant by the end of this Parliament	One new nuclear plant operational by 2030, and a further plant by 2035

Notes:

[1] Based on actions in the Ten Point Plan, Energy White Paper, Industrial Decarbonisation Strategy and England Tree and Peat Action Plans between 2025 and 2035 and the CCC's Balanced pathway from the Sixth Carbon Budget.

[2] Government commitment on low-carbon heat network deployment is illustrative, and has been inferred from Government spending commitments, using assumptions around expected leveraged investment and the proportion of funding targeted at low-carbon networks.

[3] The difference in carbon captured and stored annually largely comes from projects in the power sector in CCC scenarios, so other technologies could compensate for this shortfall.

[4] Government peatland restoration commitments include Scotland, Wales and England. CCC peatland restoration numbers in 2025 are UK-wide.

[5] The Balanced Pathway produced for the CCC's Sixth Carbon Budget assumed that two new nuclear power stations would be in operation by 2035.

a) Progress against last year's recommendations

11 of the Committee's 94 recommendations from last year have been fully achieved, 29 partly achieved and 32 are underway.

The Committee made 92 recommendations to Government departments in our June 2020 Progress Report. Of these, 11 have been achieved in full (which includes the critical cross-cutting recommendations on the level of the Sixth Carbon Budget and the UK's 2030 NDC). Some progress is being made, or is expected soon, against many others, with 29 recommendations partly achieved and 34 underway. Seven recommendations are overdue and 13 have not been achieved (Table 4.3).

We are reporting on a moving picture of progress as several critical policy documents have not yet published, with many of these delayed.

While several critical policy documents have been published over the last year, other key strategies and plans remain to be published, or have been delayed:

- At the time of finalising this report in early June, the Heat and Buildings Strategy, the Transport Decarbonisation Plan, the final HM Treasury Net Zero review, the Net Zero Aviation Strategy and the Nature Strategy had not yet been published. These are needed to extend action to reduce emissions into all areas of the economy, within a portfolio of policy that accelerates a fair and just transition to Net Zero.

- The absence of these documents means we are reporting on a moving picture. It will only be possible to judge the overall approach to meet the Sixth Carbon Budget and the Net Zero target when the Government's Net Zero Strategy, as well as other overdue and underway documents, are published.

We see evidence of a multi-speed Government, with some departments' progress lagging behind others.

As the disparities in progress in Table 4.3 illustrate, we see evidence of a multi-paced Government, with some departments lagging behind others:

- The **Ministry of Housing, Communities & Local Government (MHCLG)** is not fully supporting local government to play its part in the transition to Net Zero. Progress has fallen short to date on ensuring that building standards are fit for purpose and properly enforced. The current Planning Bill does not ensure that developments and infrastructure are compliant with Net Zero and appropriately resilient to climate change. It would be serious were this opportunity to be missed.

- While the **Department for Environment, Food & Rural Affairs (Defra)** has made important steps forward on ambition for afforestation and peat restoration – though the latter is short of the CCC pathway and implementation is slow – progress on agriculture and land use remain slow and partial, and gaps in ambition remain. On waste, large gaps remain both on banning materials from landfill and getting a grip on the rapid expansion of Energy from Waste facilities.

- Even within Departments that are performing better overall there are pockets of poor or slow performance. For example, the **Department for Business, Energy and Industrial Strategy's (BEIS)** Heat and Buildings Strategy has been delayed by almost a year, while the **Department for Transport (DfT)** has not set out any plans for limiting growth in aviation demand.

- More generally, Government progress has been slow on overarching challenges towards Net Zero, which has now been law for two years. The most notable delay is to the **HM Treasury's** Net Zero Review, but there are delays and uncertainty to a suite of other challenges: the just transition, jobs and skills, public engagement. With a Spending Review later this year, it is essential that the Treasury clarifies its strategic priorities for the remaining carbon budget in the UK. There is also a need for strong governance of the transition within Government, including ensuring that wider policy decisions are routinely made compatible with Net Zero.

For the full programme to align to the challenge, and provide the leading example that the Government wishes to take to COP26, government will have to address these failures.

Table 4.3
Progress against departmental recommendations in the Committee's 2020 Progress Report to Parliament

Department	Progress against last year's recommendations
Cabinet Office & No. 10	🟢⚪⚪🟡
FCDO, BEIS & the COP26 Unit	🟢⚪⚪🟡🟡🔴
HM Treasury	🟡🟡🟡🟠🟠🟠🔴
Department for Business, Energy and Industrial Strategy	🟢🟢🟢🟢⚪⚪⚪⚪⚪⚪⚪⚪⚪⚪🟡🟡🟡🟡🟡🟡🟡🟡🟠🔴🔴🔴
Department for Environment, Food and Rural Affairs	🟢⚪🟡🟡🟡🟡🟠🔴🔴🔴🔴
Department for Transport	🟢🟢🟢⚪⚪⚪⚪🟡🟡🟡🟠🟠🔴🔴
Ministry of Housing, Communities and Local Government	🟡🟡🟡🟡🟡🔴
Department for Education	⚪⚪
Department for International Trade	⚪⚪🟡
Department of Health and Social Care	⚪🟡
Ministry of Defence	🟢⚪⚪
Home Office & Ministry of Justice	⚪⚪
Department for Digital, Culture, Media and Sport	⚪⚪🟡🔴
Department for Work and Pensions	⚪⚪

🟢 = action achieved, ⚪ = underway, 🟡 = partly achieved, 🟠 = overdue, 🔴 = not achieved.

Notes: Based on recommendations in the CCC's 2020 Progress Report to Parliament. Recommendations for all departments, or those relating to adaptation are not included in this table. Some recommendations apply to more than one department, so the sum of recommendations in this table does not add up to the 92 cited in the text. Tables of recommendations and scores is in the supplementary material published alongside this report.

Progress across the devolved administrations has also been significant over the past year.

Delivering Net Zero by 2050 will require strong policy frameworks across all levels of Government, and collaboration between the governments of Wales, Scotland and Northern Ireland with Westminster to develop the required policies. The past year has also seen important developments in climate policy in the devolved administrations (Box 4.1), including:

- The Scottish Government updated its Climate Change Plan, which integrates the 2045 Net Zero target and its new interim targets into its delivery plan for emissions reductions out to 2032.
- The Welsh Government increased its 2050 emissions target to Net Zero, from a 95% reduction on 1990 levels, following advice from the Committee.
- The Northern Ireland Assembly is working towards legislating a Climate Change Bill before the next Assembly election in 2022.
- Both Scotland and Wales created ministerial portfolios that focus on Net Zero and decarbonisation following the May 2021 elections.

Box 4.1
Policy progress in Scotland, Wales and Northern Ireland

The past year has seen significant developments in climate policy in Scotland, Wales and Northern Ireland, even in the midst of the response to the pandemic. This box sets out major climate policy developments since our 2020 Progress Report.

Scotland:

- The Scottish Government committed to significant spending in low-carbon areas in its **Budget and Programme for Government**, including £1.8 billion for low-carbon infrastructure and £1.6 billion for heat and energy efficiency measures (or: including £2 billion to decarbonise travel and heating, and promote woodland creation).[1,2]
- Published an **update to the Climate Change Plan** to integrate the 2045 Net Zero target and new interim targets into the plan for the delivery of Scottish emissions reductions until 2032. The update aligns sectoral emissions pathways to the higher ambition of the 2045 goal. We will scrutinise elements of that update in our 2021 Scottish Progress Report.[3]
- Following the May 2021 election, the Scottish Government created a new cabinet position for **Minister for Net Zero, Energy and Transport**, with a portfolio that includes the delivery of Net Zero and COP26, as well as transport, biodiversity, infrastructure and circular economy.
- The **Just Transition Commission** published its final report, and the findings from **Scotland's Climate Assembly** are due to be published around the same time as this Progress Report.[4]
- Scotland's **Draft Heat in Buildings Strategy** was published, setting out a pathway for achieving Net Zero emissions in Scotland's buildings.

Wales:

- The Welsh Government legislated a **2050 Net Zero target** and a set of targets on the pathway to that goal, in line with the Committee's advice.[5]
- Published a **Transport Strategy (Llwybr Newydd)**, which places decarbonisation by 2050 at the centre of transport and infrastructure planning.[6]
- Published 'Beyond Recycling', a **circular economy strategy** that sets out policy to promote resource efficiency and make Wales 'zero waste' by 2050.[7]
- Continues to work on the second **Low Carbon Delivery Plan**, which will outline the delivery of the Second Welsh Carbon Budget and beyond.

- Following the May 2021 election, the Welsh Government has created a new cabinet position **Minister for Climate Change**, with responsibilities including decarbonising transport, the housing sector and energy generation.

Northern Ireland:

- The Executive requested the **Committee's advice on setting emissions targets** that reflect Northern Ireland's equitable contribution to the UK's 2050 Net Zero target. We published this advice in December 2020.[8]
- The Northern Ireland Assembly is in the process of legislating a **Climate Change Bill** before the next Assembly election in 2022. The Committee will continue to provide evidence throughout the legislative process.
- In March 2021, the Northern Ireland Executive consulted on an **Energy Strategy** and published a set of **decarbonisation scenarios** that would see Northern Ireland's energy systems reach net-zero carbon by 2050. The final strategy is scheduled for publication in November 2021.[9, 10]

b) Judging progress towards the Sixth Carbon Budget

We have assessed Government progress towards the Sixth Carbon Budget by judging whether sufficient ambition is in place, and whether policy is being developed to meet that ambition, for each source of abatement in the CCC pathway to Net Zero*. Figure 4.3 illustrates our assessment of progress against required emissions abatement, and Table 4.5 sets out our scoring and justification across some of the most significant sources of abatement in the economy. We find a mixed picture:

- **Ambition is beginning to align with what is needed, although there is more limited action or major risks** for almost half of the abatement in the CCC pathway (e.g. heat networks, emissions from landfill and waste incineration, developing greenhouse gas removals). Precise intentions still need to be clarified for around a third of the remaining abatement that is broadly aligned with the targets (e.g. zero-emission cars, energy efficiency in buildings).

Progress in setting out policies is significantly behind ambition, which is broadly on track with some important gaps.

- **Progress in setting out policies is significantly behind ambition**, with less than one-fifth of the emissions savings for the Sixth Carbon Budget having policies that are 'potentially on track' or 'fully on track' for delivery (e.g. renewable electricity generation).
  - In many other areas, some policy plans have been set out but these lack detail and/or do not comprehensively cover the necessary set of issues (e.g. in terms of funding, appropriate mechanisms, timing). Together, areas in which policy is in danger of falling behind cover over three-fifths of the emissions reduction required to 2035.
  - A further one-fifth of the emissions reductions still have major policy gaps, including on demand-side action and tackling emissions from landfill and waste incineration. We highlight the need to fill a range of policy gaps in section 4.

* The 'CCC pathway' refers to the Balanced pathway to Net Zero developed by the Committee in our December 2020 report, CCC (2020) *Sixth Carbon Budget – The UK's path to Net Zero.*

Table 4.4 provides an overview of the scoring criteria which informed the Committee's judgement in Figure 4.3. A list of scores for all sources of abatement is available in the supplementary materials accompanying this report.

Effective policies must be developed at greater pace. The path to Net Zero requires a rapid scale-up in low-carbon investment and low-carbon choices across the economy. Government must lead that change with more urgency than we have seen so far, and **speed up delivery, which will need to accelerate even where ambition is broadly on track**, for example:

Delivery is falling short even where ambition is broadly on track.

- Although the Government's 2030 target for **offshore wind** is in line with the CCC pathway, a minimum of 4 GW of additional offshore wind capacity will be needed each year from the mid-2020s onwards, significantly greater than the current 2 GW per year.

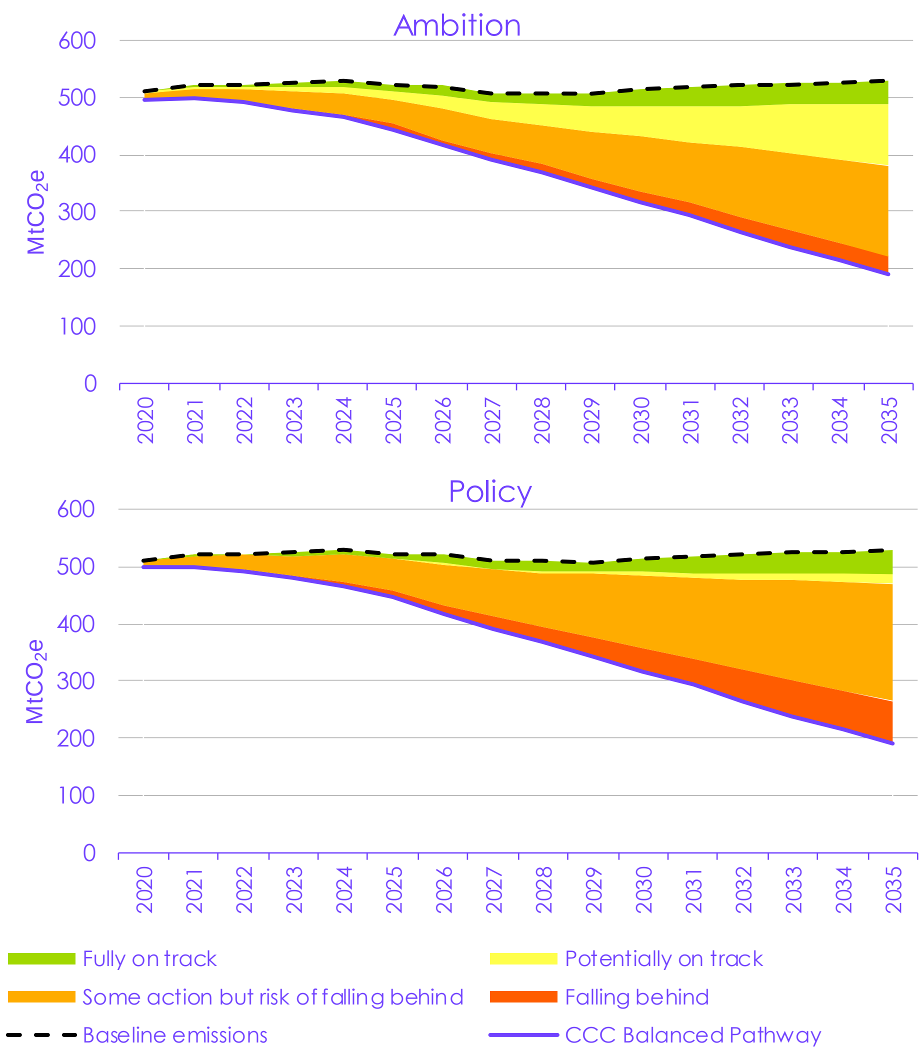
- The Ten Point Plan set a direction to phase out new internal combustion engine van sales by 2030, which is broadly in line with the pace of the transition required to meet the Sixth Carbon Budget, provided only a limited role for hybrid vehicles is allowed beyond this point. However, the **battery-electric van** market share was only 2% in 2020.

- Government ambition on **tree planting**, which reaches 30,000 hectares of trees each year, is in line with the CCC pathway out to 2025 (although there is not yet a commitment post 2025) but only 13,000 hectares were planted in 2019/20.

Table 4.4
Scoring criteria for ambition and policy against each source of abatement in the CCC pathway

	High-level ambition	Specific policies in place (or imminent)
Fully on track, limited risks	Clear ambition **fully in line with or beyond CCC recommendations**	**Credible, proven policy** that is already working
Potentially on track, some risks	**Broadly in line with CCC recommendations**, subject to clarification	**Credible policy** in place (or imminent) **but not yet proven**, or **policy only covers the next few years of scale-up** but not out to Sixth Carbon Budget period (2033-37)
Some action, more significant risks	Some commitments but there are **gaps**, or **commitments are not ambitious enough**	**Policy in place** (or imminent) that is **limited in ambition**, or policy is in place but there are **risks of it ending without replacement**
Falling behind, major risks	**No, or very limited, ambition** stated	**None, very limited, or clearly ineffective policy** in place

Figure 4.3 Is Government progress on track?



Source: CCC analysis; CCC (2020) *The Sixth Carbon budget – The UK's path to Net Zero*.

Table 4.5
Ambition and policy progress on significant sources of abatement

	Abatement source	Ambition	Policy	Rationale
Surface transport	Zero-emission cars			The confirmation of a 2030 phase-out date is a welcome step, but policy is lacking for how to deliver it. The market share of new battery-electric cars reached 6.5% in 2020, up substantially from 1.6% in 2019.
Surface transport	Demand-side behaviour change and modal shift			Despite the recent 'Gear Change' and 'Bus Back Better' strategies, Government focus on reducing the need to travel and increasing car occupancy is lacking. Substantial road-building investment continues and car demand is increasing.
Buildings	Residential – low-carbon heat in existing homes			UK Government has only set a clear fossil phase-out ambition for homes off the gas grid i.e. 15% of all homes. 600,000 heat pumps a year committed to by 2028, which is below the 900,000 required in the CCC pathway. Insufficient financial support planned for heat pumps or low-carbon heat networks.
Buildings	Residential – energy efficiency and low-carbon heat in new homes			Uplifts in buildings standards announced, but ambition lags for energy efficiency and airtightness, and legislation is not planned until 2024. Risks policy design may not drive heat pump uptake needed from 2021 – heat pumps were installed in 5% of new homes in 2020, far behind the 20% level required by 2021 in the CCC pathway.
Buildings	Residential – energy efficiency in existing homes			Success contingent on a comprehensive framework of standards, Energy Performance Certificates and Standard Assessment Procedure (SAP) being made fit for purpose to drive the right measures, and on a successor to the Green Homes Grant. Installations of loft and solid wall insulation are only a third of the rate needed by 2021 in the CCC pathway.
Buildings	Non-residential – energy efficiency and behaviour change			Commitments of 20% efficiency savings in business and 50% reduction of public emissions by 2032 are in line with the CCC pathway. Policy proposals only cover private-rented and larger buildings to date and there is little evidence for reduced energy demand at present.
Manufacturing and construction	Resource efficiency			The Waste Prevention Programme consultation sets out planned actions, but is not backed up with sufficient ambition on pace or estimated abatement, which is mostly not indicated.
Manufacturing and construction	Energy efficiency			Abatement from energy efficiency in the Industrial Decarbonisation Strategy is in line with our Sixth Carbon Budget analysis, but it is not clear that this could be delivered by existing policies, such as Climate Change Agreements and the Industrial Energy Transformation Fund.
Manufacturing and construction	Electrification			There is a lack of ambition on future levels of electrification, no specific business models have been developed and there is insufficient policy to address the cost issues around electrification.
Manufacturing and construction	Hydrogen			Ambition potentially exceeds the level in the CCC pathway. BEIS have published updates on a potential hydrogen supply business model. The proposals could provide some support for hydrogen use in manufacturing but may falter as they are not designed for this purpose.

CCS in manufacturing and refining				The Industrial Decarbonisation Strategy has a target of 3 $MtCO_2$ captured from industry by 2030 that aligns to our advice. Government has also set out a 'minded to' position for an industrial carbon capture business model, although some aspects of the model are yet to be set out in detail.
Fuel Supply – electrification of oil and gas production				The North Sea Transition Deal stated an ambition of 50% emissions reductions by 2030 (from 2018 levels), which falls well below the underlying 68% in the CCC pathway. No credible policy has been implemented beyond the EU Emissions Trading Scheme, which alone was not sufficient to incentivise decarbonisation.
Electricity supply	Offshore wind			The Government's 40 GW target for 2030 is stretching, and Contracts for Difference (CfDs) have been working well to deliver capacity, though clarity is needed on the auction schedule and pathway of volumes to be procured to 2030.
Electricity supply	Other renewables			While onshore wind and solar are now eligible for CfDs, there is no clear medium- to long-term ambition. CfDs are a proven policy for delivering new capacity, but clarity is needed on the auction schedule and pathway of volumes to be procured to 2030.
Electricity supply	Nuclear			Government has made a commitment for at least one further plant and recognises the potential for advanced nuclear innovation. The CCC pathway assumes two large-scale plants are operational by the mid-2030s. Further clarity is needed on contracting models, and deployment of already contracted capacity is falling behind schedule.
Electricity supply	Dispatchable low-carbon generation			Government has committed to deliver at least one Power CCS project by 2030 but there is no equivalent for hydrogen, both of which fall short of the CCC pathway. No commercial deployment but trials are underway globally.
Agriculture and Land use	Diet change			There has been no stated ambition on the role of diet change in meeting climate targets or policy development aimed at diets.
Agriculture and Land use	Peatland restoration			Defra's restoration target of 30,000 hectares by 2025 is less ambitious than the CCC pathway and there is no target beyond 2025. The ban on rotational burning introduced in May 2021 only covers 40% of all upland bog in England, while the commitment to end the sale of peat in horticulture by 2024 captures the amateur market only.
Aviation – demand management				No recognition that demand needs to be managed and several policies (e.g. proposed Air Passenger Duty reductions and airport expansion) are encouraging growth in the sector. Passenger-kilometres travelled per person have been increasing (pre-COVID-19) faster than can be accommodated in the CCC pathway.
Waste				Despite some progress in 2021, e.g. Defra's Waste Prevention Programme for England, delivery of key measures has been delayed and critical gaps remain. Recycling rates have stalled and Energy from Waste emissions are rising.
Removals				Recognition of need for removals but expected amount/timing unspecified. Growing innovation funding committed, but underlying policy frameworks and CCS infrastructure need urgent delivery.

= falling behind, major risks = some action, more significant risks = potentially on track, some risks = fully on track, limited risks

Notes: See Table 4.4 for further description of the 'ambition' and 'policy' scores given to each source of abatement.

3. Policy priorities and gaps

We have identified cross-cutting priorities, essential elements of the transition and significant policy gaps, alongside a detailed set of departmental recommendations for this Progress Report.

Through our analysis for the Sixth Carbon Budget and an updated assessment of progress for this report, we have identified a set of five cross-cutting policy priorities and seven essential elements of the Net Zero transition, as well as four significant policy gaps which require urgent action. We make a detailed and comprehensive set of approximately 200 recommendations for UK Government departments and the devolved administrations in the tables in the Annex to this report. These tables also include recommendations on climate change adaptation, which are covered in detail in the Adaptation Progress Report to Parliament.

a) Cross-cutting priorities

We recommend implementation of a Net Zero test to ensure policy is compatible with climate objectives.

There is a need for a coherent approach to achieving Net Zero and to ensuring that all Government policies are compatible with the transition to Net Zero. Decisions on road building, fossil fuel production, planning and expansion of waste incineration are not only potentially incompatible with the overall need to reduce emissions but also send mixed messages and could undermine public buy-in to the Net Zero transition. We recommend implementation of a '**Net Zero Test**' to ensure that all Government policy decisions are compatible with the legislated emissions targets.

Several cross-cutting issues must be addressed to enable sector-specific strategies and plans to be rolled out effectively. These are essential in calibrating the public's expectations for what lies ahead and building broad public support for the changes:

Priorities include a Net Zero Strategy, a plan for a just transition and public engagement, a framework for local delivery and integration of adaptation in climate plans.

- **A comprehensive Net Zero Strategy** is needed this year to fill gaps in ambition and pull together a coherent story of how sectoral efforts fit together to achieve the Net Zero target and interim budgets. The inclusion of international aviation and shipping in targets from the Sixth Carbon Budget and onwards allows for the first comprehensive look at a pathway to Net Zero covering *all* sectors. It should also commit to a 'Net Zero Test' to ensure that all Government decisions are compatible with the legislated emissions targets.

- **A plan for achieving a just transition** for people, workers, consumers and regions, which ensures that opportunities are taken to create jobs and improve the skills base while maintaining international competitiveness. Alongside this, a credible plan is needed for the fair funding of the transition, building on HM Treasury's Net Zero Review, as well as ensuring that investment is supported by strong financing.

- **Public engagement** around the need for climate action, the co-benefits to health of low-carbon choices, information about how individual actions can contribute to reducing emissions and involvement in decisions on how best to achieve a transition.

- **A framework for local delivery** to deliver ambitious climate objectives at different scales (i.e. devolved administrations, regions and local authorities), through workable business models, removal of barriers to action, dedicated resource and an approach that facilitates sub-national action to complement action at the national level.

