Morecambe Offshore Windfarm: Generation Assets

Examination Documents

Volume 9

The Applicant's Response to Spirit Energy Deadline 1 Submissions Appendix C: Helicopter Supporting Information Technical Note

Document Reference: 9.35.3

Rev 01

MORECAMBE

Document History

Doc No	MOR001-FLO-CON-ENV-TEC-0012	**Rev**	01
Alt Doc No	n/a		
Document Status	Approved for Use	**Doc Date**	12 December 2024
PINS Doc Ref	9.35.3	**APFP Ref**	n/a

Rev	Date	Doc Status	Originator	Reviewer	Approver	Modifications
01	12 December 2024	Approved for Use	Anatec	Morecambe Offshore Windfarm Ltd	Morecambe Offshore Windfarm Ltd	n/a

Morecambe Offshore Windfarm Helicopter Access Supporting Information

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Presented to	Morecambe Offshore Windfarm Ltd
Date	03 December 2024
Revision Number	03
Document Reference	A5035-FLO-TN-03

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Revision Number	Date	Summary of Change
00	16 September 2024	First Issue
01	26 September 2024	Updated based on client comments
02	14 November 2024	Updated to consider alternative aircraft mass assumptions
03	03 December 2024	Updated based on client comments

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Abbreviations Table

Abbreviation	Definition
AltMoC	Alternative Means of Compliance
AMC	Acceptable Means of Compliance
AMSL	Above Mean Sea Level
ARA	Airborne Radar Approach
CAA	Civil Aviation Authority
CAP	Civil Aviation Publication
CAT	Commercial Air Transport
DCO	Development Consent Order
EASA	European Aviation Safety Agency
HOFO	Helicopter Offshore Operations
IFR	Instrument Flight Rules
IMC	Instrument Meteorological Conditions
nm	Nautical Mile
NUI	Normally Unmanned Installation
OEI	One Engine Inoperative
SAR	Search and Rescue
SERA	Standard European Rules of the Air
SPA HOFO	Specific Approval for Helicopter Offshore Operations
TEMPSC	Totally Enclosed Motor Propelled Survival Craft
VMC	Visual Meteorological Conditions

1 Introduction

1. This Technical Note will provide an overview of the regulations that address helicopter Commercial Air Transport (CAT) flights to offshore locations. As part of the overview, the relevant classes of meteorological conditions will be identified alongside the obstacle avoidance criteria, including during emergency conditions. Search and Rescue operations are subject to separate regulations, which will be noted.
2. Secondly, a proposed change to the regulations covering helicopter take-offs and landings within 3nm of a wind farm will be discussed. This will identify the progress to date and potential future impacts.
3. Thirdly, the approach and take-off distances required according to the meteorological conditions will be identified.
4. A discussion on Search and Rescue access is also presented.
5. Finally, a comparison will be made between the CAT helicopter access available to the permanently crewed South Morecambe installation and the Calder normally unmanned installation (NUI).

2 Helicopter Commercial Air Transport Regulations

6. UK CAT regulations are based on European Law. The European Aviation Safety Agency (EASA) assumed competency for helicopter flight operations after 2013, with the UK Civil Aviation Authority (CAA) adopting the role of a "Competent Authority". After Brexit the EASA regulations were adopted wholesale by the UK under the European Union (Withdrawal) Act 2018 and regulated by the CAA.

7. In the regulations some types of operations, such as helicopter offshore operations, are subject to additional requirements.

2.1 Helicopter Offshore Operations

8. Helicopter Offshore Operations (HOFO) regulations control the risks associated with offshore operations that are not adequately addressed in the basic regulations. 'Offshore operation' means a helicopter operation that has a substantial proportion of any flight conducted over open sea areas to or from an offshore location. An offshore operation includes, but is not limited to, a helicopter flight for the purpose of:

   - support of offshore oil, gas and mineral exploration, production, storage and transport;
   - support of offshore wind turbines and other renewable-energy sources; or
   - support of ships including sea pilot transfer.

