PLANNING ACT 2008

THE INFRASTRUCTURE PLANNING (APPLICATIONS: PRESCRIBED FORMS AND PROCEDURE) REGULATIONS 2009

The Morecambe Offshore Windfarm Generation Assets

Written Representation of Spirit Energy Production UK Limited

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EN010121
Unique Reference: 20049981

Date	26 November 2024

1. Introduction

1.1 'Spirit Energy' is the trading name used by Spirit Energy Limited and its subsidiaries, including Spirit Energy Production UK Limited, a group which collectively conducts European oil and gas operations.

1.2 We are instructed by Spirit Energy (**Spirit**) in relation to the proposed development consent order application (the **Application**) made by Morecambe Offshore Windfarm Ltd (the **Applicant**) for the proposed Morecambe Offshore Windfarm Generation Assets (the **Project**).

1.3 Further to Spirit's Relevant Representation [**RR-077**] (**RR**), which provided background to Spirit's assets and operations, this Written Representation comprises an update on the status of Spirit's objection and further information to inform the Examining Authority's understanding of Spirit's concerns.

1.4 Spirit **maintains its objection** to the Application in its current form, in light of its unacceptable impacts on Spirit's assets and operations. In particular with respect to:

1.4.1 aviation related safety and consequential impacts on Spirit's operations;

1.4.2 shipping and navigational impacts within the vicinity of Spirit's offshore installations;

1.4.3 the implications with respect to Spirit's decommissioning activities and obligations; and

1.4.4 the implications of the Project with respect to Morecambe Net Zero (**MNZ**) and the UK's carbon capture utilisation and storage (**CCUS**) ambitions and targets.

1.5 The remainder of this Written Representation adopts the abbreviations and acronyms (and related definitions) in Spirit's response dated 8 October 2024 [**PD1-019**] to the Examining Authority's Rule 9 Letter dated 4 September 2024 [**PD-006**].

2. Aviation related safety

2.1 Spirit refers to its submissions at Part 5 of its RR. In summary, Spirit identified the following aviation related concerns.

2.1.1 A minimum 1.5 nautical mile (nm) "buffer zone" between the siting of wind turbines and the "active" AP-1, DP-1 and Calder "heli-decks" was inadequate for the purposes of ensuring safe helicopter arrivals and departures to and from (and between) its Affected Assets (as more particularly described in the RR).

2.1.2 The Applicant's assessment of the implications of helicopter flight restrictions (including daylight and visual flight rules (**VFR**)) that apply where there is the potential siting of wind turbines within proximity of oil and gas installations was not fit for purpose.

2.1.3 The consequence of the two preceding issues is significant implications for the safe operation of all of the Affected Assets and related uncertainty over Spirit's residual ability to comply with health and safety regulatory requirements.

2.1.4 The only way to effectively mitigate that safety risk whilst ensuring the continued operation of the Affected Assets (themselves of national significance) is for the Applicant to increase the "buffer zone" between the siting of wind turbines and the Affected Assets.

2.2 Spirit has (at its own expense) engaged the services of AviateQ International Limited (**AviateQ**), a global aviation consultancy, to provide specialist aviation assurance support to review the Applicant's proposals and, in light of those, determine the implications for safe continued operation of helicopter flights to, from and between the Affected Assets. The preliminary findings of AviateQ informed Spirit's submissions in its RR.

2.3 AviateQ is a global aviation consultancy company that offers credible aviation assurance, consultancy, and Aviation Technical Authority services to the offshore industry. They are known within the industry for their high standards and dependability undertaking numerous annual UK industry Search and Rescue (**SAR**) and Commercial Air Transport (**CAT**) audits on behalf of peer companies. AviateQ also run a Joint Oil and Gas Aviation Audit (JOGAA) programme covering all four major helicopter operators in the UK on behalf of multiple clients. AviateQ's team are qualified pilots and licensed aircraft engineers who have also received their Auditor and Lead Auditor training certificates. They have been assessed and certified as meeting the requirements of ISO 9001:2015 for their Quality Management System and the Provision of Aviation Consultancy services for customers globally by the British Assessment Bureau.

2.4 Following submission of Spirit's RR, and as specified at paragraph 5.5 and 5.44 of the RR, AviateQ has now carried out an updated assessment that draws on input from NHV, the operator of the helicopters that fly to and from the Affected Assets, and assesses the impact on helicopter flying operations assuming turbine tip heights of up to 310 metres (the **Updated AviateQ Report**).

2.5 The Updated AviateQ Report is enclosed at **Appendix A**.

2.6 Taking into account the findings in the Updated AviateQ Report, Spirit confirms that it maintains its aviation related concerns expressed in its RR and summarised at paragraph 2.1 above. It supplements those submissions as follows.

<u>Applicant's view of 1.5nm buffer (Visual Flight Rules)</u>

2.7 The Applicant's position is that a 1.5nm "buffer zone" between wind turbines and the "active" AP-1, DP-1 and Calder "heli-decks" provides a sufficient unobstructed airspace requirement to: a) safely descend on approach and land at offshore oil and gas platforms using visual flight rules (**VFR**); and b) safely depart offshore oil and gas platforms and achieve sufficient altitude in VFR. Indeed it is the Applicant's position that 1.26nm applies and thus the 1.5nm is a precautionary minimum obstacle free distance.

2.8 The assessment work carried out by AviateQ, as summarised at paragraphs 5.7 and 5.8 of Spirit's RR, has already demonstrated that 1.5nm is inadequate.

<u>3.9nm buffer (IFR)</u>

2.9 Spirit had identified in its RR (at paragraph 5.43) that at least 3.3nm of unobstructed airspace was required in Instrument Flying Conditions (**IMC**) based on the early work undertaken by AviateQ. However, as advised in paragraph 5.44 of the RR, Spirit identified that further work to be undertaken by AviateQ could demonstrate that an increased unobstructed distance was necessary in order to operate safely using Instrument Flight Rules (**IFR**).

2.10 At the time of writing the RR, AviateQ were completing a review of the helicopter analysis which has now concluded, with the results set out in the Updated AviateQ Report. This review highlighted that the One Engine Inoperative (**OEI**)take off profile had omitted to include the level of acceleration period required from take-off safety speed to achieve the best rate of climb speed required for the AW169 helicopter airframe. This has resulted in a change from the minimum distance of 3.3nm to an updated minimum distance of 3.9nm from existing infrastructure for IFR flying.

2.11 The Examining Authority is directed to Figure 14A of the Updated AviateQ Report (extracted below). The Examining Authority is also directed to pages 26 to 28, and page 31, of the Updated AviateQ Report for further technical justification.

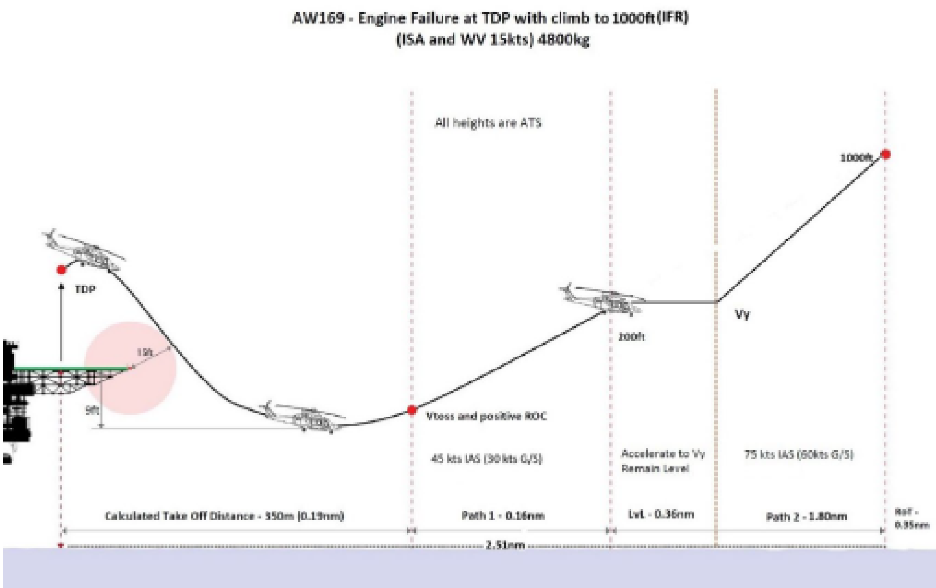


Figure 14A

AW169 Profile View Distance Required OEI Climb to 1,000ft

2.12 This figure summarises the AW169 profile distance requirements for OEI take off with climb to 1000 feet. The figure does not take into account a rate one turn distance of 0.35nm and 1nm legal obstacle clearance requirement which must be added to the profile distance of 2.51nm noted above. The total calculated unobstructed airspace when operating in IFR must be **at least 3.86nm**.

1.9nm buffer (VFR)

2.13 The Updated AviateQ Report demonstrates that, for the AW169 helicopter, there must be **at least 1.9nm** of unobstructed airspace when operating in VFR between wind turbines and any part of the Affected Assets[1].

2.14 At least 1.9nm would be the minimum safe distance in order to:

2.14.1 For arrival: ensure the helicopter positioning into the wind onto the Final Approach Sector and thereafter performing a stabilised landing onto the helideck. See Figure 8 of the Updated AviateQ Report.

2.14.2 For departure: accommodate an engine failure on departure from a helideck, accommodate an OEI climb to 500 feet in VFR as well as the turn away from the turbine array. See Figure 7A of the Updated AviateQ Report.

2.15 There are no operational mitigations which overcome the requirement for buffers for safe helicopter access and egress whilst maintaining compliance with regulatory requirements. Accordingly physical mitigation is required by increasing the distance between the turbines and the Affected Assets.

Analysis of buffer zones

2.16 The appropriate physical distance must be considered in the context of the wider implications of VFR only flying which, for the reasons that follow in this Written

[1] Airspace requirement calculations throughout this Written Representation are based on the helicopter model Leonardo AW169. Spirit also utilises the Leonardo AW139 model. However the AW139 model, having better performance capabilities than the AW 169 will be able to operate in the airspace that is required for the AW169 model. The Examining Authority is referred to page 31 of the Updated AviateQ Report.

Representation, materially compromise the operational efficiency of Spirit's operations with consequential (and potentially very severe) safety implications. As a result, there is a necessity for Spirit to retain the ability to fly at night and in restricted weather conditions – which requires operating using IFR.

2.17 It is acknowledged by the Applicant that a minimum buffer distance of 1.5nm is well under the minimum unobstructed airspace required to fly using IFR. Spirit's aviation technical authority also consider 1.5nm to be well under the minimum unobstructed airspace required to fly using VFR, with the UK North Sea Operators Group having reached agreement in February 2023 that, whenever wind turbines are located within 3nm of an offshore oil and gas facility, all flights to the facilities shall be restricted to VFR.

2.18 In short, with a 1.5nm or indeed a 1.9nm buffer, Spirit's helicopter operations will be constrained to VFR flying, which prevents night time flying (outside daylight hours conditions) and subject to restrictions on flying in certain weather conditions (IMC).

2.19 The Examining Authority is directed to paragraph 5.10 of Spirit's RR for further details of the flight restrictions. The safety and efficiency issues related to flight delays and cancellations associated with VFR only flying are set out in detail in the RR.

2.20 A VFR flying restriction is unacceptable for the reasons set out above. On the same basis, IFR must continue to be permitted. Thus to determine what is an acceptable minimum buffer zone between the Affected Assets and wind turbines, it is necessary to answer the following question: what is the minimum unobstructed airspace required to fly safely to, from and between the Affected Assets in IFR?

2.21 We refer to paragraph 2.17 which cites a minimum 3nm threshold agreed by the UK North Sea Operators Group. The Applicant will also be aware that the imposition of a minimum 3nm airspace requirement is now the subject of consideration by the UK Civil Aviation Authority (**CAA**). Based on its discussions with the CAA, Spirit understands that the 3nm restriction to aviation operations outside daylight hours will be secured by a regulatory change in 2025.

2.22 In summary, Spirit's aviation buffer requirements can be categorised as follows:

2.22.1 1.9nm - Minimum distance for safe CAT operations for both platform approach and OEI take off in VMC conditions using VFR; and

2.22.2 3.9nm - Minimum distance for safe CAT operations for both platform approach and OEI take off in IMC conditions using IFR.

Impact Analysis

2.23 The RR stated that if a wind farm was introduced within the minimum 3.3nm distance, then VFR only flying would cause the following delays and cancellations to Spirit's Central Processing Complex (**CPC**) and Normally Unmanned Installations (**NUIs**):

	CPC Delayed/Cancelled flights	**NUI Delayed/Cancelled flights**
Annual Average Loss	14%	23%
Winter Loss	24%	39%

2.24 This impact is considerably greater than the impact analysis that the Applicant has shared in its DCO submissions. This is despite the parties using the same historic flight, weather data, and flying restrictions.

2.25 Since Spirit's RR was submitted on 19 August 2024, Spirit has met with the Applicant to try and understand the differences in impact analysis, particularly the underlying assumptions that inform the findings.

2.26 It is Spirit's understanding that the differences can be attributed to differing inputs including:

2.26.1 Blackpool airport opening times;

2.26.2 daylight and darkness times;

2.26.3 wind speed and wave height; and

2.26.4 the use of a different calculation methodology.

2.27 As a result of this workstream, Spirit has undertaken to review and revise its impact analysis (as was set out more fully in Appendix D of the RR) to align, where reasonable, with the Applicant's base inputs. This includes by way of making updates to the daylight/darkness assumption to Sunset/Sunrise +/-45 minutes to allow for 15-minute flying time to/from Blackpool (compared to the previous assumption based on +/-30 minutes). Spirit has also committed to updating heliport opening hours to 0700-2100 to align with the Applicant's assumptions.

2.28 Wind speed and wave height have been tested and have been deemed to have such negligible impact that they will remain as they were. Spirit understands that the Applicant shares this view.

2.29 Initial work indicates that, even if Spirit adopt the aforementioned base assumptions preferred by the Applicant, the conclusions of the impact analysis would still differ from those identified by the Applicant, with much more severe implications for Spirit's operations. Spirit will share any updated impact analysis with the Examining Authority and the Applicant as discussions in this regard continue to evolve.

2.30 The remaining misalignment would appear to be in relation to the Applicant's assumptions around the way Spirit operates in the East Irish Sea, and the 'sectoring' calculation methodology used by the Applicant. This has allowed the Applicant to show a partial impact to a multi-legged flight, as opposed to treating the flight as a whole - which would in reality incur a much greater impact as a consequence of that 'partial' impact.

2.31 From discussions with the Applicant, Spirit is aware that its analysis splits flights into multiple sectors, representing individual trips and stops on the flight route. Conversely, Spirit's analysis treats each multi-leg flight plan as one flight as it is not possible to cancel separate sections of multi leg flights, or one sector of a multi sector flight. Any routing changes must be made prior to the aircraft's departure from Blackpool which will cause a further 1 hour delay for aircraft departure. It must follow that the Applicant's assumption is not correct and not a true representation of the aviation operations executed by Spirit in the East Irish Sea. Where Spirit will show a whole flight being impacted, the Applicant's analysis may only show half, or even less of the flight being impacted.

2.32 The impact on Spirit's normally unmanned installations (**NUIs**) is of particular concern as transport to NUIs require an early outbound flight and a late return flight to maximise offshore working hours. Delays in the morning, which may then be compounded by a much earlier end to the day due to night flying restrictions, may impede Spirit's operations to the point that the work is not possible to achieve in the time that remains. Accommodation at the NUI is limited to emergency overnight accommodation only.

2.33 For the purposes of this submission, a summary of the way Spirit operates (as described above) is illustrated at **Appendix B**.

2.34 Spirit has also taken the Applicant through the way Spirit's aviation operations are managed and has participated in a Q&A session.

2.35 Spirit understands from recent discussions with the Applicant that it is planning to revise its calculation methodology. Spirit awaits further information and is committed to reviewing the updated analysis from the Applicant when it is available (as well as updating its own to take account of the Applicant's preferred assumptions – see paragraph 2.27).

VFR Safety Implications

2.36 Whilst the precise extent of impacts is the subject of further assessment and discussion between the parties, what is clear is that there will still be a material impact in terms of delays and cancellations to flights.

2.37 As explained in paragraphs 5.17 to 5.42 of the RR, this has consequential implications for the safe operation of Spirit's assets in terms of transportation risk, emergency evacuation, non-emergency downmanning and enforcement risks. Spirit makes the following additional submissions in this regard.

Transportation Risk

2.38 Restrictions on Spirit's ability to access NUIs to complete scheduled Maintenance, Inspection and Testing (**MIT**) activities will have a direct negative impact on risk exposure to the personnel carrying out this maintenance.

2.39 Flight restrictions will shorten the productive working window on each platform, requiring a significant number of additional trips to complete scheduled MIT activities over the course of a year.

2.40 Each flight taken by personnel carries with it a quantifiable risk, and significantly increasing the number of flights required to deliver the current volume of MIT activity will therefore significantly increase personnel transportation risk. Risk tolerability limits are defined in the Health and Safety Executive publication 'Reducing Risks, protecting People'; commonly referred to as R2P2 {hyperlink: https://www.hse.gov.uk/enforce/expert/r2p2.htm}

2.41 Paragraph 128 of this document defines the upper acceptable limit of a risk of death to any individual per annum. This terminology has been translated across industry in Quantitative Risk Assessments (QRA's) as Individual Risk Per Annum (IRPA):

2.41.1 Each return flight between CPC and a NUI contributes to the Individual Risk Per Annum (**IRPA**) for each person on the intervention crew (this is the risk of fatality per year);

2.41.2 Personnel within the interventions team are already subject to the highest levels of Individual Risk of all worker groups due to the substantial contribution of in-field transport risk from regular intervention visits to the NUIs;

2.41.3 Increasing the total required interventions per team member would almost double their in-field transportation risk, and increase their overall IRPA by 15%.

2.42 Such a significant increase in transportation risk has the potential to present a significant regulatory challenge and burden on Spirit to demonstrate that risks remain As Low As Reasonably Practicable (**ALARP**), as further described in Part 4 of Spirit's RR. The additional risk exposure would also require submission of a material change to the Safety Case in accordance with the Offshore Installations (Offshore Safety Directive)(Safety Case etc) Regulations 2015. This would require acceptance by the Competent Authority – acceptance is not guaranteed, and the Competent Authority may require Spirit to explore other options to reduce transportation risk.

Emergency Evacuation

2.43 Under the Offshore Installations (Prevention of Fire and Explosion, and Emergency Response) Regulations 1995 (**PFEER**), Spirit is required to establish suitable arrangements that will ensure, so far as is reasonably practicable, the safe evacuation of all persons. In compliance with PFEER we have identified our preferred means of evacuation as the normal means of getting people to and from the installation – for all Morecambe Hub installations, this is helicopter transport.

2.44 Alternative means of evacuation are available by lifeboat to account for occasions where weather conditions or the nature of a major accident emergency makes helicopter evacuation impracticable. However evacuation by lifeboat exposes personnel to higher risks than the preferred means of evacuation by helicopter.

2.45 Furthermore, given the multi-jacket design of the CPC, helicopter evacuation is less likely to be impaired by a fire or explosion event than would otherwise be the case and would potentially remain a credible means of evacuation.

2.46 Restrictions that could compromise Spirit's ability to access offshore installations by helicopter have the potential to place a higher reliance on lifeboat evacuation than would otherwise be the case, and hence increase risks to personnel.

2.47 Spirit's acknowledges that national SAR provisions would not be affected but other helicopter operators are not guaranteed to respond, potentially delaying helicopter evacuation efforts and increasing likelihood of Offshore Installation Manager (**OIM**) opting for lifeboat evacuation.

Non-Emergency Downmanning

2.48 Spirit are reliant on helicopter transportation for the 'downmanning' of offshore installations. Put simply, in the event of significant health, safety or welfare issues, there are no other viable options to downman the asset.

2.49 The availability of national SAR services to support non-emergency downmanning has been explored by Spirit to mitigate risks associate with the Project. However, discussions with the SAR provider have confirmed that the service is designed to cover 'life and limb' emergencies only, and could not credibly be called upon for situations where there is no imminent threat to life.

2.50 Alternative means of evacuation by lifeboat are available for use in an emergency but these are only suitable for situations requiring rapid evacuation in response to an imminent threat to life e.g., hydrocarbon fire.

2.51 Under the Health and Safety at Work Act 1974, Spirit is required to reduce risks to the workforce so far as is reasonably practicable and the ALARP guidance published by the Health and Safety Executive builds on this general duty of care to provide the guiding principles for risk related decision making.

2.52 Under this framework, use of lifeboats to downman the installation in the event of a significant health, safety or welfare issue evacuation could not be demonstrated to be ALARP.

2.53 Restrictions that could compromise Spirit's ability to access offshore installations by helicopter would therefore severely limit its ability to downman a large population in a reasonable timeframe, extending their exposure to the health, safety or welfare threat.

3. Shipping and navigation impacts

3.1 Spirit refers to its submissions at Part 6 of its RR. In summary, Spirit identified the following shipping and navigation related concerns:

3.1.1 First, that the Project would increase the number of marine vessels in the vicinity of the Affected Assets and licensed blocks.

3.1.2 Second, that a lack of sea room will place restrictions on the use of larger vessels such as drilling rigs, crane barges and accommodation vessels.

3.1.3 Third, that there is a far higher risk of emergency production shutdowns due to vessels on collision course with platforms or breakdowns caused as a result of emergency shutdowns and waiting for repairs. In addition, there is the risks related to the displacement of third-party passing traffic towards Spirit's assets, increasing the traffic density and hence risk of collision.

3.1.4 Fourth, that there will be a new requirement for designated access paths and exclusion areas in addition to the 500m exclusion zone around each platform.

3.1.5 Fifth, that the protective provisions in Part 3 of Schedule 3 of the draft DCO [**PD1-002**] only secure a 1.5nm buffer between the "active" AP-1, DP-1 and Calder "heli-decks" (which may be removed or change location). A 1.5nm marine buffer zone must therefore be secured independently of any corresponding aviation related buffer zone.

3.1.6 Sixth, that wind turbines near Spirit's Radar Early Warning System (**REWS**) can interfere with its performance (with consequential risk to safe operations).

3.2 Spirit maintains its shipping and navigation related concerns expressed in its RR and summarised at paragraph 3.1 above. It supplements those submissions as follows.

<u>Temporary structures</u>

3.3 For the purpose of the RR and this Written Representation, reference to "wind turbine" shall be deemed to include any structure or vessel, temporary or permanent, placed in the advancement of the Project. Where Spirit requests distances or restrictions of a shipping and navigation nature, such distances or restrictions extend to temporary infrastructures (such as buoys or any other windfarm construction support vessels including jack up installation vessels) and not only to turbines.

<u>Collision risk and mitigation</u>

3.4 In terms of quantifying the collision risk and related mitigation requirements, it is informative to revisit a Vessel Collision Risk Assessment (**VCRA**) for the East Irish Sea installation located within Morecambe Hub Asset that was carried out by Spirit in 2021. The main objectives of the assessment were as following:

3.4.1 Identify the passing merchant vessel activity within 10nm of the installations;

3.4.2 Identify the fishing vessel activity in the vicinity of the installations;

3.4.3 Identify the infield vessel activity associated with the installations;

3.4.4 Estimate the vessel collision frequencies associated with the installations;

3.4.5 Estimate the consequences in terms of impact energy.

3.5 In addition a review of the effectiveness of Collision Risk Management and REWS system was undertaken together with site-specific inputs for the Morecambe Hub Installations, including the emergency response and rescue vehicle (**ERRV**) procedures.

3.6 This identified that an overall collision risk reduction of 64% was estimated, i.e., in 64 out of 100 scenarios, the ERRV will be effective in recovering an errant vessel on a projected collision course.

3.7 Existing annual passing powered collision frequencies for the Morecambe Hub Installations are noted below. This analysis was undertaken to understand annual collision frequency between offshore infrastructure and passing/drifting vessels in order to implement the appropriate collision mitigations by determining the level of risk and support vessels required to minimise this risk. Each offshore installation has an impact energy assessment with the maximum energy the infrastructure can withstand during the collision prior to catastrophic failure (MJ: Megajoules).