- **Plans must make climate adaptation an integrated part of the transition to Net Zero.** Across multiple areas, and in particular on buildings and land use, there are benefits to thinking holistically about how policy can reduce emissions, while ensuring it improves resilience to the UK's changing climate. Like Net Zero, climate adaptation will also need to be integrated into core Government policy.

The economic recovery following COVID-19 should accelerate the transition to Net Zero, avoiding harmful lock-ins and an overshoot in emissions.

The Government must also ensure that public funding and investments to encourage an economic recovery are consistent with its Net Zero commitments and the need to adapt to climate change, and avoid harmful lock-ins in emissions or stranded assets. An overshoot in emissions relative to the CCC pathway as the economy recovers from the pandemic – as occurred following the financial crisis of 2008 – can be avoided with the right policies (Box 4.2).

b) Essential elements of the transition to Net Zero

While progress is needed across a wide range of areas in order to get on track to Net Zero, there are several indispensable parts to the transition. We have identified seven priority areas for the Government, within the approximately 200 recommendations for the next year developed for this report, on which it is crucial that good progress is made. These are primarily focused on delivery:

Delivery priorities for the next year include EV charging infrastructure, a policy package for buildings decarbonisation, delivery mechanisms for land use change, comprehensive manufacturing policy, further auctions for low-carbon power, a hydrogen strategy and GGR support mechanisms.

- Develop and implement a comprehensive policy package to enable the delivery of the 2030 transition to **electric vehicles**, to build on the phase-out announcement and the positive response from automakers and motorists. This should include a full strategy for widespread deployment of charging infrastructure and a mandate requiring manufacturers to sell a rising proportion of zero-emission vehicles.

- Implement a comprehensive policy package for **buildings decarbonisation**, and enshrine the long-term standards framework in regulation and law, to finalise the roadmap for decarbonising the UK building stock.

- Implement comprehensive delivery mechanisms for landscape-scale **land use change for afforestation and peatland restoration** and a high take-up of **low-carbon farming practices**. This should cover mechanisms for private and public financing and a strategy to address non-financial barriers. Interim policies will be needed to avoid a hiatus in action while awaiting the implementation of the new mechanisms.

- Advance policy for **manufacturing decarbonisation** by establishing incentive mechanisms to support fuel switching, implementing CCS proposals, and initiating the development of product and construction standards both to improve energy and resource efficiency and to develop the option of managing carbon leakage by applying carbon policy to imports.

- Continue **auctions for low-carbon capacity**, together with supporting actions to enhance system flexibility, to deliver an emissions intensity of 50 gCO_2/kWh or better in electricity generation by 2030.

- Deliver a **Hydrogen Strategy** that sets out a vision of the role of hydrogen on the path to Net Zero and the steps needed to realise it. The strategy should focus on hydrogen use in sectors that cannot decarbonise without it and low-carbon hydrogen production routes to 2035 with aims to start large-scale hydrogen trials in the 2020s.

- **Enable domestic engineered greenhouse gas removals (GGR)** to contribute to UK carbon budgets and Net Zero, and establish GGR support mechanisms and monitoring, verification and reporting (MRV) structures in the UK that ensure that GGR is timely, sustainable and verifiable.

c) Gaps that must be addressed

Key gaps that must be addressed include phasing out unabated gas power generation, public engagement and encouraging behaviour change, addressing emissions from EfW and a Net Zero aviation strategy that addresses airport capacity.

Our assessment of strategies and policies announced to date has identified specific key gaps that need to be addressed by Government policy:

- Commit to **phasing out unabated gas-fired electricity generation** by 2035, subject to ensuring security of supply. Publish a comprehensive long-term strategy for unabated gas phase-out, including ensuring new gas plant are properly CCS- and/or hydrogen-ready as soon as possible and by 2025 at the latest, and thoroughly assessing the market challenges that will emerge.

- Include contributions in the Net Zero Strategy from **demand-side action** – on aviation, a shift towards healthier diets and a switch away from cars towards active travel and public transport. This should be accompanied by public engagement to explain how low-carbon choices can contribute to Net Zero and wider co-benefits to health, and policy frameworks that seek to encourage and incentivise these changes.

- Address with urgency the rising emissions from, and use of, **Energy from Waste (EfW)**, including by ensuring that the capacity and utilisation of EfW plants is consistent with necessary improvements in recycling and resource efficiency, providing support to enable existing EfW plants to begin to be retrofitted with CCS from the late 2020s, and introducing policy to ensure that any new EfW plant are built either with CCS or are 'CCS ready'.

- The overdue **Net Zero Aviation Strategy** must set out credible pathways and policies to encourage technological development in the sector but also recognise the potential need to manage aviation demand in future, should improvements in sustainable aviation fuels and low-carbon aircraft fall short of Government and industry ambitions. An assessment of the UK's airport capacity strategy and a mechanism for aviation demand management should be part of the aviation strategy.

Section 4 of this chapter provides further insights into our assessment of progress in each sector, identifies policy priorities and gaps and provides context for the sectoral recommendations for the next year.

Box 4.2
Policy for a 'green recovery'

The pandemic and the public health response have had far-reaching consequences for the UK and global economy. As economies locked down, the world has seen recessions, lost jobs and higher Government debt.

This has resulted in a shift in the underlying conditions for reducing emissions and adapting to climate change. Although we are now seeing the start of an economic recovery in the UK, with the Bank of England predicting a 7.25% increase in GDP in 2021, this follows on from a 9.9% decline in 2020.[11] Government support to businesses and individuals affected by the pandemic has boosted the prospect of an economic recovery but also resulted in increased fiscal pressures (Government borrowing reached £355 billion in 2020-21 and is expected to be £234 billion in 2021-22). The pandemic has also highlighted existing wealth- and health-inequality and opened up new dimensions of inequality that were previously perceived as being less significant (for example the ability to work at home, quality of housing, or access to gardens and green spaces).

The Committee previously set out six principles to help guide the recovery in this economic context. These principles remain a useful framing for thinking about short and longer-term recovery from the pandemic:

- Use climate investments to support the economic recovery and jobs. Government can act to bring forward investment needed to reduce emissions and manage the social, environmental and economic impacts of climate change, often without direct public funding or by co- financing to accelerate private investment.
- Lead a shift towards positive long-term behaviours. There is an opportunity to encourage a 'leap forward' rather than a return to business as usual, on some of the new social norms resulting from the pandemic that benefit wellbeing, improve productivity, and reduce emissions, especially for travel. Government can lead the way through its own operations, public communications and infrastructure provision, and investing in measures to facilitate social distancing on public transport.
- Tackle the wider 'resilience deficit' on climate change. Comprehensive plans to reduce emissions and to prepare for climate change are not yet in place. Strong policies from across Government are needed to reduce our vulnerability to the destructive risks of climate change and to avoid a disorderly transition to Net Zero. Business must also play its part, including through full disclosure of climate risks.
- Embed fairness as a core principle. The crisis has exacerbated existing inequalities and created new risks to employment in many sectors and regions, placing even greater priority on the fair distribution of policy costs and benefits. The benefits of acting on climate change must be shared widely, and the costs must not burden those who are least able to pay or whose livelihoods are most at risk as the economy changes.
- Ensure the recovery does not 'lock-in' greenhouse gas emissions or increased climate risk. It is right that actions are taken to protect jobs and industries in this immediate crisis, but the Government must avoid 'lock-in' to higher emissions or increased vulnerability and exposure to climate change impacts over the long term. Support for carbon-intensive sectors should be contingent on them taking real and lasting action on climate change, and new investments should be resilient to climate change.
- Strengthen incentives to reduce emissions when considering fiscal changes. Changes in tax policy can aid the transition to Net Zero emissions. Many sectors of the UK economy do not currently bear the full costs of emitting greenhouse gases. Revenue could be raised by setting or raising carbon prices for these sectors, and low global oil prices provide an opportunity to offset changes in relative prices without hurting consumers.

The UK has taken initial steps towards a green recovery, in line with the principles we set out:

- Doubling the capacity to be contracted in this year's Contract-for-Difference (CfD) auction for renewable electricity to up to 12 GW.

- An initial £250 million of funding out of a package of investment of £2 billion over five years for new **cycling and walking** infrastructure and a £5 billion funding package over five years to improve **bus services** and cycle links across the country.
- £40 million of funding for **nature-based investments** such as tree planting and peatland restoration via the Green Recovery Challenge Fund, as well as a £10 million Natural Environment Investment Readiness Fund to encourage private sector investment in nature.
- £5 billion of investment over five years on **flood protection**.
- The **Green Homes Grant** scheme, which provided grants to support investments in greening residential and public buildings, was announced in September 2020 with a budget of £2 billion. However, it reached just 10% of the 600,000 homes it set out to improve and was cancelled by the Government in March 2021. The Government must learn from this experience to develop a replacement to the Green Homes Grant that works (Box 4.3).

Other Government announcements could also contribute to fund a green recovery, if the right rules are developed and put in place:

- A capital investment **super deduction** was announced in the March Budget, which aims to bring forward capital investment in plant and machinery. The transition to Net Zero will be capital intensive, but the super deduction in its current formulation does not rule out investment in high-carbon assets, which could lead to lock-in of higher emissions from these assets.
- The remits of the **Bank of England's Monetary Policy Committee** (MPC) and **Financial Policy Committee** (FPC) were updated to reflect the Government's economic strategy to achieve economic growth that is consistent with Net Zero. The MPC remit update could tilt the preference of the central bank's asset purchases towards low-carbon assets, potentially lowering borrowing costs for these assets.
- A **National Infrastructure Bank** (NIB) with £12 billion in capital and the aim of funding £40 billion worth of public and private projects was announced, with a remit to encourage Net Zero. The NIB is forecast to invest £1.5 billion a year[12], only a fraction of the investment previously provided by the European Investment Bank each year (around £7 billion), which the UK lost access to after EU exit.
- The Government is issuing **green sovereign bonds** for the first time, committing to issuing £15 billion worth of green bonds in 2021. The rules on what will count as green spend have not been announced. This guidance should ensure that revenue raised through green bonds is used to fund policies that will genuinely contribute to Net Zero.

While fiscal pressures remain, overall UK investment continues to be low. More can be done to boost private investment and increase tax revenues while accelerating decarbonisation. Government announcements, while encouraging, do not go far enough to deliver the level of decarbonisation needed to achieve Net Zero.

4. Sectoral progress and next steps for policy

This section revisits key sectoral priorities and gaps identified in the Sixth Carbon Budget policy report and sets out progress since.

The Committee's December 2020 report, *Policies for the Sixth Carbon Budget and Net Zero*, set out comprehensive proposals for policy development across all sectors. This continues to be a relevant guide to policy development. This section revisits key sectoral priorities and gaps identified in the Sixth Carbon Budget policy report and sets out progress since, in sectors where significant developments have occurred. There are no specific sections for shipping and F-gases as material progress has not occurred in these sectors since December 2020 – here the Sixth Carbon Budget policy report continues to be our most up to date assessment of progress and priorities.

Based on this assessment we have put together approximately 200 recommendations for UK Government departments and the devolved administrations. Key priorities within these recommendations were set out in section 3 of this chapter, and the full lists of recommendations are in the Annex to this report.

a) Surface Transport

We have set out the core requirements of a policy package in transport in the Sixth Carbon Budget policy report. The past year has seen considerable progress in the ambition and strategy for decarbonisation of the UK's transport sector, although specific policies and delivery plans are now needed to deliver on this increased ambition. Key progress over the past year has included:

The commitment to a 2030 phase-out of new petrol and diesel cars and vans is welcome. The focus needs to be on fully battery-electric vehicles, rather than hybrids.

- The commitment to a 2030 phase-out date for new petrol and diesel cars and vans in the Government's Ten Point Plan for a Green Industrial Revolution. Provided the focus is on a transition to fully electric vehicles (EVs) and the role allowed for hybrids is limited, this should deliver a transition which meets our Sixth Carbon Budget trajectory and delivers cost savings to society. Detailed supporting policies and implementation plans are now required, including:
  - A Zero-Emission Vehicle Mandate, requiring manufacturers to produce a rising percentage of EVs each year, alongside more ambitious CO_2 emissions regulations.
  - Support continues to be offered for purchases of plug-in cars and has been extended to 2022-23, although the maximum value of these grants was recently reduced by £500 to £2,500. Sustained financial support for the cleanest vehicles and disincentives to drive higher emitting cars will help shift the market.
  - The Ten Point Plan also confirmed plans to support the development of UK-based EV supply chains (including giga-factories for battery production) and to accelerate charge point roll-out with increasing focus on on-street charge points near homes and workplaces. A coordinated national strategy for charging infrastructure is needed, to ensure that provision is sufficient and appropriate across all regions of the country and that deployment is meeting the needs of the consumers who rely on public charging (in particular those without private off-street parking).

Now is an opportunity to reinforce the increase in walking and cycling and positive public responses to lower air pollution following the pandemic.

- The Gear Change strategy[13] set out Government's vision for increasing active travel and using modal shift as a cost-effective way of reducing transport emissions.
  - The focus on high-quality infrastructure that would provide an attractive alternative to car use and on delivery through Local Authorities (including recognition that different solutions will be appropriate for different areas) within this strategy are important.
  - Government should reinforce the increase in walking and cycling, and positive public responses to reduced air pollution, that occurred during the COVID-19 pandemic to deliver lasting longer-term travel behaviours.

Public transport will need support to rebuild public confidence and avoid a car-led recovery.

- The Bus Back Better strategy[14] aims to improve services across the country, including through better connectivity, simplified fares and increased use of prioritisation measures, to encourage more people to use the bus, rather than the car, as we build back from the COVID-19 pandemic.
  - This strategy included funding for UK production and purchase of zero-emission buses and was accompanied by a consultation[15] on phasing out new sales of diesel buses.
  - Further empowerment of, and support for, Local Authorities is likely to be needed to deliver improvements to bus services and simultaneously continue driving zero-emission bus take-up.
  - The public transport sector will require particular support to rebuild public confidence in its safety and avoid a car-led recovery. Bus and train operators may need further support as social distancing rules reduce capacity and impact profitability.
- The Scottish Government's Climate Change Plan Update[16] included a commitment to reduce car-kilometres by 20% by 2030. A comprehensive package of measures to support active travel, shared mobility and public transport, as well as reducing the need for some types of journey, will be needed to deliver this transformation.
- The Welsh Government launched LLwybr Newydd: the Wales Transport Strategy,[17] setting out its intention to improve the quality, reliability and affordability of public transport and provide better active travel and EV charging infrastructure to encourage people to switch to more sustainable modes of transport.

Trials of zero-carbon HGVs will generate data on the best options for this sector. In the short-term, efficiency and logistics improvements are also needed.

- The Ten Point Plan also committed £20 million in initial funding for trials of zero-emission heavy-goods vehicles (HGVs) and promised an upcoming consultation on a phase-out date for new sales of diesel HGVs.
  - This funding is being made available through two innovation competitions – one[18] proposing to test battery-electric trucks in real-world operation, and a second[19] to conduct pre-deployment planning for separate trials of an electric road system and hydrogen fuel-cell HGVs.

– Separate development and demonstration projects have also received funding this year, including Advanced Propulsion Centre grants[20] for development of electric HGV propulsion systems with better range and improved energy efficiency and a commitment[21] to establish a hydrogen transport hub in the Tees Valley.

The Transport Decarbonisation Plan will be important in setting out how the Government plans to deliver Net Zero across the whole transport system.

The upcoming **Transport Decarbonisation Plan** is expected to provide further detail on how the Government plans to deliver Net Zero for the transport sector.

Alongside this, it will be important to embed the positive behavioural changes that have been developed during the COVID-19 pandemic, but also to act decisively to mitigate those more negative consequences which could jeopardise the sector's decarbonisation pathways. Key priorities as the economy emerges from the pandemic should be:

- To restore confidence in and use of public transport. This is important not only for transport emissions, but to ensure all people have access to affordable and safe transport.

- To prioritise funding away from car use. The costs of car travel have fallen relative to both average wages and to bus and rail.[22] This needs to be rebalanced away from cars, the most carbon-intensive mode, and towards public transport and walking and cycling.

- To encourage behaviours that reduce travel demand such as working from home or using technology in place of business trips. Prioritisation of investment in improved digital connectivity rather than road-building would help achieve this, contributing towards a greener recovery.

- To encourage behaviours which improve efficiency of travel such as increased car sharing.

b) Buildings

We have set out the core requirements of a policy package in buildings in the Sixth Carbon Budget policy report. UK Government's Heat and Buildings strategy, which was originally due by summer 2020, had not been published as this year's Progress Report was being finalised.

At its core, the strategy needs to set out the trajectory of standards on energy efficiency and heating emissions with policy proposals to deliver on this ambition in a way that works for households. It must signal a clear route to expanding heat pump and heat network supply chains now, while kicking off the process to clarify the role for hydrogen in any locations where it may be a viable option, as well as those where it is not. There are critical questions to resolve around who pays for buildings decarbonisation, along with considerations around how to ensure resilience measures are integrated and co-benefits (e.g. for health and fuel poverty alleviation) maximised.

i) Key developments in the past year

Key developments over the past year have included a commitment to phase out the installation of natural gas boilers by 2035 UK-wide, and to require zero or near zero carbon heating from as early as 2025 in Scotland.

Strategy and implementation

A number of important publications have been released over the past year including the Ten Point Plan, the Energy White Paper, the Scottish Government Draft Heat in Buildings Strategy, consultations on new build standards, the Northern Irish Energy Strategy consultation and the Welsh plan on tackling fuel poverty – amongst others. Developments have included the following:

BEIS and the Scottish Government have developed new proposals for energy efficiency standards for owner-occupied homes, with further proposals from BEIS for an in-use performance scheme for large commercial buildings.

- **Owner occupier energy efficiency.** The Scottish Government committed to consulting on detailed proposals for requiring owner-occupied private housing to meet Energy Performance Certificate (EPC) C at trigger points such as point of sale from 2023-25 onwards, with a backstop standard by 2035.* UK Government consulted on a framework for lenders to disclose the energy performance of their portfolios, and on an associated target for all lenders to meet a portfolio average of EPC C by 2030. The Energy White Paper also announced a commitment to consult on regulatory measures to improve the energy performance of owner-occupied homes.

- **Private rented sector energy efficiency.** UK Government consulted on requiring all properties with new tenancies to meet EPC C from 2025, with properties for all tenancies required to reach the standard by 2028. The Scottish Government also committed to requiring private-rented sector properties to meet EPC C by 2028. The 2020 Energy White Paper confirmed that the future trajectory for the non-domestic minimum energy efficiency standards will be EPC B by 2030 – BEIS are now consulting on proposals to tighten enforcement and an interim target.

- **Energy efficiency in social homes.** The UK Government Social Housing White Paper commits to reviewing whether the Decent Homes Standard should be updated and how it can better support decarbonisation and energy efficiency. In Scotland, plans were announced to bring forward the review on strengthening the EPC B target. The Welsh Government launched the optimised retrofit programme to pilot approaches to retrofit.

- **Other commercial energy efficiency.** BEIS have published proposals for a new in-use performance rating for commercial and industrial buildings over 1,000 square metres, with a view to introducing standards on in-use performance based on the successful Australian NABERS scheme and in line with our advice. Success relies on absorbing lessons from the original scheme, including the role of public procurement in establishing the standard.

- **Metrics.** UK Government published the EPC action plan examining the steps needed to improve the reliability, impact, and data infrastructure of EPCs. The Scottish Government also committed to consult on proposed reforms to EPCs in 2021.

- **New buildings.** UK Government has announced an interim standards uplift for new homes to apply from 2021, and proposed to legislate in 2024 for the Future Homes Standard to be introduced in 2025. This standard will require carbon savings of 75% relative to today and the Government plans to consult on whether to end gas grid connections to new homes built from 2025. UK Government have also consulted on the Future Buildings Standard, with implementation proposed as starting in 2025. Consultations have also been undertaken in the devolved administrations, with the Scottish Government targeting new buildings consented from 2024 for zero emissions heating (and cooling).

* A range of commitments here and elsewhere have been made around requiring homes to meet an EPC C standard, which is broadly consistent with the level of home insulation in our pathways, provided EPCs are made fit for purpose. This means that they must be designed to drive deployment of the necessary energy efficiency measures - all practicable lofts and cavities insulated alongside other low-regret measures, with solid wall insulation deployed where this supports low-carbon heat and wider benefits; to do so on a holistic basis (i.e. to address issues such as overheating and ventilation simultaneously); whilst not disincentivising low-carbon heat or treating onsite generation as a replacement for energy efficiency or low-carbon heat. See below for further discussion.

- **Low-carbon heat.** The Scottish Government have proposed regulations to require installation of zero or near zero emissions heating in existing buildings at trigger points (such as heating system replacement) from 2025, with a backstop requirement for all buildings to meet this standard no later than 2045. UK Government have set an ambition for all newly installed heating systems from the mid-2030s to be low carbon, or appliances which can be converted to a clean fuel supply. UK Government have also announced an ambition to deliver 600,000 heat pump installations per year by 2028, alongside plans for hydrogen trials from 2023 and a plan to consult on the role of hydrogen-ready appliances. The details of the Green Gas Support scheme, supporting biomethane, have also been announced.

- **Heat networks.** BEIS is finalising proposals for the £270 million Green Heat Network Fund, which will shift the focus away from gas Combined Heat and Power to lower-carbon networks. The Heat Networks Bill is going through the Scottish Parliament, including ambitious proposals for zoning.

- **Skills.** The Green Jobs Taskforce was launched, with a commitment to publishing an action plan this spring.

- **Wood in construction.** The England Trees Action Plan commits Government to developing a policy roadmap on use of timber in construction, to increase public demand for sustainably sourced timber through procurement policies and to conduct further research.

A full table of progress to date against the CCC's previous recommendations can be found in supplementary material published alongside this report. It should be noted that the ratings are assigned on the basis of UK progress, reflecting the majority position. For this reason they often do not, in isolation, reflect the pace of progress in the devolved administrations. Nevertheless, following publication of the Draft Heat in Buildings Strategy, it remains the case that Scotland demonstrates a strong example of action to develop an effective policy framework. We will comment on progress in Scotland in more detail in our Scottish Progress Report in late 2021.

While important progress on ambition has been made or is imminent, effective policy has yet to be designed or implemented in many areas.

HM Treasury committed over £3 billion of public funding in the 2020-21 financial year to buildings decarbonisation as part of the Green Recovery. This included over £1 billion for public sector decarbonisation, alongside home efficiency schemes.

Delivery and the Green Recovery

The case for investing in buildings retrofit as part of economic recovery remains strong – there are major benefits in terms of emissions reduction, cost savings and wider benefits; it is labour-intensive and spread across the country. Fundamentally this is something that needs to happen on the path to Net Zero and supply chains are well below the levels they need to be at in order to deliver Government commitments on fuel poverty, energy efficiency and heat over the next decade.

Significant time pressure and issues with the private sector contractor led to the £1.5 billion Green Homes Voucher scheme being scrapped prematurely with only £264 million allocated to date.

In recognition of these points, Treasury committed over £3 billion of public funding in the 2020-21 financial year, including over £2 billion grant funding for home retrofit and £1 billion funding for public sector decarbonisation.

The very significant time constraints for spending the funding have led to mixed results, with severe consequences for the Green Homes Grant voucher scheme due to the requirement to undertake the work before payment is issued:

- Where the decision was taken to commit spending by the end of the financial year but actually undertake the work in 2021/22, funds were successfully committed. This includes the £1 billion Public Sector

Decarbonisation Fund, the £500 million Local Authority Delivery programme for the Green Homes Grant, focussed on fuel poor, and the £50 million Social Housing Decarbonisation Fund Demonstrator.

- The £1.5 billion Green Homes voucher scheme was conceived as the only direct-to-household offer, with a requirement to undertake the work within the 2020/21 financial year. Major delivery issues with the private sector administrator led to the scheme cancellation in March 2021 with only £264 million allocated to date (of which £211 million to low income households).[23] The Government has agreed to honour existing vouchers meaning a portion of the spend will fall under the 2021/22 financial year.

It is essential that lessons are learnt. Government must now come forward with plans for a successor scheme in the next fiscal event, committing to long-term funding and taking sufficient time to develop and test a scheme so that we get one which works.

To avoid further harm to supply chains at this stage, it is essential that Government comes forward with plans for a successor to the Green Homes Grant voucher scheme in the next fiscal event– ensuring this time that it is thoroughly tested, provides a long-term funding commitment, and builds on lessons learnt (Box 4.3).