9. 'Offshore location' means a location or destination on a fixed or floating offshore structure or vessel, and includes helidecks, helicopter hoist operations areas and operating sites. 'Offshore location' includes, but is not limited to:

   - helidecks;
   - shipboard heliports; and
   - winching areas on vessels or renewable-energy installations.

10. 'Helideck' means a Final Approach and Take-off Area located on a floating or fixed offshore structure. The term 'helideck' includes take-off and landing operations on ships and vessels and covers shipboard Final Approach and Take-Off Areas.

11. It is clear that the same regulations are applicable to flights to offshore gas installations as well as to helidecks used for renewable projects. The same limitations, such as night or Instrument Meteorological Conditions (IMC) access, also apply to all these operations as they are based on safety requirements.

2.2 Visual and Instrument Meteorological Conditions

2.2.1 Visual Meteorological Condition (VMC)

12. The regulations[1] define VMC offshore as:

- Day: cloud base >=600ft and visibility >= 4,000m
- Night: cloud base >=1,200ft and visibility >=5,000m

2.2.2 Instrument Meteorological Conditions (IMC)

13. IMC exists when the cloud base or visibility is below VMC. IMC are conditions which require pilots to fly by primary reference to instruments.

2.3 Airborne Radar Approach

14. In IMC an approach to an offshore helideck is flown using a profile called an Airborne Radar Approach[2] (ARA). There are a number of requirements associated with this approach profile:

    - Before commencing the final approach, the pilot should ensure that a clear path exists on the radar screen for the final and missed approach sector, that ensures a 1nm lateral clearance from any obstacle. N.B. this requirement should also be applied to a take-off into IMC.
    - The Minimum Descent Height for an ARA should be no lower than 200ft by day or 300ft by night. In addition, the Minimum Descent Height must be no lower than 50ft above the helideck. For example, the CPC-1 helideck is 184ft above sea level and so the Minimum Descent Height by day will be 234ft (helideck height plus 50ft), the Calder helideck is 105ft above sea level and so the Minimum Descent Height will be 200ft.

2.4 Night Operations

15. The International Civil Aviation Organisation defines night as *"the hours between the end of civil twilight and the beginning of morning civil twilight or such other period between sunset and sunrise, as may be prescribed by the appropriate authority".*

16. In the UK the CAA is the "appropriate authority". The UK Standardised Rules of the Air Regulation[3] defines night as:

    "'night' means the hours between the end of evening civil twilight and the beginning of morning civil twilight. Civil twilight ends in the evening when the

[1] AMC2 SPA.HOFO.120 Selection of aerodromes (helidecks) and operating sites
[2] GM1 SPA.HOFO.125 Airborne radar approach (ARA) to offshore locations
[3] UK Regulation (EU) No. 923/2012 dated August 2024

centre of the sun's disc is 6 degrees below the horizon and begins in the morning when the centre of the sun's disc is 6 degrees below the horizon;"

17. There are various definitions of night that could be applied to this assessment.

- Civil Twilight: the period after sunset or before sunrise ending or beginning when the sun is about 6 degrees below the horizon and during which on clear days there is enough light for ordinary outdoor occupations.
- Nautical Twilight: the period after sunset when the sun is 12 degrees below the horizon. In clear weather the horizon is faintly visible during this phase. Pilots record night flying when Nautical Twilight commences.

18. To illustrate the difference in the two versions of twilight, on the 15 September 2024 Civil Twilight for Blackpool ended at 20:03 and Nautical Twilight ended at 20:45.

19. During this assessment, Civil Twilight has been used to assess when night conditions exist. This definition aligns with the CAA definition of night.

3 Proposed Changes to Operations Within 3nm of a Windfarm

20. Discussions have taken place between some helicopter operators and the CAA regarding limiting flights within 3nm of a windfarm to day VMC only. The Applicant has a copy of the minutes from a meeting between the operators and the CAA that occurred on 6th April 2023. During the meeting it was proposed that:

- *"All the proposals made by this group are solely intended for Oil & Gas support operations to Oil & Gas helidecks. Windfarm support operations to windfarm helidecks or wind turbines are not included and the proposals are not intended for windfarm support operations."*

- *"Within 3nm the operating weather limits increase to 700ft cloud base/5000m visibility"*

- *"Wind Turbines to Power Offshore Production Platforms*

  It was agreed that wind turbines installed by O&G companies to power offshore installations will be addressed separately and will likely require bespoke mitigation. Currently these are expected to be within 2nm of the affected helideck although none have been built.