3.8 For the avoidance of doubt, the figures presented in the table are not individual risk to personnel, they are the predicted collision frequency for different vessels for each asset.

Platform	Annual Collision Frequency vs Impact Energy							Total
	0-5 MJ	5-10 MJ	10-15 MJ	15-50 MJ	50-100 MJ	100-200 MJ	≥ 200 MJ	
CPC	4.5E-09	9.1E-09	1.4E-08	1.4E-08	Negligible	Negligible	Negligible	**4.1E-08**
DP6	3.8E-07	7.6E-07	1.1E-06	1.1E-06	Negligible	Negligible	Negligible	**3.4E-06**
DP8	9.8E-09	2.0E-08	2.9E-08	7.1E-06	1.5E-05	2.4E-05	6.2E-05	**1.1E-04**
Calder	3.3E-09	6.6E-09	9.9E-09	3.0E-08	5.4E-08	7.7E-07	2.5E-06	**3.4E-06**
DPPA	4.0E-07	8.0E-07	1.2E-06	4.6E-06	2.3E-05	3.1E-05	5.2E-05	**1.1E-04**

3.9 The highest annual passing powered collision frequency associated with the Morecambe Hub Installations was therefore estimated to be 1.1 x 10-4 for the DPPA platform, corresponding to a collision return period of approximately **9,000 years**.

3.10 Annual passing drifting collision frequencies for the Morecambe Hub Installations is estimated to be 5.9 x 10-07 for the DP8 platform**,** corresponding to a collision return per approximately **4.1 million years**.

3.11 These rates reflect the fact that a drifting collision is generally a low probability event. However, when considered as a risk to people, a small collision risk can translate into a significant increase to individual risk to an already highly exposed workforce. The contribution to individual risk from ship collision events is calculated within the QRA using the ship collision impact frequency and fatality fraction for the given impact energy of each collision; currently the average contribution to IRPA from ship collision is 2.11E-05 and contributes from 15% to 46% to IRPA for different worker groups; the overall IRPA is therefore very sensitive to changes in merchant shipping density and proximity to our assets – any change in risk exposure will require a material change to the safety case. We will not be able to quantify or understand the full impact on individual risk from changes in shipping routes / shipping density without a detailed ship collision risk assessment being carried out to determine the ship impact frequency for the future routes and levels of shipping traffic, and an update of the QRA to assess the impact on IRPA for these impact frequencies.

3.12 There is no annual collision frequency evaluation similar to the above available in the Volume 5 Chapter 14 Shipping and Navigation, Appendix 14.1 Navigation Risk Assessment [**APP-073**] and Appendix 14.2 Cumulative Regional Navigation Risk Assessment [**APP-074**]. However Spirit note that the proposed offshore wind farm will impact the vessel traffic routes to/from the ports of Barrow, Heysham and Liverpool.

3.13 The majority of vessel routes from the Port of Liverpool will be directed further away from the existing Morecambe Hub Installations to the west. Thereby further reducing the likelihood of vessel collision with the offshore platforms outlined above.

3.14 Conversely, the commercial vessel routes to/from the Port of Barrow and Heysham will either be moved closer to the Morecambe Hub Installations, or re-routed to the east of the proposed windfarm array. Such scenarios has been evaluated under Section 8.3 of the Volume 5 Appendix 14.1 – Navigation Risk Assessment [**APP-073**] as a 'Barrow/Off Skerries TSS commercial route future case passage plan(s)'. However there are no regulatory requirements for commercial shipping to follow proposed routes. The corollary is that the vessel collision risk must be assumed to still exist in evaluating the Applicant's proposals.

3.15 With the traffic patterns in the East Irish Sea expected to change as a direct result of the proposed windfarm development, Spirit request that the Applicant conducts a similar VCRA to re-evaluate the above findings with up-to-date data accounting for the introduction of the proposed wind farm with further periodical re-evaluations following windfarm generation asset installation at least every 3-5 years to validate the traffic pattern developed in the Applicant and Spirit's VCRA.

3.16 As the changes are all required as a consequence of the Project, the costs for the updated analysis must be borne by the Applicant.

Aids to Navigation

3.17 The Calder 110/7a platform, located 0.9km to the western boundary of the windfarm site has an Aids to Navigation (**AtoNs**) marking with a white light displaying morse 'U'.

3.18 Spirit is the designated duty holder, and therefore operator, of the East Irish Sea fields including Calder, licenced by Chrysaor Resources (Irish Sea) Limited (a Harbour Energy plc group company). It is a duty holder obligation to maintain the offshore AtoNs and provide collision guard cover during the AtoNs non-availability and servicing period, including submission of PON10 notification (Petroleum Operations notice no.10 for reporting non-compliance with Consent Conditions under part 4A of the Energy Act 2008, including the failure of Aids to Navigation).

3.19 This cover is normally performed by Spirit's ERRV. However, with the ERRV being engaged in the ongoing monitoring of the REWS system, and specifically new limitations being imposed on the REWS system as a consequence of the Project, Spirit will no longer be able to continue to use the ERRV as a guard vessel cover. This will necessitate Spriit contracting an additional guard vessel for the period of the AtoNs failure or maintenance.

3.20 This impact is also as a direct consequence of the Project. Accordingly the costs for the contracting guard vessel must be borne by the Applicant.

Distances for Well Interventions

3.21 Whilst the need for coexistence between offshore wind farms and CO_2 storage facilities is accepted by Spirit, it is important to recognise the challenges that the presence of the Project may present for future (nationally significant) CCUS projects in this area. In particular, as part of an application for a Carbon Storage Permit for **MNZ**, Spirit as the Carbon Storage licence operator is required to submit an approved Monitoring Plan and an associated Corrective Measures Plan.

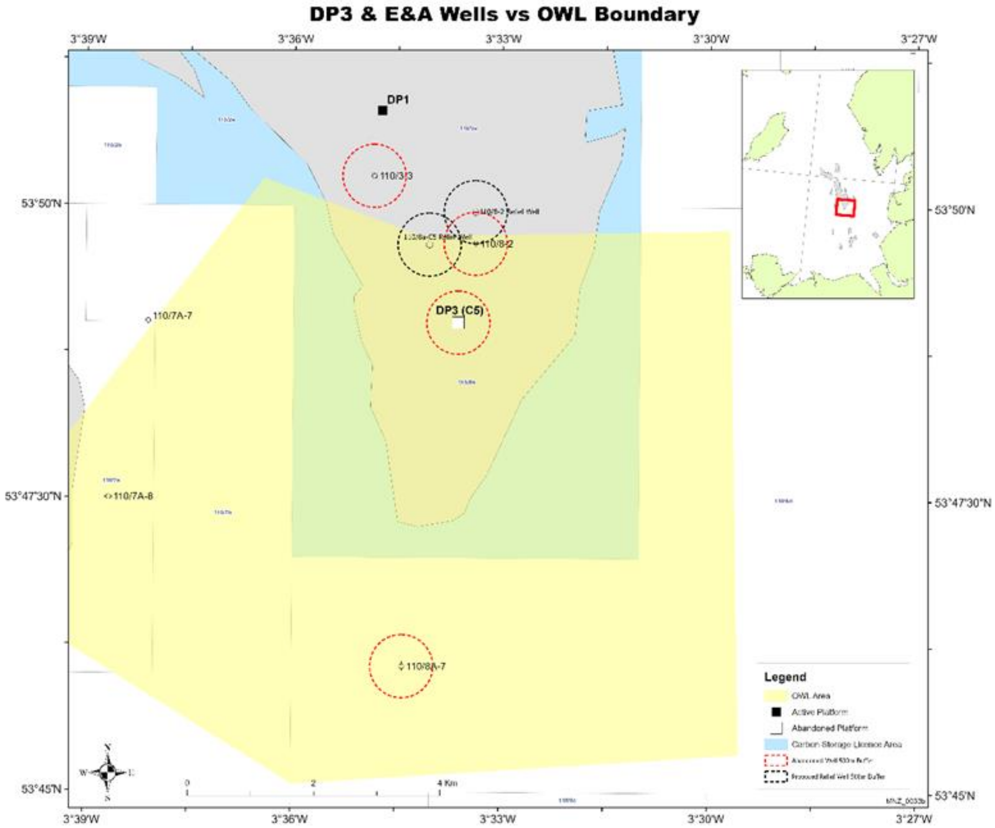
3.22 A Monitoring Plan commits the operator to repeated acquisition of various type of survey data to confirm the emplacement of the injected CO_2 in the subsurface conforms to operator's models and that the CO_2 is being contained within the storage site.

3.23 Spirit has identified three old exploration and appraisal wells and six abandoned development wells within the boundary of "Work No. 1" (Wind Turbine Generators and Inter-Array Cables) as shown on the Offshore Works Plan [**APP-007**].

3.24 All of these wells have been abandoned in line with current regulatory requirements. Integrity problems are therefore not anticipated. However, Spirit is obliged as part of its Monitoring Plan to monitor the area for potential leakage of CO_2 from the wells and to secure mitigation arrangements in its Corrective Measures Plan in order to address any CO_2 leakage that may occur.

3.25 As part of its Corrective Measures Plan, it may be necessary for Spirit to mitigate a CO_2 leakage from a legacy well due to elevated reservoir pressure from CO_2 injection. Spirit can control most of the wells by entering the well from above. However, for two wells (110/08-2 and development well C5) Spirit would need to drill a relief well from an offset location to enter the leaking well at a greater depth.

3.26 To repair a well in case of leakage (including wells 110/08-2 and C5) would require moving a mobile drilling rig over the well to re-enter it. During operations there would be a 500m exclusion zone around the rig (reflecting the circular dashed areas in the plan below). The 500m exclusion zones overlap with Work No. 1 as shown on the Offshore Works Plan [**APP-007**].



3.27 Whether Spirit is left with enough space between turbines for the exclusion zone will depend upon the precise location of the turbines relative to the wells and contingent on the rig being manoeuvred into position within the spacing of the wind turbines. This level of detail is not provided in Spirit's protective provisions (or elsewhere) in the draft DCO [**PD1-002**].

3.28 Well intervention must take into account the need for:

3.28.1 safe navigation of a self-elevating jack-up drilling rig and the towing vessel spread;

3.28.2 deployment of anchors for precise rig positioning;

3.28.3 as identified above, a 500m safety zone around the drilling rig; and

3.28.4 access corridors for offshore supply vessels and ERRVs.

3.29 The following distances are required based on operational requirements:

3.29.1 Rig Safety zone – 500m exclusion zone;

3.29.2 Rig access corridor – 1 nm (1.8km) wide to allow vessel spread of 3 x Anchor Handling Vessel (**AHVs**) / tugs and the rig to arrive to well location;

3.29.3 Unobstructed zone for deployment of anchors for positioning – 1790m minimum (noting that this is different to the decommissioning vessel and rig anchoring requirements for larger vessels in paragraph 5.4.2);

3.29.4 Supply vessel and ERRV access corridors – at least 2 x access/egress corridors each 1 nm (1.8km) wide to allow safety access and evacuation of the supply vessel and an ERRV.

3.30 The anchor deployment zone is based on Spirit's recent experience with Jack-up rig – Borr Ran performing decommissioning plugging and abandonment activities in the East Irish Sea. The rig anchor pattern consisted of 4 x anchors deployed to a distance of 500m from the rig positioned at the well centre. Taken together, the total distance requirements comprised: 500m anchor line distance + 90m average AHVs length + 100m work wire payout + further 1000m clearance for the vessel. Thus in total 1690m. That distance does not take into account anchor slippage where a further 100m length for a piggy back anchor may be required.

3.31 In addition, a rig positioned, for either an above well intervention or by an offset relief well, would still be subject to the significant aviation restrictions within the offshore wind farm area. See Part 2 (aviation related safety) of this Written Representation.

3.32 Enquiries regarding the use of Walk to Work (**W2W**) rather than using helicopters for crew change from the rigs in such circumstances have been made. However Spirit consider that the W2W vessel to rig interface is a significant challenge since very few W2W systems can reach the lower deck of a jack-up drilling rig. Thus the number of suitable W2W vessels is very limited and they may not be available when required.

3.33 An alternative would be to construct a lower access deck to interface with the W2W vessel. This would add cost and also add the time to design the deck, gain the rig's certifying authority's approval and to construct the deck. Whilst this was being done, any leak from a legacy well would continue.

3.34 In addition, the rig would have to have this activity included in its Safety Case, which would not be the case for many rigs. This would either greatly restrict the availability of a suitable drilling rig or would necessitate the lengthy process (over 6 months) to have a modified Safety Case prepared and accepted.

3.35 Using W2W rather than helicopters is a significant restriction and would also have consequences should emergency evacuation be required, delaying to unacceptable level the safe evacuation of the drilling rig in the case of an emergency. The alternative of using lifeboats exists but that cannot be a credible primary solution in the context of Spirit's Corrective Measures Plan.

3.36 For the foregoing reasons, Spirit consider that a standalone vessel collision strategy including vessel detection capability (REWS – see paragraph that follows) and rig emergency evacuation should be developed due to an inability to perform routine and unconstrained CAT operations within the windfarm array for rig personnel evacuation. Due to aviation restrictions, the rig's ERRV requirements should be reviewed and, potentially, a higher specification vessel and/or secondary ERRV vessel must be considered to support well intervention activities.

Radar Early Warning System

3.37 Spirit refer to paragraphs 6.18 to 6.21 of the RR which identifies impacts on Spirit's Radar Early Warning Systems (**REWS**).

3.38 REWS are critical radars installed onboard offshore oil and gas platforms to monitor nearby vessels to provide protection against collisions. Wind turbines near REWS can interfere with the system due to their large and varying returns, radar shadows and overloading of the track table.

3.39 The Applicant has attempted to assess the impact of the Project on REWS within Appendix 17.2 of its ES (PINS Document Reference: 5.2.17.2). Having reviewed this assessment, Spirit's technical team identified a number of incorrect assumptions which are considered to undermine the assessment and the extent of likely impacts on Spirit's REWS system and consequently the safety of its installation. These observations were summarised in Appendix E of the RR. Spirit would also direct the Examining Authority to its responses to the comments by the Applicant on Appendix E as set out in the Applicant's Response to Relevant Representations [**PD1-011**].

3.40 The REWS system is a critical system for the duty holder under Safety Case regulations to manage 'Major Accident Hazards' under the Offshore Installations (Offshore Safety Directive)(Safety Case etc) Regulations 2015. Such 'Major Accident Hazards' include which hazards involving the risk of collisions with passing and errant vessels. In addition, the REWS system is also used to assist in preventing damage to the subsea infrastructure including pipelines and cables.

3.41 Spirit has an installed REWS system based on the current area layout, traffic routes and without the Project south from south east of the CPC platform.

3.42 Due to close proximity of the windfarm and limitations outlined in the Appendix E of the RR, Spirit consider that this system would require significant upgrades with a solid state radar for an increased detection performance in poor weather conditions and for vessel detection within the windfarm array.

3.43 It is also recognised that current position of the REWS system on AP1 platform (part of the CPC) has no identified blind sectors (an area shadowed by another object that you cannot physically see an approaching vessel) within the proposed location of the windfarm array. Any or all blind sectors will be introduced by the Project.

3.44 As a direct result of the introduction of the proposed wind farm, the REWS system would require to be upgraded, including in respect of Automatic Identification System (**AIS**) equipment with a full integration of vessel target data into the REWS system in order to mitigate collision further by providing additional collision monitoring capability.

3.45 It is important to note that AIS is not a replacement for a radar system, which remains the primary sensor for collision avoidance for the following reasons:

3.45.1 AIS relies on active transmission of data;

3.45.2 AIS systems can be switched off, or may go off in the event of a loss of power on the vessel;

3.45.3 AIS may not be working;

3.45.4 AIS may have inaccurate information entered such as vessel position or heading;

3.45.5 AIS may be spoofed or falsely used;

3.45.6 AIS carriage requirements mean that AIS is not mandatory for vessels <300grt.

3.46 Furthermore, the UK Health and Safety Executive does not recognise AIS as a standalone system and it should be seen as complementing existing collision detection arrangements (i.e. radar), not replacing them.

3.47 The ongoing monitoring of the REWS is managed by the field ERRV which is manned for 24/7 operations with the watch keepers subject to required training. The current ERRV vessel manning is designed to support existing operations and the level of watch keeping requirements. However those requirements will have to be reviewed in order to account for additional monitoring of blind sectors inside the windfarm array.

3.48 In addition, Spirit Energy's Morecambe Hub asset consists of multiple NUI installations which are being guarded by the ERRV vessel where the vessel has to provide collision monitoring support simultaneously to up-to 4 x manned platforms (manned CPC and 3 x manned NUI platforms). Such vessel collision monitoring support may no longer be possible due to the physical limitations of the REWS system imposed by the windfarm array and ERRV's Automatic Radar Plotting Aid (ARPA) system capability.

3.49 Furthermore, vessel collision monitoring support is required in all environmental conditions for all offshore infrastructure (manned and unmanned installations) including environmental conditions which impact radar detection performance. As a result, the degradation of the REWS performance and additional demands on the ERRV's ARPA system has the potential to impact Spirit's ability to safely perform offshore operations.

3.50 During the main ERRV crew change periods every 28 days, the REWS monitoring is also being managed by the CPC platform, where additional manning and suitable training will be required due to imposed operational restrictions of the windfarm array. In the event of REWS system equipment failure and close proximity of the windfarm, the ERRV ARPA system will not be able to provide adequate coverage inside/outside windfarm array and Spirit may not be able to maintain its performance standard for vessel collision, and all other field NUI operations will be ceased. In such scenario, Spirit may have to shutdown offshore production operations and to demobilise all non-essential personnel from CPC platform until the system will be operational.

4. MNZ

4.1 As set out in paragraphs 3.6 to 3.9 of the RR, the Morecambe Hub fields will play a pivotal part in the UK's journey to net-zero. Once the gas fields have ceased natural gas production, repurposing the reservoirs and associated infrastructure for carbon storage is of paramount importance to ensure the UK can meet its Net Zero targets. As a result, Spirit's vision for repurposing of the fields has been endorsed by the UK Government through the award of Carbon Storage Licence CS010 in September 2023, pursuant to section 18 of the Energy Act 2008 (the **CS010 Licence**).

4.2 Spirit are obliged to carry out specific activities pursuant to its CS010 Licence issued by the North Sea Transition Authority (NSTA), including those associated with monitoring and corrective actions (the Examining Authority is directed to 3.21 to 3.36 of this Written Representation). Spirit must also comply with its obligations to undertake the project in accordance with *NSTA Stewardship Expectations* including Expectation 5: robust project delivery and preparation of a development plan which sets out the proposed optimised plan for the project development.

4.3 The OGA expects the operator to ensure that the front end preparation will secure maximum value to the CCUS project. This scope includes studying the project options including pipeline, cable routing and optimised offshore infrastructure locations to identify the optimised development and report the outcome to the OGA in an above-ground select phase report by mid-2025, and subsequently in a development plan in mid-2027. The front end preparation has identified the following effects of the Project on the CS010 development options:

4.3.1 **Pipeline routing** – due to the Project, Spirit would require the offshore CO_2 pipeline from the carbon source (Peak Cluster) to the MNZ store to be longer. That is because the pipeline cannot be laid via the shortest route to the preferred well location due to access restrictions i.e. not passing through the Project area. The effect of the Project is therefore an increase in the length of the CO_2 pipeline with associated increase in capital cost for material, pipeline installation (including cable crossing) duration and associated inspection and maintenance over the lifetime of the pipeline.

4.3.2 **Offshore facilities design** - the offshore CO_2 injection facilities will be located at the well location. The Project has an impact on the well locations which has an effect on the design of the offshore CO_2 injection facilities. As a result, Spirit may not be able to proceed with the most optimal location and design of its facilities. The outcome will be increased equipment requirements with associate capital costs. The increase in equipment has two subsequent effects. First, an increased jacket size to support the increase in equipment with associated increase in installation and inspect and maintenance capital and operational cost. Second, an increased power requirement with associated operational costs.

4.3.3 **Access to the offshore facilities during installation and operation** – a likely option for the location of the offshore CO_2 injection facilities is in the vicinity of the manned CPC. The Project has an effect on the access to the existing Central Processing Complex (as identified in the aviation and shipping and navigation sections of the RR and this Written Representation). A CO_2

injection facility would be subject to the same or similar limitations and associated consequences.

4.3.4 **Offshore surveys** - to inform the CO_2 facilities design and in advance of the submission for the development plan to the OGA, offshore surveys need to be undertaken. These are planned for 2025, 2026 and 2027. Given the location of the Project over the CS010 area, the construction and operations of the Project could significantly limit the access to the area.

4.4 The Examining Authority is directed to the following clause included in CS010:

Para 39. Without prejudice to clause 37 (Ministry of Defence) and clause 38 (Relationship with fishing industry), when planning any activity or operation under this licence, the Licensee shall ***take into consideration any activities being undertaken, or likely to be undertaken, in the licensed area or that impact, or are likely to impact, such licence activities or operations****.*

4.5 The Examining Authority is also directed to the following clauses included in CS010 which, as a consequence of the Project and its related implications identified above, may present particular challenges for Spirit:

Para 6.1 In respect of both the North Morecambe and South Morecambe potential storage sites, the Licensee shall by 30th June 2025 complete and submit to the OGA an above-ground select phase report including but not limited to:

a) a pipeline CO_2 transportation study evaluating the technical and commercial feasibility of an East Irish Sea storage cluster, including interconnectivity between the potential Morecambe Bay CO_2 storage project and the potential Liverpool Bay CO_2 storage project; and

b) a shipped CO_2 transportation study evaluating the technical and commercial feasibility of ship-borne transportation of CO_2 to the potential Morecambe Bay CO_2 storage project.

Para 9.1 By 31st December 2026…an outline concept-select assessment of the pipeline/transportation, facility and well options being considered, a forecast range of injection volumes during the operational term, and the associated carbon dioxide phase management engineering considerations. The timing of well abandonment and facility removal should be considered;

Para 10.2 Storage site(s) and complex(es) development plan; including the carbon dioxide pipeline/transportation and injection facilities.

5. Decommissioning

5.1 Spirit retains serious concerns regarding the Project's implications on the ability to perform safe and efficient decommissioning activities throughout the East Irish Sea, in accordance with its Seaward Production Licences with references P.251 (6 July 1976), P.1483 (13 June 2007) and P.153 (10 July 1972) (**SPLs**) and the Petroleum Act 1998. Specifically, Spirit maintains its concerns expressed at paragraph 7.1 of the RR and makes the following supplementary submissions.

<u>Increase in vessels and helicopters</u>

5.2 Decommissioning activities are currently being planned for the early to mid-2030's. It a requirement under the Petroleum Act 1998 for operators to fulfil decommissioning obligations in their entirety to allow the applicable licence block to be relinquished.

5.3 The number of vessels (transiting and undertaking decommissioning) in the vicinity during the period of decommissioning will increase above normal operations. Helicopter operations to conduct crew change on vessels would continue throughout. Relevant categories of vessels and associated time periods to enable decommissioning operations to be completed include:

5.3.1 **Rig/ barge P&A campaign** across all Morecambe hub assets (DP6, DP1, DP8, DPPA, Rhyl subsea have wells) to safely decommission wells, clean the platform topsides and pipelines. Duration of the campaign would be approximately 24 months (36 wells + weather). Personnel on Board (POB) ~125 crew changing via helicopter – every 2 weeks with ad-hoc flights depending on operational requirements.

5.3.2 **Construction preparation** using a construction support vessel, across all platforms to carry out preparation for removal activities, including activities such as separation of the topsides and jacket, installation of lifting points and sea-fastening to enable safe removal by a heavy lift vessel. Approximately ~3 months per asset – POB is not yet known but rotations by helicopter would be required throughout the year.

5.3.3 **Removal vessel campaign** across all assets (AP1, CPP1, DP1, FL1, DP6, DP8, DPPA) to undertake safe lifting and removal of topsides and jackets in a single lift, relocate to a barge and sail to a disposal location onshore. Duration assumed to be 1 month per asset (jacket & topsides together including any barge transfer) – POB is not yet known but rotations would be required by helicopter (Pioneering Spirit as an example can have a POB up to 571).