The initial success of the public sector scheme means that there is a template to build on now. Our scenarios imply funding levels of £1 billion a year through the next decade, with a growing role for low-carbon heat alongside energy efficiency. The next stages must now pivot to longer-term planning cycles, with clear roles for local authorities backed by funding, and strong integration with wider heat policy including the heat networks roll-out. The funding streams must also be designed so as to be accessible to smaller public bodies, who anecdotally have not had the resources to bid into the Public Sector Decarbonisation Scheme and who have been affected by the merging of Salix funding with this pot.*

For the public sector, the key is moving now to longer term planning cycles, with clear roles for Local Authorities backed by funding, and strong integration with wider heat policy including the heat networks roll-out.

Box 4.3
Lessons from the Green Homes Grant

The £1.5 billion Green Homes Grant voucher scheme opened for applications in September 2020, a few months after it was announced by the Treasury. It is the first publicly funded direct-to-household offer on home energy efficiency since the demise of the Green Deal scheme in 2015.

The scheme aimed to improve the energy efficiency of over 600,000 homes, with grants focussed on fabric efficiency measures and low-carbon heating primarily. Grants of up to £5,000 were issued, covering two-thirds of the cost. Households in receipt of certain benefits were eligible for grants of up to £10,000, covering 100% of the cost of improvements.

Lessons for the successor scheme
There are a number of important lessons to take into account in the design of a successor scheme, along with an important positive story on demand:

- **Demand for the scheme.** The scheme generated a significant amount of interest from the public, with close to 2 million views of the Simple Energy Advice GHG eligibility checker in a 4-month period and 170,000 measures applied for over seven months. By comparison, only 20,000 measures were funded through Green Deal loans between 2013 and 2015. Media reports covered people unable to apply due to the lack of local approved suppliers. The fact that it was announced by the Treasury may have helped raise the profile, along with the relative simplicity of the basic offer to consumers.
- **Timelines and the need for a policy package approach.** From the outset there were calls for the Treasury to extend the funding window beyond March 2021 to allow supply chains time to scale up and provide more certainty to businesses to invest, develop and retain skills in the sector. These calls were backed by significant

* Salix funding provides Government funding to the public sector to improve energy efficiency, reduce carbon emissions and lower energy bills. Salix is funded by the Department for Business, Energy and Industrial Strategy, the Department for Education, the Welsh Government and the Scottish Government.

evidence of the negative impacts on home insulation markets from short-term subsidy schemes in England and Wales, including job losses of 30,000 following the end of the Green Deal. There is also evidence of poor-quality installations linked to the surge in funding in the final year of the Supplier Obligation schemes, which shows the impact of scaling up too quickly without the skills in place to deliver. Government can move forward by announcing a successor scheme in the next fiscal event alongside proposals for a timetable of standards, with funding designed to support market stability and long-term investment planning.

- The need for testing with installers. The timelines for getting the scheme up and running also put pressure on scheme development. In the £50 million Social Housing Decarbonisation Fund Demonstrator fund launched in parallel, market testing had already taken place through the Whole House Retrofit competition meaning there was evidence to draw on. A key learning from the Green Homes Grant voucher scheme is the need to workshop the consumer journey and practicalities with a group of installers/practitioners covering the core trades. This could have flagged a number of issues with the IT system including (but not limited to) the importance of being able to track existing applications, the difficulties with delivery around Christmas, and ways to streamline evidencing so as not to rely on consumers acting following installation.
- Procurement and use of existing systems. The issues with the scheme contractor are currently subject to review by the National Audit Office (NAO). There remain important questions over the procurement and contracting, as well as the decision not to make use of existing IT systems such as the one used on the ECO scheme, or to make more use of existing commercial relationships and expertise, including through local authorities.
- Accreditation. Households need to be confident that when they upgrade their property they will see genuine improvements and technology that works. Government has undertaken a considerable programme of work following the recommendations of the 2014 Each Home Counts review to improve standards and accreditation, notably through its support of the PAS2030 and PAS2035 standards overseen by Trustmark. The Microgeneration Certification Scheme (MCS) similarly has accredited installers of low-carbon heat under the Renewable Heat Incentive. However, there were a number of issues with the accreditation process for Trustmark, particularly for low-carbon heating measures already covered by MCS which created bottlenecks in the supply chain and meant that consumer demand remained unmet, with strong geographical variation.

It is essential that these lessons are taken into account in a successor scheme to create a long-term stable market which can deliver the major upgrade of the housing stock to EPC C over the next decade.

Source: BEIS (2020) *Press release: Greener homes, jobs and cheaper bills on the way as Government launches biggest upgrade of nation's buildings in a generation*; BEIS (2021) *Official Statistics - Green Homes Grant voucher release, May 2021*

ii) Next steps for buildings decarbonisation

Major gaps include a clear trajectory of standards on efficiency and heat; funding proposals and interventions to make low-carbon choices attractive; green buildings passports and a governance framework to drive decisions on heat infrastructure and zoning from the mid-2020s. including a role for area-based energy plans.

As part of our Sixth Carbon Budget advice we set out our view of the four necessary components of a policy package for the decarbonisation of heat in buildings: setting a clear direction, making low-carbon financially attractive, implementing enabling measures, and getting on with it.

As summarised above, a number of important commitments have been made over the past year, but important gaps also remain at a UK level in every area:

- A clear direction. We do not yet have a long-term trajectory of standards in place to deliver the efficiency upgrades and fossil fuel phase-out that is needed. There is not yet a sufficiently strong commitment to the role of electrification – in particular, the current Government ambition of 600,000 heat pumps a year by 2028 will almost certainly fall short of the 2030 NDC target (given the lack of any stated ambition on heat networks) as well as falling short of the Committee's pathway to meeting the Sixth Carbon Budget.

There is no support in place now for commercial heat pumps over 45kW – a key supply chain.

- **Making low-carbon financially attractive.** There is currently no plan for how price signals will be reformed to drive low-carbon choices (i.e. to correct the current distortions that work against electrification), and a number of existing funding routes are set to fall away. A multi-year programmatic funding regime is needed to replace them. In particular, there are major risks given the lack of support mechanism for commercial heat pumps over 45 kW after the Renewable Heat Incentive closed to new applications. Grants of up to £4000 are unlikely to be sufficient for medium-sized installations up to 45 kW given capital costs of £750-1550 per kW.* Equity and consideration of the fair distribution of costs will be critical to designing the price signal reforms and funding programmes necessary.

- **Enabling measures.** While progress has been made, more is needed to ensure householders have access to high quality information and can have confidence that work will be delivered to high standards. The forward roadmap should include plans for incorporating in-use performance and transitioning to green building passports.

EPCs are not fit for purpose – further reforms are essential.

EPCs are not fit for purpose – further reforms are essential.

  – Government plan to increase the reliance on EPCs as a key policy lever. As such it is critical they are made fit for purpose, robust and enforceable and make use of energy consumption data. The EPC action plan is a positive step forward but further action is needed to ensure EPCs and Standard Assessment Procedure (SAP) deliver the energy efficiency measures needed and do so in a holistic way which supports (rather than disincentivises) low-carbon heat deployment and actively drives measures to simultaneously address ventilation, damp and overheating (rather than simply communicating risks). Onsite generation, such as solar PV, should not be treated as a substitute for energy efficiency or low-carbon heat, and needs to be valued proportionately to its benefits (factoring in seasonality and any on-site storage). Biomass boilers must not be encouraged in areas where they will impact public air quality and biofuels in buildings should be minimised (for example, through efficient use in hybrid heat pumps rather than 'drop-in' biofuel boilers) given our assessment of economy-wide best use being elsewhere.

Other barriers need to be addressed, including poor compliance and enforcement and the risk of high connection charges.

  – The reforms in the Buildings Safety Bill create a framework to improve the efficacy of building regulations, including those relating to climate change mitigation and adaptation.[24] This should be strengthened through an explicit responsibility for sustainability alongside buildings safety and performance. It will be important to ensure the buildings safety regulator is sufficiently equipped to monitor and enforce compliance across all building regulations and to ensure that local authorities are properly funded for enforcement activities.

  – Barriers to deployment of key measures, such as the risk posed by the current connection charging regime to the uptake of low-carbon technology such as heat pumps, need to be addressed.

* Range based on an air-to-air heat pump at the lower bound, and a low-temperature air-to-water heat pump at the upper bound, Sixth Carbon Budget published dataset, available online.

It will be difficult if not impossible to develop the full mix of heat options (i.e. low-carbon heat networks and hydrogen alongside building-scale technology) without any planning or clear roles for local authorities, networks and other actors.

- **Getting on with it.** Recognition is needed of the importance of a geographically planned approach to heat decarbonisation, with plans introduced to deliver it. Commitments are lagging in areas with potential for early progress.
  - There is an urgent need to formalise a governance framework to drive decisions on heat infrastructure and zoning from the mid-2020s, including a role for area-based energy plans. This should be underpinned by a programme of research initiated in 2021 to identify areas unlikely to be suitable for hydrogen (a key enabler to efficiently targeting early electrification and network development) alongside priority candidate areas for hydrogen.
  - Levers such as the 2021 buildings standards uplift have potential to drive early growth in heat pumps, but it remains unclear to what extent they will do so.

The priority now must be on implementing a comprehensive policy package, and enshrining the long-term standards framework in regulation and law, to finalise the roadmap for decarbonising the UK building stock.

Climate adaptation and resilience is an essential part of this, including good ventilation to manage overheating risks, green sustainable urban drainage systems and water efficiency measures.

Progress in decarbonising buildings must go hand in hand with adapting them to the changing climate. An integrated approach to housing and thermal comfort is required to manage overheating risk and ensure good ventilation.* Programmes to improve energy efficiency of the housing stock provide an opportunity also to undertake work to adapt properties to possible heat and flood risks and improve water efficiency.

c) Manufacturing and construction

This year has seen a substantial increase in the Government's stated ambition on decarbonisation of manufacturing. However, progress on developing and delivering policy has been slower than required with large gaps in policy remaining.

i) Progress in the past year

The Government's Industrial Decarbonisation Strategy set out ambition to reduce emissions from manufacturing and refining by around two thirds by 2035 from 2018 levels.

In March, the Government's Industrial Decarbonisation Strategy (IDS) set out ambition to reduce emissions from manufacturing and refining by around two thirds by 2035 from 2018 levels. This represents a substantial step forward in the Government's ambition, but it is still below the CCC pathway, in which the equivalent emissions are reduced by 73% by 2035.

Underlying this ambition, the Government has made several commitments in the past year to deliver fuel switching, CCS and energy and resource efficiency, through the IDS, Waste Prevention Programme and business model updates.

- **Fuel switching.** The IDS set an ambition that at least 20 TWh of fuel use will switch to low-carbon energy by 2030, which is close to, but below, the 24.5 TWh in the CCC pathway.

* High levels of energy efficiency measures installed in new and existing homes can increase the retention of heat and airtightness of the building. This can increase the risk of overheating and exposure to indoor air pollutants if appropriate adaptation and ventilation measures are not implemented at the same time.

Government has set out a 'minded to' business model for industrial carbon capture, but only and small commitment to 'set out initial steps to support uptake of electrification'.

The Waste Prevention Programme consultation proposed policies to improve resource efficiency.

Government has committed to consult on a target-consistent cap for the UK ETS and a call for evidence on product standards.

Overall, while progress has been made, development and delivery of policy to decarbonise manufacturing and construction will need to broaden and accelerate.

- Hydrogen. Government has committed to consult on a hydrogen supply business model that would incentivise hydrogen use by subsidising the cost of hydrogen production.

- Electrification. Government has made a smaller commitment to 'set out initial steps to support uptake of electrification'. It also committed to publish a call for evidence on energy affordability and fairness, by April 2021, which may consider the distribution of energy levies and taxes.

- Mandatory requirements. Government has committed to explore the option of making it a mandatory requirement for upgraded equipment to be low-carbon ready in the 2020s, which is also likely relevant to CCS.

- CCS. The IDS set an ambition for around 3 $MtCO_2e$ of industrial CCS by 2030, which is broadly in line with the CCC pathway* The Government also set out a 'minded to' position for an industrial carbon capture business model, although some aspects of the model are yet to be detailed.

- Resource and Energy Efficiency. The Waste Prevention Programme consultation proposed policies to improve resource efficiency, although the sectoral scope of these proposals is often limited, the pace of proposals modest and the emissions impact is not estimated. Further details are set out in sub section (f) on waste. Government also agreed an updated set of Climate Change Agreements with industry to encourage energy efficiency.

- Material Substitution. The England Trees Action Plan commits Government to developing a policy roadmap on use of timber in construction and to increase public demand for sustainably sourced timber through procurement policies.

Government has also set out several plans that could provide cross-cutting support for different decarbonisation measures and maintaining industrial competitiveness:

- Carbon and energy pricing. The UK Emissions Trading System (UK ETS) launched at the start of the year. Government has committed to consulting by September 2021 on a cap for the UK ETS consistent with the Sixth Carbon Budget.

- Product standards. Government has committed to a call for evidence on low-carbon industrial product standards within a year, highlighting the potential for mandatory standards to be introduced in the mid-to-late 2020s.

Government has made mixed progress with awarding existing capital funding. £170 million was awarded from the Industrial Decarbonisation Challenge, but progress awarding funding from the £315 million Industrial Energy Transformation Fund has continued to be too slow since its announcement in October 2018 and the £250 million Clean Steel Fund appears to have made no progress.

Overall, while progress has been made, development and delivery of policy to decarbonise manufacturing and construction will need to broaden to fill several policy gaps, and accelerate if it is to deliver abatement levels consistent with the CCC pathway.

* Note that this 3$MtCO_2e$ of CCS includes CCS on refineries which falls within our Fuel Supply sector. We have compared to our pathway on an equivalent basis.

ii) Next steps on manufacturing and construction policy

Our Sixth Carbon Budget policy report set out the core requirements of a policy package for decarbonising manufacturing and construction. In this subsection, we set out key near-term policy actions required to deliver the longer-term actions recommended in our Sixth Carbon Budget advice. Full details are set out in the tables of departmental policy recommendations at the end of this report. These policy actions should address the shortfalls of existing decarbonisation policy for manufacturing and construction, and ensure longer-term policy has the right ambition, delivers key measures, strengthens incentive mechanisms, maintains industrial competitiveness, and develops infrastructure and skills.

Ambition

Government has stated that it will revisit its ambition for decarbonisation of manufacturing and refining in its Net Zero Strategy. It should take this opportunity to align its ambition with the CCC pathway for manufacturing or identify other areas of the economy to make up for this shortfall. The strategy must also set out the Government's ambitions and plans to decarbonise off-road mobile machinery.

It should also set out which policies will enable this ambition and quantify how much abatement Government expects to be enabled by each policy, particularly for resource and energy efficiency abatement through the 2020s.

Delivering specific measures

Government should establish incentive mechanisms to support fuel switching, implementing CCS proposals and initiating the development of standards to improve energy and resource efficiency.

Government should establish incentive mechanisms to support fuel switching, implementing CCS proposals and initiating the development of standards to improve energy and resource efficiency. The Government should:

- Establish funding mechanism(s) to support operational and capital costs of both electrification and hydrogen use in manufacturing, as soon as possible, with the aim of awarding funding in 2022. It should also deliver industrial carbon capture contracts to enable final investment decisions on the first industrial carbon capture projects in the first half of 2022.

- Consult on detailed proposals for product standards and extended producer responsibility to improve the resource efficiency of consumer goods' lifecycles by spring 2022. It should also implement policies to drive more resource-efficient construction and use of existing low-carbon construction materials, including a substantial increase in the use of timber in construction, on the same timetable. This should include finalising the reporting methodology for whole-life carbon standards for buildings, roads and infrastructure.

Cross-cutting incentives and maintaining competitiveness

Government should also work towards strengthening its cross-measure incentive mechanisms and start to develop the crucial framework for maintaining long-term competitiveness, which will require development of measurement standards.

Government should also work towards strengthening its cross-measure incentive mechanisms and start to develop the crucial framework for maintaining long-term competitiveness, which will require development of measurement standards.

The Government should:

- Set a cap for the UK ETS consistent with the path through the Sixth Carbon Budget to Net Zero. It should also reform energy and carbon pricing for manufacturers not covered by the UK ETS, to provide a clear and strong incentive for decarbonisation.

- Consult on reforms to electricity pricing to remove disincentives to electrification, based on consideration of the strategic and fair allocation of legacy policy costs associated with past deployment of less-mature low-carbon electricity generation. It should also consider the balance of existing taxes, such as the Climate Change Levy, on different energy sources.

- Start to develop the options of applying either border carbon tariffs or minimum standards to imports of selected emissions-intensive products. This should include developing carbon-intensity measurement standards, encouraging the international development of these (e.g. through the G7 and COP26 presidencies) and fostering international consensus around trade policies.

Implementation of manufacturing decarbonisation will require development of supporting policies on infrastructure and skills and a focus on jobs.

Infrastructure, skills and jobs

Implementation of manufacturing decarbonisation will require development of supporting policies on infrastructure and skills, and a focus on jobs. The recommendations tables in the annex of this report detail our recommendations in full, capturing their cross-sectoral and cross-departmental nature:

- On infrastructure, Government should deliver the CCS Transport and Storage Regulatory Investment Model; develop plans for CO_2 transport from dispersed sites; deliver plans to ensure electricity networks can accommodate large localised increases in demand; and formalise the process for decisions on the conversion to hydrogen of (zones of) the gas networks.

- On skills and jobs, Government should develop a strategy for the development and roll-out of manufacturing training and skills and design industrial decarbonisation policies to support and create jobs, especially in regions with reliance on industrial jobs.

d) Agriculture and land use

While the UK Government and the devolved administrations have set out elements of their ambition to reduce emissions from land, there has been limited implementation of policy in these sectors over the past year. Key announcements on peat and trees in England were published in their respective Action Plans in May 2021.[25]

i) Progress in the past year

UK Government's afforestation targets are in line with the CCC pathway for 2025.

Trees

The UK Government has committed[26] to the planting of 30,000 hectares of woodland per year by 2025 across the UK, in line with the CCC pathway:

- England's share is around 7,000 hectares per year based on Defra's commitment to treble tree planting rates from the 2,340 hectares achieved in 2019/20.

- The Scottish Government intends to deliver 18,000 hectares per year by 2024/25.[27] The Welsh Government's current ambition remains at 2,000 hectares a year, with a commitment to increase that to 4,000 hectares by an unspecified time. Northern Ireland's target of 18 million trees during this decade averages 900 hectares per year.[28]

£500 million of funding has been committed through the Nature for Climate Fund to meet England's woodland creation target. Scottish Forestry will receive £100 million to reach its afforestation target and Northern Ireland launched a £4 million Small Woodland Grant Scheme.

£500 million from the Nature for Climate Fund will be the main source of public funding to meet England's woodland creation target to 2025. This will provide grants for conventional planting in urban and rural areas (including trees on farms), as well as natural colonisation. Focus will be given to the planting of native broadleaves, and extra funding will be provided for planting that can deliver wider benefits such as riparian shading (trees planted along water courses can reduce the risks to freshwater species from higher water temperatures), biodiversity, water filtration and flood risk alleviation.

To meet the 2024/25 afforestation target in Scotland, Scottish Forestry will receive £100 million, £30 million will go to Forestry and Land Scotland and £20 million to boost tree nursery capacity. Northern Ireland launched the £4 million Small Woodland Grant Scheme at the end of 2020 to encourage the integration of trees on farmland.

Peat

Defra's new £50 million Nature for Climate Peatland Grant Scheme funded by the Nature for Climate Fund will support the Government's target for restoring 35,000 hectares of peatland in England by 2025. Of this area, around 5,000 hectares is expected to come from the restoration of lowland agricultural land to peat habitat.

The Government's peat restoration commitments for England falls short of the CCC pathway.

This falls short of the Committee's pathway for the restoration of 56,000 hectares of peatland in England by 2025, which includes 8,000 hectares of lowland rewetted to peat habitat. Defra is expected to publish details on the options to manage sustainably the area of lowland peat that remains in agriculture in 2022.

The Government's partial ban on rotational burning of peat is less ambitious than the CCC's recommendation that all burning in England and the devolved administrations should cease immediately.

Legislation introduced in May 2021 prevents the rotational burning of certain blanket bog sites in England with immediate effect.* The partial ban covering an area of around 142,000 hectares accounts for around 40% of all blanket bog in England.[29] Of the area covered by the ban, around 52,000 hectares hold a live consent to burn, with the remainder either being subject to a consent that is not exercised or has no current relevant consent. This partial ban is less ambitious than our recommendation that all rotational burning in England and the devolved administrations should cease immediately. Data on the area of land that is burned each year is poor as the requirement to notify the authorities only covers newer consents.

The sale of peat in compost is to end in England by 2024 subject to a consultation later this year on a range of measures to achieve this. The consultation will also consider extending the sales ban to the professional market, by an as yet unspecified date. These proposals are less ambitious than our recommendation that all peat extraction, along with its sale in both the amateur and professional horticultural market should end by 2023. This should also apply to imported peat, which makes up two-thirds of peat sold in the UK.

In Wales, between 600-800 hectares of peat will be restored annually between 2020 and 2025 under the Government's National Peatland Action Programme (NPAP). Launched in November 2020, around 680 hectares was directly delivered through the NPAP in 2020/21.

* Sites of Special Scientific Interest that are also a Special Area of Conservation or a Special Protection Area.

Pilots focused on delivering eight land-based management standards are being funded through the Sustainable Farming Incentive ahead of national roll-out in 2022.

Agriculture

Defra is funding pilots under the Sustainable Farming Incentive (SFI) this year ahead of a national roll-out in 2022. The SFI, which is part of the new Environmental Land Management Scheme (ELMS) will see farmers pilot actions focused on delivering eight land-based management standards covering arable land, grasslands, horticultural soils, hedgerows, agroforestry and water buffers. In addition to delivering emissions reduction and carbon sequestration, many of the actions will deliver other benefits such as improved wildlife habitat, reduced diffuse water pollution and improvements to air quality.

The Welsh Government introduced legislation to extend coverage of Nitrate Vulnerable Zones to all of Wales in line with our recommendation. In force since April this year, mandatory measures covering manure management and fertiliser use to reduce nitrate run-off into water courses will also deliver reductions in N_2O emissions.

Nature

Defra recently announced it will be amending the Environment Bill to require a legally-binding target for species abundance, aiming to halt the decline of nature by 2030.[30] This will apply to species within protected sites, the wider countryside and urban areas. The exact target level and broader details will be set in secondary legislation following consultation and further evidence gathering.

ii) Next steps for decarbonising agriculture and land use

Ambition in England and the devolved administration falls short of what is needed to achieve the Sixth Carbon Budget and Net Zero. Gaps must be addressed quickly given the time profile of carbon sequestration.

Existing ambition in England and the devolved administrations falls short of the trajectory needed to meet the Sixth Carbon Budget on the path to Net Zero. Ambition needs to be raised and gaps addressed quickly as delayed action now puts future targets at risk given the time profile of carbon sequestration. Policy voids should be addressed quickly (e.g. what will replace the Common Agricultural Policy in Scotland and Northern Ireland):

- Defra and the devolved administrations should set out targets for woodland creation and peat restoration beyond 2025. These bodies should work together to ensure that the combined levels are in line with the UK ambition set out in our Sixth Carbon Budget Advice (e.g. 30,000 hectares of new woodland each year from 2025, increasing to 50,000 hectares in 2035).

- Authorities should develop and implement further mechanisms to leverage private sector finance to help support woodland creation and peat restoration targets in England and the devolved administrations. This includes increasing participation in the Woodland Carbon Guarantee, and assessing the scope for and merits of including trees and peat in the UK Emissions Trading Scheme. Further development of the Peatland Code is needed to widen eligibility to a range of peatlands and enable accreditation by the UK Accreditation Service.

- The Sustainable Farming Incentive pilots are currently focused on land management actions. The pilots should be extended to include the full range of available low-carbon farming measures set out in our Sixth Carbon Budget advice, aimed at reducing other sources of emissions (e.g. enteric emissions from cattle and sheep). Future piloting of the Local Nature Recovery and Landscape Recovery schemes, which make up the other two ELM schemes should incentivise landscape-scale change such as afforestation and peat restoration.

Gaps in ambition and policy include targets for woodland creation and peat restoration beyond 2025; extending the Sustainable Farming Incentive pilots to additional low-carbon farming measures; expediting legislation to ban rotational burning of all upland peat and ending the sale of peat for all horticultural use by 2023.