- *This group recommends liaison with the helicopter operator to ensure the operational impact is minimised. Considerations should include;*
  - *Prevailing wind/approach directions*
  - *Need for night or IFR (Instrument Flight Rules) operations*
  - *Prevailing wind direction when IFR approaches required.*
  - *Requirement for restricted sectors"*

3.1 Concerns Regarding This Change

21. Restricting operations within 3nm of a wind farm to day VMC could be due to safety concerns. However, this proposal, which has not been issued for wider industry consultation, appears to suggest that there will be 3 sets of regulations: retaining the *status quo* for wind farm operations; applying a day VMC only limitation for operations to an oil or gas installation within 3nm of a wind farm owned by a 3rd party; thirdly, allowing alleviations from the new requirement if the gas operator owns the wind turbine(s). Clearly all HOFO operations are currently controlled under a single set of regulations that consider safety requirements. The new proposal deviates from this principle and imposes limits on operations close to 3rd party wind farms that might not be applicable when the wind turbines are owned by the gas installation operator. If safety is the determining factor, then all operations should be treated equally, as is the current case. A safe approach and departure is determined by the size, location and conspicuity (electronic and visual) of any obstacles, not the ownership of the obstacle.

22. In the meeting minutes, no justification was provided for why a distance of 3nm should be applied to 3rd party wind farms. The only reference to 3nm in the regulations concerns a missed approach area for an ARA, which states:

> *"A missed approach area, taking the form of a 45⁰ sector, orientated left or right of the final approach track, originating from a point 5nm short of the destination, and terminating on an arc 3nm beyond the destination, should normally satisfy the specification of a 30⁰ missed approach".*

23. As the area can be orientated left or right of the final approach track, a 3nm radius around the helideck free from wind turbines is not required.

3.2 Timescale for the Proposed Rule Change

24. At the present time there is no indication if this rule change will be progressed, and if so, the timescale for the change. It is understood that post Brexit the CAA has a backlog of regulations they wish to amend.

3.3 Acceptable Means of Compliance

25. If the rule change did occur then it will be at the level of Acceptable Means of Compliance. Acceptable Means of Compliance (AMC) adopted by the CAA are means by which the requirements in the UK Regulation (EU) 2018/1139 (UK Basic Regulation) and it's Implementing Rules can be met. For example, AMC1 SPA.HOFO. 125 covers airborne radar approaches to offshore locations. Since requirements can be met by other means, regulated persons and organisations may apply for permission to use alternative procedures to comply with the law by the use of Alternative Means of Compliance (AltMoC)[4].

26. For the CAA to accept an AltMoC the helicopter operator will need to demonstrate that the alternative approach nonetheless maintains compliance with the law. Applicants may also apply for AltMoCs as a means to establish compliance with the UK Basic Regulation and its Implementing Rules for which no associated AMC has been adopted. Where regulated persons or organisations wish to utilise their own alternative means of compliance, they must first obtain the approval of the CAA.

27. Even if the CAA regulatory change covering helicopter flights within 3nm of wind turbines did progress, then helicopter operators would still have the option to apply for an AltMoc to continue some operations under day IMC and night providing an acceptable level of safety was maintained. The AltMoc process is described in Civil Aviation Publication (CAP) 1721.