5.3.4 **Subsea removal campaign** across Morecambe assets to remove sub-surface structures (Rhyl) and complete pipeline decommissioning including any remediation.

5.3.5 **Additional vessels** such as ERRV and platform supply vessels (PSVs), and survey vessels used to undertake post-decommissioning surveys for pipelines and areas where infrastructure has been removed.

Access Restrictions

5.4 Although all wells require plugging and abandoning (P&A) within the Morecambe offshore area, the access to DP1 to undertake decommissioning of eight wells is directly impacted by the area of the proposed wind farm P&A using a rig or barge and associated access corridors for ERRV and PSVs would require the following:

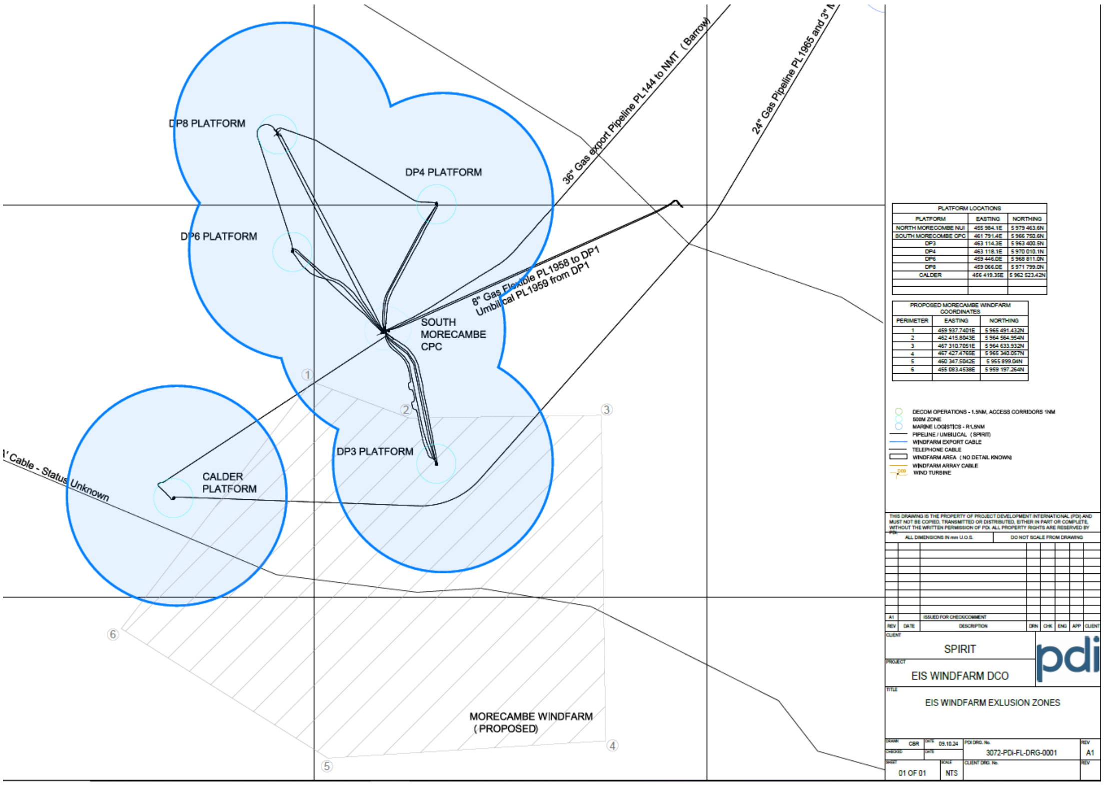
5.4.1 Rig access corridor required to be a minimum of 1 nm (1.8km) wide to allow vessel spread of 3 x AHVs/Tugs and the rig to arrive to DP1 location in the Central Processing Complex

5.4.2 Unobstructed zone for decommissioning heavy lift removal vessel and rig positioning including deployment of anchors required to a minimum of 1.5nm (2.8km) (noting that this is different to well access requirements in 3.29.3)

5.4.3 Supply vessel and ERRV access – at least 2 x access/egress corridors each a minimum of 1 nm (1.8km) wide to allow safety access and evacuation of the supply vessel and an ERRV.

Platform Removals

5.5 The Project has potential implications on the ability for heavy lift vessels to safely manoeuvre, resulting in specific access restraints to DP1, CPP1 and AP1 installations (i.e. the CPC). A minimum obstruction free radius of 1.5nm surrounding each platform to allow heavy lift vessels into position is required (see the figure below). Clear pathways are needed to allow for stand by and drift off positions and space for associated vessels (e.g. barges, tugs and/or anchor handlers) to operate safely in addition to the presence of the heavy lift vessel in the area.



5.6 Spirit considers that a lack of "sea room" will be one of the main impacts of the Project for vessels operating in support of Spirit's oil and gas activities placing restrictions on the use of larger vessels such as heavy lift vessels (the Pioneering Spirit as an example is 382m in length). Designated access paths and exclusion areas in addition to the 500m exclusion zone around each platform will be required for these vessels and the associated barges in order for Spirit to be able to safely remove assets and fulfil respective decommissioning obligations. If there is a situation (such as a mechanical failure, changing weather conditions or an operational change of plan) with the vessel still under command, the vessel would retreat to the standby position which would be at a safe distance and usually a drift off position, requiring appropriate sea room to be able to do so.

Flight Restrictions

5.7 Rotation flights to rigs to enable crews to change out would be applicable for P&A and removals vessels that are on location for long periods of time to undertake the work will be impacted by restricted ability to fly to the asset (requirement for an aviation buffer zone noted elsewhere) within the CPC area. The result of this will be delays or cancellations due to the restrictions that would be imposed. This could result in an extension to the overall decommissioning schedule. Spirit's initial assessment of the additional cost associated with these impacts has been assessed to be well in excess of £10 million.

Decommissioning obligations

5.8 The location of the Project prohibits completion of seabed verification clearance activities and impacts Spirit's ability to close out the decommissioning programmes. The decommissioned DP3 asset and pipelines are entirely within the proposed wind farm area. The infrastructure at DP3 has been removed, however buried pipelines remain *in-situ*.

5.9 Spirit is required to close out the decommissioning programme with OPRED by demonstrating the seabed is clear of oilfield debris that could present a snagging hazard to other users of the sea, such as fishermen. Within the proposed area, a 500m corridor either side of all pipelines, including those decommissioned, will be required. The activity to verify seabed will be conducted by a third party and will be undertaken alongside decommissioning of the whole Morecambe field once decommissioning is complete.

5.10 In addition, pipelines/ cables that have not yet been decommissioned and do not have an approved decommissioning programme, require a minimum of 500m either side of pipelines/cables to ensure safe access. Until an approved decommissioning programme is agreed with OPRED, it is not known what the decommissioning approach will comprise. However, over and above inspection surveys, there is the potential requirement for access to allow cutting, removal, dredging, removal of stabilisation such as mattresses and access to install rock protection.

5.11 Furthermore, post-decommissioning surveys are required in these areas for a period of time until the regulator, OPRED, is satisfied that these are no longer required (when any pipelines or material remaining *in-situ* no longer presents a risk to other users of the sea). Work within the wind farm development area (laying cables, surveys, for example) will need to demonstrate that it will not have an impact on Spirit's decommissioning obligations (for example, by operations negatively impacting Spirit's pipelines that remain *in-situ*).

6. **Supplementary Figures**

6.1 For the purpose of providing a visual aid to this submission, Spirit has prepared **Figure 1 of Appendix C** which shows existing offshore infrastructure in proximation to, and crossing, Spirit's assets in the East Irish Sea, including the windfarms either already constructed or proposed.

6.2 Spirit has further provided a visual indication of the measures requested in this submission in **Figure 2 of Appendix C**.

7. **Design Parameters**

7.1 The design parameters in Table 2 of Requirement 2 of Schedule 2 of the dDCO [**PD1-002**] for the maximum diameter of monopiles of 12m for the wind turbine generators on monopile foundation is 2m wider than the modelled turbine geometry used in the Appendix 17.2 Radar Early Warning System Technical Report [**APP-082**] for calculating shadowing effect and blind sectors for the Spirit Energy Radar Early Warning System installed on CPC platform offshore. The effect is being calculated using tower diameter of 10m and transition piece diameter of 10.3m outlined in the Figure 3.1 of the aforementioned report [APP-082]. However monopile foundations can be installed with the height of up-to 100ft above the sea level and the designed parameters for the diameter of monopiles is larger than tower/transition piece diameter. If the design parameters are 2m wider than the modelled turbine geometry then the shadow sectors may be larger than anticipated in the REWS study resulting in the reduced performance of our REWS system on CPC.

8. **Status of negotiations**

8.1 Since submission of its RR on 19th August 2024, discussions have been held with the Applicant as to the steps required to addressed Spirit's concerns. This has included discussions with respect to progressing the terms of revised protective provisions. Spirit have received details of the Applicant's legal advisors and contact has been made with a view to progressing protective provisions on all non-aviation related matters including shipping and navigation, MNZ and decommissioning matters. The terms of the protective provisions, and capacity for agreement, will be informed by ongoing technical discussions between the parties. However, it is expected that the content of this Written Representation, will provide the framework for the drafting and negotiation of protective provisions.

8.2 With respect to aviation, Spirit has particular concerns with respect to ensuring the continued safe and efficient operation of helicopter flights to, from and between its offshore installations. A meeting between the parties and its respective technical advisors was held on Thursday 31st October. Updated analysis from the Applicant is awaited.

8.3 Spirit's position is that there is a limitation on the parties ability to meaningfully negotiate aviation related protective provisions.

8.4 Spirit is engaging with the Applicant on Statements of Common Ground (SoCG). Spirit provided a response to the original SoCG drafted by the Applicant on 25 November 2024.

9. **Conclusion**

9.1 For the foregoing reasons, Spirit **maintains its objection** to the Application.

Eversheds Sutherland

26 November 2024

Appendix A

Updated AviateQ Report

AviateQ International Limited

CONFIDENTIAL

Morecambe Offshore Windfarm

Date:	**August 2024**
By:	**Ray Reynolds** **Nigel Blackstock** **Mike Reynolds**
Distribution:	**Spirit Energy** **Harbour Energy**

AVIATEQ INTERNATIONAL LIMITED, UK 28 AUGUST 2024

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1. TERMS OF REFERENCE

Spirit Energy operates manned and normally unattended installations in the Morecambe Bay area of the East Irish Sea. During the past decade, and in alignment with the United Kingdom Government objectives to develop renewable energies, the area has witnessed an extensive and ongoing development of windfarms.

Morecambe Offshore Windfarm Limited, a joint venture between Cobra Instalaciones y Servicios, S.A. (Cobra) and Flotation Energy Ltd., is planning the development of the Morecambe Offshore Windfarm. The earliest anticipated commencement of any construction is 2026.

Wind turbines will be constructed in closer proximity to the Sprit Energy operated Morecambe south central drilling, production and accommodation complex, CPC1, and the Harbour Energy owned Calder production platform, a normally unattended installation (NUI). Currently, the airspace surrounding these facilities is unobstructed allowing unrestricted access under Visual Flight Rules (VFR) or Instrument Flight Rules (IFR), day and night.

Recognising the need for co-existence and the potential of turbines to become obstacles in the current obstacle free environment, Spirit Energy (Spirit) contracted the independent services of AviateQ International Limited (AviateQ) to:

- Review the windfarm development plans and the proposed positioning of wind turbines in the vicinity of the CPC1 and the Calder;
- Taking into consideration Spirit's responsibilities associated with the operation of these facilities and the continuing need beyond 2026 for access by air in Leonardo AW139 and AW169 helicopters, determine the unobstructed airspace required to ensure continued safe Commercial Air Transport (CAT) helicopter access to the CPC1 and Calder; and
- Verify the airspace requirements.

2. SCOPE and CRITERIA

The scope and criteria are designed to take into consideration the relevant current and potential future regulatory and operational requirements that ensure the safe operation of helicopters to the Sprit Energy operated Morecambe South Central drilling, production and accommodation complex, CPC1, and the Harbour Energy owned Calder production platform, a normally unattended installation (NUI).

This encompasses flights to the CPC1 and Calder production platform during Visual Meteorological Conditions (VMC) and Instrument Meteorological Conditions (IMC) day and night. The following captures the key elements in broad outline:

- Commercial Air Transport Regulations
- Guidance from the UK Civil Aviation Authority
- UK Aircraft Operator Approved Operations Manuals (HOFO)
- UK Aircraft Operator Approved Standard Operating Procedures
- AW169 and AW139 Rotorcraft Flight Manual
- Minimum En-Route Requirements
- Minima for VFR Flights in Class G airspace

- UK Aircraft Operator Minimum Cloud Base Requirements / Proximity of an Array
- UK Aircraft Operator Minimum Horizontal Visibility Requirements / Proximity of an Array
- UK Aircraft Operator Minimum Horizontal Distances from Obstacles when in Instrument Meteorological Conditions
- Stabilised Approach Criteria
- Airborne Radar Approach (ARA) Criteria
- Circling Approaches off an ARA
- AW169 Elevated Helideck Continued Take Off Distances One Engine Inoperative (OEI)
- AW169 ARA Missed Approach OEI from the Missed Approach Point (MAPt)
- Circling Descent into an Embedded Facility
- Operating to Facility Adjacent to a Wind Farm Array
- Meteorological Data
- Effects of Turbulence

3. INTRODUCTION

Policy and guidance on issues associated with wind turbines and their effect on aviation that need to be taken into considered by aviation stakeholders, wind energy developers and local planning authorities are outlined in UK Civil Aviation Authority (CAP 764). First issued in July 2006, issue 6 dated February 2016 is currently undergoing a review and probable update. The scope of CAP 764 explains that the final decision regarding wind farm development rests with the stakeholders, developers and local authorities and since it is not possible or appropriate to prescribe a standard solution, specific cases need to be addressed on a case-by-case basis.

This approach has led to many case-by-case studies focusing on how close wind turbine assemblies can be located to offshore installations. Differences of opinion between those representing the oil and gas producers and those representing the wind farm developers have been evident. Additionally, differences in operating procedures and limitations between the major helicopter operators servicing the North Sea offshore industry (North Sea Operators) have also been evident.

This report, initiated in November 2022, was not compiled in isolation. The major UK North Sea Helicopter Operators providing offshore aviation support services to the oil and gas industry set up a working group (NSHO WG) towards the end of 2022 to discuss the issue of operating in the vicinity of wind farms. The purpose of the working group is to finally agree on and where necessary revise Standard Operating Procedures (SOPs) for adoption by all UK offshore helicopter operators when supporting the oil and gas industry. Aware of progress being made by the NSHO WG, the opportunity was taken to meet with the respective NSHO WG representatives, individually, to present the approach being taken by AviateQ. These meetings confirmed that AviateQ was in alignment with current industry thinking and in certain areas was ahead in determining the dimensions of the airspace as reflected in the diagrams contained in this report.

This report does not address the Point-in-Space (PinS) concept of operating helicopters based on Global Navigation Satellite System (GNSS) enhanced by Satellite Based Augmentation Systems (SBAS) permitting flight in Instrument Meteoritical Conditions (IMC) to and from specific way points. While in development in some onshore locations in Europe it is anticipated that PinS offshore the UK will take significant investment and detailed research before being considered; external factors such as the potential effect of turbine rotor discs on satellite signals being amongst them. Helicopters fitted with advanced on-board avionics which are compliant with the technical system requirements needed to fly these new procedures with very high accuracy (RNP1/RNP0.3/RNP APCH) within 1.0/0.3 nautical miles on either side of the nominal flight path need to be able to achieve this accuracy at least 95% of the time. The current airspace requirement for an Airborne Radar Approach (ARA) is that there are no obstacles within 1 nautical mile either side of the approach path.

At the time of the issue of this report, the NSHO WG was continuing with its joint review of SOPs covering flights over, into and in the proximity of wind farm arrays / turbines. This includes trials in flight simulators and the analysis of Helicopter Flight Data Monitoring (HFDM) data which is estimated to take between 6-12 months to complete. The NSHO WG has yet to agree and finalise the minimum airspace requirements which will be passed to the UK CAA for possible inclusion in CAP 764. Changes to future SOPs may well have an impact on the airspace requirements identified in this report especially when considering larger helicopter types such as the Sikorsky S92A which will call for longer distances when taking off from an elevated offshore helideck in the event of an engine failure just after the take-off decision point.

Whilst best endeavours have been made when calculating the minimum required airspace distances in this report, these distances may well prove to be different to those finally adopted by the UK North Sea Helicopter Operators and by the UK CAA for inclusion as guidance in CAP 764.

Revision 2 of this report was issued due to changes in the minimum distances required for both the VFR and IFR operations on the AW169. During discussions with the current helicopter operator to verify the accuracy of the information within the report it came to light that AviateQ had failed to include the level acceleration from Vtoss to Vy in the departure profile. This portion of the take-off profile is not illustrated on the profile diagram within the Rotorcraft Flight Manual nor is it mentioned in the description of the continued OEI take-off profile, it is only addressed in the Performance section of the RFM. This has now been corrected in Revision 2 of the report.

4. ASSUMPTIONS

4.1 Meteorological Data

a) The Met Ocean weather data used, obtained by Harbour Energy from Viasat, was forwarded to AviateQ via Spirit Energy. The data covered the period from 2017 to 2022 and averaged out over the 5-year period indicated a prevailing wind from 210° at 15 knots. This value has been used throughout this report.

4.2 Helicopter Types and Performance

a) The primary helicopter operating offshore in the East Irish Sea supporting Sprit Energy is the Leonardo AW169 with the AW139 as a backup. Given that the performance of the AW139 is superior to the AW169, all performance calculations have been based on the AW169 Rotorcraft Flight Manual to ensure that the airspace requirements would be suitable for both aircraft types.

b) All performance calculations are based on the AW169 Performance Class 2e (PC2e) with zero exposure.

c) For the continued take off following an engine failure at the Take off Decision Point (TDP) when departing an elevated helideck, the First Sector climb performance is based on the AW169 2.5-minute One Engine Inoperative (OEI) rating until reaching a height of 200ft. Thereafter, the Maximum Continuous OEI Rating has been applied. Meteorological conditions are based on ISA (15°C) and a 15kt headwind.

d) The Maximum All Up Weight (MAUW) of the AW169 is 4,800kgs.

e) The undercarriage of the AW169 is locked down and has extended sponsons for the life rafts.

f) For helicopter types such as the Sikorsky S92A which have not been included in this study, the distance taken up during an OEI continued take off from an offshore elevated helideck will be far more than the distance required for the AW169.

4.3 Day VFR Operations

a) Unobstructed VFR corridors leading towards oil and gas facilities in the operating area will be oriented 210° into the prevailing wind.

b) The transit height for helicopters overflying windfarm arrays is a minimum of 500ft above the rotor tip of the highest turbine in the overflight area.

c) When remaining clear of cloud and in sight of the surface in accordance with VFR requirements, the minimum vertical distance between the helicopter and the cloud base has been set at 100ft.

d) The Final Approach Sector (FAS) leading up to the Stabilised Approach Point (SAP) has been set at 1nm for standardisation although some pilots may elect, due to wind conditions, to intercept the FAS at a point closer than 1nm.

e) The maximum groundspeed during the final approach is 80kts. With a headwind of 15kts the time taken to cover the 1nm leading up to the SAP is 55 seconds.

4.4 Day and Night IFR Operations

a) The current requirement for aircraft to remain clear of all obstructions by 1nm either side of the Final Approach Track when conduction an Airborne Radar Approach will apply equally to significant structures such as wind turbines as it does for transiting vessels, temporary jack-ups or fixed platforms.

b) Unobstructed IFR corridors leading towards oil and gas facilities in the operating area will be oriented 210^{0} into the prevailing wind.

4.5 VFR and IFR Scenarios Evaluated

The following scenarios have been evaluated to determine the required unobstructed airspace requirements:

i. VFR – Dimensions of a VFR access corridor permitting a 180° Rate One turn withing the confines of the corridor. (Section 7.2)

ii. VFR - Accessing a facility in the centre of a HPZf via a VFR corridor and positioning for an approach with the wind from any direction. (Section 8.2)

iii. VFR - Engine failure after take-off from a facility with OEI climb to 500ft followed by a Rate One turn. (Section 8.3)

iv. VFR – Accessing a facility located adjacent to a wind farm array with the turbines positioned on one side. (Section 8.4)

v. VFR - Overflying a wind farm array to access a facility in the centre of a HPZf without a VFR corridor, conducting a circling descent and positioning for an approach with the wind from any direction. Additionally, following an engine failure after take-off from the facility to climb to 500 t followed by a circling climb to 1,500ft to exit the HPZf and transit on only one engine over the windfarm array. (Section 8.5)

vi. IFR - ARA approach to enter a HPZf via a 2 nautical mile wide corridor oriented into the prevailing wind. (Section 9.2)

vii. IFR – Engine failure at the ARA Missed Approach Point with OEI climb in IMC to 1,000ft followed by a Rate One climbing turn to reach MSA before exiting via the ARA approach corridor. (Section 9.5)

viii. IFR - Engine failure after take-off from a facility with OEI climb in IMC to 1,000ft followed by a Rate One climbing turn to reach MSA before exiting via the ARA approach corridor. (Section 9.6)

ix. IFR - Positioning overhead a facility inside a HPZf and executing a letdown procedure within the confines of the unobstructed airspace to setup an ARA, initially joining the Final Approach Track at a defined distance from the facility with the wind from any direction. Additionally, an engine failure after take-off from the facility with OEI climb in IMC to MSA and transit on only one engine over the windfarm array. (Section 9.4)

5. AIRCRAFT OPERATOR STANDARD OPERATING PROCEDURES – LIMITATIONS

5.1 Wind Turbines Near Oil and Gas Facilities

The UK North Sea Operators working group participants reached agreement during February 2023, concluding that:

1. Whenever wind turbines are located within 3 nautical miles of an offshore oil and gas facility (including visiting mobile units fitted with helidecks), all flights to the facilities shall be restricted to Day Visual Flight Rules (VFR) only.
2. The cloud base for Day VFR flights to such facilities shall not be lower than 700ft Above Mean Sea Level (AMSL).
3. The horizontal visibility in the operating environment shall not be less than 5km.
4. All air corridors must be direct, straight line of sight without any bends. (Possibly being reassessed).
5. The Stabilised Approach Point (SAP) shall be 0.5nm from the destination helideck.

5.2 Flying Within and Adjacent to Windfarm Arrays

Aircraft service providers operating into windfarm array areas can be described as those supporting:

i. windfarm construction and maintenance; and

ii. non windfarm related activities such as oil and gas.

Pilots flying aircraft in support of windfarm construction and maintenance could be considered as experienced in flying amongst turbine towers with the associated movement of the turbine blades as they are exposed to such as a matter of routine. They will also be familiar with overall array areas and the routes used. Some of these operators use a distance of 0.3nm as the "stabilised" point on the approach to the helideck.

Pilots flying aircraft primarily to oil and gas facilities do not normally fly into windfarm arrays and those who do operate into these areas tend to do so on an infrequent basis. Operating procedures when flying into oil and gas facilities outside, inside and adjacent to a wind farm array need to be standardised for these pilots with, for example, the Stabilised Approach Point being set at a minimum distance of 0.5nm from the facility.

6. AIRSPACE REQUIREMENTS

6.1 Helicopter Protected Zones (HPZs)

Access to and from non-wind farm related facilities need to be conducted in unobstructed airspace thereby ensuring the safety of offshore Commercial Air Transport (CAT) by helicopter, thus protecting the passengers and crew and potentially third parties in the vicinity. The unobstructed airspace requirement can be broken down into different "zones" namely the arrival and departure zone and the zone around the facility whether this be a fixed platform or a mobile unit servicing a subsea well. These zones are referred to in this report as Helicopter Protected Zone - Corridor (HPZc) and Helicopter Protected Zone - Facility (HPZf).

Helicopter Protected Zones (HPZs) comprise of a horizontal and vertical airspace component with the dimensions of each of the components depending on the type of flying activity. For operations at night in poor weather conditions the dimensions of the HPZ are understandably greater than that required for daytime only operations.