- Legislation to ban rotational burning of all upland peat sites in England (and elsewhere in the UK) should be expediated to come into force before the start of the burn season in October 2021. The ban on horticultural peat sales (including imports) should cover both the amateur and professional markets and be brought forward to start in 2023 – a year earlier than planned. Damaging peat extraction practices should stop for all uses by 2023. These recommendations apply to all of the UK.

- The ongoing Industrial Strategy Fund for agriculture (i.e. Transforming Food Production Challenge), and the roll-out of future productivity schemes such as Defra's Farming Investment Fund and the Innovation Research and Development Scheme must cover funding of measures to improve agricultural productivity while reducing the GHG impact of farming.

- Measures to address non-financial barriers to increase the take-up of low-carbon farming practices and land-use change need to be addressed. For example, both England and Scotland's respective Plans identified a range of barriers that could impede the planting of more trees, and work must now proceed to find solutions to address these.

- The Scottish Government should develop a new rural support scheme that builds towards its climate goals. The Northern Ireland Executive should set out the future direction of its post-CAP policy and how this will be used to deliver emissions reduction and carbon sequestration in the sector.

e) Electricity Supply

The Sixth Carbon Budget report set out the key elements of a policy package to fully decarbonise electricity generation. That includes the need to follow the coal phase-out with phase-out of unabated gas generation while keeping pace with growing demand from electrification, by deploying variable renewable generation at scale, developing markets for dispatchable low-carbon capacity, and ensuring that the enabling infrastructure and market arrangements are in place to accommodate this.

i) Progress in the past year

The main policy developments in the past year have been the publication of the Government's Ten Point Plan and Energy White Paper, which committed to increasing the capacity of offshore wind significantly over the coming decade. Progress was also made around the processes for delivering this, and on the longer-term future of electricity markets.

The Government has committed to increasing offshore wind capacity from 10 GW today to 40 GW by 2030, and to support power CCUS and additional nuclear investment.

- **Ten Point Plan and Energy White Paper.** These included headline commitments to increase the level of offshore wind capacity four-fold by 2030, to make onshore wind and solar eligible for low-carbon contracts once more, and to take forward carbon capture utilisation and storage (CCUS), nuclear, and demand-side flexibility.

  - **Offshore wind.** The Government committed to increasing capacity of offshore wind from 10 GW today to 40 GW by 2030. That includes 1 GW of floating offshore wind, which is likely to be increasingly important over the period to 2050.

  - **Low-carbon auctions.** The Government confirmed that the fourth round of auctions for low-carbon electricity will take in place in late 2021. These will now include onshore wind and solar, and the capacity limit has been doubled to 12 GW compared to the last auction round in 2019.

– **Power CCUS, nuclear, and demand-side flexibility** all featured additional commitments to:

  - Support at least one power CCUS project by 2030. Currently, only new power plants above 300 MW are required to be CCS-ready. The White Paper commits to removing this distorting threshold.

  - Bring at least one large-scale nuclear plant to point of Final Investment Decision this Parliament, and to provide up to £385 million of funding to develop a Small Modular Reactor (SMR) design and to build an Advanced Modular Reactor (AMR) demonstrator.

  - Publish a new Smart Systems Plan and a new Energy Data Strategy in 2021, to unlock more of the potential for demand-side flexibility.

The Government has commissioned a review of the regime for connecting offshore projects to the onshore network.

- **Offshore Transmission Network Review.** Following our recommendation in the 2020 Progress Report, the Government has commissioned a review of the regime for connecting offshore projects to the onshore electricity network. This will explore whether a more coordinated approach for connections would be cost-effective in the context of increased ambition for offshore wind.

- **Call for evidence on market design.** A future electricity system with high shares of variable renewable generation is likely to require a different market design compared to the current arrangements. This call for evidence aimed to understand more about how to continue to maintain deployment of renewable generation at scale while minimising costs and supporting innovation in a high-renewable system.

ii) Next steps for decarbonising electricity generation

The Ten Point Plan and Energy White Paper made a significant step towards a low-carbon electricity system with the commitment to 40 GW of offshore wind by 2030. However, gaps remain and further policies are needed to meet the Sixth Carbon Budget. Priorities include:

The Government should commit to phasing-out the use of unabated gas for electricity generation by 2035, subject to ensuring security of supply.

- **Unabated gas phase-out.** The Government should commit to phasing-out the use of unabated gas for electricity generation by 2035, subject to ensuring security of supply. It should publish a comprehensive long-term strategy in 2021 for achieving this. That should include through developing and deploying CCUS and hydrogen in electricity generation, and by ensuring new gas plant are properly CCUS- and/or hydrogen-ready as soon as possible and by 2025 at the latest.

Barriers to delivery will need to be addressed, and investment will be needed to ensure networks can accommodate higher demand.

- **Renewables delivery.** While the Government has committed to regular auctions for low-carbon electricity, it should set out a schedule and clear pathway of volumes to be procured in order to provide visibility to the supply chain. It will need to address potential barriers to deploying and using low-carbon generation at scale (e.g. the planning and consenting regime for renewables and networks).

- **Networks.** The CCC Pathway has a 50% increase in electricity demand by 2035 and a two-to-three-fold increase by 2050 as the economy increasingly electrifies. The Government will need to work with Ofgem to deliver the strategic investment required to ensure that electricity networks can accommodate this.

The Government should start planning for the market arrangements needed for a fully decarbonised electricity system in the 2030s.

- **Market design.** Given lead times for potential changes to market arrangements, the Government will need to go beyond their recent call for evidence and develop a strategy as soon as possible on market design for the medium- to long-term for a fully decarbonised, resilient electricity system in the 2030s and onwards.

f) Fossil fuel supply

We previously set out the core requirements of a policy package for fuel supply in the Sixth Carbon Budget Policy report.

i) Progress in the past year

The key development in the past year has been the North Sea Transition Deal (NSTD), which commits to reducing the greenhouse gas footprint of North Sea oil and gas production and processing by 50% by 2030 relative to 2018 levels. This target is less ambitious than our Sixth Carbon Budget recommendation of reducing emissions by 68% for the same period (Figure 4.4). We strongly advise that ambition on reducing emissions from North Sea fossil fuel production and processing be strengthened to be consistent with the CCC Pathway and the Sixth Carbon Budget:

The targets of the North Sea Transition Deal should be strengthened.

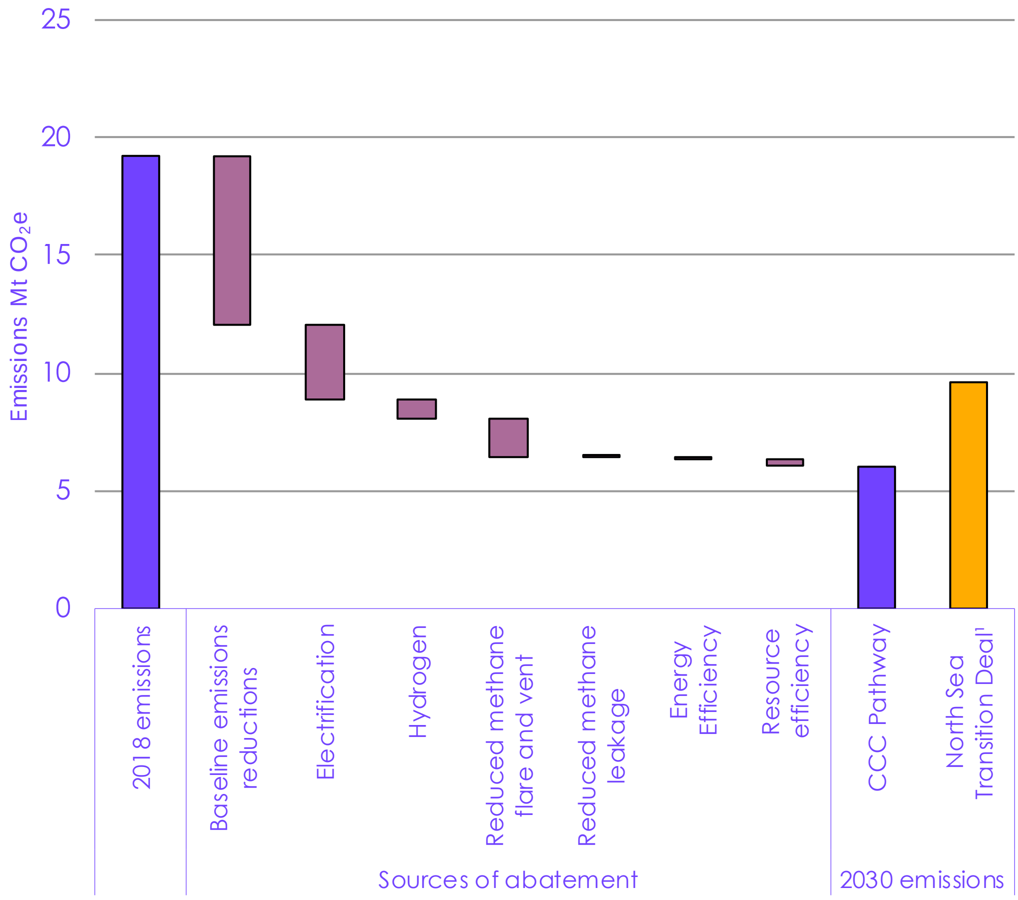
- The commitment for a reduction in emissions occurs in the context of declining oil and gas production in the North Sea. While it is difficult to forecast precise levels of production out to 2030, our baseline scenario – before actions to reduce the footprint of production – implies a 37% reduction in emissions by 2030 on 2018 levels.

- Electrification offers opportunities to reduce emissions from fossil combustion emissions associated with oil and gas production, by a further 17% of 2018 emissions. However, the degree of electrification assumed in the NSTD targets falls short of our estimate for cost-effective action. Stronger action is needed to reduce the emissions footprint of fossil fuels consumed in the UK.

- The CCC Pathway sets out a further 8% of emissions reductions from 2018 levels through measures to reduce flaring and venting. The NSTD also falls short of this level of ambition – by aiming to only permit flaring and venting for safety reasons by 2030. We have recommended this should be done by 2025, which would contribute to accelerating the pace of emissions reductions in the sector.

- The announcement of 'climate compatibility checkpoint' reviews prior to licensing rounds can ensure new fossil fuel production is consistent with the UK's climate commitments, including zero direct emissions from energy use by 2027. These reviews would need to present a transparent and coherent case for there to be a potential justification for proceeding with new licenses.

Figure 4.4 Emissions reductions in oil and gas production and processing in the CCC Pathway & the North Sea Transition Deal



Source: CCC analysis, BEIS (2021) *North Sea Transition Deal.*
Notes: Abatement in oil and gas production reflects emissions reduction from oil and gas platforms and processing terminals but does not include LNG terminals or compression stations. 1. North Sea Transition Deal residual emissions assume 50% emissions reductions from 2018 levels.

ii) Next steps for fossil fuel production

Meeting Net Zero will involve transitioning almost entirely away from the unabated use of fossil fuels. Indeed, the CCC pathway set out in the Sixth Carbon Budget entails unabated fossil fuel use falling from 1,750 TWh in 2019 to 110 TWh in 2050, with use in 2050 limited predominantly to aviation.

Fossil fuel use should decrease by 95% by 2050.

Specifically, petroleum use in the CCC pathway decreases by 85% in 2050, by which time oil products are combusted exclusively used in aviation. In a similar vein, unabated gas is only 3 TWh by 2050, which represents less than 1% of current gas use.

In the transition towards low-carbon fuels, some fossil fuel use can be consistent with UK targets.

As the energy system transitions towards low-carbon energy carriers such as hydrogen, low-carbon electricity and bioenergy, some fossil fuels can be used in a way that is consistent with UK targets:

- Unabated gas use and oil should decline by 62% in 2035 to be consistent with the Sixth Carbon Budget. However, some oil will still be needed, predominantly in surface transport (135 TWh), aviation (123 TWh) and shipping (42 TWh).

- In addition, there is uncertainty on the role of fossil gas in the UK, as some sectors are likely to use gas with carbon capture and storage (CCS) as a means to decarbonise. Our analysis found that 50 to 105 TWh could be used across the economy in 2035, with that range widening further in 2050 from 60 to 445 TWh.[31] As use of fossil gas with CCS only reduces emissions by up to around 85% compared to unabated fossil gas use, use of zero-carbon energy is preferable where it can feasibly be deployed.

Reducing the footprint of fossil fuel use is crucial to limit the impact on global GHG emissions.

Remaining fossil fuel use in the UK will need to consider the emissions footprint associated with oil and gas production in order to limit the impact on GHG emissions:

- The Sixth Carbon Budget requires the emissions of UK oil and gas production and processing to fall by 87% in 2035, relative to 2018 levels. For the same year, active efforts to move towards electrification and reduced methane flaring and venting should contribute to reducing emissions by 22% and 6% respectively below 2018 levels, beyond the expected decline in oil and gas production.

- However, current projections of the North Sea oil and gas production suggest it is unlikely to be sufficient to meet future UK needs. This suggests that there is likely to continue to be a need for some additional fossil fuel supply and/or imports of Liquified Natural Gas (LNG).

- Given the demand for fossil fuels during the transition, it will be important to consider the upstream emissions from oil and gas production in the UK against those of imports in order to limit the impact on global GHG emissions. Implementation of standards on the emissions footprint of fossil fuels supplied for UK use could both drive reductions in fossil fuels supply emissions in countries supplying fuels to the UK and provide a level playing field for UK production that means more stringent standards than embodied in the NSTD can be implemented without losing market share.

Reducing demand for fossil fuels and the emissions footprint of UK oil and gas production and processing are key to limiting the impact on global GHG emissions, reinforcing the need for more ambitious targets that more closely align to a 68% emissions reductions in 2030 against 2018 levels.

g) Waste

Our Sixth Carbon Budget advice set out the policies and measures required to get the waste sector on track to deliver the UK's pathway to Net Zero. The Government has made progress in some of these areas but there are still key gaps which must be addressed quickly.

i) Progress in the past year

Government has made some progress in developing policies to deliver on its 2018 Resources and Waste Strategy for England, which set out its ambition to double resource efficiency and eliminate avoidable wastes by 2050, achieve 65% municipal recycling by 2035 and eliminate food waste to landfill by 2030.

Defra's Waste Prevention Programme, and BEIS' Industrial Decarbonisation Strategy set out a number of important initiatives on waste and resource efficiency.

Defra's Waste Prevention Programme, which was launched for consultation in March 2021, is central to this. It includes several measures aimed at driving more resource-efficient approaches to product design and consumer behaviour, including:

- Extended Producer Responsibility (EPR) schemes for several key waste streams so that producers bear the cost of waste disposal, incentivising more efficient and sustainable product design.
- New product standards and product information to reflect how reusable, recyclable and repairable a product is, with the aim of minimising premature obsolescence.
- A plastics tax and new charges on certain single-use plastic items.

Also, as mentioned under the section on manufacturing and construction, BEIS published their Industrial Decarbonisation Strategy which sets out a number of measures to improve resource efficiency, including:

- Exploring low-carbon product standards and labelling which will consider embodied carbon, as well as broader environmental impacts.
- A £30 million UKRI Circular Economy Research Programme aimed at working with industry to develop new approaches to resource efficiency.

Delivery timelines for waste and resource efficiency policies are too slow and important gaps remain, in particular around the landfilling of biodegradable waste, recycling and emissions from Energy from Waste plants.

However, despite this progress, delivery timelines are too slow, policy is weak in some areas and key gaps remain. For example:

- The Environment Bill, which contains key powers to deliver on the Resources and Waste Strategy and Waste Prevention Programme, has been delayed and is yet to be passed into law.
- The Waste Prevention Programme itself is only now out for consultation – over two years after the Resources and Waste Strategy was published, while specific consultations on key elements of the programme, such as some Extended Producer Responsibility schemes, are not expected for a number of years.
- A number of aspects need to be strengthened, in particular raising the level of recycling targets, increasing the plastics tax threshold and extending the commitment to end landfilling of food waste to cover all major biodegradable waste streams – and implementing this in 2025 rather than 2030.

Of particular concern is a lack of policy or guidance governing the use of, and emissions from, Energy from Waste (EfW) plants. If EfW usage is left to grow unchecked, EfW emissions will quickly exceed those of the CCC pathway while undermining recycling and re-use efforts. A recent policy statement indicating EfW plants will be eligible for CCS support is encouraging, but further action is urgently needed in this space.

ii) Next steps on waste policy

To deliver the CCC pathway urgent action is needed to ban biodegradable waste from landfill from 2025 while improving recycling, re-use and waste prevention.

Full details of all the policies needed to get the waste sector on track to Net Zero are set out in our Sixth Carbon Budget polices report and the Departmental Recommendations tables at the end of this report. The following actions should be prioritised by Government in the next few years:

- The Environment Bill should be legislated this year and should be used to strengthen commitments on waste and resource efficiency including:
  - Raising recycling targets for England from 65% by 2035 to at least 68% by 2030. Experience in Wales has shown that this is feasible.
  - Sending a policy signal to ban the main biodegradable waste streams (i.e. paper, card, textiles, wood, food and garden waste) from landfill from 2025.
- Delivery of the Waste Prevention Programme must be accelerated so that key measures such as Extended Responsibility Schemes and product standards are in place well before 2025.

A systems approach to waste management and prevention is crucial to avoid merely shifting emissions from one source to another, for example from landfill to Energy from Waste or from the UK to overseas.

- In order to avoid unintended consequences, Government must take a whole system approach to improving waste prevention, re-use and recycling, including by:
  - Encouraging investment in recycling and re-use services and infrastructure to ensure that, as far as possible, waste is not diverted from landfill to EfW plants.
  - Ensuring a holistic policy approach to reduce waste arisings, for example by expanding measures aimed at reducing single-use plastic waste to cover other single-use items and materials.
  - Phasing out exports of waste by 2030 at the latest while strengthening tracking and enforcement, to ensure waste intended for recycling or recovery are treated as such.
- Government must urgently address rising emissions from, and use of, EfW, including by:
  - Setting out capacity and utilisation requirements for EfW which are consistent with plans to improve recycling and waste prevention, by the end of 2021.
  - Consulting on the introduction of a carbon price on EfW emissions (either as part of the UK ETS or a separate carbon tax), by the end of 2022.
  - Providing the necessary support to enable existing EfW plants to begin to be retrofitted with carbon capture, utilisation and storage (CCUS) from the late 2020s, and introducing policy to ensure that any new EfW plants are built either with CCUS or are 'CCUS ready'.

Delivering these actions requires different Departments to work closely together so Government should consider establishing new cross-Whitehall governance on waste and resource efficiency.

h) Aviation

The formal inclusion of international aviation in the Sixth Carbon Budget is an important step towards tackling these emissions alongside other UK emissions

The Government announced that international aviation (and shipping) emissions would be formally included in carbon budgets for the first time when accepting the Committee's recommendation on the level of the Sixth Carbon Budget. We strongly welcome this significant step, which recognises that international aviation emissions need to be tackled alongside other UK emissions, and look forward to seeing legislation on the formal inclusion of international aviation and shipping laid before Parliament soon.

i) Progress in the past year

There have been a few minor policy developments since we published the Sixth Carbon Budget, but the Net Zero Aviation Strategy is overdue:

- The new UK Emissions Trading Scheme (UK ETS, a replacement to the EU ETS), which will cover emissions from domestic UK flights and flights between the UK and the European Economic Area, was launched and ran its first auctions in May 2021.
- DfT published a consultation on implementing monitoring, reporting and verification requirements of the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) as its first voluntary phase commences, including options for interaction between CORSIA and the UK ETS for flights that are covered by both schemes.[32]
- The Civil Aviation Authority published the Airspace Modernisation Strategy (AMS), a plan for the use of UK airspace up to 2040 which aims to deliver quicker, quieter and cleaner journeys. DfT also announced a funding support package for initiatives within the AMS that support the post-pandemic recovery of the aviation sector and decarbonisation.[33]
- The Ministry of Defence announced a change in RAF aviation fuel standards, allowing RAF aircraft to utilise up to 50% of sustainable aviation fuels (SAF) in the future.[34]
- An aviation Net Zero Consultation and Strategy were planned for 2020. At the time of finalising this report the Government's consultation on decarbonising aviation had not yet been published. The Government intends to publish a Net Zero Aviation Strategy following the consultation, ahead of COP26.

ii) Next steps for decarbonising aviation

We have set out the core requirements of a policy package in aviation in the Sixth Carbon Budget policy report.

There remain significant gaps within the policy framework for aviation. Government support at present is focused on innovation funding and demonstration activities, but without clear long-term policy mechanisms driving SAF uptake or valuing negative emissions in the UK. These policy gaps should be addressed in the Aviation Strategy:

- The Road Transport Fuel Obligation development fuels sub-mandate is unlikely to drive significant development of jet fuels, as it can be met with cheaper fuels.

- There is currently no price signal for **GHG removals** in the UK.

- There is a lack of larger-scale **deployment support and policy frameworks** specifically for sustainable aviation fuel and GHG removals.

While SAF and technological innovations in aircraft provide an opportunity to reduce emissions in the aviation sector, our analysis for the Sixth Carbon Budget suggests that these measures alone are unlikely to go far enough in reducing emissions. The CCC pathway allows for some further growth in aviation demand, but below growth in a 'business as usual' case. Government must recognise the need for demand management as part of a wider strategy to decarbonise aviation, which should include:

- **An aviation decarbonisation pathway.** Although the UK aviation industry has committed to a Net Zero goal for 2050 (via the Sustainable Aviation coalition), this is not yet a policy goal for Government. A sector emissions trajectory is needed to inform demand management and airport capacity policies.

Managing aviation demand is a critical part of achieving the Net Zero target, future airport capacity needs must be considered alongside appropriate price incentives.

- **An assessment of airport capacity.** Several UK airports are in the process of seeking planning permission to expand, or have already sought permission to expand and are challenging planning permission rejections (see Box 4.4). Government has not made commitments to review its airport capacity strategy nor stated a clear position on this issue. Our advice from the Sixth Carbon Budget remains unchanged – there should be no net expansion of UK airport capacity unless the sector is on track to outperform its net emissions trajectory. Government needs to assess its airport capacity strategy and develop and put in place a demand management framework to assess and, if required, control sector GHG emissions and non-CO_2 effects.

- **Appropriate price incentives.** Reforming aviation taxation, alongside wider reform of carbon pricing, will be critical to achieving Net Zero. The Government's current proposals for air passenger duty (APD) reform[35] are largely going in the wrong direction:

  – Proposals include halving domestic APD to improve domestic connectivity. Current price signals mean that flights are often cheaper than lower carbon alternatives (e.g. rail). Redressing this requires both higher taxes for flights (where there is an alternative to flying) and subsidies on trains. Rather than reducing APD to incentivise domestic flights, policy to improve domestic connectivity should focus on reducing the cost and improving the service for surface transport, especially rail.

  – Where surface transport is not an option, relaxed requirements in APD could relate not to distance but to the time taken to travel by alternative routes. Favourable treatment may be justified for small islands in Scotland which would take hours to reach by other means, or for Northern Ireland, but not for example for travel from London to Newcastle or London to Edinburgh which can be done by train easily and relatively quickly.

  – Government should seek to embed positive behaviours that have emerged during COVID-19, such as a reduction in business travel, through taxation.

The Government is at present developing legislation on the implementation of CORSIA. These regulations should be used to maximise opportunities to tackle climate change impacts of aviation, including non-CO_2 effects:

CORSIA credits should only be used towards ETS obligations if and when these meet minimum eligibility criteria. Non-CO_2 effects of aviation must start to be measured.

- Government's CORSIA consultation includes options for interaction between CORSIA and the UK ETS. Any such interaction should ensure credits used to offset aviation emissions meet minimum credibility criteria.
- Non-CO_2 effects of aviation can have significant warming impacts. While it is true that further research is needed to better understand these impacts, and estimates may change as the science evolves, the data needed to enable these estimates should start to be collected now. Government should include a requirement within CORSIA regulations for monitoring and reporting of non-CO_2 effects.

Box 4.4
Airport capacity expansion

Several UK airports are in the process of seeking planning permission to expand or have already sought permission to expand and are challenging planning permission rejections:

- A Supreme Court ruling in December 2020 overturned a previous court decision that had blocked the plan to build a third runway at Heathrow airport on environmental grounds, although airport operators still need to apply for planning permission for the expansion to go ahead.
- Expansion plans for Leeds Bradford airport were given conditional approval by Leeds city council. Government later issued a direction preventing councillors from granting planning permission without special authorisation. In April 2021, Government postponed deciding on this request, providing no timescales for its resolution.
- London airports, as well as many other regional airports, are seeking to push ahead with expansion proposals.