28. Applying an AltMoc does not lead to a reduction in safety. Some regulatory regimes, such as the Health and Safety Executive (HSE) adopt a goal setting regime. For example, under the Prevention of Fire and Explosion, and Emergency Response

[4] https://www.caa.co.uk/publication/download/17109

Regulations it is a requirement to show a “good prospect of rescue” following a helicopter ditching but with no defined targets. Conversely, aviation regulations adopt a prescriptive approach, which frequently lag advances in technology or operational procedures. However, to prevent innovation being stifled, variations from the regulations are permitted where an equivalent or better level of safety can be demonstrated. An AltMoc is an example of this approach to permit innovation whilst maintaining an acceptable level of safety. An example is the AW169 helicopter used by IPs in the Morecambe Bay gas fields. The AW169’s Type Certificate Data Sheet[5] shows that six Special Conditions were applied during certification and 11 Equivalent Safety Findings were applied. A Special Condition is applied when the certifying authority finds that the airworthiness regulations for an aircraft or aircraft engine do not contain adequate or appropriate safety standards, because of a novel or unusual design feature. An Equivalent Safety Finding is another way to meet the certification requirements, usually through an Alternative Means of Compliance. In summary, applying an AltMoc for approaches in IMC to CPC-1 post any CAA rule change is consistent with aviation practice, aimed at maintaining safety levels whilst providing flexibility.

[5] https://www.easa.europa.eu/en/document-library/type-certificates/rotorcraft-cs-29-cs-27-cs-vlr/easar509-aw169

4 Obstacle and Terrain Avoidance Distances

29. The following distances from obstacles are applicable for VMC and IMC approaches and take-offs.

Table 4.1 Required Distances

	Approach	Take Off
Day VMC	**1.26nm** (see Section 4.2.1)	**1.14-1.38nm** (see Section 4.3.1)
IMC	**9nm** (see Section 4.2.2)	**2.73-3.26nm** (see Section 4.3.2)

30. The following sections provide further explanation.

4.1 Flight Rules

4.1.1 VMC

31. Under Visual Flight Rules[6], except during landing or take-off, 150m (500ft) is the minimum height above terrain, water, or above the highest obstacle within a radius of 150m (500ft) from the aircraft. So, when operating by day in VMC the minimum distance from any wind turbine (vertically or laterally) is 150m (500ft).

4.1.2 IMC

32. Under Instrument Flight Rules[7], except as part of a landing or take-off procedure, the minimum flight level is 300m (1000ft) above the highest obstacle located within 8km of the estimated position of the aircraft. For example, in IMC, flights over the wind turbines would have to be at or above the height of the turbines plus 1,000ft.

33. During an ARA all obstacles must be avoided by 1nm laterally[8] until they are visual.

4.2 Approach

4.2.1 Day VMC – Stabilised Approach

34. Relevant to this assessment is the HeliOffshore industry guidance on stabilised approaches[9]. This guidance has been adopted into the helicopter operators'

[6] SERA. 5005 Visual Flight Rules
[7] SERA. 5015 Instrument flight rules (IFR) – Rules applicable to all IFR flights
[8] GM1 SPA.HOFO.125 Airborne radar approach (ARA) to offshore locations
[9] https://static1.squarespace.com/static/61545016c5513327f64b3107/t/63ed366bc023f87e243e7bfa/1676490381581/Flightpath+Management+%28FPM%29+-+Version+3

operations manuals, training and monitoring systems. An approach is deemed to be stable if:

- the helicopter is in the correct configuration, including landing gear down and floats armed;
- at the briefed airspeed, ± 10kt, or appropriate for the distance to go for a visual approach;
- steady and appropriate power set;
- tracking into wind towards the landing point;
- rate of descent less than 700ft/min.

35. If the approach deviates from these criteria a go-around is flown. The guidance shows a stabilisation point at 0.5nm from the landing site. One helicopter operator has chosen a stabilisation point at 0.75nm but another permits a stabilisation point at 0.3nm when operating day VMC inside wind farms. Manoeuvring, such as turning, is permitted up until the stabilisation point.

36. Sufficient space must be available to manoeuvre in order to align with the landing point, into wind at the stabilisation point. All turns will be flown using the industry norm of "Rate One", which results in a rate of turn of 3° per second. The radius of turn is proportional to the airspeed flown. At an airspeed of 80 knots, the radius of turn required to complete a 180° turn is 0.43 nm (786m).