6.2 Wind Turbines

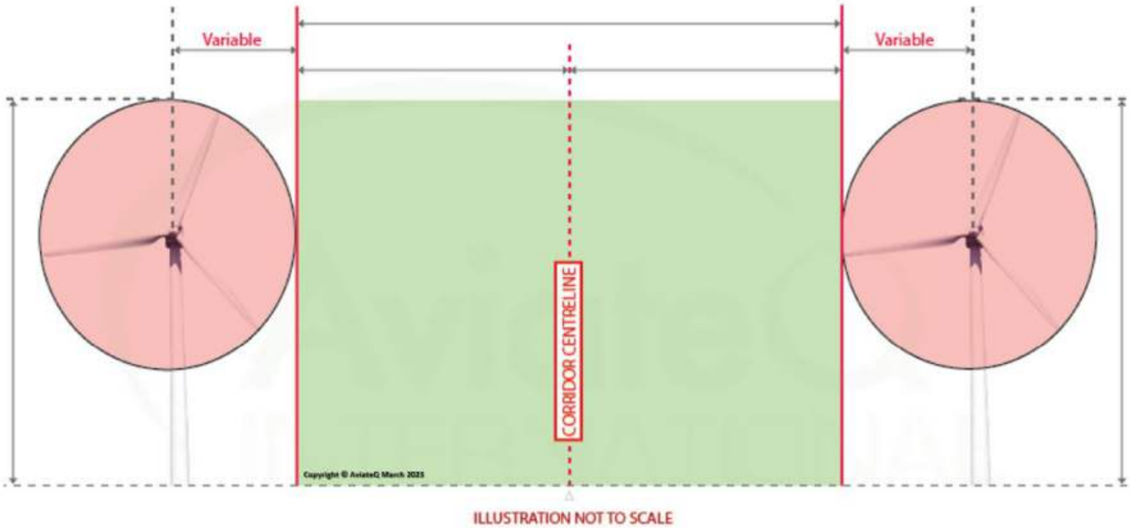
The size of offshore horizontal-axis wind turbines (HAWT) varies with the radius of the rotor blade being one of the driving factors when determining the height of the supporting tower. Turbines installed offshore are usually three bladed. The rotor blades are attached to the main rotor shaft (hub) located at the top of the tower. The hub is installed on a yaw system which is used to orientate the blades into wind.

6.3 Helicopter Protected Zones - Corridor (HPZc)

To access a facility inside a wind farm array a Helicopter Protected Zone Corridor (HPZc), free from all obstructions, must be provided. The dimensions of the HPZc depends on whether the flying activity will be conducted day only in Visual Meteorological Conditions (VMC) or day and night in Instrument Meteorological Conditions (IMC).

6.4 Positioning of Turbine Towers

The orientation of the turbine rotor disc (rotating blades) is normally influenced by changes in wind direction. To guarantee that Helicopter Protected Zones (HPZs) remain free of any obstructions, the positioning of the turbine tower must be such that the rotor tips of the rotor blades must not penetrate the HPZ irrespective of the orientation of the rotor disc.



It is therefore the length of the rotor blade fitted to a tower which determines how close the tower can be constructed to an HPZ. **See Figure 1.**

Figure 1
Unobstructed Helicopter Protected Zone Corridor (HPZc) Relative to Turbine Blades

Aircraft operators have determined that provided the main rotor hub is visible, not being able to see the top of the rotor blades should not prove problematic.

7. DAY VFR OPERATIONS

7.1 Day VFR Requirements

The helicopter operator currently providing services to Spirit Energy requires a flight visibility of 5km and has accepted a minimum cloud base of 700ft.

7.2 Helicopters Turning Around in a HPZc

In the event of an abnormal or emergency situation arising whilst enroute, the pilot may need to execute a 180^0 turn inside the corridor. The space required is determined by calculating the radius of the turn which depends on both the rate of turn (bank angle i.e. how quickly the heading changes) and the airspeed. When airspeed increases the turn radius increases. When the rate of turn increases, the turn radius decreases. Typically, the AW169 cruises at 125kts, just over 2nm per minute. Irrespective of the type of event, the airspeed would need to be reduced to execute a safe turn in the corridor.

7.3 Calculating the Radius of Turn

An accepted formula, r= V²/g tan Ø, where:

r = radius of turn (m)
g = 9.81 m/s²
V = True airspeed (kt)
Ø =Angle of bank (°)

Based on an airspeed of 80kts and a 15^0 angle of bank (Rate One Turn -3° per second based on autopilot function) the radius of turn would be 647m (0.35nm). As can be determined from ***Figure 2*** below, the turning circle requires a minimum distance of 1,295m. Allowing for an obstacle clearance requirement of 500ft (153m) either side of the corridor equates to an overall unobstructed corridor width of 1,600m.

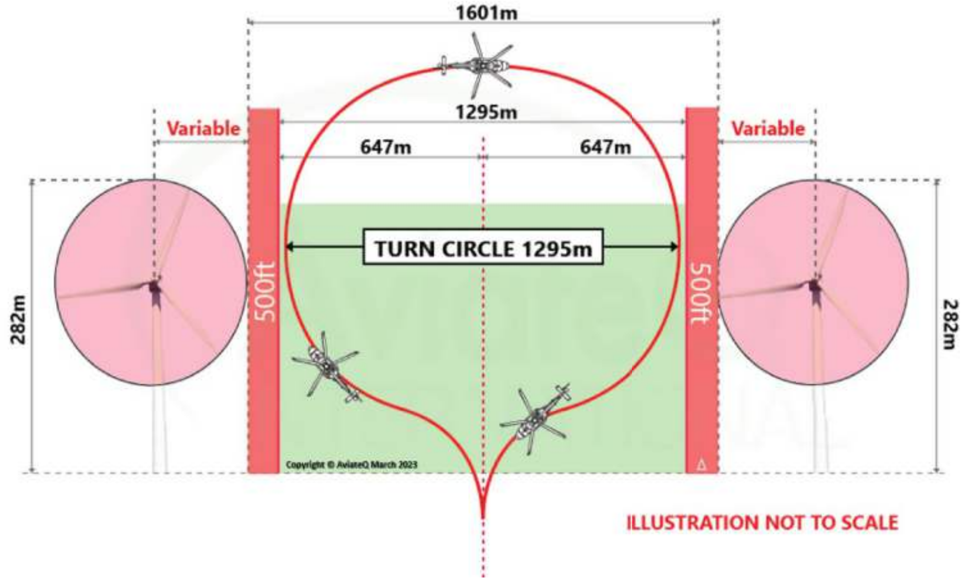


Figure 2
HPZc Turning Circle (Arc) @ 80 kts and a 150 (Rate One Turn) Bank Angle = 1,295m + Obstacle Clearance (2 x 153m) 1,600m. (Arc = 2xr)

7.4 Helicopter Protected Zone - Facility (HPZf)

Having established the VFR corridor width requirements, the airspace requirement around a facility within a wind farm array when operating VFR under a 700ft cloud base also needs to be determined.

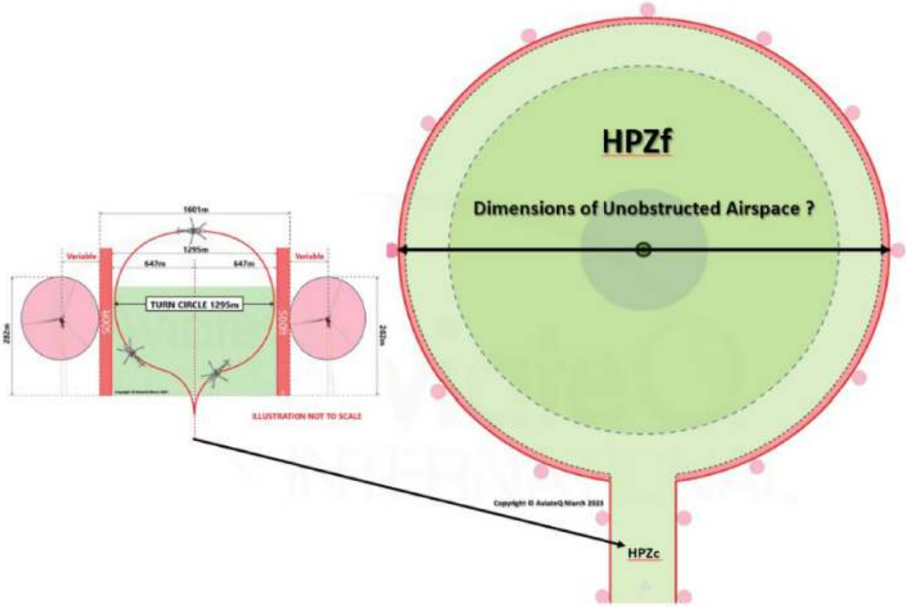


Figure 3
Helicopter Protected Zones – Relationship between Corridor (HPZc) and Facility (HPZf)

8. VFR OPERATING CONSIDERATIONS in an HPZf

8.1 Stabilised Approaches

A helicopter approaching a landing point must make a stabilised approach. The purpose of a stabilised approach is to ensure the helicopter is in the correct configuration and on the correct flight path for landing, with gear down, and groundspeed at the correct value for the conditions. The aim is to minimise pilot workload in the final approach segment down to the approach termination point resulting in a safe landing.

A stabilised approach is conducted for all approaches as it provides the optimum safety configuration and follows a standard procedure for which both crew members are trained.

An approach is stabilised when the following criteria are met:

- The helicopter is in the correct landing configuration and the indicated airspeed is stable at the briefed approach speed +/- 10 KIAS.
- The helicopter is on the correct briefed flight path.
- Only small changes in heading and power are required to maintain the flight path.

In VFR conditions the helicopter will be established on finals 1.5 nautical mile from the landing site to ensure that it is correctly configured at the 0.5 Stabilised Approach Point.

Providing crews with repeatable operating practices designed to manage flightpath control effectively and maintain awareness of the state of the helicopter offers strong mitigation against any potential loss of control.

Below is an extract from the HeliOffshore Flight Path Management, V3, showing recommended Standardised Approach Criteria. As can be seen, the distances are left to the discretion of the operator. However, Annex B "Recommended Guidance Points on Stabilised Approaches" does recommend a Stabilised Approach Point (SAP) of 0.5 m.

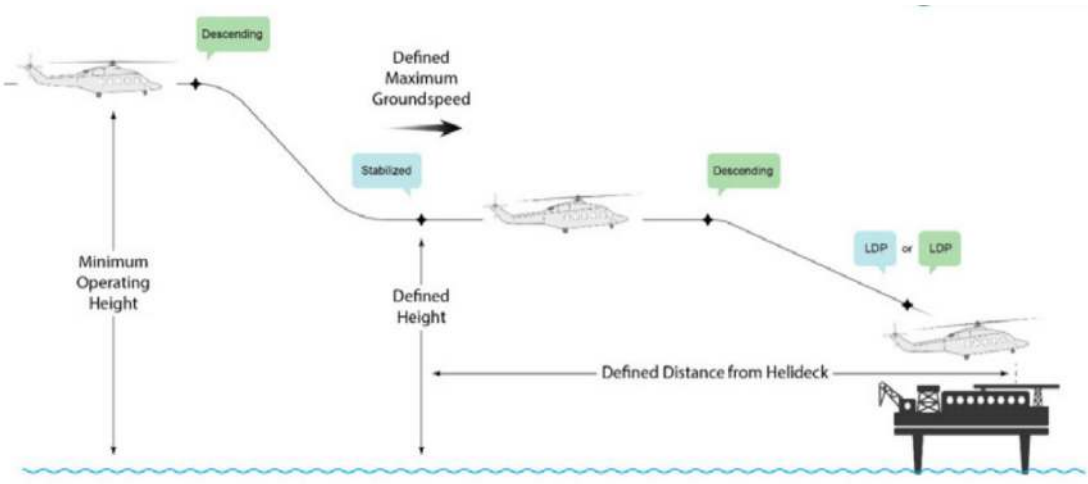


Figure 4
HeliOffshore Standardised Approach Criteria Diagram

The North Sea Operators working group, having considered a Stabilised Approach Point (SAP) distance of 0.3nm from the helideck has recently agreed that 0.5nm is required. Most operators are using 500ft as the defined height. Differences in the defined height at the SAP do not impact on the SAP distance.

Below is a diagram (elevation to scale) depicting a 700ft cloud base, a 920ft turbine and a stabilised approach profile consisting of a Final Approach Sector (FAS) of 1 nm and a SAP at 0.5nm from the facility. Note the upper portion of the turbine blades are obscured by cloud.

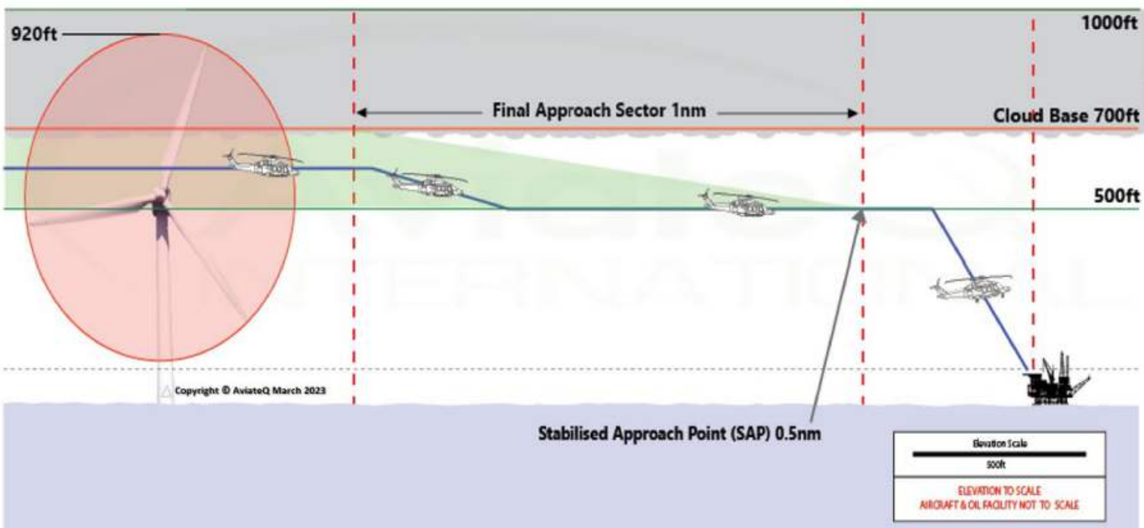


Figure 5:
VFR Stabilised Approach Profile with 700 ft Cloud Base and 5km Visibility

8.2 Entering a HPZf VFR with a Tailwind and Positioning onto the Approach to Land

Due to variations in wind directions consideration has been given to the possibility of a tailwind when entering the HPZf and the distance taken to position the helicopter onto the final approach track, into wind, including the radius of turn.

As can be seen from ***Figure 6*** below, a Final Approach Sector (**A-B**) of 1 nm allows the pilot time to make heading changes ensuring the helicopter is into wind and within the stabilised approach criteria by the 0.5nm SAP (**B**).

If the helicopter is not in a stabilised configuration on arrival at the SAP the pilot is obliged to execute a missed approach. These manoeuvres are taking place under a minimum cloud base of 700ft. The distance required to execute this manoeuvre including a 500ft (0.08nm) obstacle clearance, results in a total minimum requirement of 1.9nm.

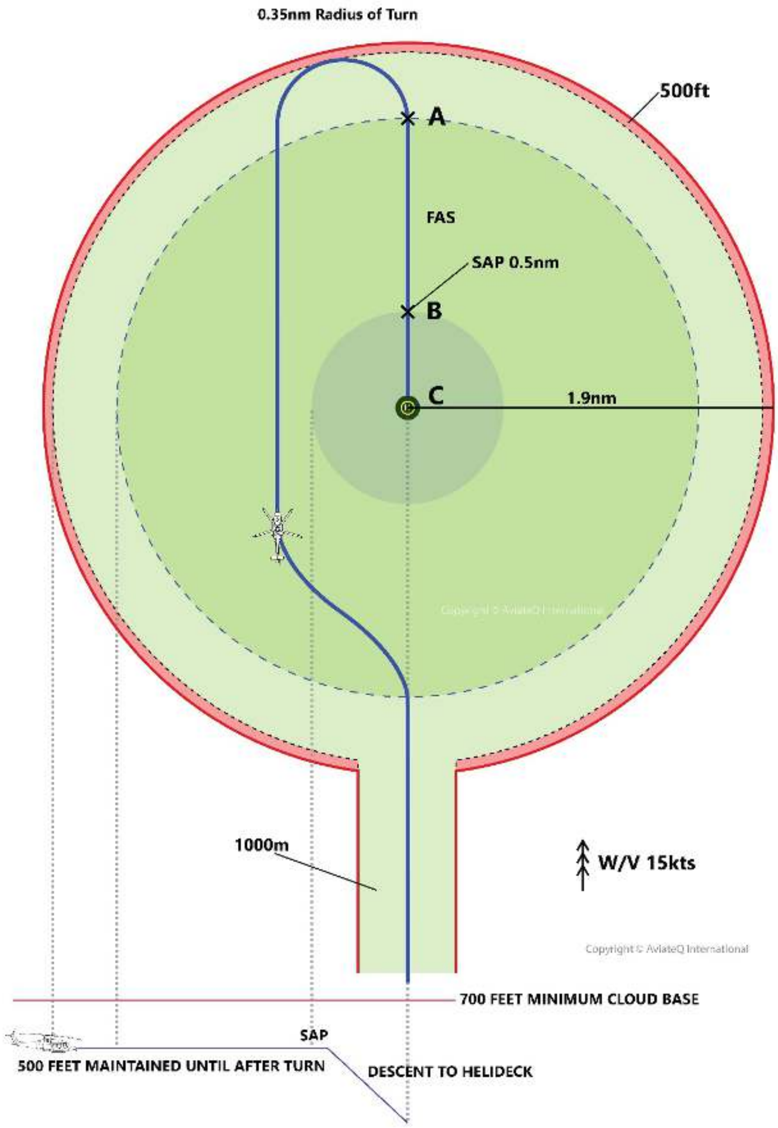


Figure 6
Entry and Positioning onto FAS into Wind in a VFR HPZf via HPZc

8.3 Engine Failure at Take-off Decision Point and OEI Climb to 500ft VMC

The distance required to safely execute a continued take off on one engine following an engine failure on rotation at the Take-off Decision Point (TDP) in the AW169 has been calculated based on the following: ***(Figure 7A)***

1. Drop down height
2. Acceleration from the Take-off Decision Point (TDP) to Take Off Safety Speed (Vtoss) with a positive Rate of Climb (CTO)
3. Path 1 climb from end of CTO to 200ft at Vtoss.
4. Level acceleration from Vtoss to Vy.
5. Path 2 climb from 200ft to 500ft at Vy.
6. Rate one turn at 500ft
7. Pressure altitude of 0ft, temperature of 15C, wind velocity of 15kts
8. All heights are Above Take-off Surface (ATS).

Section 1: Acceleration from TDP to Vtoss and positive ROC (CTO)

- 9ft drop down due head wind factor. *(Graph S4T-D15)*
  Distance required is 350m or **0.19nm**. *(Section 4 – Performance data – OEI Continued Take-off Distance)*

Section 2: Path 1 Climb from end of CTO to 200ft

- Speed – Vtoss 45kts IAS (30kts G/S)
- Height to climb – 209ft (200ft + 9ft drop down)
- Climb at 2 ½ minute power with reduced gradient due to 'Fixed Undercarriage' and 'Life rafts in extended sponsons'
- Drag factor – 0.6 *(Graph S4-6)*
- Distance travelled = 946.55 ft or **0.16nm** *(Graph S4-7 and S4-22)*

Section 3: Level Acceleration from Vtoss to Vy at 200'

- Accelerating from 45kts to 75kts
- Maintaining 2 ½ minute power
- Distance required = 660m or **0.36nm** *(Graph S4-32.)*

Section 4: Path 2 climb from 200ft to 500ft

- Speed – Vy 75kts IAS (60kts G/S)
- Height to climb - 300ft
- Climb gradient at MCP with reduced gradient due to 'Fixed Undercarriage' and 'Life rafts in extended sponsons'
- Drag factor – 0.6 *(Graph S4-6)*
- Distance travelled = 4109.58or **0.68nm** *(S4-9 and S4-43)*

The total distance required for OEI TDP to 500ft would be the sum of the 4 sections namely 0.19nm + 0.16nm + 0.36nm + 0.68nm = **1.39nm**

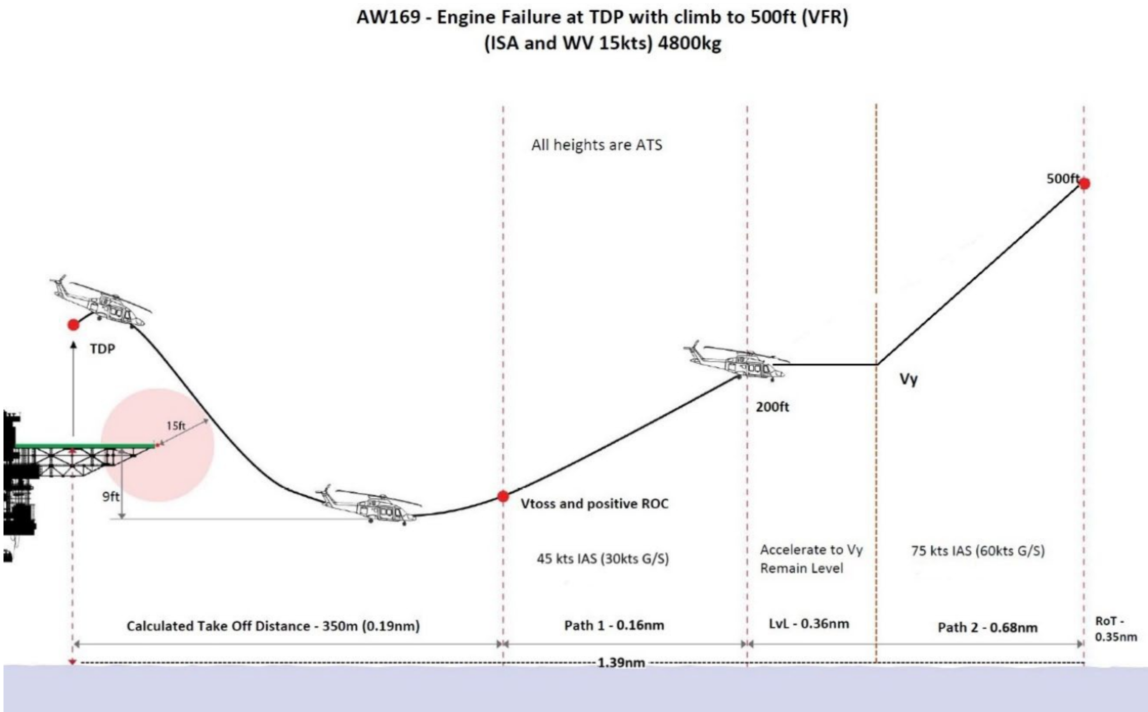


Figure 7A

AW169 Profile View of Distance Required Following Engine Failure at TDP with OEI Climb to 500 ft (ISA & W/V 15 kts)

Section 4: Rate One Turn at 500ft (VFR)

Total distance required from TDP / OEI to 500ft and taking into consideration the displaced apex of the Rate one Turn as per **Figure 7B: C to E = 1.76 nm.**

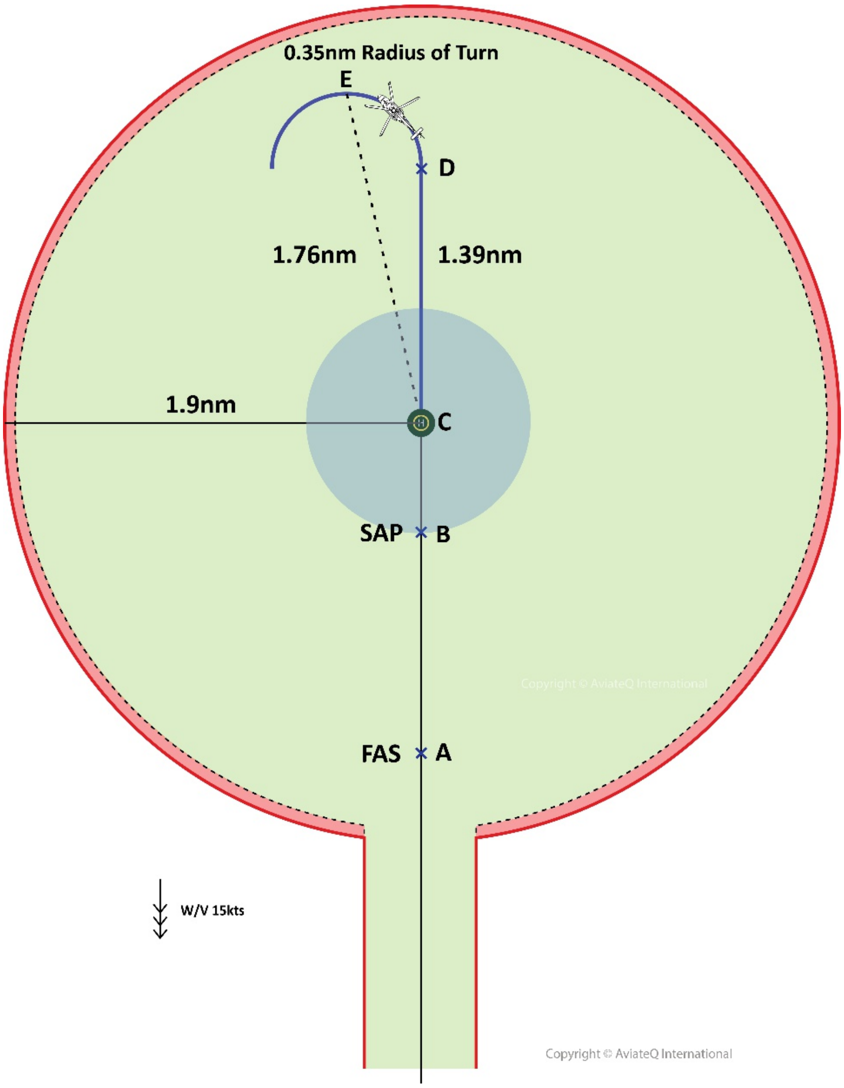


Figure 7B

AW169 Plan View of Distance Required Following Engine Failure at TDP with OEI Climb to 500 ft and turn in VFR HPZf (ISA & W/V 15 kts)

8.4 Oil and Gas Facilities Adjacent to Wind Farm Turbines

Arrival at Adjacent Facility

The minimum distance required between the windfarm array and the facility is determined by the wind direction. With the wind blowing at 90^0 towards the windfarm array, space is required for the helicopter to position onto the Final Approach Sector (FAS) into wind. **Figure 8** below depicts the helicopter entering the HPZf and flying parallel to the wind turbine boundary in a 15kt crosswind before turning onto the **FAS (A) 1 nm from SAP (B)** to be fully stabilised at the **SAP 500ft / 0.5nm** from helideck (C). The minimum distance required to safely execute this manoeuvre **VFR is 1.9nm**.