The UK already has more than enough capacity to accommodate the demand increases in our Balanced Net Zero Pathway. Our advice in the Sixth Carbon Budget was therefore that there should be no net expansion of UK airport capacity, unless the sector is on track to sufficiently outperform its net emissions trajectory and can accommodate the additional demand:

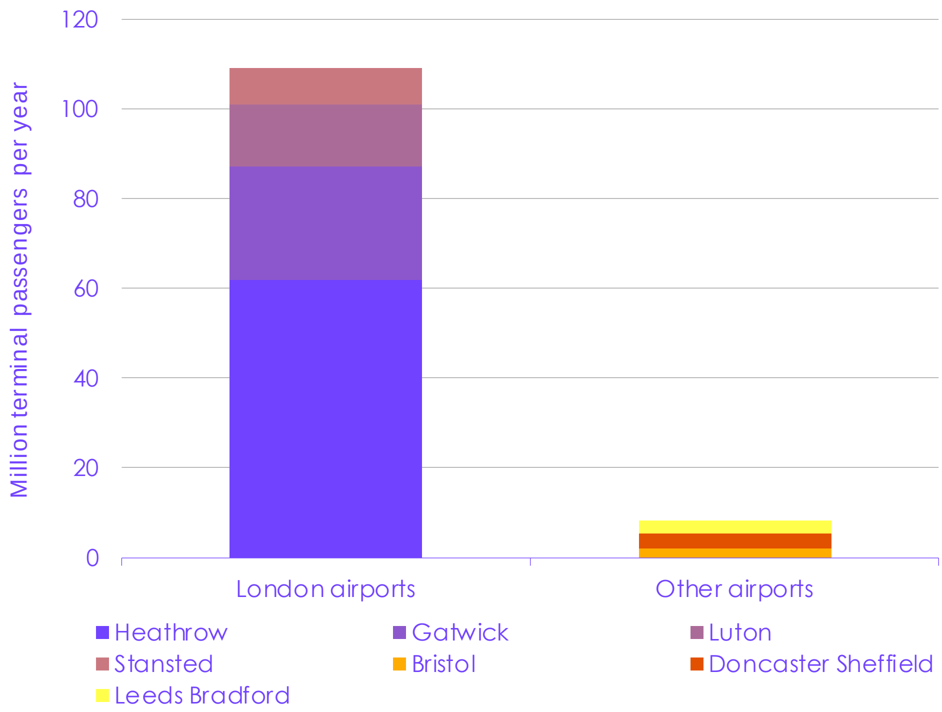
- Outperforming the net emissions trajectory means making significant progress on nascent and untested technologies like hybrid electric planes, and developing and scaling up markets for sustainable aviation fuels (SAF) and greenhouse gas removals.
- It is not possible to have certainty today over the pace of development of these technologies in future. It is therefore difficult at present to justify capacity expansion on the basis of outperforming the emissions trajectory, particularly given the uncertainty around the permanence of impacts on aviation demand from COVID-19.

The fact that we have enough capacity in aggregate to achieve our emissions targets does not mean that capacity is always in the right place:

- Airport capacity around London far exceeds capacity elsewhere in the country, as does planned capacity expansion in London compared to regional airports' plans.
- While demand is greater in and around London, other areas see economic potential in increasing their local airport capacity and improving their connectivity. There could be some emissions savings from better allocation of capacity across the country (e.g. some emissions reduction from flying from a local airport rather driving or flying to London).
- Conversely, arguments for increasing capacity in hub airports, such as Heathrow, include reducing emissions from less holding and better air traffic management.

Further work is needed to understand how capacity can best be utilised and managed across the UK to increase efficiency and minimise emissions. A mechanism for managing demand should be developed and put in place alongside an assessment of the Government's airport capacity strategy. This could act to control sector GHG emissions and non-CO_2 effects if required and could also allow Government to address issues around UK connectivity.

Figure B4.4 Airport capacity expansion plans



Source: CCC analysis based on AEF UK Airport Expansion Guide (https://www.aef.org.uk/uk-airport-expansions/), Heathrow Airport Expansion Consultation (https://www.heathrow.com/company/about-heathrow/expansion/documents), Gatwick Long Term Plans (https://www.gatwickairport.com/business-community/future-plans/long-term-plans/), Doncaster Sheffield Masterplan (https://flydsa.co.uk/dsaadmin/wp-content/uploads/2020/07/DSA_Masterplan.pdf). Includes airports with planning application submissions, that are challenging planning permission refusals as well as airports that have recently publicly stated that they intend to pursue expansion plans, where impacts of expansion plans on passenger numbers were available.

i) Removals

We have set out the core requirements for ensuring the timely delivery of Greenhouse Gas Removals (GGR) in the Sixth Carbon Budget policy report.

Key developments in the past year are new funding to GGR research and development through the UK Research and Innovation's GGR demonstrators programme,[36] selection of phase one of the BEIS Direct Air Capture and GGR competition,[37] and inclusion of GGR within the Scottish Government's Emerging Energy Technologies Fund.[38]

Alongside, during 2020-21 BEIS carried out a call for evidence on GGR.[39] This invited submissions on the contribution of GGR to reaching Net Zero, on GGR governance, and on possible approaches to GGR support mechanisms.

i) Next steps towards GGR delivery

Innovation support for engineered Greenhouse Gas Removals needs to be complimented by policy development to set out and support deployment.

The Net Zero Strategy should set out expected amounts and timings of land-based and engineered removals (i.e. bioenergy with CCS (BECCS) and direct air carbon capture and storage (DACCS)) in contributing to meeting the Sixth Carbon Budget and the Net Zero target. These should avoid over-reliance on these solutions.

Building on the results of the BEIS GGR consultation, policy on governance and support mechanisms should be developed over the next year in order to enable GGR scale-up during the mid-late 2020s. This should include enabling domestic engineered removals to contribute to UK carbon budgets and Net Zero, establishing GGR monitoring, verification and reporting structures that ensure that GGR is sustainable and verifiable, and setting out support mechanisms that align with the expectations for the role and timing of GGR contribution to UK emissions reductions.

More generally, as GGR by BECCS and DACCS is reliant on CCS infrastructures for the storage of the removed CO_2, it is critical that CCS is established in a consistent timeframe and in a manner that allows for the usage of CO_2 pipeline and storage for removals.

Endnotes

[1] Scottish Government (2020) *Protecting Scotland, Renewing Scotland: The Government's Programme for Scotland 2020-2021.*

[2] Scottish Government (2021) *Scottish Budget: 2021-2022.*

[3] Scottish Government (2020) *Securing a green recovery on a path to net zero: climate change plan 2018 – 2032 – update.*

[4] Just Transition Commission (2021) *A National Mission for a fairer, greener Scotland.*

[5] Senedd Cymru | Welsh Parliament (2021) *The Climate Change (Interim Emissions Targets) (Wales) (Amendments) Regulations 2021.*

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[9] Northern Ireland Executive (2021) *Energy Strategy for Northern Ireland: consultation on policy options.*

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[13] Department for Transport (2020) *Gear change: a bold vision for cycling and walking.*

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[15] Department for Transport and Office for Zero-Emission Vehicles (2021) *Ending the sale of new diesel buses*.

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[32] Department for Transport (2021) *Implementing the carbon offsetting and reduction scheme for international aviation (CORSIA).*

[33] Department for Transport, Civil Aviation Authority (2021) *Airspace Modernisation Plan.*

[34] Ministry of Defence (2021) *Sustainable fuels to power RAF jets* .

[35] HM Treasury (2021) *Consultation on aviation tax reform*.

[36] UK Research and Innovation (2021) *Greenhouse Gas Removal Demonstrators Programme.*

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[38] Scottish Government (2020) *Update to the Climate Change Plan 2018 – 2032.*

[39] Department for Business, Energy & Industrial Strategy (2020) *Greenhouse gas removals: call for evidence.*

Joint Departmental Recommendations

Central Government departments:

- Table A1: Cabinet Office and Number 10
- Table A2: COP Unit, the Foreign, Commonwealth and Development Office (FCDO) and the Department for International Trade (DIT)
- Table A3: HM Treasury (HMT)
- Table A4: Department for Business, Energy and Industrial Strategy (BEIS)
- Table A5: Department for Environment, Food and Rural Affairs (Defra)
- Table A6: Department for Transport (DfT)
- Table A7: Ministry of Housing, Communities and Local Government (MHCLG)
- Table A8: Department for Digital, Culture, Media and Sport (DCMS)
- Table A9: Department for Education (DfE)
- Table A10: Department for Work and Pensions (DWP)
- Table A11: Department of Health and Social Care (DHSC)
- Table A12: Home Office and the Ministry of Justice (MoJ)
- Table A13: Ministry of Defence (MoD)

Regulators and the Office for National Statistics:

- Table A14: Office of Gas and Electricity Markets (Ofgem)
- Table A15: Water Services Regulation Authority (Ofwat)
- Table A16: Office for National Statistics (ONS)

Devolved administrations:

- Table A17: The Scottish Government
- Table A18: The Welsh Government
- Table A19: The Northern Ireland Executive

Table A1 Recommendations for Number 10 and Cabinet Office		Timing
Cross-cutting	Use the **Cabinet Committees** on Climate Strategy and Climate Action to drive home the need for more pace in policy development across Departments. Consider whether additional governance mechanisms such as independent delivery bodies are required in particular areas, such as heat decarbonisation.	2021-22 Priority recommendation
	Commit to a **'Net Zero Test'** to ensure that all Government decisions are compatible with the legislated emissions targets.	2021 Priority recommendation
	Develop (with BEIS) a **public engagement strategy** for Net Zero which builds on the findings of the UK Climate Assembly by involving people in decision-making, providing trusted information on decarbonisation choices and the need to reduce emissions and adapt to climate change. The strategy should also identify preferred policy options to empower people to contribute fully towards the path to Net Zero.	2021-22 Priority recommendation
	Support **local government** (with MHCLG) to play a full role in the Net Zero transition, including through increased resourcing, guidance, involvement in local area energy plans, statutory reporting on the emissions from their estate and reforming the planning framework to enable delivery of low-carbon and climate-resilient measures. This is likely to require additional funding for staffing and resources for local delivery plans, alongside a 'duty to collaborate' to encourage authorities to work with local, regional and national partners to deliver their climate ambitions.	2021-23 (funding for local authorities at next Budget) Priority recommendation
	Cabinet Office should ensure that **adaptation** is integrated into major upcoming policies in the next two years related to the priority CCRA3 risk for which it has lead responsibility, coordinating work with other relevant departments as necessary: • Multiple risks to the UK from climate change impacts overseas In addition, for the coming five-year period (2023-2028), Cabinet Office should outline appropriate actions in the next **National Adaptation Programme** to address the adaptation gap identified for the other risks and opportunities in the CCRA3 for which it is the lead department (see Adaptation Report Annex).	By 2023 Priority recommendation
	Review **guidance documents** used in policy and business case development (e.g. the Green Book) and ensure these are consistent with the requirements of Net Zero and account for the impacts of climate change.	2022
	Ensure all departmental policy decisions, and procurement decisions, are consistent with the **Net Zero goal** and reflect the latest understanding of **climate risks.**	Now and ongoing
	Cabinet Office should build a strong **climate resilience capability** for the UK, including making use of storyline or 'what-if' scenarios to assess risks, in addition to or instead of using 'reasonable worst-case' approaches. It should develop an early warning system for global climate shocks. It should consider how more allowance and flexibility can be built into policy making and policy implementation. This could include enhancing the ability of the Government to make fast decisions by bringing in technical advice and expertise quickly when needed, and both protecting, and enhancing, monitoring and surveillance systems to enable faster reactions as events unfold.	By 2023
	Develop and implement fully-funded plans towards making all **public buildings and vehicle fleets** zero-carbon in the long term. This must include a move to multi-year programmatic funding to deliver the stated ambitions of switching to ultra-low emission vehicles by 2030 and to halve emissions from public buildings by 2032, supported by cross-government strategy (including an ambitious new set of Greening the Government commitments) and capital funding levels in the order of £1 billion/year for buildings.	2021-22
	As the public sector, lead the shift to other positive behaviours that **reduce travel demand**, for example encouraging home-working.	2021
International (With BEIS and the COP Unit)	Work towards securing more **climate finance commitments** from developed countries to get back on track for mobilising $100 billion a year in climate finance as soon as possible.	2021
	Work to bring forward additional **emissions reduction ambition** from countries that haven't yet strengthened commitments ahead of COP26.	H2 2021
	Place aligning **global COVID-19 recovery plans** with the goals of the Paris Agreement as a core goal of the UK's G7 and COP26 presidencies.	2021-22
	Ensure that any outcome on **international carbon markets** at COP26 has high integrity and genuinely supports global ambition to tackle climate change.	H2 2021
	Develop the option of applying either **border carbon tariffs or minimum standards to imports** of selected embedded-emission-intense industrial and agricultural products and fuels. This should include initiating development of carbon intensity measurement standards and fostering international consensus around trade policies through the G7 and COP presidencies.	2021 Priority recommendation

	Table A2 Recommendations for the COP Unit, the Foreign, Commonwealth and Development Office (FCDO) and the Department for International Trade (DIT)	Timing
Cross-cutting	Ensure all departmental policy decisions, and procurement decisions, are consistent with the **Net Zero goal** and reflect the latest understanding of **climate risks.**	Now and ongoing
Action in the run-up to COP26	Work towards securing more **climate finance commitments** from developed countries to get back on track for mobilising $100 billion a year in climate finance as soon as possible.	2021 (COP26)
	Work to bring forward additional **emissions reduction ambition** from countries that haven't yet strengthened commitments ahead of COP26.	H2 2021
	Provide a clear commitment prior to COP26 regarding the timescale by which the **UK's official development assistance (ODA) contribution** will return to 0.7% of GNI given the UK's commitment to align its ODA spend with Paris Agreement requirements and the need for increased finance to achieve the Paris Agreement.	H2 2021
	Place aligning **global COVID-19 recovery** plans with the goals of the Paris Agreement as a core goal of the UK's G7 and COP26 presidencies.	2021-22
	Ensure that any outcome on **international carbon markets** at COP26 has high integrity and genuinely supports global ambition to tackle climate change.	H2 2021
	Develop the option of applying either **border carbon tariffs or minimum standards to imports** of selected embedded-emission-intense industrial and agricultural products and fuels. This should include initiating development of carbon intensity measurement standards and fostering international consensus around trade policies through the G7 and COP presidencies.	2021 Priority recommendation
Ongoing climate action	For the coming five-year period (2023-2028), FCDO should outline appropriate actions in the next **National Adaptation Programme** to address the adaptation gap identified for the risks in the CCRA for which it is the lead department (see Adaptation Report Annex).	2023 Priority recommendation
	Publish a new strategy for the UK's **international climate policy** for after COP26 - ensuring that the initiatives for the COP26 presidency have long-term benefits for global emissions over the coming decade and supports the implementation of policies to deliver on strengthened national targets.	H1 2022
	For the coming five-year period (2023-2028), DIT should outline appropriate actions in the next **National Adaptation Programme** to address the adaptation gap identified for the risks and opportunities in the CCRA3 for which it is the lead department (see Adaptation Report Annex).	2023
	DIT should use trade policy to **encourage increased ambition** on both climate change mitigation and adaptation in other countries, including considering the role for border carbon adjustments and standards to **prevent carbon leakage.**	Spring 2022

Table A3 Recommendations for the HM Treasury (HMT)		Timing
	Complete the overdue **Net Zero Review**, which should: • Develop a plan for funding decarbonisation fairly, reviewing the distribution of costs for businesses, households and the Exchequer. • Set approach to near-term and long-term decarbonisation funding needs. • Consider policy implications for a just transition.	2021 Priority recommendation
	The **spending review(s)** should ensure departments are fully equipped to deliver the necessary actions across climate change mitigation and adaptation, during the rest of this Parliament and beyond.	2021 Priority recommendation
	For the coming five-year period (2023-2028), outline appropriate actions in the next **National Adaptation Programme** to address the adaptation gap identified for the risks in the CCRA for which it is the lead department (see Adaptation Report Annex).	2023 Priority recommendation
	Ensure all departmental policy decisions, and procurement decisions, are consistent with the **Net Zero goal** and reflect the latest understanding of **climate risks.**	Now and ongoing
Funding	Increase resources for **local government** to play a full role in the Net Zero transition.	2021-23 (funding for LAs at next budget) Priority recommendation
	Fund plans towards making all **public buildings and vehicle fleets** zero-carbon in the long term. This must include a move to multi-year programmatic funding to deliver the stated ambitions of switching to ultra-low emission vehicles by 2030 and halving emissions from public buildings by 2032, supported by cross-government strategy (including an updated set of Greening the Government commitments) and capital funding levels in the order of £1 billion/year for buildings.	2021-22
	Provide a clear commitment prior to COP26 regarding the timescale by which the **UK's official development assistance (ODA) contribution** will return to 0.7% of GNI given the UK's commitment to align its ODA spend with Paris Agreement requirements and the need for increased finance to achieve the Paris Agreement.	H2 2021
	Establish mechanisms (with BEIS) to close the substantial funding gap for **heat networks**, with a multi-year funding programme needed of sufficient scale to deliver the growth in network deployment, and transition to low-carbon heat sources.	2022
Taxation, carbon and energy pricing	Work with BEIS on the **Heat and Buildings Strategy:** to ensure that relative prices favour a shift to low-carbon technologies, consulting widely including with the Committee on Fuel Poverty; to ensure that sufficient funding is available; and to consider the role of tax incentives (e.g. Stamp Duty differentials). Work with MHCLG and the new buildings safety regulator to ensure that local authorities are properly funded to enforce buildings standards.	2021 Priority recommendation
	Consult on **reforms to electricity pricing** to remove disincentives to electrification, based on consideration of the strategic and fair allocation of legacy policy costs associated with the past deployment of less-mature low-carbon electricity generation. Also consider the balance of existing taxes, such as the Climate Change Levy, on different energy sources. These reforms in combination with wider sectoral incentives, standards and carbon pricing should remove price barriers to electrification.	H1 2022
	Consult (with BEIS) on the introduction of a **carbon tax** (either as part of the UK ETS or a separate instrument) aimed at curbing rising emissions from Energy from Waste.	2022
	Reform **Vehicle Excise Duty**, with larger differentials across all vehicle types, to provide stronger incentives to purchase zero-emission vehicles and reverse the shift towards cars that have higher lifecycle emissions. The reforms should consider the impact and design of second and subsequent year rates, to ensure they encourage the purchase of zero-emission vehicles in the second-hand market.	H1 2022
	Aviation tax reform should seek to address price imbalances between aviation and surface transport, encouraging the low-carbon alternative (e.g. rail) for journeys where one exists. Taxation should also be used, alongside improvements in broadband, to embed positive behaviours that have arisen during the pandemic (e.g. replacing business travel with videoconferencing and online collaboration).	2021-22
	Create a clear incentive for manufacturing facilities not currently covered by the UK ETS to switch to low-carbon energy sources by reforming the suite of energy and carbon policies, which could include rebalancing the **Climate Change Levy** rates for electricity and gas.	2023
	Set out a clear plan for ensuring that carbon prices and taxes on manufacturers, energy producers and aviation encourage emissions reductions in line with the CCC Pathway, planning for revised (and likely higher) carbon prices from 2023. This should include setting out a **cap for the UK ETS** consistent with a credible path to the Sixth Carbon Budget for consultation by Q3 2021.	2021
	Develop (with DIT) the option of applying either **border carbon tariffs or minimum standards to imports** of selected embedded-emission-intense industrial and agricultural products and fuels. This should include initiating development of carbon intensity measurement standards and fostering international consensus around trade policies through the G7 and COP presidencies.	2021 Priority recommendation

Table A3 Recommendations for the HM Treasury (HMT)		Timing
Green finance	Develop further ways to embed Net Zero and climate risk in **financial decisions** by UK firms, building on the UK's Green Finance Strategy. This should include implementing mandatory climate disclosure, adoption of a robust green taxonomy with clear guidance on how it should be used. It should also consider the recommendations of the Committee's Finance Advisory Group, such as making Net Zero and adaptation plans mandatory for financial institutions and monitoring financial flows into climate action.	2021-25
	In the **green gilt framework**, setting out the rules on what spending green sovereign bonds can be used for, ensure that revenue is used to fund expenditure that will genuinely contribute to Net Zero and improved climate resilience.	2021

Table A4 Recommendations for the Department for Business, Energy and Industrial Strategy (BEIS)		Timing
Cross-cutting	Publish the overall **Net Zero Strategy**. It should: • Provide a comprehensive plan for achieving Net Zero, the 2030 NDC and the carbon budgets, setting out ambition for sectors and key technologies and behaviours that together will meet the challenge. • Set out the approach to the key cross-cutting challenges of fair funding, just transition, skills, public engagement, local delivery, governance. • Set timelines for how policies will start to deliver decarbonisation with the required urgency, and ensure that wider policy development is consistent with the UK's climate goals. • Ensure adaptation is properly integrated in the plan, maximising synergies and minimising trade-offs, while recognising the risks and impacts from climate change (see Adaptation Progress Report for more details). • Introduce processes for monitoring progress and mechanisms to course-correct over time.	2021 Priority recommendation
	Ensure that **adaptation is integrated** into major upcoming policies in the next two years related to the eight priority risks identified in the Committee's advice on the third UK Climate Change Risk Assessment (CCRA3) for which BEIS has lead responsibility, coordinating work with other relevant departments as necessary: • Risks to the supply of food, goods and vital services due to climate-related collapse of supply chains and distribution networks (with Defra and DIT). • Risks to people and the economy from climate-related failure of the power system. In addition, for the coming five-year period (2023-2028), BEIS should outline appropriate actions in the next National Adaptation Programme to address the adaptation gap identified for the other risks and opportunities in the CCRA for which it is the lead department (see Adaptation Report Annex).	By 2023 Priority recommendation
	Develop a **public engagement** strategy for Net Zero which builds on the findings of the UK Climate Assembly by involving people in decision-making, providing trusted information on decarbonisation choices and the need to reduce emissions. The strategy should link to engagement on adaptation and identify preferred policy options to empower people to contribute fully towards the path to Net Zero.	2021-22 Priority recommendation
	Ensure **all departmental policy decisions**, and procurement decisions, are consistent with the Net Zero goal and reflect the latest understanding of climate risks.	Now and ongoing
International	Update the UK's long-term **low greenhouse gas emission development strategy with the UNFCCC** to reflect a formulated economy-wide plan to achieve Net Zero by 2050 (expected to be the Net Zero Strategy).	H2 2021
	Place aligning **global COVID-19 recovery plans** with the goals of the Paris Agreement as a core goal of the UK's G7 and COP26 presidencies.	H2 2022
	Publish a new strategy for the UK's **international climate policy for after COP26** - ensuring that the initiatives for the COP26 presidency have long-term benefits for global emissions over the coming decade and support the implementation of policies to deliver on strengthened national targets.	H1 2022
Jobs and skills	Working with DWP, DfE, the Home Office and MHCLG, develop a strategy for a **Net Zero workforce** that ensures a just transition for workers transitioning from high-carbon to low-carbon and climate-resilient jobs, integrates relevant skills into the UK's education framework and actively monitors the risks and opportunities arising from the transition. This strategy should include the development and roll-out of plans for training and skills, with buildings and manufacturing being priority areas.	2021 Priority recommendation
	Design industrial decarbonisation policies to **support and create jobs**, especially in regions with reliance on industrial jobs.	Now and ongoing