37. Under the Standard European Rules of the Air (SERA)[10], all obstacles must be avoided in VMC by 150m (0.08nm) laterally. Summing the three requirements of the stabilisation distance, radius of turn and lateral avoidance criteria results in a distance of 1.26nm (2334m) for a stabilisation point of 0.75nm. As the industry guidance uses a stabilisation point at 0.5nm, the figure of 0.75nm provides an additional margin of 50%.

38. An approach distance of 1.26nm was agreed for the Dudgeon and Sheringham Shoals Extension Project, although shorter distances are commonly applied in other operations.

4.2.2 IMC – ARA

39. An ARA conducted in IMC requires an approach distance of 9nm, in order to arrive at the 6nm point shown in Figure 4.1 at the required altitude of 1500ft. The ARA profile is shown in Figure 4.1 and Figure 4.2.

[10] CAA (2023). UK Reg (EU) No 923/2012 (the UK Standardised Rules of the Air Regulation)

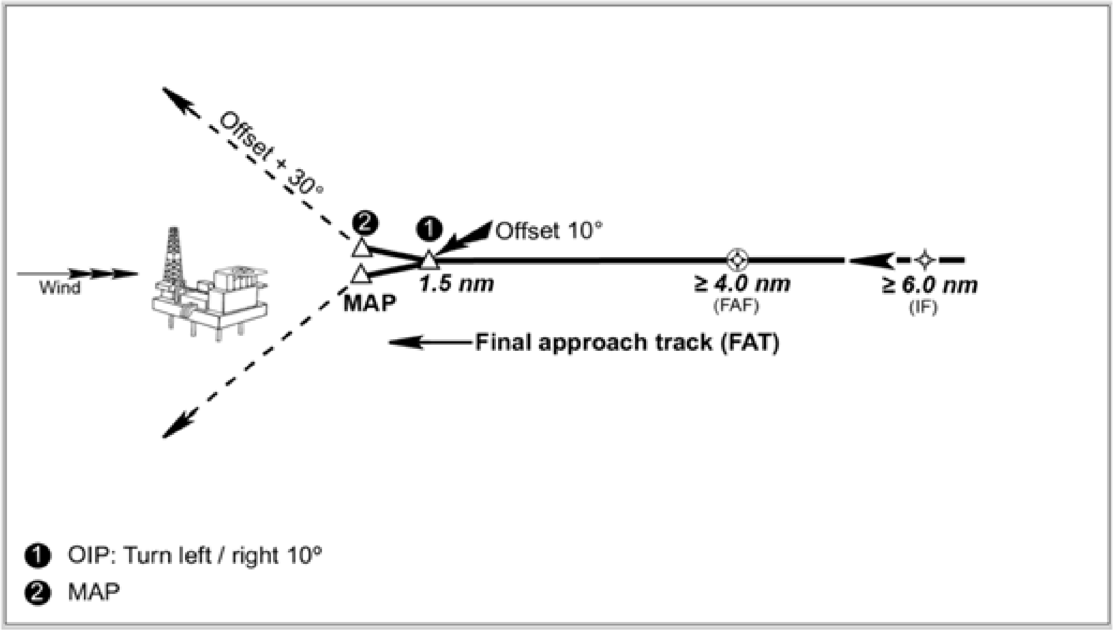

Figure 4.1 ARA Horizontal Profile

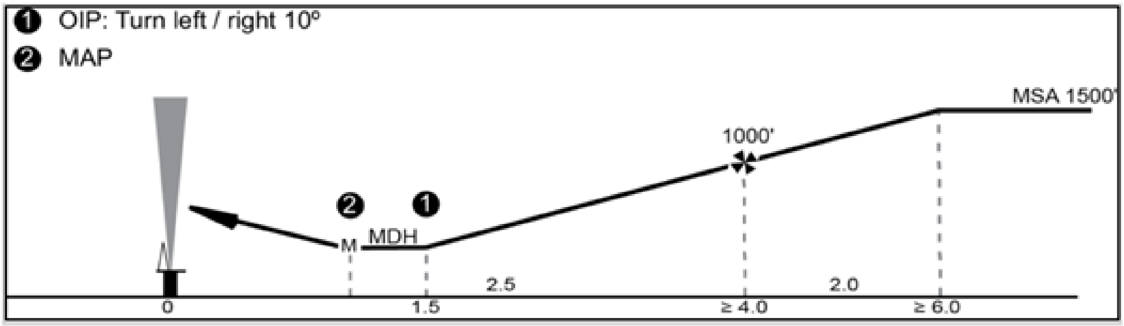

Figure 4.2 ARA Vertical Profile

40. During an IMC approach or take-off all obstacles have to be avoided by a minimum lateral distance of 1nm. Figure 4.3 shows a 1nm buffer (red line) around the Morecambe Unconstrained Areas where wind turbines could be placed. Any IMC approach or take-off would have to remain outside the 1nm red line buffer.