Note 1: For airspace dimensions with regards to IFR operations to adjacent facilities please refer to the airspace requirements shown in Figures 14A and 14B.

Note 2: Whilst the helicopter could also approach from a different angle, the distances required to establish into wind on the FAS remains the same.

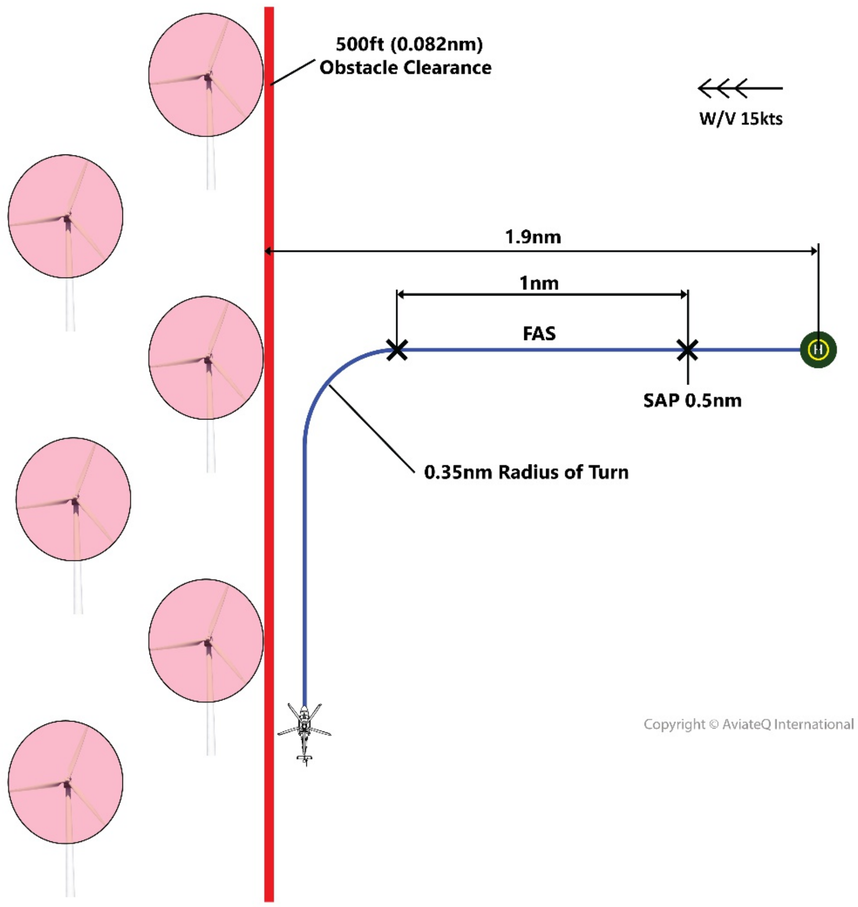


Figure 8

Plan View of Distance Required to establish VFR onto an Approach to a Facility Adjacent to a Wind Farm Array (80 kts / Rate 1 Turn) and in a fully Stabilised Configuration

Departure from Adjacent Facility with Engine Failure at TDP

With the wind blowing from the windfarm array at 90^0 to the array boundary, space is required for the helicopter to depart the adjacent facility, to climb to 500ft and turn away from the obstructions. The wort case scenario is an engine failure just after the Take-Off Decision Point (TDP) when departing the elevated helideck.

Based on a headwind of 15kts, an AW169 helicopter continuing the take-off directly into wind with One Engine Inoperative (OEI) would, as depicted in **Figure 9** below, fly 0.91nm from **(A)** the facility to **(B), 500ft** above sea level. On reaching 500ft, additional space **(B)** to **(C)** is required to execute the turn away from the obstructions. The minimum distance required to safely execute this manoeuvre in **VFR is 1.76nm.**

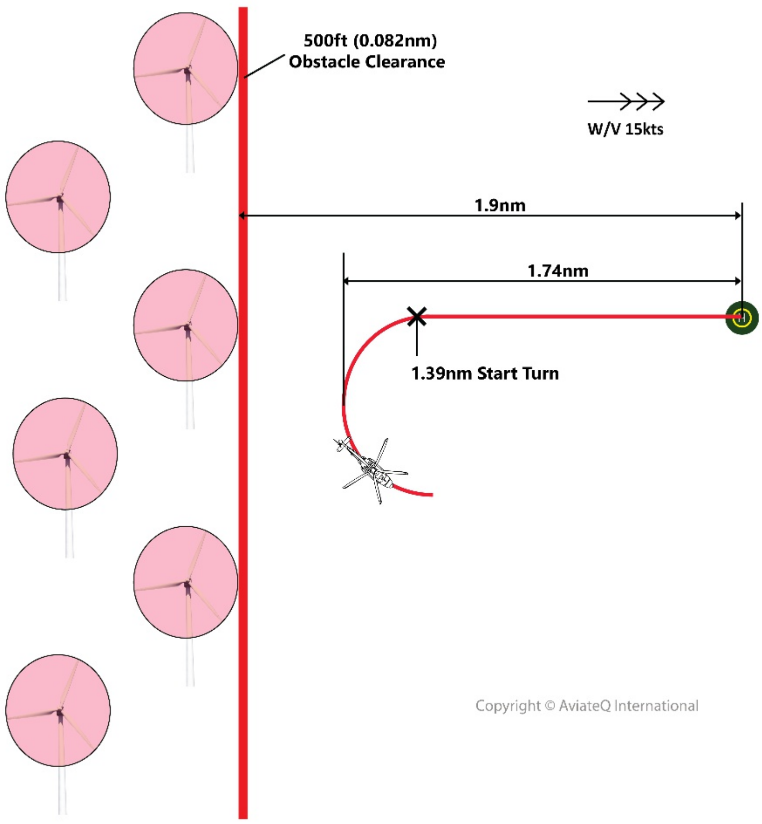
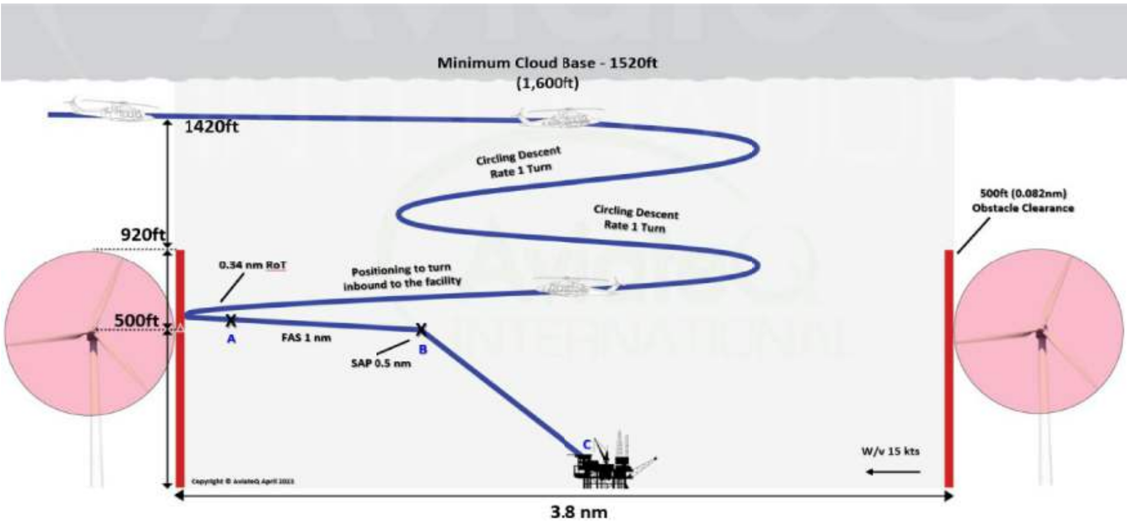


Figure 9
AW169 - Plan View of Distance Required Following Engine Failure at TDP with OEI Climb VFR to 500ft and turn away from Wind Farm Boundary (ISA & Headwind of 15 kts)

8.5 Circling Descent to a Facility Embedded in a Wind Farm Array

Accessing a facility embedded within a windfarm array with no dedicated access corridor would necessitate the helicopter overflying the array enroute to the embedded HPZf.

Based on a turbine assembly height of 920ft (rounded up to 1,000ft) plus the obstacle clearance of 500ft and a cloud base clearance of 100ft, the minimum cloud base required is 1,600feet.



NOTE: *Diameter of 3.8nm = Radius of 1.9nm*

Figure 10A

Profile View of Minimum Dimensions of Unobstructed Airspace for a VFR Circling Descent and Approach to a Remote Facility located in the centre of a HPZf in a Windfarm Array.
(80 kts / Rate 1 Turn)

The helicopter would be able to approach the area from any direction and, once overhead the facility, commence a Rate One circling descent while remaining visual with the facility. On reaching a height of 500ft the helicopter positions onto the Final Approach Sector, into wind, where the pilot manoeuvres the helicopter into a stabilised configuration prior to reaching the Stabilised Approach Point (SAP) at 0.5nm. Assuming the helicopter enters the HPZf at 1,500ft, based on a descent rate of 500ft per minute it would take two minutes and one 360^0 turn to reach the approach height of 500ft.

On departure the aircraft would conduct a circling climb to 1,500ft prior to transiting over the array en-route to destination. However, in the event of an engine failure at TDP there is enough space within the confines of the HPZf to achieve a safe OEI departure and to conduct a circling climb to 1,500ft before exiting the HPZf. However, this would necessitate a single engine transit over the array enroute to destination.

As depicted in **Figures 10A** above and **10B** below, a HPZf with a minimum diameter of 3.8nm would be needed. This manoeuvre, if ever used, could only be conducted under Visual Meteorological Conditions where the facility and the turbines remain visual at all times.

Note: Circling descents are not currently practiced by North Sea operators serving the oil and gas industry.

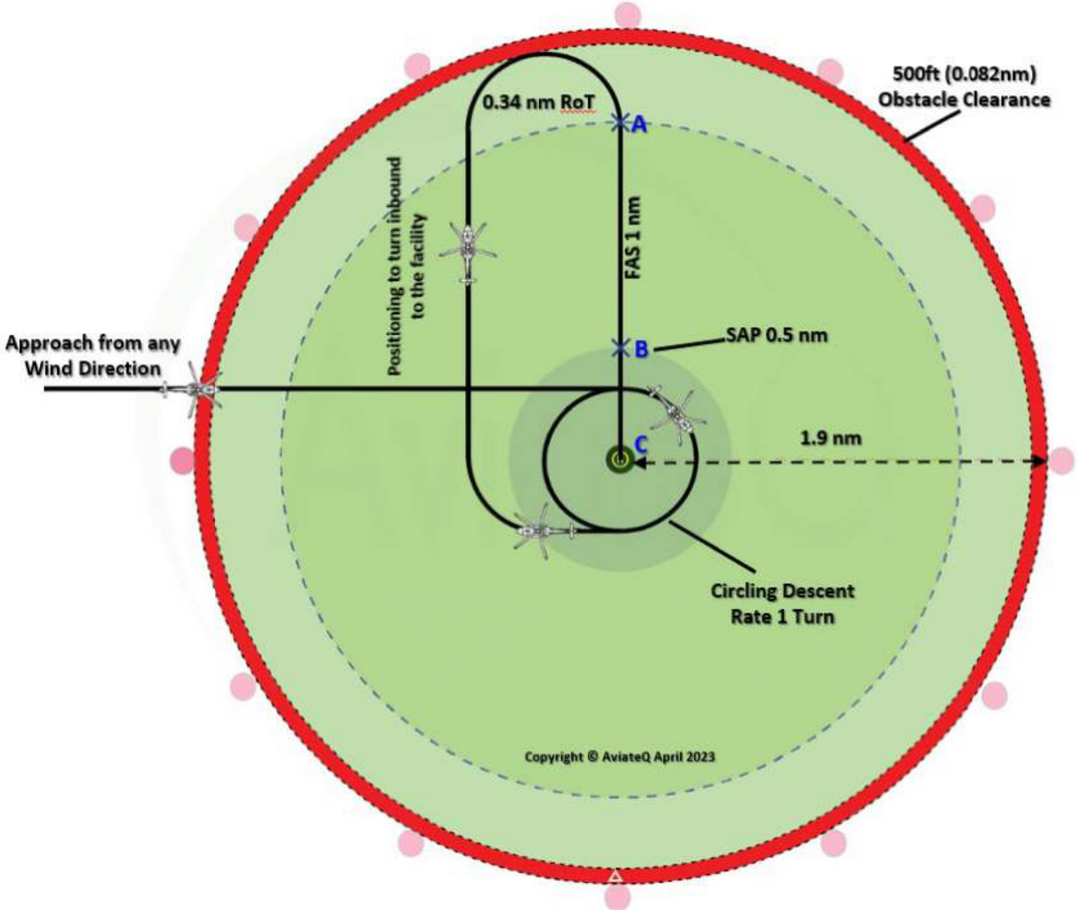


Figure 10B

Plan View of Minimum Dimensions of Unobstructed Airspace for a VFR Circling Descent and Approach to a Remote Facility located in the centre of a HPZf in a Windfarm Array.

(80 kts / Rate 1 Turn)

9. IFR OPERATIONS

9.1 IFR HPZc Requirements

The minimum corridor width for IFR operations is 2nm since the minimum obstacle clearance distance in IMC is 1nm.

9.2 IFR Operating Considerations in an HPZf

9.2.1 ARA Approaches

Airborne Radar Approaches (ARAs) to offshore locations, CAT operations, are covered under EASA Regulations Part SPA, Specific Approval, SPA.HOFO.125. ARAs are a standard practice applied by helicopter operators when operating IMC offshore the United Kingdom. Crews check the weather before departure and determine if the approach to the facility will involve the ARA procedure.

The helicopter offshore ARA procedure may have as many as five separate segments namely the arrival, initial, intermediate, final and the missed approach segments as can be seen from the horizontal and vertical profiles extracted from the EASA regulations. The footprint of an offshore ARA varies slightly between North Sea offshore helicopter operators; primarily the point at which the aircraft commences the ARA approach which for some operators is up to 7nm from the facility. These distances are subject to review amongst the operators to agree on the minimum acceptable distance.

ARA Horizontal Profile

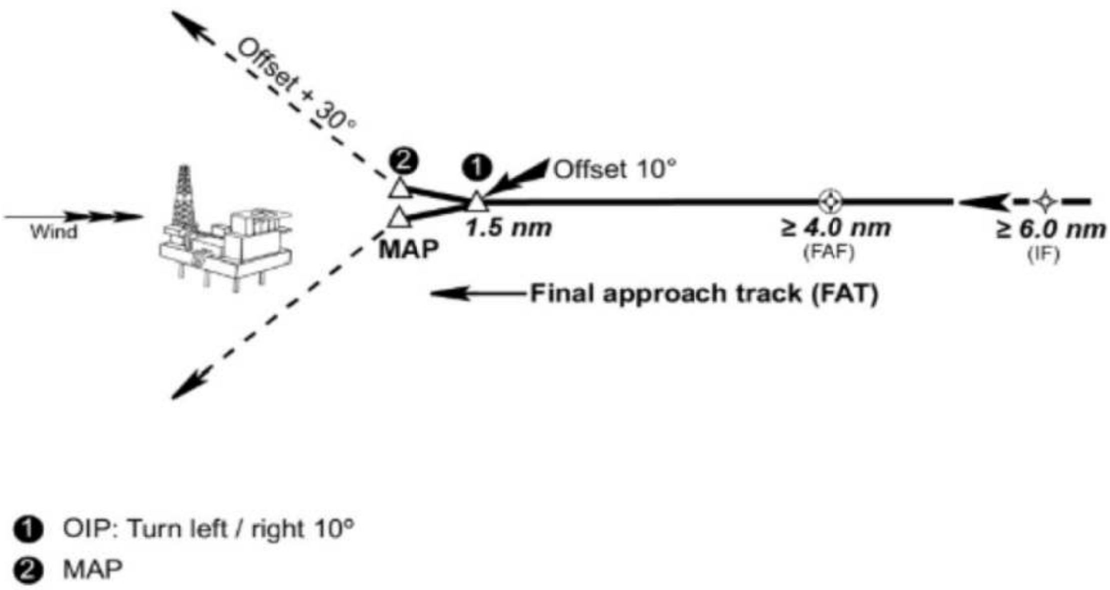


Figure 11
ARA Horizontal Distances

As can be determined from the above, an ARA typically calls for a straight, into wind approach. The distances and offsets depicted in the horizontal and vertical profiles show the Initial Fix (IF) at 6nm, a Final Approach Fix (FAF) at 4nm, an Offset of 10^0 at 1.5nm with the Missed Approach Point (MAP) at .75nm. If not visual by the MAPt a climbing turn away from the facility of not less than 30° and not greater than 45° is required.

ARA Vertical Profile

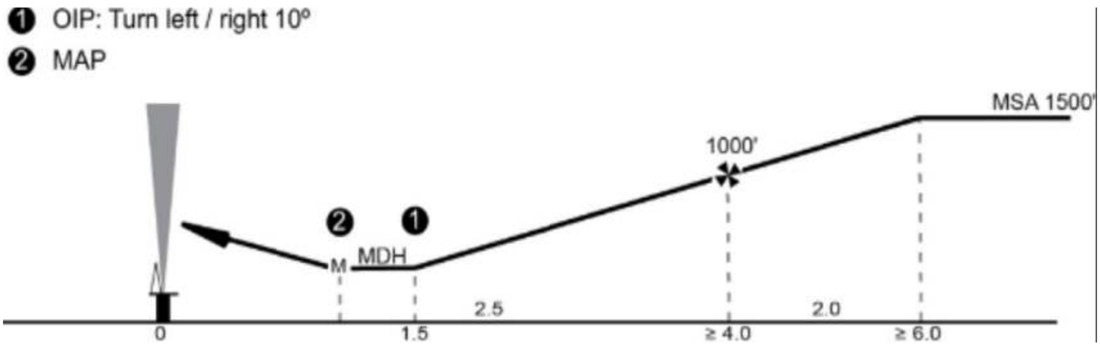


Figure 12
ARA Heights

9.3 Aircraft Operator ARA Minima for Offshore Operations

The current aviation service provider stipulates:

Minimum Descent Height (MDH) shall not be less than 50 ft above the elevation of the helideck.

The MDH for an ARA shall not be lower than :-

- 200 ft by day
- 300 ft by night

The MDH for visual manoeuvring after an ARA shall not be lower than :-

- 300 ft by day
- 500ft by night

9.4 Unrestricted Access to a Facility Surrounded by Wind Turbines

Due to variations in the wind direction, in order to ensure unrestricted access to a facility within a wind farm array, in IMC, the facility must be accessible from all directions.

Based on the above ARA criteria, the minimum unobstructed airspace around the facility would need to extend to 7nm allowing for an MSA above 1500ft (due to wind turbine height). This would require the aircraft to enter a hold over the facility and descend in the hold to the final approach fix at a distance between 6 and 4nm as determined by the operator. Notwithstanding, consideration would need to be given to overflying wind farm arrays to reach the facility in order to carry out the ARA.

9.5 Engine Failure at ARA Missed Approach Point and Climb OEI to 1,000ft

In the event of an engine failure on reaching the Missed Approach Point (MAPt) the pilot will execute a 30^0 turn away from the facility and commence a climb at V_Y to 1000ft, followed by a Rate One Turn through 180^0 while continuing the climb to the Minimum Sector Altitude (MSA) i.e. 1000ft above the height of the wind turbines. The distances required as shown in ***Figure 13*** below equates to a radius of 1.96nm. Adding the 1nm obstacle clearance in IMC brings the total distance required to **2.96 nm**.

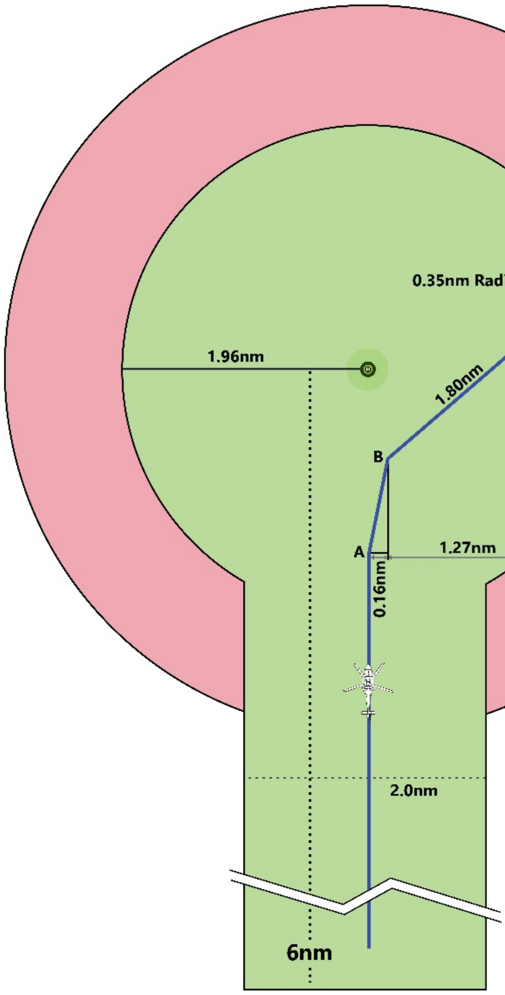


Figure 13

AW169 Distance Required OEI Climb from ARA MAPt to 1000 ft & turn through 180^0 inside the HPZf

9.6 Engine Failure at TDP and Climb to 1,000ft in IMC

A take-off from a helideck, with an engine failure on rotation at the Take Off Decision Point (TDP), and a climb to 1000ft in IMC is deemed to be the most restrictive case taking up the most distance to achieve a safe departure within the confines of a windfarm array.