Table A4 Recommendations for the Department for Business, Energy and Industrial Strategy (BEIS)		Timing
Supporting business action	**Support businesses** to play their full role in the Net Zero transition and in adapting to climate risks and opportunities, for example by extending and expanding the role of the Net Zero Business Champion beyond COP26, building on the Race to Zero and Race to Resilience campaigns and providing sufficient resources to fully support businesses of all sizes to engage in the transition, to input to policy development and to set their own robust Net Zero and adaptation action plans.	2021-22
	Develop further ways to embed Net Zero and climate risk in **financial decisions** by UK firms, building on the UK's Green Finance Strategy. This should include implementing mandatory climate disclosure, adoption of a robust green taxonomy with clear guidance on how it should be used. It should also consider the recommendations of the Committee's Finance Advisory Group, such as making Net Zero and adaptation plans mandatory for financial institutions and monitoring financial flows into climate action.	2021-25
	Determine appropriate regulatory arrangements, rules and guidance for the use of **carbon offsetting by UK corporates** within their Net Zero strategies, recognising the growing demand for offsetting markets, the interactions with the UK ETS and currently accredited schemes (i.e. the Woodland Carbon Code and the Peatland Code), and the need to avoid double-counting or negative outcomes for non-carbon objectives.	2021-22
Research and data	Drawing on the Energy Innovation Needs Assessments ensure **innovation funding** (e.g. through UKRI, Catapults, the Industrial Strategy Challenge Funding, BEIS Innovation Programme and the Net Zero Innovation Portfolio) drives forward an extensive research and innovation package for delivering a Net Zero, climate-resilient future.	Now and ongoing
	Make monitoring and data analysis of climate risks more accessible, alongside better digitisation of past records. Further efforts should be taken to make the evidence on climate risks more usable for decision makers through co-design of research programmes with end users, where the user drives the research question from the beginning of the process. A major gap is the lack of projections of impacts in 2°C and 4°C scenarios; this needs addressing as an urgent priority ahead of CCRA4.	2022
	Review plan for improving **data collection** and statistical reporting for the purposes of monitoring and informing the low-carbon transition, as part of the broader work the ONS are already undertaking to improve the collection of climate-related data.	2022
	Work with ONS to put in place plans to **collect and report data** annually on low-carbon heat networks, specifically the amount of heat delivered (split by DUKES consumption sector, i.e. Residential/Public/Commercial/Industry, and where possible, by source of heat supply). This should be part of a plan for improving data collection and statistical reporting for the purposes of monitoring and informing the low-carbon transition.	2022
	Improve the collection and reporting of **industrial decarbonisation data** to allow for progress to be monitored more effectively, particularly on energy and resource efficiency.	2022
Energy / carbon pricing and emissions trading	Set out a clear plan (with HMT) for ensuring that carbon prices and taxes on manufacturers, energy producers and aviation encourage emissions reductions in line with the CCC Pathway, planning for revised (and likely higher) carbon prices from 2023. This should include setting out a **cap for the UK ETS** consistent with a credible path to the Sixth Carbon Budget for consultation by Q3 2021.	2021
	Consult (with HMT) on **reforms to electricity pricing** to remove disincentives to electrification, based on consideration of the strategic and fair allocation of legacy policy costs associated with the past deployment of less-mature low-carbon electricity generation. It should also consider the balance of existing taxes, such as the Climate Change Levy, on different energy sources. These reforms in combination with wider sectoral incentives, standards and carbon pricing should remove price barriers to electrification.	H1 2022
	Consult (with HMT) on the introduction of a **carbon tax** (either as part of the UK ETS or a separate instrument) aimed at curbing rising emissions from Energy from Waste.	2022
	Commit (with DfT) not to use credits from the **Carbon Offsetting and Reduction Scheme for International Aviation** (CORSIA) for flights covered by the UK ETS unless and until they can satisfy strict eligibility criteria (equivalence, additionality, permanence, sustainability).	2021-22
	Develop (with DIT) the option of applying either **border carbon tariffs** or **minimum standards to imports** of selected embedded-emission-intense industrial and agricultural products and fuels. This should include initiating development of carbon intensity measurement standards and fostering international consensus around trade policies through the G7 and COP presidencies.	2021 Priority recommendation

Table A4 Recommendations for the Department for Business, Energy and Industrial Strategy (BEIS)		Timing
Buildings	Produce a robust, equitable and ambitious **heat strategy** to eliminate emissions from buildings through a clear direction for the next 30 years. This must include: • Standards covering all segments of the building stock, with support for consumers through the transition. • Plans to rebalance policy costs - in consultation with the Committee on Fuel Poverty and wider stakeholders - while making low-carbon solutions more financially attractive. • Plans to introduce Green Building Passports. • Formalisation of a governance framework to drive decisions on heat infrastructure including a role for area-based energy plans and zoning of heat networks.	2021 Priority recommendation
	Provide a stable long-term policy framework to support sustained **energy efficiency and heat pump** growth at sufficient scale (i.e. 600,000 heat pumps per year in existing homes by 2028). This must include a replacement for the Green Homes Grant voucher scheme which works, backed by standards and support for non-residential heat pump installations. Create a level-playing field for hybrid heat pumps off the gas grid and ensure hybrid heat pumps are an integral part of PAS2035 retrofit coordinator advice.	2021 Priority recommendation
	Establish mechanisms to close the substantial funding gap for **heat networks**, with a multi-year funding programme of sufficient scale to deliver the growth in network deployment, and transition to low-carbon heat sources, needed. Finalise policy on the future market framework for heat networks, including requiring new district heat schemes to utilise low-carbon sources from 2025 at the latest and setting regulations for the conversion of legacy fossil fuel schemes to low-carbon sources.	2022
	Publish proposals for standards to phase out the installation of **new liquid and solid fossil fuel heating** by 2028 at the latest. Send clear signals on the phase-out of gas heating, including the roles for area-based planning and standards in phasing out gas installations (as in Scotland).	2021
	Move to **multi-year programmatic funding** to deliver the stated ambition of halving emissions from public buildings by 2032. This must be supported with cross-government strategy (either independent or integrated with the Net Zero or Buildings Strategies) and funding levels in the order of £1 billion/year. Support mechanisms must be designed so that smaller public bodies can access them.	2022
	Set requirements for all **new gas boilers to be hydrogen-ready** by 2025 at the latest, while ensuring that all new boilers outperform current and expected future air quality standards.	2021
	Implement improvements to the **Energy Performance Certificate** (EPC) and **Standard Assessment Procedure** (SAP) framework, including: • Ensuring EPCs drive deployment of the necessary energy efficiency measures and do so on a holistic basis to address overheating, ventilation, and moisture-risk. • Supporting delivery objectives across both energy efficiency and low-carbon heat, and valuing properly the benefits of low-carbon and flexible technologies. • Formally integrating a forward trajectory for declining grid carbon-intensity, in line with Government projections. • Addressing wider issues of quality/robustness, with a commitment to integrate in-use performance metrics from 2023. • Plans for the future role of Green Building Passports.	2022
	Improve understanding of and support action on **overheating in existing residential buildings** and encourage retrofit of passive cooling measures. The Heat and Building Strategy must consider overheating risks. The following steps are needed: • Further research to understand when overheating occurs in existing homes, including ongoing monitoring of temperatures in the housing stock, monitoring of overheating exceedances in homes, and the number of homes currently adapted. • Guidance and information for homeowners with the steps that can be taken if their homes overheat. This should include an outline of behavioural options and the measures that can be installed to reduce internal temperatures. Green Building Passports and home retrofit plans could provide holistic guidance and help to unlock green finance. • Overheating risk considered and mitigated against if necessary when doing energy efficiency retrofit programmes. • Making finance available to install adaptation measures. This could be via grant schemes or green finance for private owners, with public funding targeted at low-income or vulnerable households alongside energy efficiency retrofit.	2022
	Bring forward the date to reach EPC C in **social homes** to 2028, in line with the Private Rented Sector (PRS) proposals and finalise the delivery mechanism. Implement ambitious **PRS standards** for homes which drive fabric efficiency, while valuing deployment of cost-effective low-carbon heat alongside this. Implement the EPC B target for **PRS non-domestic buildings** in line with new proposals. Consult on options to cover the regulatory policy gap for **owner-occupied homes**.	2021

Table A4 Recommendations for the Department for Business, Energy and Industrial Strategy (BEIS)		Timing
Power	Publish a plan for reaching an emissions intensity of 50 gCO_2/kWh by 2030, with a total of around 350 TWh of low-carbon generation. Set out a schedule for regular auctions to procure **low-carbon generation**, with a clear pathway of volumes to be procured and robust contingency for uncertainties in demand and delivery. Address potential barriers to deploying and using low-carbon generation at scale (e.g. the planning and consenting regime for renewables and networks, exposure to climate risks) and, with Ofgem, develop a framework under which sufficient supply resilience can be ensured.	2022 Priority recommendation
	Commit to phasing out **unabated gas generation** by 2035, subject to ensuring security of supply.	2021 Priority recommendation
	Publish a comprehensive long-term strategy for **unabated gas phase-out**, including ensuring new gas plant are properly CCS- and/or hydrogen-ready as soon as possible and by 2025 at the latest.	By Spring 2022 Priority recommendation
	Develop a strategy as soon as possible on **market design** for the medium to long term for a fully decarbonised, resilient electricity system in the 2030s and onwards.	2023
	Develop mechanisms for strategic investment in coordination with Ofgem to ensure that **electricity networks** can accommodate increased future demand levels, including large localised demand increases associated with electrification in manufacturing, transport and buildings, and that lack of network capacity does not cause delays in emissions reduction.	2023
	Develop a strategy to coordinate the development of **interconnectors**, connections for offshore wind farms and the enhancement of inter-area transfer capacity for the onshore network, ensuring cost-effective, timely delivery, bringing forward any legislation necessary to enable it.	H1 2022
	Work in partnership with Ofgem to publish and implement a new **Smart System Plan** and **Energy Data and Digitalisation Strategy**, including working with DCMS on cyber-security, in order to continue to unlock the full benefits of electricity system flexibility. Ensure that, alongside smart standards for heating, all electricity users have access to half-hourly metering and the option of tariffs that encourage flexibility in use of electric heat and electric vehicle charging.	2021
	Improve information sharing on climate risks to infrastructure interdependencies at a local level, especially for **electricity, digital and ICT networks**. As reported in our previous assessment in 2019, NAP actions to enhance arrangements for information sharing between local infrastructure operators and improve understanding of critical risks arising from interdependencies have not been completed. Defra's link with Local Resilience Forums is key, and BEIS and DCMS should engage with utility companies to encourage standardised benchmarking and data sharing on climate risks to electricity networks, digital & ICT.	Now and ongoing
Waste	Set out capacity and usage requirements for **Energy from Waste** consistent with plans to improve recycling and waste prevention. Issue guidance to align local authority waste contracts and planning policy to these targets.	2021 Priority recommendation
	Introduce the necessary planning guidance and policy to ensure any **new Energy from Waste** plants (including incineration, gasification & pyrolysis facilities) are built with carbon capture usage and storage (CCUS) or are 'CCUS-ready'.	Spring 2022 Priority recommendation
	Set out how **existing Energy from Waste** plants will be supported to be retrofitted with CCUS from late 2020s onwards, with 2050 a backstop date for full CCUS coverage.	2022

Table A4 Recommendations for the Department for Business, Energy and Industrial Strategy (BEIS)		Timing
Manufacturing and construction	Establish funding mechanism(s) to support operational and capital costs of both **electrification and hydrogen-use in manufacturing**, as soon as possible, with the aim of awarding funding in 2022. There must be mechanisms for both options, not only hydrogen, and the mechanism(s) should be designed to ensure that, in the medium term, hydrogen-use and electrification compete on a level playing field, to ensure the best value for consumers and taxpayers. Support for electrification may be combined with reforms to electricity pricing.	2022 Priority recommendation
	Continue to support **innovation** and demonstration of fuel switching and CCS technologies for decarbonising manufacturing and construction. Ensure that a full range of options is developed, filling previous gaps in support, such as encouraging electrification projects to come forward.	Spring 2022
	Set out which policies will deliver the pathway to 4 $MtCO_2e$ of **industrial energy efficiency** abatement set out in the Industrial Decarbonisation Strategy and quantify how much abatement will come from each policy: • Set out the future role of Climate Change Agreements (CCAs) and any required CCA reforms. • Consult on mandating the use of Energy Management Systems and on Government support and incentives for implementing energy management standards. • Set out the role of energy efficiency standards and audit programmes. • Develop resources such as direct advice and training to address capacity and expertise gaps, and highlight available energy efficiency solutions, particularly for SMEs.	Spring 2022
	Ensure the policy package for decarbonising manufacturing addresses manufacturers' low appetite for investments with long **payback times**, either using grants or favourable loans, particularly for energy efficiency.	2022
	Work with the minerals industries to develop a detailed joint plan for **CO_2 transport from dispersed sites**.	Spring 2022
	Commit to **targets** for ore-based steelmaking and cement production in the UK to reach near-zero emissions by 2035 and 2040, respectively.	2021
	Deliver industrial **carbon capture contracts** (ICC) to enable final investment decisions on the first ICC projects by mid-2022.	H1 2022
	Deliver the proposed **CCS transport and storage** regulatory investment model to enable final investment decisions by mid-2022 that are consistent with establishing at least two CCS transport and storage clusters in the mid-2020s.	H1 2022
	Create a clear incentive for **manufacturing facilities not currently covered by the UK ETS** to switch to low-carbon energy sources by reforming the suite of energy and carbon policies, which could include rebalancing the Climate Change Levy rates for electricity and gas.	2023
	Set out a strategy for decarbonisation of **off-road mobile machinery** and work with industry to identify potential policies to increase uptake of low-carbon off-road mobile machinery. This will require work across BEIS, MHCLG, DfT and Defra.	2021

Table A4 Recommendations for the Department for Business, Energy and Industrial Strategy (BEIS)		Timing
Resource efficiency in manufacturing and construction	Step up efforts (with Defra) to deliver the **waste prevention and resource efficiency** improvements required as part of the pathway to Net Zero, including by: • Accelerating delivery of the Waste Prevention Programme so that key policies, such as Extended Producer Responsibility and new product standards, are on track to be in place well before 2025. • Setting out how levels of resource efficiency improvements identified within the Industrial Decarbonisation Strategy will be delivered. • Beginning to develop and implement any additional policies needed to deliver these resource efficiency improvements, by the end of 2022. • Ensure cross-departmental working, potentially through new cross-Whitehall governance focused on resource efficiency.	Spring 2022 Priority recommendation (end 2022 for additional policies)
	Develop policies (with MHCLG, Defra and DfT) to drive more **resource-efficient construction** and use of existing low-carbon materials, including a substantial increase in the use of **wood in construction**. Policies should include: • Reviewing and clarifying the position of structural timber in the ban on combustible materials, underpinned by further research and testing where necessary, and ensuring there are no barriers to the safe use of timber in buildings. The buildings safety regulator to play a role in overseeing this on an ongoing basis. • The development of a fully-funded policy roadmap on the use of timber, including policies to support the development of UK wood supply chains. • Finalising the reporting methodology for whole-life carbon standards. • Setting out a plan for phasing in mandatory whole-life reporting followed by minimum whole-life standards for all buildings, roads and infrastructure by 2025, with differentiated targets by function, scale, and public/private construction.	Spring 2022
	Consult on detailed proposals (with Defra) for **product standards and extended producer responsibility** to improve the resource efficiency of consumer goods' lifecycles. The proposals should include all consumer goods with high environmental impact and cover how products are made, through indicators such as the level of recycled content and critical material content, and the repairability, durability and upgradability of a product.	Spring 2022
	Work with business to encourage and **enable consumers to share**, lease and use products for longer while discouraging 'disposable' business models.	Spring 2022
Transport	Continue to support (with DfT and Ofgem) widespread deployment of **EV charging infrastructure**: • This should ensure it can support high EV uptake levels. Project Rapid has the right ambition for the strategic road network and should be developed into a full strategy for the 2020s and beyond. • Further investment is needed to support on-street and other urban charging solutions for those without off-street parking and destination charging. • Government should aim for there to be around 150,000 public charge points operating by 2025. These should be widely available across all regions of the UK. • Implement the recommendations of the EV Energy Taskforce, in particular improving the consumer charging experience and making smart-charging accessible, appealing and cost-effective for as many EV users as possible.	Now and ongoing Priority recommendation
	Produce a clear assessment (with DfT) of how best to re-use and **recycle EV batteries** and fund development of competitive, large-scale battery recycling facilities in the UK.	2021-22
	Continue innovation and demonstration support (with DfT) for **zero-carbon fuel technologies** and their use in shipping, and ship efficiency measures. Develop incentives for zero-carbon ammonia and hydrogen supply chains.	Early 2020s

Table A4 Recommendations for the Department for Business, Energy and Industrial Strategy (BEIS)		Timing
Greenhouse gas removals (GGRs)	The overall Net Zero Strategy should place **GGRs in context** of a wider strategic approach to reaching Net Zero, setting out a plan for development and deployment of removals, but also for actions elsewhere to limit the need for them.	2021 Priority recommendation
	Building on the Greenhouse Gas Removals (GGR) call for evidence, launch consultation on Government's preferred **GGR strategy** and long-term expected requirement for GHG removals, including a proposed market design, a set of governance principles and proposals that recognise the need for a long-term price signal.	H1 2022 Priority recommendation
	Support the **demonstration of engineered GGR** at scale in the 2020s, either through amending existing policies or introducing new support mechanisms.	2022 Priority recommendation
	Build on the recently commenced **innovation programmes**, the Direct Air Capture and other Greenhouse Gas Removals Competition and UK Greenhouse Gas Removal Demonstration Programme, to support both the demonstration and commercialisation of more advanced greenhouse gas removal technologies (taking these from technology readiness level 5 to 8), and alongside undertake research and development into less advanced removal approaches including through pilots and field experiments.	Now and ongoing
	Ensure that a **public engagement strategy** for Net Zero includes national, regional, and local communities to improve the public's understanding of GGR approaches and both the local and system-wide implications of different options - awareness is currently very low, and support is mixed or uncertain.	2021-22
	Align with adaptation policies to ensure long-term **resilience and effectiveness of GGRs** in the face of climate impacts and exploit potential for co-benefits (e.g. choice of tree species, protecting new infrastructure from flood risks).	Before 2025
Fuel supply	Develop a **Hydrogen Strategy** out to 2035 that determines plans and sets out pathways to appropriate hydrogen use across power, industry, transport, and buildings; low-carbon hydrogen production options; and the associated infrastructure. Ensure that large-scale hydrogen trials begin in the early 2020s.	2021 Priority recommendation
	Deliver a **Biomass Strategy** that is aligned to the UK's path to Net Zero, and which reflects recommendations on governance, monitoring and best-use from the Committee's 2018 Biomass report and 2020 Land Use report. The UK should also continue to take a global lead on further developing and improving UK and international biomass governance and sustainability criteria.	2022 Priority recommendation
	Set new requirements for CCS-readiness at **biofuel conversion facilities** of all scales. This should include dates beyond which new facilities should be built with CCS, and dates for when CCS will need to be retrofitted to biofuel facilities already in operation.	2022
	Set out policies to reduce **upstream emissions from oil and gas** production by 68% by 2030, relative to 2018 levels: • Develop policies to reduce emissions from existing oil and gas platforms, including developing carbon-intensity measurement standards for gas and oil. • Set a requirement for new plans for offshore oil and gas platforms and associated installations to use low-carbon energy for their operations, aligning to zero direct emissions from operational energy use by 2027. • Make plans to ensure flaring and venting is only permitted for safety reasons from 2025.	2021
	Work with Ofgem to make explicit how current and future policies will reduce emissions associated with **methane leakage** from the gas networks in a way that is consistent with the Sixth Carbon Budget.	2021
	Formalise the process, governance framework and timeline for decisions on the **conversion to hydrogen** of appropriate parts of the gas pipeline networks. This should include starting a programme of research with Ofgem to identify areas which are unlikely to be suitable (such that electrification and alternatives can be prioritised), alongside priority candidate areas for hydrogen.	2021

Table A5 Recommendations for the Department for Environment, Food and Rural Affairs (Defra)		Timing
Cross-cutting	The next **National Adaptation Programme**, due in 2023, should ramp up adaptation ambition, implementation and evaluation. It should: • Set out the Government's vision for a well-adapted UK, alongside the measurable outcomes that the Government is aiming to achieve by the end of the next NAP period (2023 – 2028). • Include a detailed monitoring and evaluation framework, including which indicators will be used to monitor progress in reducing risk and showing the effectiveness of different adaptation responses for each risk in CCRA3. • Report how departments have addressed the top eight priority risks set out in the CCRA3 Advice Report for urgent action between 2021 and 2023. • Set out how adaptation is being integrated into policy, and the measurable actions by department for adaptation across each of the 61 risks and opportunities set out in the CCRA3 Technical for the period 2023-2028. • Ensure the adaptation actions and the programme as a whole are framed around the principles for good adaptation outlined in the CCRA3 Advice Report: – Adapt to 2°C warming, assess the risks for 4°C – Prepare for unpredictable extremes – Assess interdependencies – Understand threshold effects – Integrate adaptation into relevant policies – Ensure adaptation is sufficiently financed – Avoid lock-in – Address inequalities – Consider opportunities from climate change • Specific actions to manage international climate risks should be included, setting out the direct response to the risks identified in CCRA3.	2023 onwards Priority recommendation
	Ensure that **adaptation is integrated** into major upcoming policies in the next two years related to the priority CCRA3 risks for which Defra has lead responsibility, coordinating work with other relevant departments as necessary: • Risks to the viability and diversity of terrestrial and freshwater habitats and species from multiple hazards. • Risks to soil health from increased flooding and drought. • Risks to natural carbon stores and sequestration (trees, soils and wetlands) from multiple hazards. • Risks to crops, livestock, and commercial trees from multiple hazards. In addition, for the coming five-year period (2023-2028), Defra should outline appropriate actions in the next National Adaptation Programme to address the adaptation gap identified for the other risks and opportunities in the CCRA for which it is the lead department (see Adaptation Report Annex).	By 2023 Priority recommendation
	Implement a **public engagement programme about national adaptation objectives**, acceptable levels of risk, desired resilience standards, how to address inequalities, and responsibilities across society. The findings from the programme should feed into the vision and desired outcomes of the next National Adaptation Programme.	2021 Priority recommendation
	Implement measures to address **non-financial barriers to tackling emissions from land use and agriculture**, including awareness and improving skills in sustainable forestry and peatland management; scaling up supply chains; streamlining application processes and addressing contractual and tax issues where they are acting as barriers. Delivery plans should also set out measures to: • Improve knowledge exchange of low-carbon farming practices to provide confidence to farmers to take up measures to reduce on-farm GHGs. • Improve the science and evidence base for woodlands and peatlands, to deliver GHG reductions and multiple other benefits, ensure the right tree is planted in the right place and that they are resilient to future climate impacts.	2021-25 Priority recommendation

Table A5 Recommendations for the Department for Environment, Food and Rural Affairs (Defra)		Timing
Cross-cutting	Legislate the **Environment Bill** this year, using it to strengthen commitments on waste, resource efficiency, agriculture and land-use.	2021
	Develop (with DIT) the option of applying either **border carbon tariffs or minimum standards to imports** of selected embedded-emission-intense industrial and agricultural products and fuels. This should include initiating development of carbon intensity measurement standards and fostering international consensus around trade policies through the G7 and COP presidencies.	2021 Priority recommendation
	Ensure **all departmental policy decisions**, and procurement decisions, are consistent with the Net Zero goal and reflect the latest understanding of climate risks.	Now and ongoing
Research and data	Fund a programme of work to design and populate the appropriate new **priority adaptation indicators** for England. These should complement other environmental and social indicators collated by Government. The CCC could be tasked to coordinate this activity in partnership with other relevant organisations such as the Office for Environmental Protection and Environment Agency.	2021
	Continue to monitor **consumption emissions**. These are important to ensure that action to decarbonise UK-based activities does not result in emissions moving offshore, and to track progress in decarbonisation of imports to the UK, which in turn can inform future policy (e.g. border carbon adjustments).	Now and ongoing
	Improve the collection and reporting of **industrial decarbonisation data** to allow for progress to be monitored more effectively, particularly on energy and resource efficiency.	2022
Nature and land use	Extend current ambition set out by the UK government and the devolved administrations to implement a comprehensive delivery mechanism to address **degraded peatland**: • 17% of upland peat is restored, equivalent to 200,000 hectares (and where this is not possible, stabilise the peat) by 2025; 58% by 2035 (700,000 hectares) and the remaining area by 2045. • Rewet and sustainably manage 12% of lowland peat used for crops by 2025 (24,000 hectares), rising to 38% by 2035 (72,000 hectares). • Rewet 8% of lowland grassland area by 2025 (18,000 hectares), rising to 25% by 2035 (54,000 hectares). • Remove all low-productive trees (i.e. less than YC8) from peatland (equivalent to 16,000 hectares by 2025), and restore all peat extraction sites by 2035 (equivalent to 50,000 hectares by 2025).	2021-25 Priority recommendation
	Extend current ambition set out by the UK government and the devolved administrations to implement a comprehensive **delivery mechanism for new woodland** to create at least 30,000 hectares per year across the UK by 2025 (in line with the Government's commitment) and an average of 40,000 hectares per year in the 2030s.	2021-25 Priority recommendation
	Introduce legislation to: • Extend the **ban on rotational burning of peat** from certain protected upland bog sites to all peatland before the start of the burn season in 2021 • End peat extraction, and ban its sale for all horticultural uses including in the professional sectors and apply this to imports by 2023. • Mandate water companies to restore peatland under their ownership. • Ensure lowland peat soils are not left bare.	2021-23 Priority recommendation
	Publish an overarching strategy that clearly outlines the relationships and **interactions between the multiple action plans** in development for the natural environment, including those for peat, trees, nature and plant biosecurity. This must clearly outline how the different strategies will combine to support the Government's climate change goals on both Net Zero and adaptation, along with the wider environment and other goals.	2021
	Make **long-term targets for biodiversity**, set out under the Environment Bill, and associated timeframes outcome-based and linked directly to the goals set out in the Government's 25-Year Environment Plan.	H1 2022
	Make **interim targets for biodiversity** statutory and link them clearly to the long-term targets set out in the Environment Bill.	H1 2022
	The commitment in the 25 Year Environment Plan to achieve 75% **restoration for terrestrial and freshwater** protected sites should be extended to include all priority habitat sites.	2021
	Set out a clear mechanism to account for the consequences of **higher water temperatures and low flows** (including drying up) in water bodies for freshwater habitats and species, and for meeting the Water Framework Directive (WFD) targets. This is lacking in current plans to revise the River Basin Management Plans (RBMPs).	H1 2022
	Extend the statutory requirements of **marine plan policies** to the decisions of public and private organisations. At present only public authorities are duty bound under law to apply the plan policies to their decisions meaning there is a significant gap in the protections they are designed to provide.	Now