The distance required to safely execute a continued take off on one engine following an engine failure on rotation at the Take-off Decision Point (TDP) in the AW169 has been calculated based on the following ***(Figure 14A)****:*

1. Drop down height
2. Acceleration from the Take-off Decision Point (TDP) to Take Off Safety Speed (Vtoss) with a positive Rate of Climb (CTO)
3. Path 1 climb from end of CTO to 200ft at Vtoss.
4. Level acceleration from Vtoss to Vy.
5. Path 2 climb from 200ft to 1000ft at Vy.
6. Rate one turn at 1000ft
7. Pressure altitude of 0ft, temperature of 15C, wind velocity of 15kts
8. All heights are Above Take-off Surface (ATS).

Section 1: Acceleration from TDP to Vtoss and positive ROC (CTO)

- 9ft drop down due head wind factor. *(Graph S4T-D15)*
- Distance required is 350m or **0.19nm.** *(Section 4 – Performance data – OEI Continued Take-off Distance)*

Section 2: Path 1 Climb from end of CTO to 200ft

- Speed – Vtoss 45kts IAS (30kts G/S)
- Height to climb – 209ft (200ft + 9ft drop down)
- Climb at 2 ½ minute power with reduced gradient due to 'Fixed Undercarriage' and 'Life rafts in extended sponsons'
- Drag factor – 0.6 *(Graph S4-6)*
- Distance required is **0.16nm** *(Graph S4-7 and S4-22)*

Section 3: Level Acceleration from Vtoss to Vy at 200'

- Accelerating from 45kts to 75kts
- Maintaining 2 ½ minute power
- Distance required = 660m or **0.36nm** *(Graph S4-32.)*

Section 4: Path 2 climb from 200ft to 1000ft

- Speed – Vy 75kts IAS (60kts G/S)
- Climb gradient at MCP with reduced gradient due to 'Fixed Undercarriage' and 'Life rafts in extended sponsons'
- Drag factor – 0.6 *(Graph S4-6)*
- Distance travelled is **1.80nm** *(S4-9 and S4-43)*

The total distance required for OEI TDP to 1000ft would be the sum of the 4 sections namely 0.19nm + 0.16nm + 0.36nm + 1.80nm = **2.51nm.**

Rate One Turn at 1000 ft (IFR)

The total distance required from TDP / OEI to 1000ft and 180° turn taking into consideration the displaced apex of the Rate one Turn **= 2.90 nm.** ***(Figure 14B)***

Minimum distance required would need to include the legal obstacle clearance requirement of 1nm for IFR flight and therefore minimum distance required is **3.90nm.**

On completion of the turn the aircraft will continue to climb to the Minimum Sector Altitude (MSA) i.e., 1000ft above the tips of the turbine rotor blades.

Note: the MSA will vary depending on the height of the turbine assembly.

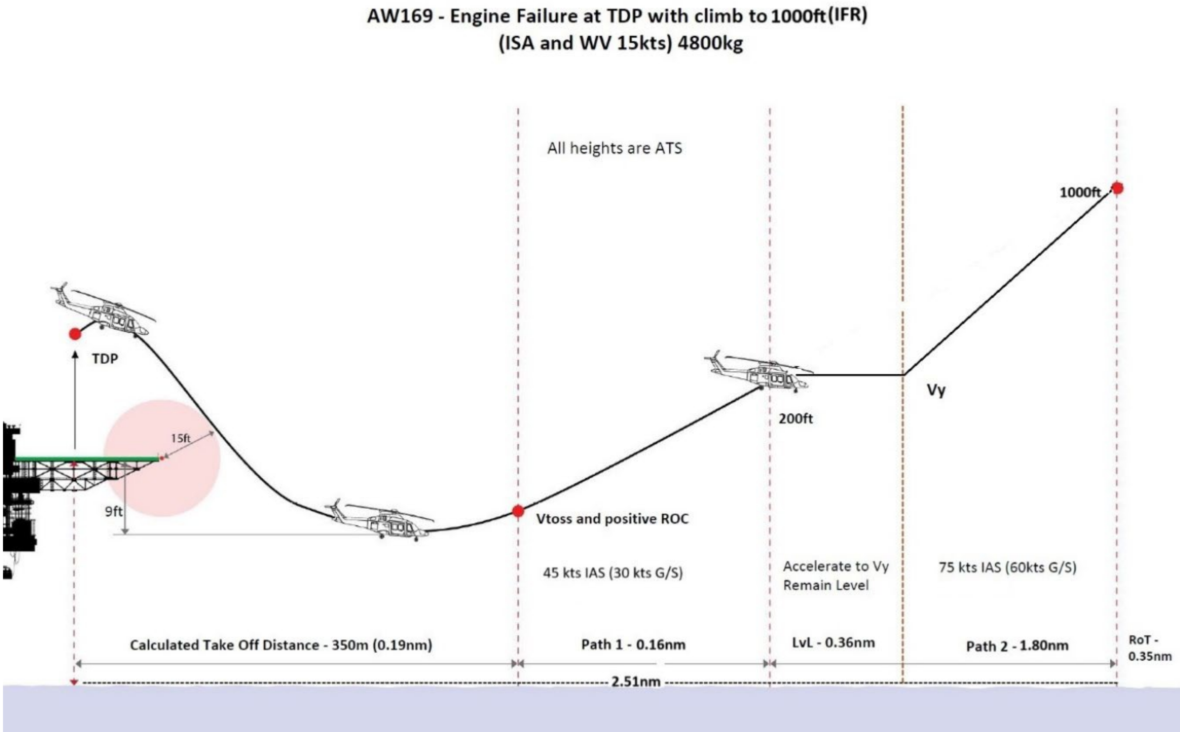


Figure 14A
AW169 Profile View Distance Required OEI Climb to 1,000ft

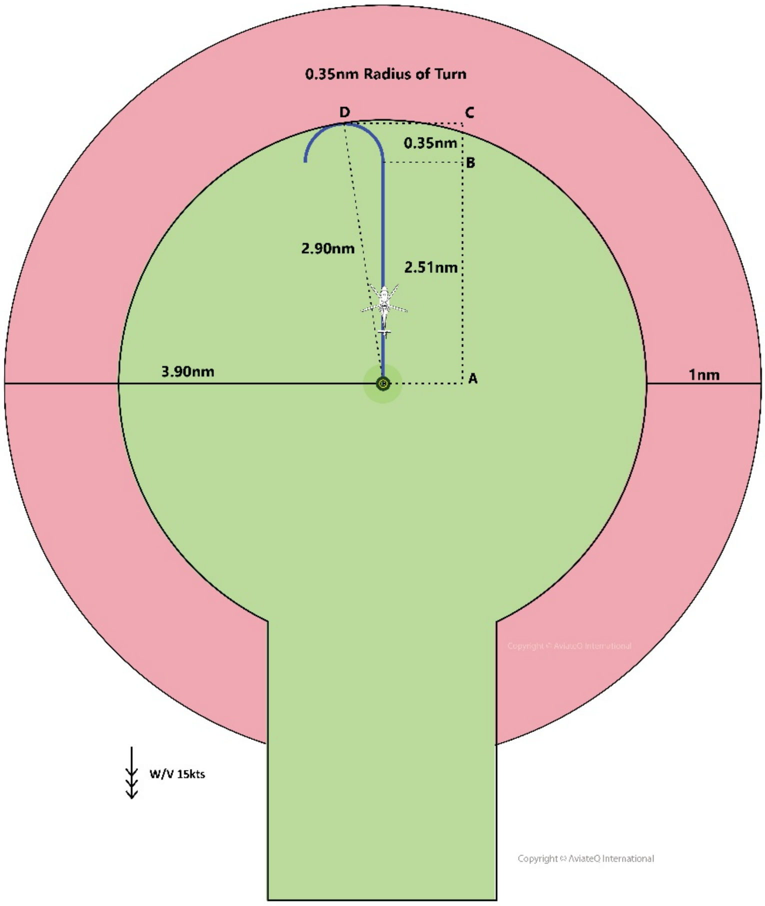


Figure 14B

AW169 Plan View Distance Required OEI Climb to 1,000 ft and turn in IMC inside the HPZf

As can be seen from **Figure 15** below, the distance to execute the OEI missed approach procedure is accommodated withing the minimum airspace required (3.90nm) for the continued take-off after engine failure at TDP from an elevated helideck.

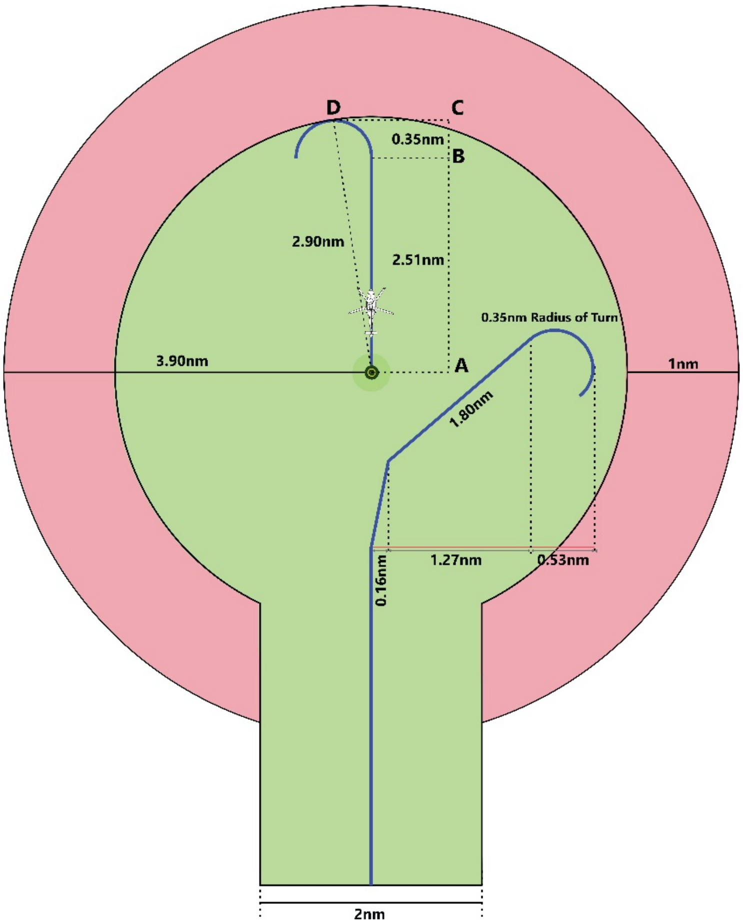


Figure 15
AW169 Engine Failure at TDP versus Engine Failure at MAPt Distances

9.7 Circling Approach Following a Downwind ARA

The operating minima for a downwind ARA and a subsequent circling approach procedure is a MDH of 300ft or deck height plus 100ft during the day and 500ft or deck height plus 100ft during the night whichever is the greater. The decision range increases from 0.75nm to 1nm day and 1.5nm at night. If visual reference is lost while circling due to for example inadvertent entry into cloud, irrespective of the location of the aircraft in the circling area, the handling pilot must execute a missed approach, climbing until the MSA is reached.

A straight in ARA is the safest procedure that simultaneously brings the helicopter to a MAPt of 0.75nm at 200 feet with the aircraft in a stabilise approach configuration.

A straight in ARA to an intermediate structure provides the same level of safety (0.75nm at 200 feet) but a low-level shuttle to the destination is unlikely since the operating minima stipulates a higher cloud base.

The risks associated with a circling approach in poor visibility are much higher than that for other types of approach.

Note 1: Inadvertent flight into IMC occurs when an aircraft is operating in visual conditions and unexpectedly enters an area of low or zero visibility such as low cloud or snow showers. If the aircraft is at low level (below 500 feet) having passed the MAPt on an approach to land on an offshore helideck, this has the potential to be a hazardous condition and would necessitate an immediate go around.

Note 2: Visual approaches in poor visibility increase pilot workload and increase the risk of pilot disorientation; this practise has resulted in several helicopter accidents in the North Sea.

10. CONCLUSION

10.1 VFR Operations – AW169

1) A facility embedded within a wind farm array could be accessed:

- **a)** via a direct, straight line of sight, unobstructed **1,600m** Helicopter Protected Zone Corridor (HPZc) **(Figure 2)**. It is unlikely that, given the wind speeds experienced in the operating area, any crosswind components in the HPZc would impact day to day operations. For the helicopter to safely manoeuvre onto an approach to the facility the radius of the unobstructed Helicopter Protected Zone (HPZf) surrounding the facility **(Figure 6)** would need to be not less than **1.9nm**. The space available will accommodate an engine failure on departure from the facility, the OEI climb to 500ft as well as a turn within the confines of the HPZf **(Figure 7B)**. Remaining clear of obstructions is always assured since exiting the area would be via the unobstructed corridor. Operations would not be permitted with a horizontal visibility of less than 5Km and a cloud base **lower than 700 feet**; or
- **b)** by approaching the Helicopter Protected Zone (HPZf) from any direction **(Figure 10A)** and, once overhead the facility, conducting a Rate One circling descent to 500ft while remaining visual with the facility. On reaching a height of 500ft, for the helicopter to safely manoeuvre onto an approach to the facility the radius of the unobstructed Helicopter Protected Zone (HPZf) surrounding the facility **(Figure 10B)** would need to be not less than **1.9nm**. The space available will accommodate an engine failure on departure from the facility, the OEI climb to 500ft as well as a turn within the confines of the HPZf. However, exiting the HPZf will necessitate a **circling climb to 1,500ft** prior to transiting OEI over the array en-route to destination. Operations would not be permitted with a horizontal visibility of less than 5Km and a cloud base **lower than 1,600 feet**. **Note:** Circling descents are not currently practiced by UK North Sea operators serving the oil and gas industry.

2) A facility located adjacent to one side of a windfarm array **(Figure 8)** would need to be not less than **1.9nm** distance away from the windfarm boundary. The space available will accommodate an engine failure on departure from the facility **(Figure 9)**, the OEI climb to 500ft as well as the turn away from the windfarm boundary.

3) Positioning a mobile such as a workover barge / accommodation unit / flotel immediately adjacent to the main facility embedded within a wind farm array or a main facility located adjacent to one side of a windfarm array boundary would not impact on the overall unobstructed airspace requirement. However, positioning a mobile away from the main facility (which could be as far as 100m away) could result in operating restrictions being imposed by the helicopter operator. Any such restrictions would depend on the wind speed and direction relative to:

- **a)** The distance the mobile has been offset away from the main facility embedded within a wind farm array.

b) The positioning and the distance the mobile has been offset away from the main facility located adjacent to a windfarm boundary. Positioning the mobile further away from the boundary would not impact the unobstructed airspace requirement.

Note: the orientation of the mobile relative to the main facility could result in operational restrictions as per current practice. This would be evaluated by the facility owner and the helicopter operator during the planning stage.

10.2 IFR Operations – AW169

1) Due to the variations in wind directions, to ensure unrestricted access to a facility within a wind farm array in IMC, the minimum unobstructed airspace around the facility would result in a HPZf with a minimum radius of 7nm allowing for an MSA above 1500ft (due to wind turbine height).

The airspace requirement could be reduced by establishing a 2nm wide, line of sight, IFR corridor oriented 210^0 into the prevailing wind and extending from the centre of the HPZf (CPC1 facility) to a distance of 6* nm. It must be noted that changes in wind speed and direction have an impact on the aircraft drift angle and aircraft operator limitations would apply.

* The current aircraft service provider requires a 7nm approach path which starts at the Minimum Sector Altitude (MSA). This varies from 1000ft to 1700ft depending on where the approach starts.

2) The space required for a continued take-off OEI when operating an AW169 is the most restrictive manoeuvre requiring an IFR HPZf with unobstructed airspace **3.90nm** around the facility **(Figures 14A and 14B)**. This distance would accommodate the space required **(Figure 13)** to execute an engine failure at the MAPt following an ARA approach.

3) An IFR HPZf with 3.90nm of unobstructed airspace around the facility would, subject to wind speed and direction being within operating limits in the IFR corridor leading into the HPZf, also accommodate a downwind ARA culminating in a circling approach to land. It is to be noted that not all aircraft operators permit this manoeuvre.

10.3 IFR Operations – AW139

1) The AW139, having better performance capabilities than the AW169, will be able to operate within the confines of the space determined suitable for the AW169.

10.4 Comparison of Airspace Requirements

AW169/AW139 Airspace Requirements by Type of Approach (Based on most restrictive helicopter type)			
Type of Approach into HPZf	**Minimum Cloud Base**	**Minimum HPZF Radius**	**Notes**
VFR with a corridor	700'	**1.9nm**	Corridor width of 1600 meters
VFR without corridor	1600' (Based on turbine height)	**1.9nm**	Circling Descent and Circling Climb required
VFR with adjacent windfarm array	700'	**1.9nm**	
IFR with corridor requiring an ARA	200' or deck height plus 50' whichever is the highest	**3.9nm**	Corridor width of 2nm
IFR without corridor requiring an ARA	200' or deck height plus 50' whichever is the highest	**7.0nm - 9.0nm**	Depending on MSA and helicopter operator.

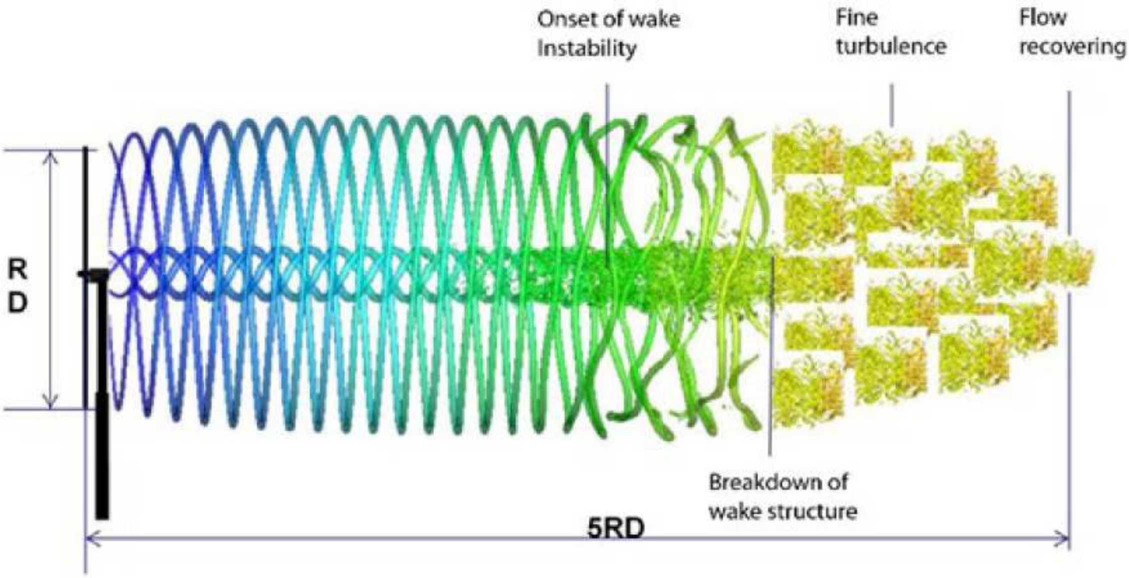
Minimum Distance Requirement Comparison for OEI departure AW169 and AW139 (Distance includes required obstacle clearance requirements)		
Type of Manoeuvre	**AW169**	**AW139**
Engine Failure at TDP - VFR (Climb to 500ft)	**1.84 nm**	**1.33 nm**
Engine Failure at TDP - IFR (Climb to 1000ft)	**3.90 nm**	**3.14 nm**

11. TURBINE INDUCED TURBULENCE

Turbine induced turbulence, caused by the wake of a wind turbine which extends down-wind behind the wind turbine blades and the tower, needs further consideration. CAP 764 Section 2.51 through to Section 2.61 cover the issue of turbulence also stating that, due to different parameters that need to be taken into consideration, it is difficult to scale up wake results from a small to large wind turbine. Work carried out by Liverpool University referenced in CAP 764 was based on small wind turbines of less than 30m rotor diameter (RD).

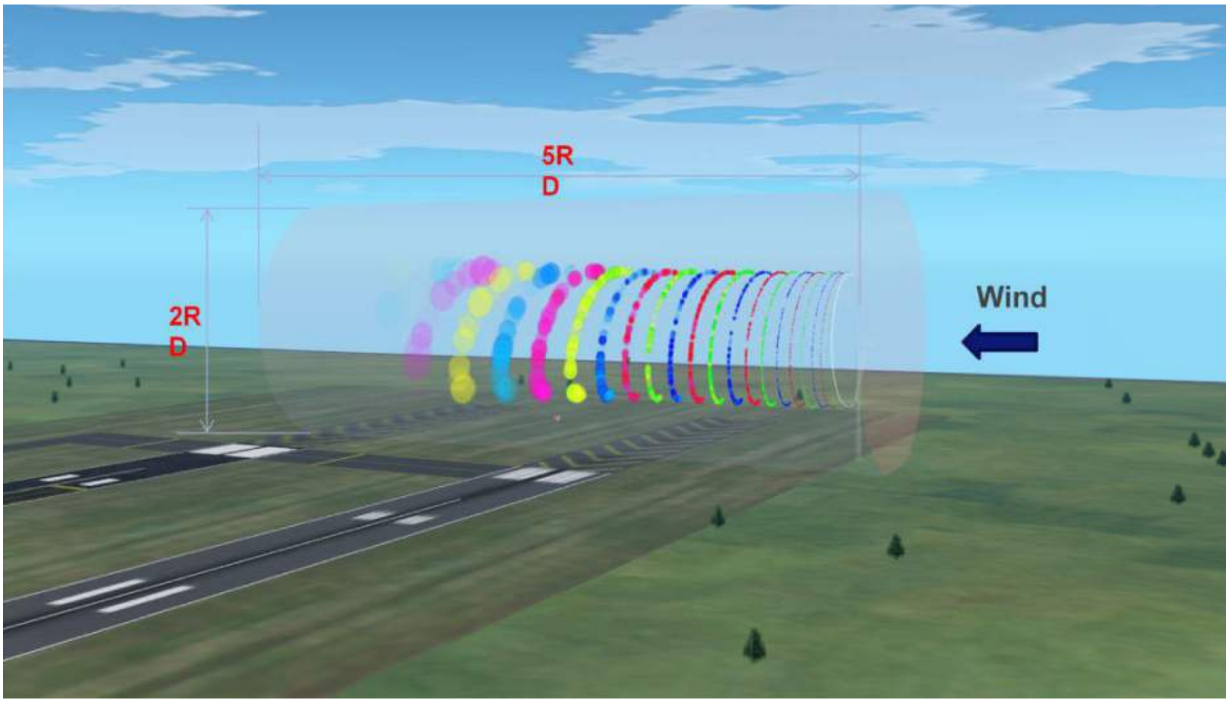
CAP 764 2.60 states that *LIDAR field measurements on a WTN250 wind turbine at East Midlands Airport, UK, indicated that statistically, the wake velocities recovered to 90% of the free stream velocity at the downstream distance of 5 RD*.

CAP 764 2.60 states *Based on the models described in the Liverpool University Research Paper, schematics of the wake region for small wind turbines are given in the following figures. The figures show the zone where wake encounter has potential to cause severe impact on the encountering GA aircraft.*



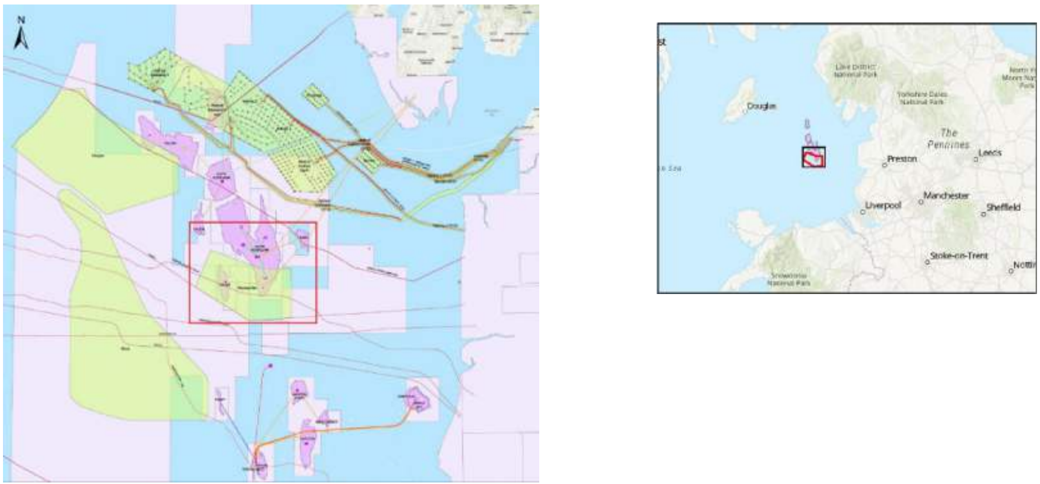
Schematic of the wind turbine wake. The effect of wake is weaker beyond 5-RD downwind for the wind turbines of diameter < 30m.

https://publicapps.caa.co.uk/modalapplication.aspx?catid=1&pagetype=65&appid=11&mode=detail&id=5609

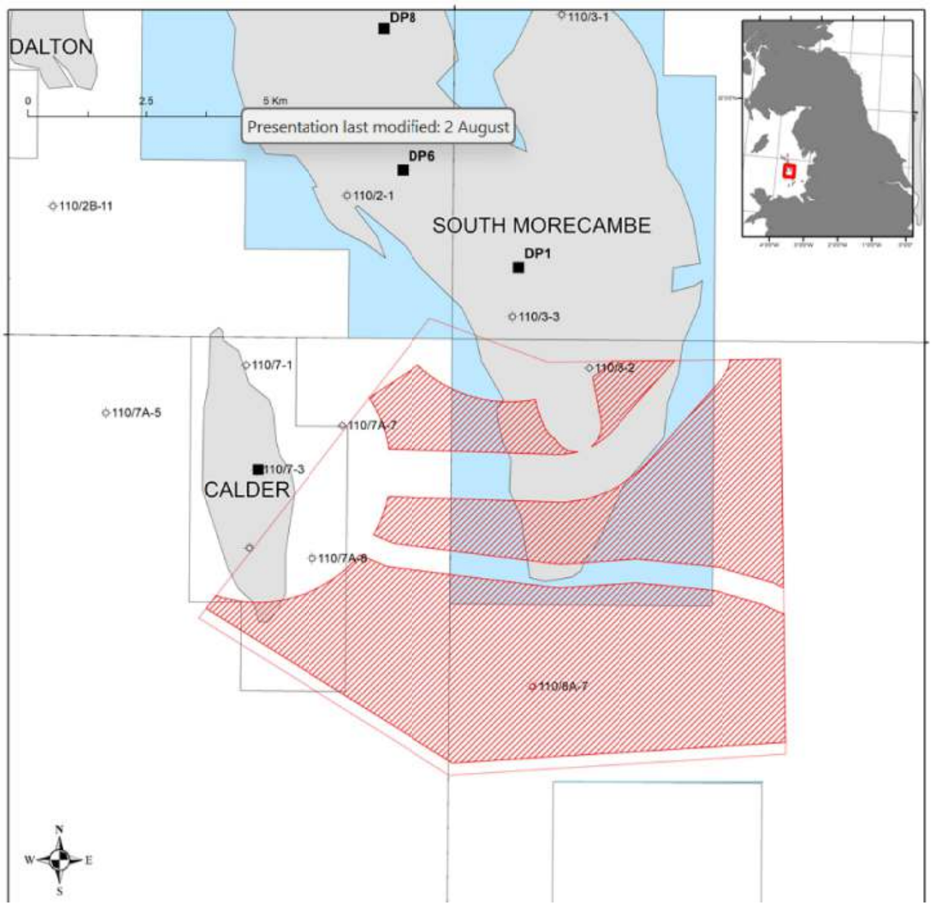


The cylindrical region downwind the rotor should be avoided. Its size is 5RD (downwind) by 2RD (vertical). Coloured helices indicate wake vortices and decay.

12. FACILITY & WINDFARM LOCATIONS



Regional Area Map



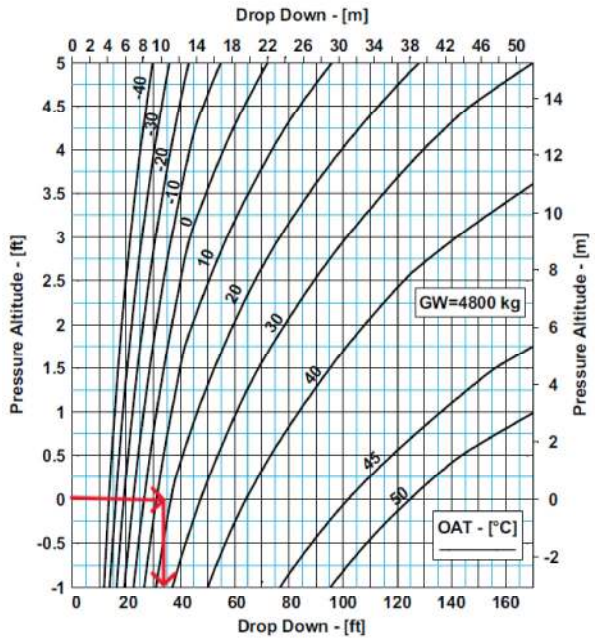
Location of Proposed Windfarm in relation to Calder and DP1

13. PERFORMANCE GRAPHS USED

AW169 | AW169 - RFM Document N° 169F0290X001 | Supplement 4 CAT A Operations OS&E Helideck Take-Off

DROP DOWN
OFFSHORE / ELEVATED HELIDECK PROCEDURE

PLUS MODE



Headwind [kt]	5	10	15	20	25	30	35	40	45	50
benefit [ft]	5	14	25	33	42	51	59	68	76	84
benefit [m]	1	4	7	10	13	16	18	21	23	26

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ICN-69-A-155204-G-A0126-00107-A-03-1

Figure S4T-D15 Drop Down Offshore Procedure - Clean Air Intake - 4800 kg

Approved Issue 3 Page S4T-D27

SECTION 4D - PERFORMANCE DATA

WAT CHARTS

The Offshore/Elevated Helideck Procedure Weight Limitations chart are shown in Figure S4D-6 and Figure S4D-7.

OEI CONTINUED TAKE-OFF DISTANCE

The OEI Continued Take-Off distance 350m

Drag Factor for Optional Kit (only Kit with effect on Performance are reported)				
Kit	Sup.	Drag Factor	DROC AEO [ft/min]	DROC OEI [ft/min]
Hoist Goodrich	5	0.3	-66	-63
Extended Landing Gear (Basic Configuration)	-	0.4	-89	-84
Fixed Landing Gear	9	0.4	-89	-84
Life Raft on extended sponson	11	0.2	-45	-42
Electric Pax Footstep	21	0.2	-45	-42
Trakkabeam A800 Searchlight	37	0.2	-45	-42
Extended Landing Gear with Snow Pads	45	0.6	-133	-125
Cabin Sliding Door(s) Open Operations	-	0.5	-110	-105
Extended Landing Gear with Snow Skis	50	0.7	-155	-147

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Figure S30-121 Correction Table for Installed Kits

Cat.A FLIGHT PATH 1
DRAG FACTORS vs GRADIENT REDUCTION

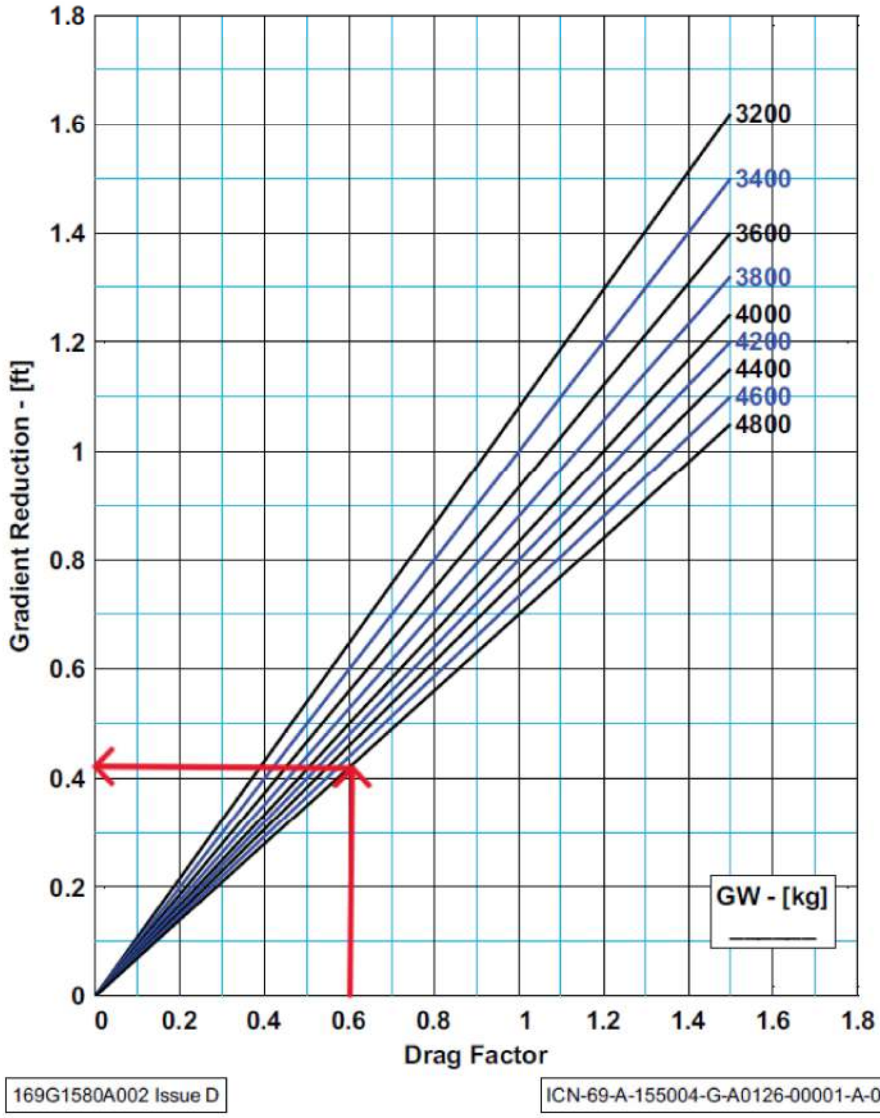

Figure S4-7 Gradient Reduction for PATH 1

TAKE OFF FLIGHT PATH 1
OEI 2.5 min

ROTOR SPEED: 103%
Vtoss/blss: 45 kts

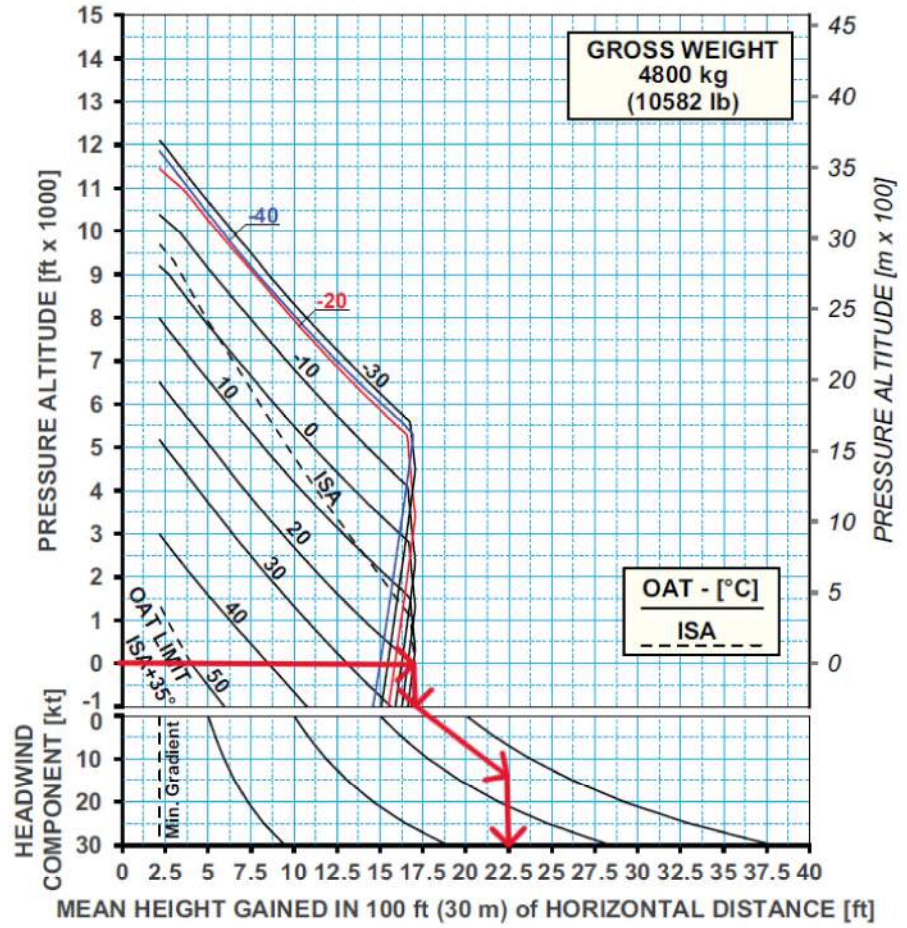

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Figure S4-22 PATH 1 Gradient, 2.5 min OEI Power - Gross Weight 4800 kg

DISTANCE REQUIRED for LEVEL ACCELERATION from $V_{TOSS}\backslash V_{BLSS}$ to V_Y

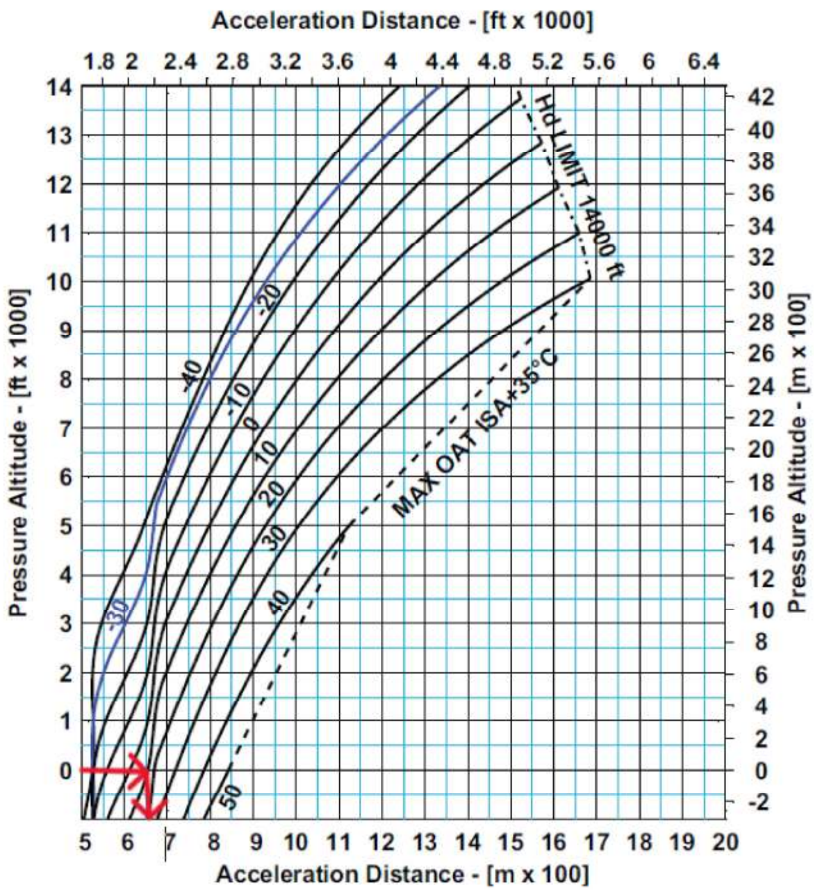

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Figure S4-32 DISTANCE REQUIRED for LEVEL ACCELERATION from $V_{TOSS}\backslash V_{BLSS}$ to V_Y

Cat.A FLIGHT PATH 2
DRAG FACTORS vs GRADIENT REDUCTION

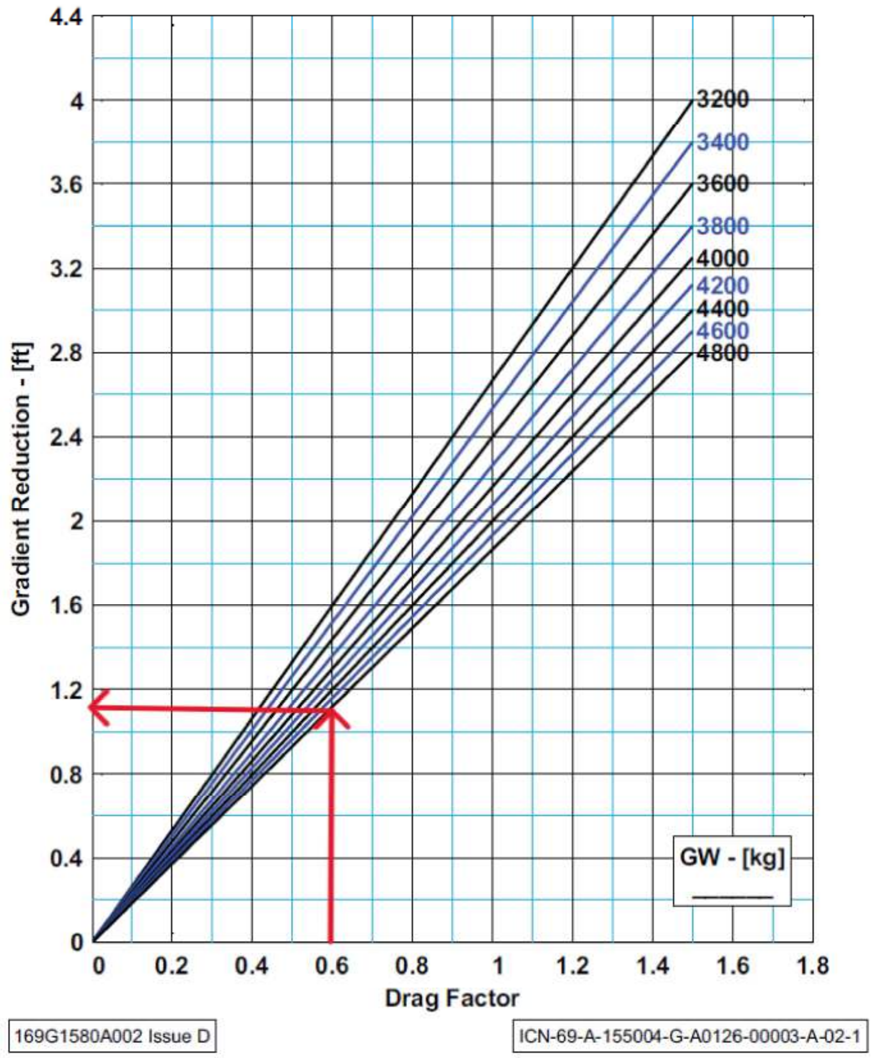


Figure S4-9 Gradient Reduction PATH 2

TAKE OFF FLIGHT PATH 2
CONTINUOUS OEI

ROTOR SPEED: 103%
Vy: 75 kIAS DECREASE 1 kt EACH 1000 ft ABOVE 10000 ft Hp

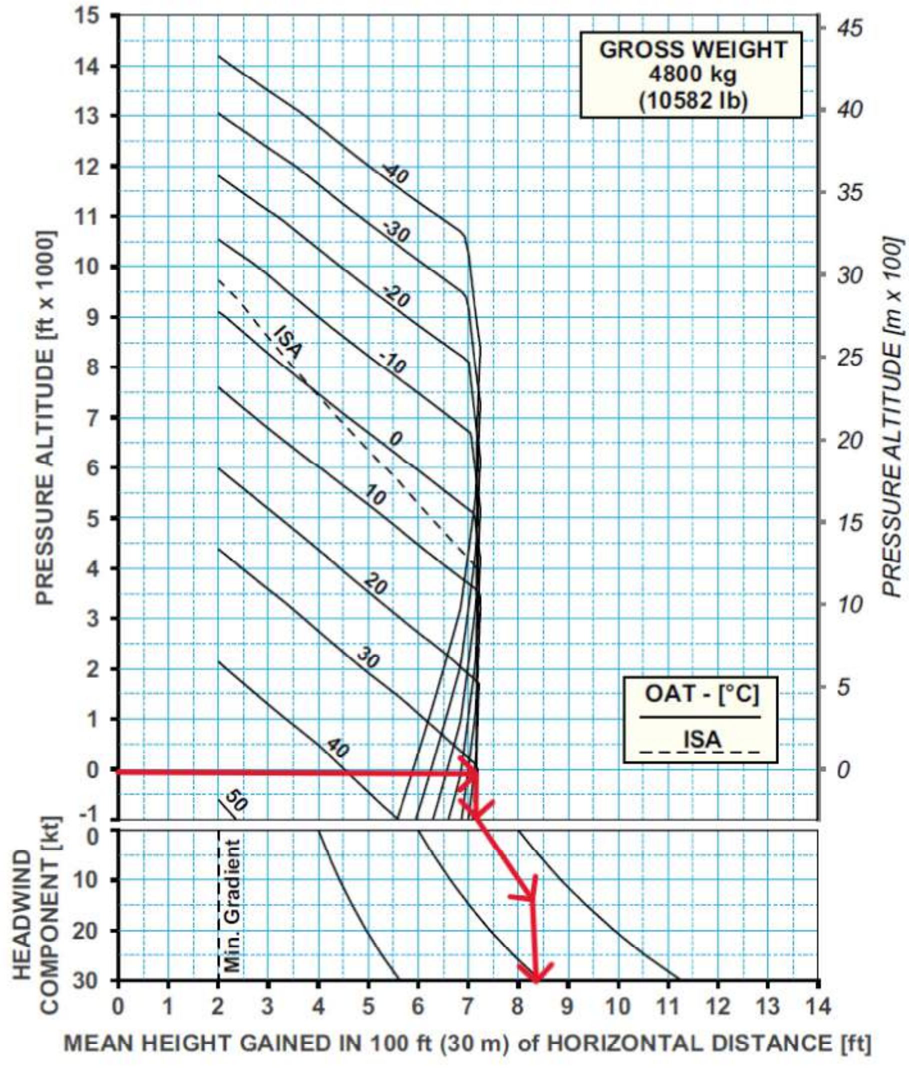
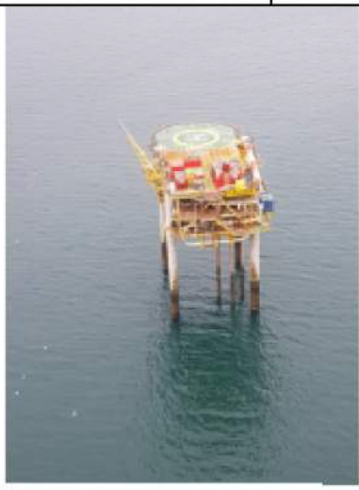


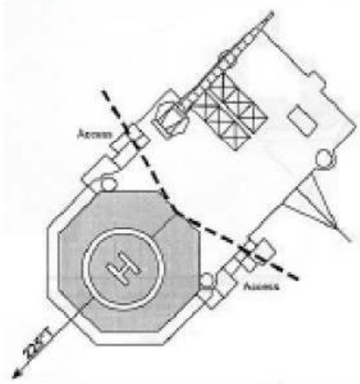
Figure S4-43 PATH 2 Gradient, Continuous OEI Power - Gross Weight 4800 kg

14. CALDER & CPC1 INSTALLATION HELIDECK PLATES

14.1 Calder

HELIDECK Elev 105 ft	VAR 2 W	POSITION N53 48.5 W003 39.8	EGCE **Calder**		
HEIGHT OF INSTALLATION: 133ft HIGHEST OBSTACLE WITHIN 5NM: Check			VHF 122.380	NDB Nil	Issue Date 21/02/2023
FUELLING INSTALLATION: No STARTING EQUIPMENT: No			Operating Company Spirit Energy		Issued By Helideck Certification Agency
HELIDECK D value: 16.66 P/R/H Category: F Max Weight: 7.0 Circle & H Lights: Yes					