Table A5 Recommendations for the Department for Environment, Food and Rural Affairs (Defra)		Timing
Agriculture and food	Provide **incentives and address non-financial barriers** across all of the UK to: • Plant **trees** on 2% of farmland by 2025 while maintaining their primary use, rising to 5% by 2035. • Extend **hedgerows** by 20% by 2035 and better manage existing hedgerows. • Increase the area growing **energy crops** across the UK to 6,000 hectares per year by 2025, and 30,000 hectares per year by 2035.	2021-25 Priority recommendation
	Implement measures to encourage consumers to **shift diets and reduce food waste** across the supply chain, including: • Low-cost, low-regret actions to encourage a 20% shift away from all meat by 2030, rising to 35% by 2050, and a 20% shift from dairy products by 2030. Develop an evidence-based strategy to establish options for successful behaviour shifts and demonstrate public sector leadership. • Policy to reduce food waste by 50% by 2030 and 60% by 2050, with the public sector taking a lead through measures such as target setting and effective product labelling.	Start now and review mid-2020s for diet change Priority recommendation
	Introduce a strong **post-CAP regulatory baseline,** and adopt and retain existing EU rules that benefit GHG mitigation into UK legislation. These include low-cost, low-regret on-farm measures to reduce emissions; extending coverage of Nitrate Vulnerable Zones across all of the UK; including measures that reduce enteric methane emissions in the Clean Air Strategy, specifically under the proposal to extend environmental permitting to the dairy and intensive beef sectors; and mandating UK feed producers to incorporate methane inhibiting additives in compound feed and mineral supplements.	2021-23
	Set out measures to ensure the resilience of the **food supply chain**, including to the risks of extreme weather in England and internationally, as part of its white paper responding to the independent review of the National Food Strategy for England.	2022
	Introduce a comprehensive plan and incentives to deliver **emissions reduction across all UK farms** through: • High take-up of low-carbon agricultural measures (60-75% by 2050) covering livestock (diets, breeding, and health), soils (cover crops and grass-legume mix) & waste management (anaerobic digestion and slurry covers). • Measures to incentivise the take-up of near-zero-emissions options for agricultural machinery and vehicles from the mid-2020s, and develop options where they are not currently available.	2021-25
	The landscape-level and on-farm measures set out above should: • **Leverage private and public finance** (e.g. a trading scheme or auctioned contracts). New and existing funding streams should continue during the transition period to this system to avoid a hiatus in deployment. • Be accompanied by a strong **monitoring, reporting and verification** system that uses the latest monitoring tools and technologies to create a strong institutional framework to verify actions across the UK.	2021-25
	Set out a strategy for decarbonisation of **off-road mobile machinery** and work with industry to identify potential policies to increase uptake of low-carbon off-road mobile machinery. This will require work across BEIS, MHCLG, DfT and Defra.	2021

Table A5 Recommendations for the Department for Environment, Food and Rural Affairs (Defra)		Timing
Waste	Introduce the necessary planning guidance and policy to ensure any new **Energy from Waste** plants (including incineration, gasification & pyrolysis facilities) are built with carbon capture usage and storage (CCUS) or are 'CCUS ready'.	Spring 2022 Priority recommendation
	Set out how existing **Energy from Waste** plants will be supported to be retrofitted with CCUS from late 2020s onwards, with 2050 a backstop date for full CCUS coverage.	2022 Priority recommendation
	Set out capacity and usage requirements for **Energy from Waste** consistent with plans to improve recycling and waste prevention. Issue guidance to align local authority waste contracts and planning policy to these targets.	2021 Priority recommendation
	Set out **funding arrangements for local authorities** to provide the recycling, composting and waste management services and infrastructure required to deliver at least the commitments in the Environment Bill, Waste Prevention Programme and Resources and Waste Strategy, by 2022.	2022-25
	Consult on the introduction of a **carbon tax** (either as part of the UK ETS or a separate instrument) aimed at curbing rising emissions from Energy from Waste.	2022
	Set a target for a 68% **recycling rate** by 2030 covering all wastes in England via the Environment Bill and announce new policies to meet this target. Northern Ireland to set a 70% target for 2030. Scotland and Wales to set new targets for 2030 that go beyond their 70% targets for 2025.	2021
	Composting facilities should be incentivised to install forced aeration as a method of reducing on-site emissions.	From 2022
	Mandatory **business food waste** reporting to be introduced by 2022, building on WRAP's existing voluntary scheme.	2022
	Legislate for (in England via the Environment Bill, and in Wales, Scotland, and Northern Ireland via new legislation) and implement a **ban on landfilling of the main biodegradable waste** streams from 2025 (both municipal and non-municipal). There must be sufficient recycling/composting/AD treatment capacity made available before the ban comes into force, so that significant increases in energy-from-waste are avoided.	2021
	Long-term plans should be announced for eventual **diversion of all wastes from landfill** (except for where no alternative treatment or disposal method exists) but with a date conditional on sufficient action on reduction, re-use and recycling, and installation of CCS at energy-from-waste plants, to avoid a surge in fossil emissions when the ban comes into force.	Mid-2020s
	Introduce policies and funding for increased **methane capture and oxidation at landfill sites**, to decrease fugitive landfill methane emissions significantly.	2022
	Phase out **exports of waste** by 2030 at the latest, through improvements in waste prevention and domestic recycling and recovery, while strengthening tracking and enforcement to ensure that any exports intended for recycling are being treated appropriately.	2020s
Greenhouse gas removals and offsets	Build on the recently commenced innovation programmes (with BEIS), the Direct Air Capture and other Greenhouse Gas Removals Competition and UK Greenhouse Gas Removal Demonstration Programme, to support both the **demonstration and commercialisation of more advanced greenhouse gas removal** technologies (taking these from technology readiness level 5 to 8), and alongside undertake research and development into less advanced removal approaches including through pilots and field experiments.	Now and ongoing
	Align with adaptation policies to ensure long-term **resilience and effectiveness of GGRs** in the face of climate impacts and exploit potential for co-benefits (e.g. choice of tree species, protecting new infrastructure from flood risks).	Before 2025
	Consider (with BEIS) the appropriate regulatory arrangements, rules and guidance for the use of **carbon offsetting by UK corporates** within their Net Zero strategies, recognising the growing demand for offsetting markets, the interactions with the UK ETS and currently accredited schemes (i.e. the Woodland Carbon Code and the Peatland Code), and the need to avoid double-counting or negative outcomes for non-carbon objectives.	2021-22

Table A5 Recommendations for the Department for Environment, Food and Rural Affairs (Defra)		Timing
Resource efficiency	Step up efforts to deliver the **waste prevention and resource efficiency** improvements required as part of the pathway to Net Zero, including by:* • Accelerating delivery of the Waste Prevention Programme so that key policies, such as Extended Producer Responsibility and new product standards, are on track to be in place well before 2025. • Setting out how levels of resource efficiency improvements identified within the Industrial Decarbonisation Strategy will be delivered. • Beginning to develop and implement any additional policies needed to deliver these resource efficiency improvements, by the end of 2022. • Ensure cross-departmental working, potentially through new cross-Whitehall governance focused on resource efficiency.	Spring 2022 Priority recommendation (end 2022 for additional policies)
	Consult on detailed proposals for **product standards and extended producer responsibility** to improve the resource efficiency of consumer goods' lifecycles. The proposals should include all consumer goods with high environmental impact and cover how products are made, through indicators such as the level of recycled content and critical material content, and the repairability, durability and upgradability of a product.	Spring 2022
	Develop policies (with BEIS, MHCLG and DfT) to drive more **resource-efficient construction** and use of existing low-carbon materials, including a substantial increase in the use of **wood in construction**. Policies should include: • Reviewing and clarifying the position of structural timber in the ban on combustible materials, underpinned by further research and testing where necessary, and ensuring there are no barriers to the safe use of timber in buildings. Buildings safety regulator to play a role in overseeing this on an ongoing basis. • The development of a fully funded policy roadmap on the use of timber, including policies to support the development of UK wood supply chains. • Finalising the reporting methodology for whole-life carbon standards. • Setting out a plan for phasing in mandatory whole-life reporting followed by minimum whole-life standards for all buildings, roads and infrastructure by 2025, with differentiated targets by function, scale, and public/private construction.	Spring 2022
	Work with business to encourage and enable consumers to share, lease and use products for longer whilst **discouraging 'disposable' business models.**	Spring 2022
Buildings and infrastructure	Make changes ahead of the next round of reporting under the **Adaptation Reporting Power** (ARP). When used effectively, the ARP can present updated risks and adaptation actions that allows for an assessment of preparedness of all infrastructure sectors and their interdependencies. In particular: • The next round of reporting must be mandatory. • The deadline for reporting must allow sufficient time for consideration of all the reports in the fourth UK Climate Change Risk Assessment, and the CCC's statutory assessment of progress on adaptation. • The list of organisations reporting should be expanded to ensure comprehensive coverage of critical infrastructure and services, such as canals and food supply chains, as recommended by the ARP3 consultation.	2023
	Work with the Environment Agency to set out the measures being taken to improve the uptake of **property-level flood resilience** (PFR) following stakeholder responses to its PFR call for evidence and consultation. This should include improved data collection to monitor progress. Plans for the new national flood risk assessment and 2025 long-term investment scenarios must ensure that the evidence they provide can be used to identify the most effective locations for PFR, and smart targets for their installation with timescales.	2022
	Work with **Port Operators and the British Ports Association** to ensure the format of reporting under the Adaptation Reporting Power is appropriate for port operators and that the right operators are being asked to report, as well as to identify what further support could be offered to enable more comprehensive reporting on adaptation by the ports sector.	2023
	Improve information sharing on climate risks to infrastructure interdependencies at a local level, especially for **electricity, digital and ICT networks**. As reported in our previous assessment in 2019, NAP actions to enhance arrangements for information sharing between local infrastructure operators and improve understanding of critical risks arising from interdependencies have not been completed. Defra's link with Local Resilience Forums is key, and BEIS and DCMS should engage with utility companies to encourage standardised benchmarking and data sharing on climate risks to electricity networks, digital & ICT.	Now and ongoing

Table A5 Recommendations for the Department for Environment, Food and Rural Affairs (Defra)		Timing
Waste and wasterwater	Work with the Environment Agency, Ofwat and other stakeholders to set out targets and supporting measures for **reducing water use by business**. This could be through ensuring that any water reduction targets linked to the Environment Bill include business as well as household water use, and responding to advice and recommendations from Defra's new Senior Water Demand Reduction Group.	2022
	Commit innovation funding to development and demonstration of novel **wastewater treatment** process that achieve a step change improvement in direct process emissions.	2022
	Outside of the municipal wastewater sector, incentivise **industrial wastewater plants** to reduce their process emissions.	From 2022

Table A6 Recommendations for the Department for Transport (DfT)		Timing
Cross-cutting	For the coming five-year period (2023-2028), DfT should outline appropriate actions in the next **National Adaptation Programme** to address the adaptation gap identified for the risks and opportunities in the CCRA for which it is the lead department (see Adaptation Report Annex).	2023 Priority recommendation
	Decisions on **investment in roads** should be contingent on analysis justifying how they contribute to the UK's pathway to Net Zero. This analysis should demonstrate that the proposals would not lead to increases in overall emissions. Wherever possible, investment in roads should be accompanied by proportionate investment in EV charging infrastructure and in active travel and public transport.	2021-22
	Develop policies (with BEIS, Defra and MHCLG) to drive more **resource-efficient construction** and use of existing low-carbon materials. DfT's focus should be on: • Finalising the reporting methodology for whole-life carbon standards • Contributing to a plan for phasing in mandatory whole-life reporting followed by minimum whole-life standards for all roads and infrastructure by 2025, with differentiated targets by function, scale, and public/private construction.	Spring 2022
	Ensure all departmental policy decisions, and procurement decisions, are consistent with the **Net Zero goal** and reflect the latest understanding of **climate risks.**	Now and ongoing
Electric vehicles	Develop a comprehensive policy package to **support the supply and uptake of EVs** to enable delivery of the 2030 phase-out of new petrol and diesel cars and vans. This will require: • Strong consumer incentives to purchase zero-emission vehicles, whether in the form of purchase subsidies or preferential tax rates and duties. These should be fair across consumer groups and scaled back as costs of EVs fall. • Introducing a zero-emission vehicle mandate requiring car manufacturers to sell a rising proportion of zero-emission vehicles (specifically, fully battery-electric vehicles), reaching nearly 50% by 2025 and 100% by 2030, with only a very small proportion of hybrids allowed alongside until 2035. This will benefit air quality and consumers, as well as greenhouse gas emissions. • Setting out ambitious UK regulations on new car and van CO_2 intensities to 2030, with more regular intervals than the EU's five years, requiring around a 55% reduction by 2025 and 97% by 2030.	Policy package: 2021 Support: Now and ongoing Priority recommendation
	Continue to support widespread deployment of **EV charging infrastructure**: • This should ensure it can support high EV uptake levels. Project Rapid has the right ambition for the strategic road network and should be developed into a full strategy for the 2020s and beyond. • Further investment is needed to support on-street and other urban charging solutions for those without off-street parking and destination charging. • Government should aim for there to be around 150,000 public charge points operating by 2025. These should be widely available across all regions of the UK. • Implement the recommendations of the EV Energy Taskforce, in particular improving the consumer charging experience and making smart-charging accessible, appealing and cost-effective for as many EV users as possible.	Now and ongoing Priority recommendation
	Produce a clear assessment of how best to re-use and **recycle EV batteries** and fund development of competitive, large-scale battery recycling facilities in the UK.	2021-22

Table A6 Recommendations for the Department for Transport (DfT)		Timing
Public transport and active travel	Strengthen support for, and provision of, schemes to support **walking, cycling and public transport** to reduce demand for higher-carbon travel: • Provision of infrastructure for active travel and other support schemes, as well as measures to make it less attractive to drive, are needed. • This should include maintaining positive behaviour shifts and addressing risks resulting from the COVID-19 pandemic. • Working across delivery bodies (e.g. local authorities) is critical.	2021-22 Priority recommendation
	Government should support the **public transport and shared mobility** sectors to recover from the COVID-19 pandemic: • Positive communications and messaging will be required to rebuild public confidence in the safety of public transport. • Financial support for the sector should be maintained while confidence and demand are rebuilt, to avoid the risk of operators cutting service provision. • Government should seek to reverse the increasing relative price advantage of car travel over public transport.	2021-22
	Set out a clear vision to deliver Net Zero in **rail,** and support Network Rail and other bodies in delivering the target to remove all passenger diesel trains by 2040. This should cover a mix of zero-emission technologies (e.g. track electrification, battery-electric, hydrogen and hybrid trains). The strategy should be published by 2021 as recommended by the National Infrastructure Commission.	2021
	Mandate a **phase-out** of new sales of all **diesel buses and coaches** by 2040 at the latest. • This should include a requirement for new sales of diesel vehicles operating on shorter, urban routes to end considerably sooner. • Local authorities should be empowered to continue driving zero-emission bus take-up and to deliver improvements to bus services.	2021-22
Freight and off-road mobile machinery	Implement large-scale **trials of zero-emission HGVs** in the early-2020s to demonstrate the commercial feasibility of these technologies and establish the most suitable and cost-effective technology mix.	Early 2020s
	Set out and implement a **strategy to transition to zero-carbon freight**, including: • Ending sales of new diesel HGVs by 2040 at the latest. • Stronger purchase and other incentives for zero-emission HGVs. • Infrastructure plans and support (e.g. ultra-rapid chargers for battery-electric HGVs and hydrogen refuelling stations for hydrogen HGVs). • Clean air zones.	2021
	Implement schemes to **reduce HGV and van use** in urban areas (e.g. e-cargo bikes and use of urban consolidation centres), to reduce traffic and improve the safety of active travel.	2021
	Set out a strategy for decarbonisation of **off-road mobile machinery** and work with industry to identify potential policies to increase uptake of low-carbon off-road mobile machinery. This will require work across BEIS, MHCLG, DfT and Defra.	2021
Shipping	Build on the **Clean Maritime Plan** and formal inclusion of international shipping in CB6 and Net Zero to set a Net Zero 2050 goal for UK shipping (including international shipping) and a pathway to get there.	2021
	Take a leadership role in working with the **International Maritime Organisation** (IMO) and other willing partners on global shipping policies, research funding, tighter efficiency targets and other initiatives to reduce shipping emissions. Work to strengthen the IMO 2050 global target.	2021-22
	Commit to the UK's first **clean maritime cluster(s)** operating at commercial scale (supplying at least 2 TWh/year of zero-carbon fuels) by 2030 at the latest, with zero-carbon fuels expanding to 33% of UK shipping fuel use by 2035.	2021-22
	Continue **innovation and demonstration support for zero-carbon fuel** technologies and their use in shipping, and ship efficiency measures. Develop incentives for zero-carbon ammonia and hydrogen supply chains.	Early 2020s
	Provide support for ports' investment in **shore power** and electric recharging infrastructure.	Early 2020s
	Start monitoring **non-CO_2 effects** of shipping and decide on how best to tackle them alongside UK climate targets.	2021

Table A6 Recommendations for the Department for Transport (DfT)		Timing
Aviation	Commit to a Net Zero goal and pathway for UK aviation as part of the forthcoming **Aviation Decarbonisation Strategy**, with UK international aviation reaching Net Zero emissions by 2050 at the latest, and domestic aviation potentially earlier. Plan for residual emissions (after efficiency, low-carbon fuels, and demand-side measures) to be offset by verifiable greenhouse gas removals, on a sector net emissions trajectory to Net Zero.	2021 Priority recommendation
	Assess the Government's **airport capacity strategy** in the context of Net Zero and any lasting impacts on demand from COVID-19, as part of the aviation strategy. There should be no net expansion of UK airport capacity unless the sector is on track to sufficiently outperform its net emissions trajectory and can accommodate the additional demand. A demand management framework will need to be developed (by 2022) and be in place by the mid-2020s to annually assess and, if required, control sector GHG emissions and non-CO_2 effects.	2021-22 Priority recommendation
	Take a leadership role within the **International Civil Aviation Organisation** (ICAO), and work with other high-ambition nations, to set a long-term goal for aviation consistent with the Paris Agreement, strengthen the CORSIA scheme and align CORSIA to this long-term goal.	2021-22
	Continue innovation and demonstration support for **sustainable aviation fuel** (SAF) technologies, aircraft efficiency measures, hybrid, full electric and hydrogen aircraft development and airspace modernisation. Set out a policy package for supporting the near-term deployment of commercial SAF facilities in the UK (with carbon capture and storage where applicable). Longer-term, support for SAF should transition to a more bespoke, enduring policy to drive uptake.	Now and ongoing Policy package in 2021
	Use **aviation tax reform** to address price imbalances between aviation and surface transport, encouraging the low-carbon alternative (e.g. rail) for journeys where one exists. Taxation should also be used, alongside improvements in broadband, to embed positive behaviours that have arisen during the pandemic (e.g. replacing business travel with online networking).	2021-22
	Commit to not use credits from the **Carbon Offsetting and Reduction Scheme for International Aviation** (CORSIA) for flights covered by the UK ETS unless and until they can satisfy strict eligibility criteria (equivalence, additionality, permanence, sustainability).	2021-22
	Start monitoring **non-CO_2 effects** of aviation (including through CORSIA for eligible aeroplane operators), set a minimum goal of no further warming after 2050, research mitigation options, and consider how best to tackle non-CO_2 effects alongside UK climate targets without increasing CO_2 emissions.	2021-22

Table A7 Recommendations for the Ministry of Housing, Communities and Local Government (MHCLG)		Timing
Cross-cutting	Support **local government** to play a full role in the Net Zero transition, including through increased resourcing, guidance, involvement in local area energy plans, statutory reporting on the emissions from their estate and reforming the planning framework to enable delivery of low-carbon and climate resilient measures. This is likely to require additional funding for staffing and resources for local delivery plans, alongside a 'duty to collaborate' to encourage authorities to work with local, regional and national partners to deliver their climate ambitions.	2021-23 Priority recommendation (funding for local areas at next budget)
	Ensure that **adaptation is integrated** into major upcoming policies in the next two years related to the priority CCRA3 risks for which MHCLG has lead responsibility, coordinating work with other relevant departments as necessary: • Risks to human health, wellbeing and productivity from increased exposure to heat in homes and buildings (with DHSC). • In addition, for the coming five-year period (2023-2028), MHCLG should outline appropriate actions in the next National Adaptation Programme to address the adaptation gap identified for the risks and opportunities in the CCRA for which it is the lead department (see Adaptation Report Annex).	By 2023 Priority recommendation
	Working with BEIS, DWP, DfE and the Home Office, develop a strategy for a **Net Zero workforce** that ensures a just transition for workers transitioning from high-carbon to low-carbon and climate-resilient jobs, integrates relevant skills into the UK's education framework and actively monitors the risks and opportunities arising from the transition. This strategy should include the development and roll-out of plans for training and skills, with buildings and manufacturing being priority areas.	2021 Priority recommendation
	Ensure that developments and infrastructure are compliant with **Net Zero** and appropriately **resilient to climate change** through proposed amendments to the Planning Bill.	2021-22
	Introduce an **urban greenspace** target to reverse the decline and ensure towns and cities are adapted to more frequent heatwaves in the future and that the 25-Year Plan goals are met.	2022
	Ensure all departmental policy decisions, planning decisions and procurement decisions, are consistent with the **Net Zero goal** and reflect the latest understanding of **climate risks.**	Now and ongoing
Flooding	Ensure that all types of current and future **flood risk** are included in policies to assess flood risk to new developments. Housing targets for local authorities should take account of flood risk, amongst other environmental issues. Assessments and management of flood risk in new developments must as a minimum: • Include evidence that the development will be safe over its full lifetime, with a consideration of the downstream interactions and impacts of new developments (i.e. it should not increase flooding in other areas). • Include an assessment of current and future flood risk under both 2°C and 4°C global climate scenarios. • Assess and manage the risk of flooding to local infrastructure as well as housing. • Include a consideration of better preparedness as set out in the Government's recent FCERM Policy Statement. • Ensure there are properly funded and trained staff in local authorities.	2022
	To help improve the **information on SuDS and surface water flood risk**, urgently begin collecting data on sewer capacity and SuDS location, type and capacity. This would bring the level of information in line with that for river and coastal flood risk defences.	2021
	To address the issue of increased risk of **surface water flooding** in new developments, commit to ensuring that new developments do not put more water into the public sewers than what was there before, taking into account climate change. To incentivise this, end the automatic right to connect to the public sewer; planning reforms should enact Schedule 3 of the Flood and Water Management Act (2010); and technical SuDS standards should be made mandatory and be updated to deliver SuDS that provide multiple economic, social and environmental benefits.	2022
	The **consultation process for surface water flood risk** must be improved. This should be done by adding statutory consultees for all development type and sizes. Consultees must have the appropriate skills to provide advice on surface water flood mitigation. Ensure that Local Authorities fully justify planning decisions where applications can proceed either without or going against formal flood risk mitigation advice.	2022