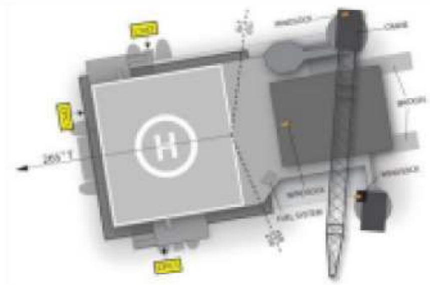


Wind (T°)	Kts	Limitation /Comment
		NUI • Table 1(T) if overflight of 5:1 item unavoidable
		Non-Compliance
	5:1	Perimeter frame at both access points 2.7m from SLA

14.2 CPC-1

HELIDECK Elev. **184 ft**	VAR **2 W**	POSITION **N53 50.7 W003 35.0**	EGMM **CPC-1**		
HEIGHT OF INSTALLATION: **397ft** HIGHEST OBSTACLE WITHIN 5NM: **Check**			VHF **122.380**	NDB **N/A**	Issue Date **23 Jan 2023**
FUELLING INSTALLATION: **No** STARTING EQUIPMENT: **Yes**			Operating Company **Spirit Energy**		Issued By **Helideck Certification Agency**
HELIDECK D value: **22.2m** P/R/H Category: **F** Max Weight: **12.6t** Circle & H Lights: **Yes**					



Wind (T°)	Kts	Limitation /Comment
		Manned platform
• 045-135	• 0-20	• Use zero wind for performance calculations
• 045-135	• 21-30	• Extreme caution due to possible turbulence
• 045-135	• 31 plus	• Emergency only
• 135-160	• 21 plus	• Extreme caution due to possible turbulence
• 060-100	All	• Main generators running without head recovery add 12 to ambient temperature for performance calculations
		• Aircraft hanger – may cause turbulence
		• Table 1 (T) if overflight of 5:1 infringements unavoidable
		• No fuel available
		Non Compliance
150°		Refuelling unit marginal infringement in second sector of LOS
5:1		North & south access platforms 4m from SLA
Misc		Inboard perimeter lights are not co-incident with perimeter line Approved for S92 (MTOW 11861Kg) Callsign CPC-1

End of report

Appendix B

Illustrative Summary of Spirit's Helicopter Operations

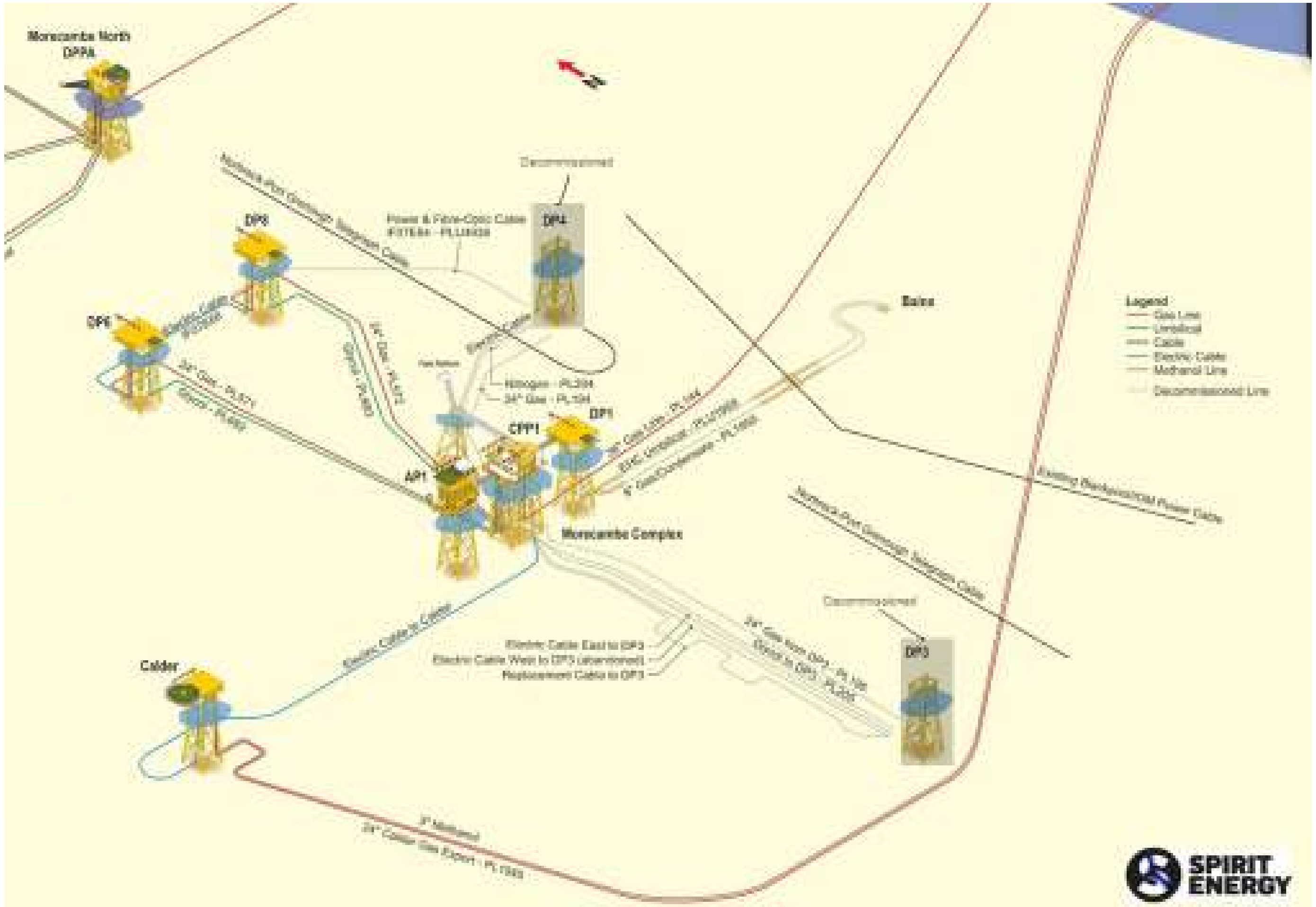
SPIRIT AVIATION OPERATIONS - APPENDIX B

November 2024

SPIRIT ENERGY

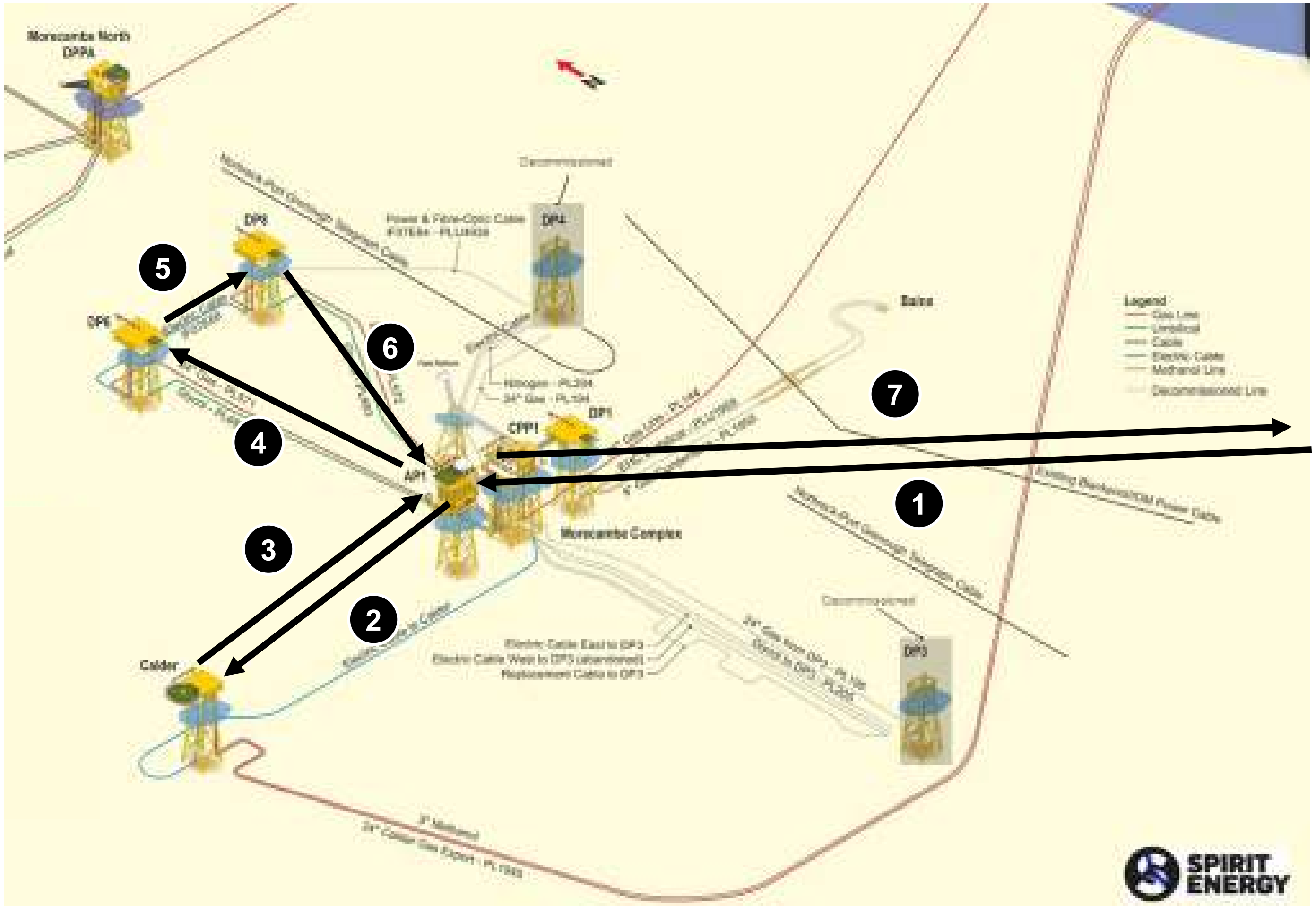
SPIRIT OPERATIONS

- To understand the impact from an offshore wind farm, some knowledge of Spirit's Morecambe hub and operations is required.
- Within the area of interest is the Morecambe Central Processing Complex (CPC) consisting of AP1 – CPP1 - DP1. This is the core hub of the Morecambe area, housing all offshore personnel and processing the production from several satellite facilities.
- The satellite facilities, such as Calder, DPPA, DP6 and DP8 are normally unmanned installations (NUIs). There are no personnel permanently stationed on the NUI's (no permanent accommodation facilities).Instead, NUI teams are housed on CPC.
- A helicopter will leave Blackpool, pick up the NUI team from CPC, and deliver them to the NUI. When the day is over, another flight is picks up the NUI team and returns them to CPC.



FLIGHT ROUTES

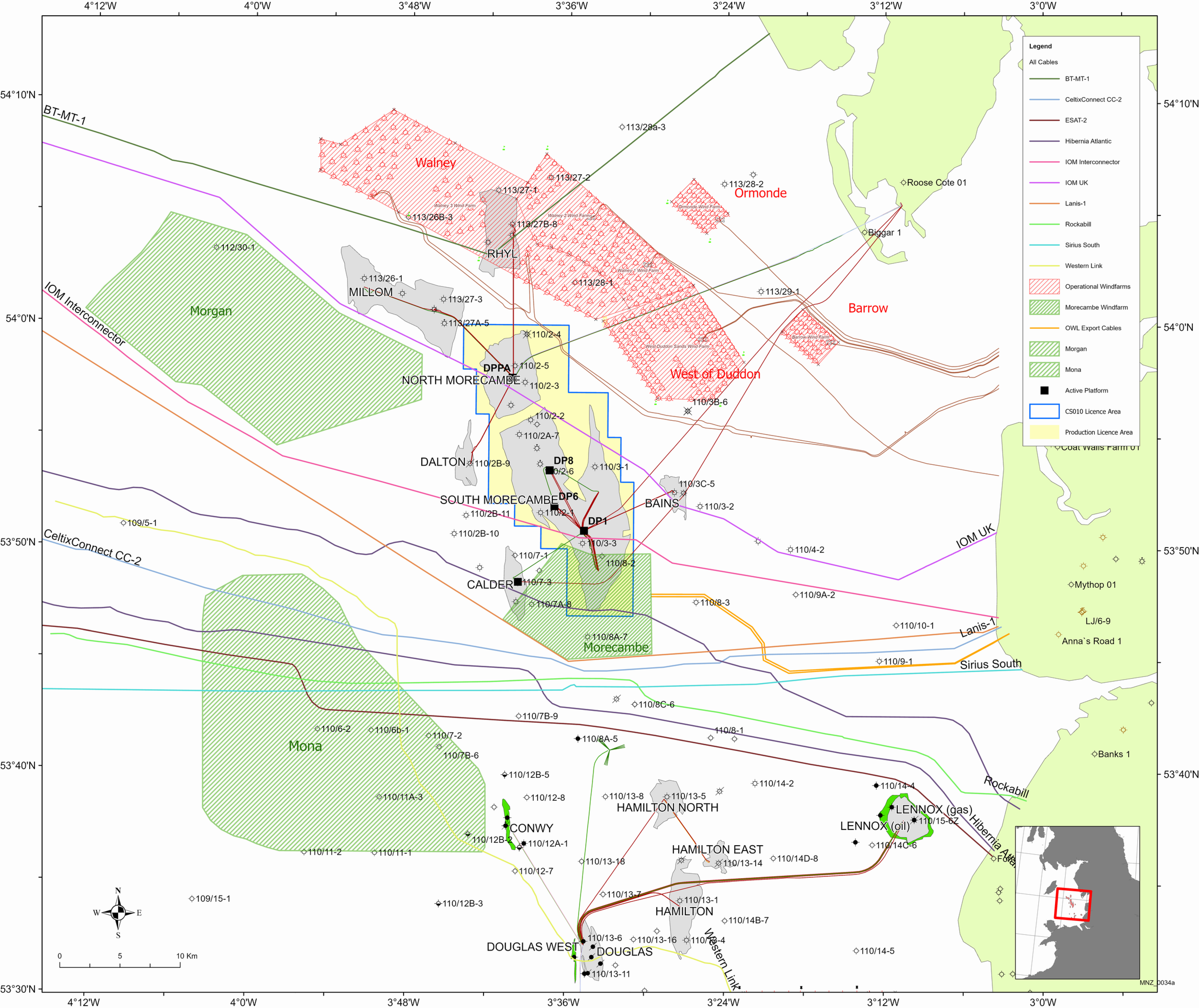
- Flights to CPC and the NUIs are planned in advance, aiming to deliver the NUI teams to the facilities in the most efficient manner possible.
- The image opposite shows one possible example of how a flight might be routed, picking up several NUI teams from CPC and delivering them to the different NUIs.
- A key objective of the flight planning is to allow as much time as possible on the NUIs for maintenance and other activities. If there is insufficient time to complete the desired work scopes, the flights will not go ahead.
- Bad weather must also be considered. If it is possible that the conditions are unfavourable later in the day, threatening the return of the NUI teams back to CPC, then the flights will again not go ahead.
- Flight routes are planned in advance in their entirety. If any of the flight route is impacted, and can't be delayed, then the whole flight will be cancelled.



Appendix C

Supplementary Figures

Figure 1



Legend
All Cables
BT-MT-1
CeltixConnect CC-2
ESAT-2
Hibernia Atlantic
IOM Interconnector
IOM UK
Lanis-1
Rockabill
Sirius South
Western Link
Operational Windfarms
Morecambe Windfarm
OWL Export Cables
Morgan
Mona
Active Platform
CS010 Licence Area
Production Licence Area
4°12'W
4°0'W
3°48'W
3°36'W
3°24'W
3°12'W
3°0'W
54°10'N
54°0'N
53°50'N
53°40'N
53°30'N
Walney
Ormonde
Barrow
West of Duddon
Morgan
Mona
Morecambe
RHYL
MILLOM
DPPA
NORTH MORECAMBE
DALTON
DP8
DP6
SOUTH MORECAMBE
DP1
BAINS
CALDER
HAMILTON NORTH
HAMILTON EAST
HAMILTON
DOUGLAS WEST
DOUGLAS
CONWY
LENNOX (gas)
LENNOX (oil)
BT-MT-1
IOM Interconnector
CeltixConnect CC-2
IOM UK
Lanis-1
Sirius South
Rockabill
Hibernia Atla
Western Link
113/28a-3
113/27-2
113/28-2
Roose Cote 01
113/27-1
113/26B-3
113/27B-8
Biggar 1
112/30-1
113/26-1
113/28-1
113/29-1
113/27-3
113/27A-5
110/2-4
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110/2-3
110/3B-6
110/2-2
110/2A-7
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110/3-1
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110/3-2
110/2B-11
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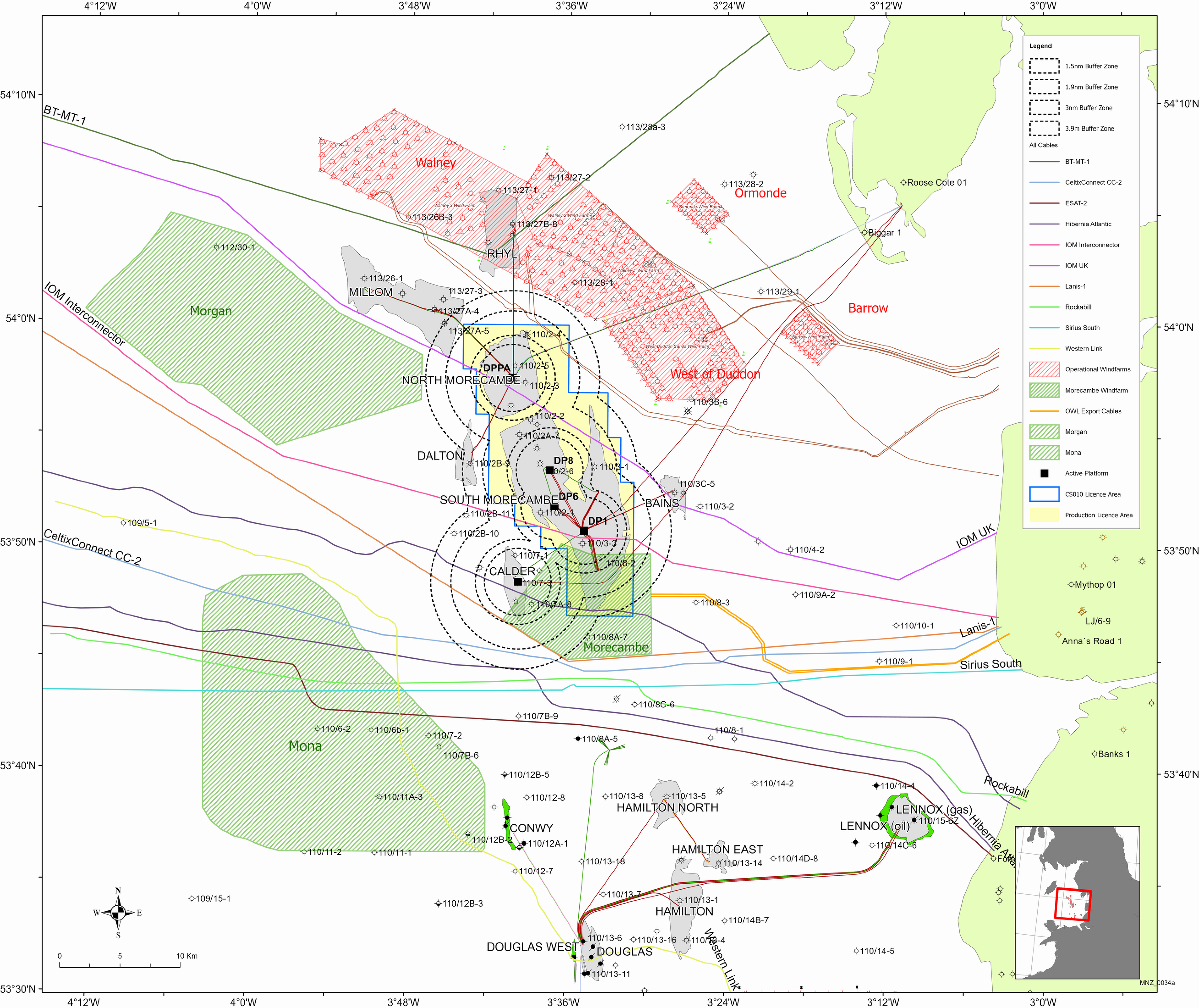
110/7-1
110/8-2
110/7-3
Mythop 01
110/7A-8
110/8-3
110/9A-2
LJ/6-9
110/10-1
Anna`s Road 1
110/8A-7
110/9-1
110/8C-6
110/7B-9
110/6-2
110/6b-1
110/7-2
110/8-1
110/8A-5
110/7B-6
Banks 1
110/12B-5
110/14-2
110/14-4
110/11A-3
110/12-8
110/13-8
110/13-5
110/15-6Z
110/12B-2
110/12A-1
110/14C-6
110/11-2
110/11-1
110/13-14
110/14D-8
110/12-7
110/13-18
110/13-7
109/15-1
110/12B-3
110/13-1
110/14B-7
110/13-6
110/13-16
110/13-4
110/14-5
110/13-11
Coat Walls Farm 01
N
S
W
E
0
5
10 Km
MNZ_0034a

Appendix C

Supplementary Figures

Figure 2



4°12'W
4°0'W
3°48'W
3°36'W
3°24'W
3°12'W
3°0'W
54°10'N
54°0'N
53°50'N
53°40'N
53°30'N
Legend
1.5nm Buffer Zone
1.9nm Buffer Zone
3nm Buffer Zone
3.9m Buffer Zone
All Cables
BT-MT-1
CeltixConnect CC-2
ESAT-2
Hibernia Atlantic
IOM Interconnector
IOM UK
Lanis-1
Rockabill
Sirius South
Western Link
Operational Windfarms
Morecambe Windfarm
OWL Export Cables
Morgan
Mona
Active Platform
CS010 Licence Area
Production Licence Area
BT-MT-1
IOM Interconnector
CeltixConnect CC-2
IOM UK
Lanis-1
Sirius South
Rockabill
Hibernia Atla
Western Link
Walney
Ormonde
Barrow
West of Duddon
Morgan
Mona
Morecambe
113/28a-3
113/27-2
113/27-1
113/28-2
Roose Cote 01
113/26B-3
113/27B-8
Biggar 1
112/30-1
RHYL
113/26-1
113/28-1
MILLOM
113/27-3
113/29-1
113/27A-4
113/27A-5
110/2-4
DPPA
110/2-5
NORTH MORECAMBE
110/2-3
110/3B-6
110/2-2
110/2A-7
DALTON
DP8
110/2B-9
110/2-6
110/3-1
110/3C-5
SOUTH MORECAMBE
DP6
BAINS
110/3-2
110/2B-11
110/2-1
109/5-1
DP1
110/2B-10
110/3-3
110/4-2
110/7-1
CALDER
110/8-2
Mythop 01
110/7-3
110/7A-8
110/8-3
110/9A-2
LJ/6-9
110/10-1
110/8A-7
Anna`s Road 1
110/9-1
110/8C-6
110/7B-9
110/6-2
110/6b-1
110/7-2
110/8-1
110/8A-5
110/7B-6
Banks 1
110/12B-5
110/14-2
110/14-4
110/11A-3
110/12-8
110/13-8
110/13-5
HAMILTON NORTH
LENNOX (gas)
110/15-6Z
LENNOX (oil)
CONWY
110/12B-2
110/12A-1
HAMILTON EAST
110/14C-6
110/11-2
110/11-1
110/14D-8
110/13-18
110/13-14
110/12-7
110/13-7
109/15-1
110/13-1
HAMILTON
110/12B-3
110/14B-7
110/13-6
110/13-16
DOUGLAS WEST
DOUGLAS
110/14-5
110/13-11
N
W
E
S
0
5
10 Km
MNZ_0034a