Table A7 Recommendations for the Ministry of Housing, Communities and Local Government (MHCLG)		Timing
Buildings	Implement a **strong set of standards – with robust enforcement** – that ensure both new and existing buildings are designed for a changing climate and deliver high levels of energy efficiency and low-carbon heat. Including: • Publish robust definitions of the Future Homes Standard and Future Buildings Standard which are legislated in advance of 2023 and ensure no fossil fuels are burnt in new buildings. This must include coordination with DfE, MoJ, DHSC as well as BEIS and HMT. • Regulate the overheating requirement as set out in the Future Buildings Standard consultation. Expand the requirement to cover refurbishments of existing buildings and conversions of non-residential buildings to residential. • Work with BEIS on the Heat and Buildings Strategy and use standards to set a clear direction for retrofit across the buildings stock. • Ensure that the remit of the new buildings safety regulator covers climate change mitigation and adaptation, strengthened through an explicit responsibility for sustainability; and is fully equipped to monitor and enforce compliance with buildings standards. • Work with HM Treasury to ensure that local authorities are properly funded to enforce buildings standards. • Close loopholes allowing homes to be built which do not meet the current minimum standards for new dwellings. This includes provisions around the expiry of planning permission and permitted development rights relating to change of use. Make accurate performance testing and reporting widespread, committing developers to the standards they advertise.	2021-22 Priority recommendation
	Develop and implement plans to make all **public-sector buildings and vehicle fleets** within the department's remit zero-carbon in the long term, switching to ultra-low emission vehicles by 2030 and halving emissions from public buildings by 2032. This must be part of a coherent cross-government strategy including an updated set of Greening the Government commitments, multi-year spending commitments and annual reporting.	2021-22
	Implement improvements to the **Energy Performance Certificate** (EPC) and **Standard Assessment Procedure** (SAP) framework, including: • Ensuring EPCs drive deployment of the necessary energy efficiency measures and do so on a holistic basis to address overheating, ventilation, and moisture-risk. • Supporting delivery objectives across both energy efficiency and low-carbon heat, and valuing properly the benefits of low-carbon and flexible technologies. • Formally integrating a forward trajectory for declining grid carbon-intensity, in line with Government projections. • Addressing wider issues of quality/robustness, with a commitment to integrate in-use performance metrics from 2023. • Plans for the future role of Green Building Passports.	2022
Construction	Step up efforts to deliver the **waste prevention and resource efficiency** improvements required as part of the pathway to Net Zero, including by: • Setting out how levels of resource efficiency improvements in construction identified within the Industrial Decarbonisation Strategy will be delivered. • Beginning to develop and implement any additional policies needed to deliver these resource efficiency improvements, by the end of 2022. • Ensure cross-departmental working, potentially through new cross-Whitehall governance focused on resource efficiency.	Spring 2022 Priority recommendation (end 2022 for additional policies)
	Develop policies (with BEIS, Defra and DfT) to drive more **resource-efficient construction** and use of existing low-carbon materials, including a substantial increase in the use of **wood in construction.** Policies should include: • Reviewing and clarifying the position of structural timber in the ban on combustible materials, underpinned by further research and testing where necessary, and ensuring there are no barriers to the safe use of timber in buildings. Buildings safety regulator to play a role in overseeing this on an ongoing basis. • The development of a fully funded policy roadmap on the use of timber, including policies to support the development of UK wood supply chains. • Finalising the reporting methodology for whole-life carbon standards. • Setting out a plan for phasing in mandatory whole-life reporting followed by minimum whole-life standards for all buildings, roads and infrastructure by 2025, with differentiated targets by function, scale, and public/private construction.	Spring 2022
	Set out a strategy for decarbonisation of **off-road mobile machinery** and work with industry to identify potential policies to increase uptake of low-carbon off-road mobile machinery. This will require work across BEIS, MHCLG, DfT and Defra.	2021

Table A8 Recommendations for the Department for Digital, Culture, Media and Sport (DCMS)		Timing
Cross-cutting	Support BEIS in developing a **public engagement strategy** for Net Zero which builds on the findings of the UK Climate Assembly by involving people in decision-making, providing trusted information on decarbonisation choices and the need to reduce emissions and adapt to climate change. The strategy should also identify preferred policy options to empower people to contribute fully towards the path to Net Zero.	2021-22 Priority recommendation
	For the coming five-year period (2023-2028), outline appropriate actions in the next **National Adaptation Programme** to address the adaptation gap identified for the risks and opportunities in the CCRA for which it is the lead department (see Adaptation Report Annex).	2023 Priority recommendation
	Work in partnership with Ofgem to publish and implement a new **Smart System Plan** and **Energy Data and Digitalisation Strategy**, including on cyber-security, in order to continue to unlock the full benefits of electricity system flexibility. Ensure that, alongside smart standards for heating, all electricity users have access to half-hourly metering and the option of tariffs that encourage flexibility in use of electric heat and electric vehicle charging.	2021
	Ensure **sport and culture strategies** align to other departments' plans for lower-carbon buildings, more active travel and improved public health.	2021
	Ensure all departmental policy decisions, and procurement decisions, are consistent with the **Net Zero goal** and reflect the latest understanding of **climate risks.**	Now and ongoing
Digital infrastructure	Ensure plans for a **digital transition and fibre roll-out** can complement changing work patterns and travel behaviours, leading to lower-carbon working. Co-ordinate with DfT to invest in digital infrastructure to lock in positive behaviours that reduce travel demand (e.g. home-working).	2021
	Resilience standards for the digital sector must include requirements pertaining to climate change risks. In addressing the National Infrastructure Commission recommendations from the Resilience Study, Government should incorporate consideration of climate change risks and adaptation actions into any new standards being developed. Standards for digital infrastructure operators should include requirements to: • Assess climate risks under both 2°C and 4°C global climate scenarios. • Consider interdependencies with other critical infrastructure, and • Set out actions to reduce risk and monitor progress.	2022
	Improve information sharing on climate risks to infrastructure interdependencies at a local level, especially for **electricity, digital and ICT networks**. As reported in our previous assessment in 2019, NAP actions to enhance arrangements for information sharing between local infrastructure operators and improve understanding of critical risks arising from interdependencies have not been completed. Defra's link with Local Resilience Forums is key, and BEIS and DCMS should engage with utility companies to encourage standardised benchmarking and data sharing on climate risks to electricity networks, digital & ICT.	Now and ongoing

Table A9 Recommendations for the Department for Education (DfE)		Timing
	Working with BEIS, DWP, MHCLG and the Home Office, develop a strategy for a **Net Zero workforce** that ensures a just transition for workers transitioning from high-carbon to low-carbon and climate-resilient jobs, integrates relevant skills into the UK's education framework and actively monitors the risks and opportunities arising from the transition. This strategy should include the development and roll-out of plans for training and skills, with buildings and manufacturing being priority areas.	2021 Priority recommendation
	Support BEIS in developing a **public engagement strategy** for Net Zero which builds on the findings of the UK Climate Assembly by involving people in decision-making, providing trusted information on decarbonisation choices and the need to reduce emissions and adapt to climate change. The strategy should also identify preferred policy options to empower people to contribute fully towards the path to Net Zero.	2021-22 Priority recommendation
	For the coming five-year period (2023-2028), DfE should outline appropriate actions in the next **National Adaptation Programme** to address the adaptation gap identified for the one risk in the CCRA for which it is the lead department (see Adaptation Report Annex).	2023 Priority recommendation
	Develop and implement plans to make all **public-sector buildings and vehicle fleets** within the department's remit zero-carbon in the long term, switching to ultra-low emission vehicles by 2030 and halving emissions from public buildings by 2032. This must be part of a coherent cross-government strategy including an updated set of Greening the Government commitments, multi-year spending commitments and annual reporting.	2021-22
	Ensure all departmental policy decisions, and procurement decisions, are consistent with the **Net Zero goal** and reflect the latest understanding of **climate risks.**	Now and ongoing

Table A10 Recommendations for the Department for Work and Pensions (DWP)		Timing
	Ensure all departmental policy decisions, and procurement decisions, are consistent with the **Net Zero goal** and reflect the latest understanding of **climate risks.**	Now and ongoing
	Working with BEIS, DfE, MHCLG and the Home Office, develop a strategy for a **Net Zero workforce** that ensures a just transition for workers transitioning from high-carbon to low-carbon and climate-resilient jobs, integrates relevant skills into the UK's education framework and actively monitors the risks and opportunities arising from the transition. This strategy should include the development and roll-out of plans for training and skills, with buildings and manufacturing being priority areas.	2021 Priority recommendation
	Design industrial decarbonisation policies to **support and create jobs**, especially in regions with reliance on industrial jobs.	Now and ongoing
	Develop and implement plans to make all **public-sector buildings and vehicle fleets** within the department's remit zero-carbon in the long term, switching to ultra-low emission vehicles by 2030 and halving emissions from public buildings by 2032. This must be part of a coherent cross-government strategy including an updated set of Greening the Government commitments, multi-year spending commitments and annual reporting.	2021-22

Table A11 Recommendations for the Department of Health and Social Care (DHSC)		Timing
	For the coming five-year period (2023-2028), DHSC should outline appropriate actions in the next National Adaptation Programme to address the adaptation gap identified for the risks and opportunities in the CCRA for which it is the lead department (see Adaptation Report Annex).	2023 Priority recommendation
	Assess **health sector vulnerability** to existing and future climate risks, particularly for care homes and home-based care. Following this, develop a cross-sector approach to address risks. This cross-sector approach should include input from DHSC, CQC, PHE, NHS, MHCLG and local level public health bodies.	2022
	Fund the strengthening and widening of vector and pathogen surveillance and early-warning mechanisms, due to the increasing risk of **disease spread** as a result of climate change and other factors.	Now and ongoing
	Develop and implement plans to make all **public-sector buildings and vehicle fleets** within the department's remit zero-carbon in the long term, switching to ultra-low emission vehicles by 2030 and halving emissions from public buildings by 2032. This must be part of a coherent cross-government strategy including an updated set of Greening the Government commitments, multi-year spending commitments and annual reporting.	Now and ongoing
	Support the **NHS** in delivering on its Net Zero plan.	Now and ongoing
	Take an active role in climate policy development that also has **health benefits**, such as active travel, access to green space, air quality, better buildings and healthier diets.	Now and ongoing
	Ensure all departmental policy decisions, and procurement decisions, are consistent with the **Net Zero goal** and reflect the latest understanding of **climate risks.**	Now and ongoing

Table A12 Recommendations for the Home Office and the Ministry of Justice (MoJ)		Timing
	For the coming five-year period (2023-2028), MoJ should outline appropriate actions in the next **National Adaptation Programme** to address the adaptation gap identified for the risks in the CCRA for which it is the lead department (see Adaptation Report Annex).	2023 Priority recommendation
	Home Office, BEIS, DWP, DfE and MHCLG, should develop a strategy for a **Net Zero workforce** that ensures a just transition for workers transitioning from high-carbon to low-carbon and climate-resilient jobs, integrates relevant skills into the UK's education framework and actively monitors the risks and opportunities arising from the transition. This strategy should include the development and roll-out of plans for training and skills, with buildings and manufacturing being priority areas.	2021 Priority recommendation
	Develop and implement plans to make all **public-sector buildings and vehicle fleets** within the department's remit zero-carbon in the long term, switching to ultra-low emission vehicles by 2030 and halving emissions from public buildings by 2032. This must be part of a coherent cross-government strategy including an updated set of Greening the Government commitments, multi-year spending commitments and annual reporting.	2021-22
	Ensure all departmental policy decisions, and procurement decisions, are consistent with the **Net Zero goal** and reflect the latest understanding of **climate risks.**	Now and ongoing

Table A13 Recommendations for the Ministry of Defence (MoD)		Timing
	Ensure all departmental policy decisions, and procurement decisions, are consistent with the **Net Zero goal** and reflect the latest understanding of **climate risks.**	Now and ongoing
	Develop and implement plans to make all **public-sector buildings and vehicle fleets** within the department's remit zero-carbon in the long term, switching to ultra-low emission vehicles by 2030 and halving emissions from public buildings by 2032. This must be part of a coherent cross-government strategy including an updated set of Greening the Government commitments, multi-year spending commitments and annual reporting.	2021-22
	Assess the potential for **alternative fuels** (such as low-carbon electricity, hydrogen or bioenergy) to be used for land vehicles, ships and aircraft, and consider opportunities to support wider use of low-carbon technologies in civil applications (e.g. through research or demonstration).	Now and ongoing

Table A14 Recommendations for the Office of Gas and Electricity Markets (Ofgem)	Timing
Continue to support widespread deployment of **EV charging infrastructure**: • This should ensure it can support high EV uptake levels. Project Rapid has the right ambition for the strategic road network and should be developed into a full strategy for the 2020s and beyond. • Further investment is needed to support on-street and other urban charging solutions for those without off-street parking and destination charging. • Around 150,000 public charge points will need to be operating by 2025. These should be widely available across all regions of the UK. • Implement the recommendations of the EV Energy Taskforce, in particular improving the consumer charging experience and making smart-charging accessible, appealing and cost-effective for as many EV users as possible.	Now and ongoing Priority recommendation
Ensure all regulatory decisions, and procurement decisions, are consistent with the **Net Zero goal** and reflect the latest understanding of **climate risks**.	Now and ongoing
Develop mechanisms for strategic investment in coordination with BEIS to ensure that **electricity networks** can accommodate increased future demand levels, including large localised demand increases associated with electrification in manufacturing, transport and buildings, and that lack of network capacity does not cause delays in emissions reduction.	2023
Start a programme of research with BEIS to identify **areas which are unlikely to be suitable for hydrogen** (such that electrification and alternatives can be prioritised), **alongside priority candidate areas for hydrogen**. Distribution Network Operators should gather and share detailed information on network capacity (at least to substation level) to feed into this.	2021
Set out reforms to encourage the **utilisation of existing network capacity** and ensure that costs of local network upgrades are shared fairly and do not disincentivise the roll-out of low-carbon technologies.	2021
Work in partnership with BEIS to publish and implement a new **Smart System Plan** and **Energy Data and Digitalisation Strategy**, including working with DCMS on cyber-security, in order to continue to unlock the full benefits of electricity system flexibility. Ensure that, alongside smart standards for heating, all electricity users have access to half-hourly metering and the option of tariffs that encourage flexibility in use of electric heat and electric vehicle charging.	2021
Develop (with BEIS) a strategy to coordinate the development of **interconnectors**, connections for offshore wind farms and the enhancement of inter-area transfer capacity for the onshore network, ensuring cost-effective, timely delivery, bringing forward any legislation necessary to enable it.	H1 2022
Work with BEIS to make explicit how current and future policies will reduce emissions associated with **methane leakage** from the gas networks in a way that is consistent with the Sixth Carbon Budget.	2021

Table A15 Recommendations for the Water Services Regulation Authority (Ofwat)	Timing
Ensure all regulatory decisions, and procurement decisions, are consistent with the **Net Zero goal** and reflect the latest understanding of **climate risks.**	Now and ongoing
Include **decarbonisation** as one of Ofwat's core principles, to assist the water industry's goal of decarbonising by 2030, and the need to roll out advanced anaerobic digestion systems.	2021
Work with Defra, the Environment Agency and other stakeholders to set out targets and supporting measures for **reducing water use by business**. This could be through ensuring that any water reduction targets linked to the Environment Bill include business as well as household water use as well as responding to advice and recommendations from Defra's new Senior Water Demand Reduction Group.	2022

Table A16 Recommendations for the Office for National Statistics (ONS)	Timing
Review plan for improving **data collection** and statistical reporting for the purposes of monitoring and informing the low-carbon transition, as part of the broader work the ONS are already undertaking to improve the collection of climate-related data.	2022
Work with BEIS to put in place plans to collect and report data annually on **low-carbon heat networks**, specifically, the amount of heat delivered (split by DUKES consumption sector, i.e. Residential/Public/Commercial/Industry, and where possible, by source of heat supply).	2022
Improve the collection and reporting of **industrial decarbonisation data** to allow for progress to be monitored more effectively, particularly on energy and resource efficiency.	2022

Table A17 Recommendations for the Scottish Government		Timing
	Scale up delivery across all sectors in line with the ambition set out in the recent **Climate Change Plan Update.**	Now and ongoing
	Publish the finalised **Heat in Buildings strategy**. • This must include finalising the regulatory framework and role of different trigger points (including area-based plans), and setting in train the legislation needed to underpin these. • Consult on the trajectory of reform for metrics such as EPCs, to ensure they are robust and enforceable, fit for purpose to deliver the measures needed on a holistic basis, do not disincentivise low-carbon heat, integrate in-use performance metrics from 2023, and include plans for the future role of Green Building Passports. • Provide further detail on the ambition for heat networks and heat pumps over the coming decade, and determine how funding for energy efficiency and low-carbon heat will be allocated to meet strategic priorities.	2021
	Proposals in Scotland's Updated Climate Change Plan 2018-32 to set out a **route map for agricultural transformation** should be scaled up, with the development of environmental conditionality that incentivises emission reduction and carbon sequestration measures in the land sector that build towards Scotland's climate goals. It is essential that appropriate incentives are in place to drive early action, given the time (often decadal) needed for some measures to reduce and sequester carbon (e.g. afforestation and peat restoration).	2021
	Renew efforts to improve **recycling and resource efficiency**, including by: Bringing forward the planned circular economy package for legislating within the forthcoming Programme for Government. Putting in place the policy and support to ensure the 2025 targets (including the 70% recycling target) within the package are delivered, and setting new ambitious targets for 2030. Legislating to ban key biodegradable waste streams going to landfill from 2025, and ensuring this is delivered through increased resource efficiency and recycling.	2021
	Publish a strategy setting out how the Scottish Government will achieve a 20% reduction in **car-kilometres** by 2030 and deliver 20-minute neighbourhoods. This should be supported by: Continuing to strengthen schemes to support walking, cycling, and public transport. Investment in infrastructure connectivity to lock in positive behavioural changes that reduce travel demand (e.g. home-working). Supporting the public transport and shared mobility sectors to recover from the COVID-19 pandemic, including through recovery funding and positive communication and messaging.	2021
	Continue to support the expansion of Scotland's **public EV charge point network**, to ensure the EV transition works for all road users in Scotland.	Now and ongoing
	Maintain the provision of **interest-free loans** for EVs (now including second-hand EVs) on top of existing UK government grants. Plan for a transition to fiscally-neutral incentives as EV costs fall.	2021-22
	Taxation should be used, alongside improvements in broadband, to **embed positive behaviours** that have arisen during the pandemic, replacing business travel with videoconferencing and online collaboration.	2021-22
	Seek to address price imbalances between aviation and surface transport, once **aviation taxation** is devolved to Scotland, encouraging the low-carbon alternative (e.g. rail) for journeys where one exists.	2021-22
	Play a leading role in decarbonising the **shipping** sector by exploring opportunities to transition ferries operated by Transport Scotland to low-carbon energy and establishing appropriate business models to encourage their adoption.	Now and ongoing

Table A18 Recommendations for the Welsh Government		Timing
	Publish a new **Net Zero Delivery Plan** that sets out a long-term vision for meeting the Net Zero goal in 2050, with a particular focus on the Third Carbon Budget and beyond.	2021
	Publish a coherent, **long-term strategy for heat and energy** efficiency in Welsh homes and other buildings, setting a framework for progress in areas of devolved responsibility. As part of this, energy efficiency policy should be designed so as to ensure that funds go as far as possible in reducing the fuel poverty gap and improving the energy efficiency of homes, by focusing on the most cost-effective interventions (including upgrading homes to EPC B and EPC C where applicable).	2021
	Deliver on the priorities set out in Llbwyr Newydd to **reduce demand for higher-carbon travel**. This includes: • Delivering a better, more integrated, decarbonised bus system. • Developing a network of connected local routes for walking and cycling. • Investing in infrastructure connectivity to enable delivery of the ambition for 30% of the workforce to work remotely on a regular basis. • Supporting the public transport and shared mobility sectors to recover from the COVID-19 pandemic, including through recovery funding and positive communication and messaging.	2021-22
	Support delivery of a **charging network** that meets the ambition set out in the Electric Vehicle Charging Strategy, to ensure the EV transition works for all road users in Wales.	Now and ongoing
	The Welsh Government's second statutory decarbonisation plan (LCDP2), due out later this year, should set out policies to **accelerate afforestation rates** to deliver its share of the UK target to plant 30,000 hectares in 2025.	2021
	Build on strong progress made on **recycling and resource efficiency**, including by: • Implementing the policies set out in the recent 'Beyond Recycling' strategy. • Legislating and progressing towards the existing 70% recycling target, and set new ambitious targets for 2030. • Legislating to ban key biodegradable waste streams going to landfill from 2025, and ensuring this is delivered through increased resource efficiency and recycling.	2021

Table A19 Recommendations for the Northern Ireland Executive	Timing
Legislate a credible **long-term emissions reduction target** that is backed up by evidence on its deliverability and a clear plan for how it can be achieved in a way that is fair for Northern Ireland's citizens – the Committee previously advised that an 82% reduction on 1990 levels by 2050 is Northern Ireland's appropriate contribution to the Paris Agreement and the UK Net Zero goal.	2021-22
Publish a final energy strategy that sets out how Northern Ireland will achieve a **net-zero-carbon energy system** by 2050, in line with the pathways recommended in our December 2020 advice.	2021
Publish a coherent, **long-term strategy for heat and energy efficiency** in Northern Ireland's homes and other buildings; encompassing regulatory, policy and funding commitments to facilitate delivery. • The strategy should include a trajectory of regulatory standards for energy efficiency, supported by reforms to relevant metrics (such as EPCs) to ensure they drive the measures needed on a holistic basis and do not disincentivise low-carbon heat. Reforms should ensure metrics are robust and enforceable such that standards targeted are achieved in practice. • Publish proposals on the phase-out of fossil fuel heating, including standards to phase out the installation of new liquid and solid fossil fuel heating. Proposals should recognise the critical role of heat pumps and hybrid heat pumps in these homes, minimising the use of biofuels to reflect economy-wide needs.	2022
Consult on an ambitious trajectory of **new-build standards** uplifts, including ensuring all new homes are designed for a changing climate, are ultra-efficient and use low-carbon heating from 2025.	2021
Set out provisions to integrate a **post-CAP framework** that helps the land sector contribute to Northern Ireland's climate goals as soon as the climate legislation is introduced. This should include providing incentives for landowners and tenants to deliver low-carbon farming practices and change the use of land to reduce emissions and increase carbon sequestration.	2022
The Northern Ireland Executive should bring forward a **resource efficiency package** which matches the ambition of Wales and Scotland, including by: • Setting a target for 70% recycling across all wastes by 2030. • Policies to deliver such a target, as well as improving waste prevention and re-use. • Legislating to ban key biodegradable waste streams going to landfill from 2025, and ensuring this is delivered through increased resource efficiency and recycling.	2022
Strengthen support for and provision of schemes to support **walking, cycling and public transport** to reduce Northern Ireland's high levels of car-dependence: • Strengthen schemes to ensure access to local amenities without dependency on cars. • Invest in infrastructure connectivity to lock in positive behavioural changes that reduce travel demand, e.g. home-working. • Support the public transport and shared mobility sectors to recover from the COVID-19 pandemic, including through recovery funding and positive communication and messaging.	2021-22
Support the deployment of **public charge points** across Northern Ireland, to address the issue that Northern Ireland currently has the fewest EV charge points per capita of any of the UK nations.	Now and ongoing
Resume collecting and publishing **data on vehicle-kilometres** travelled by mode in Northern Ireland. This will help identify which actions are effective in encouraging modal shift away from car travel.	2021-22
Long-haul air passenger duty, which is devolved to Northern Ireland, should be increased at least in line with UK-wide long-distance APD, to better reflect the climate change impact of flying.	2021-22

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