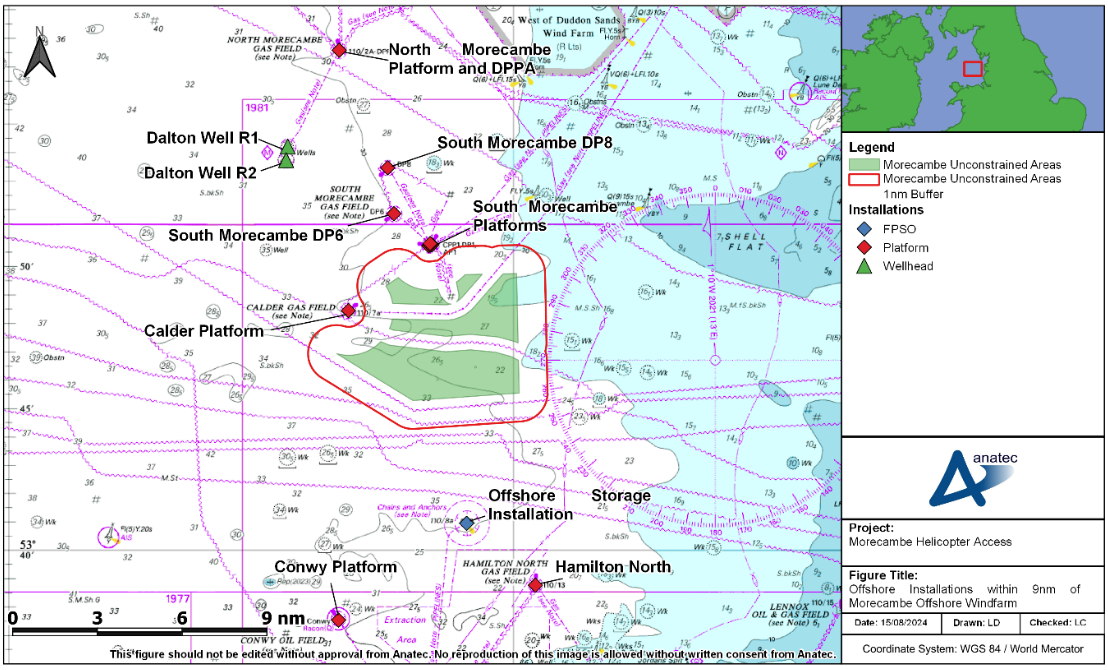

Figure 4.3 Morecambe Unconstrained Areas with a 1nm Buffer

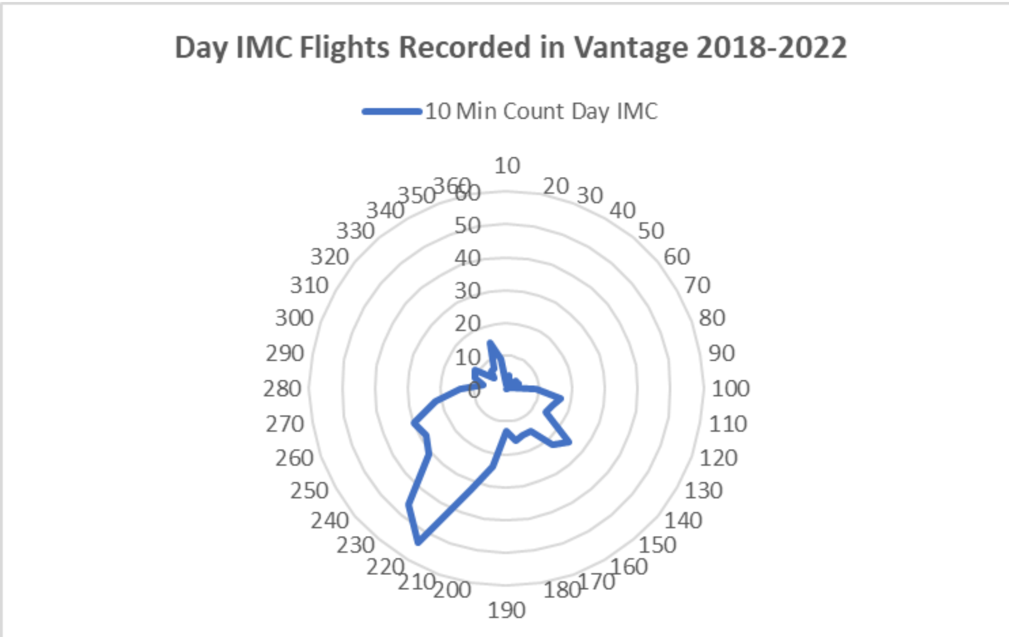

Figure 4.4 Wind Directions for IMC Flights Recorded in the Vantage Data

41. Figure 4.4 shows the wind directions for IMC flights recorded in the Vantage Data. The horizontal ARA profile in Figure 4.1 shows that at 1.5nm from the platform a turn of 10^{o} is made either to the left or right: in the case of an approach on a south westerly heading towards CPC-1 this turn would be to the right, i.e. away from the windfarm. At the Missed Approach Point (MAP), the point at which a go-around is

flown if the pilots are not visual with their landing point, a further turn to the right would be made, again away from the windfarm.

42. A similar profile could be flown with a south easterly wind, this time with a 10° offset and go-around to the left. In addition, the sector from the Initial Fix to the MAP can be flown slightly out of wind, providing the drift angle is less than 10°. For a 20kn wind this means the approach could be flown up to 30° out of wind.

43. Under the current CAA regulations, ARAs could be flown to the CPC-1 with a south westerly or south easterly wind; approaches when the wind is from a northerly direction would be obstructed by the wind farm for a small percentage of flights.

4.3 Take-off

44. Aviation regulations require the operator to take account of an engine failure occurring on take-off, i.e. the One Engine Inoperative (OEI) case. The loss of one engine will reduce the helicopter's climb performance, requiring a longer distance to achieve a given height above the surface. The rate of climb will depend on the aircraft mass, the ambient pressure and temperature. The distance required to achieve a given height will also vary with the wind velocity, with a stronger wind resulting in a lower ground speed and hence a shorter distance to climb to a given height.

45. Take-off performance, including OEI operations, depends on a number of factors:

- Air temperature. This will affect both the helicopter's aerodynamic performance and engine power available. Hot ambient air will reduce the helicopter's overall performance. Air temperature data was available in the meteorological data provided by Harbour Energy.
- Air pressure. This will affect both the aerodynamic performance and engine power available. Low pressure will reduce the helicopter's overall performance. Pressure data was not available in the meteorological data provided by Harbour Energy and some assumptions have therefore been applied.
- Aircraft mass. The higher the aircraft mass the higher the take-off power required for given conditions. The Vantage flight data provided by Harbour Energy did not include passenger and baggage figures, as is available in Vantage. If Harbour Energy could provide the passenger and baggage data, i.e. the required payload for a given flight, then this assessment could be updated.
- Ambient wind conditions. Taking-off into wind reduces the ground speed and so the distance required to climb to a given height above the surface. Wind data was available in the meteorological data provided by Harbour Energy.

46. The meteorological data showed the following distribution of wind velocities.

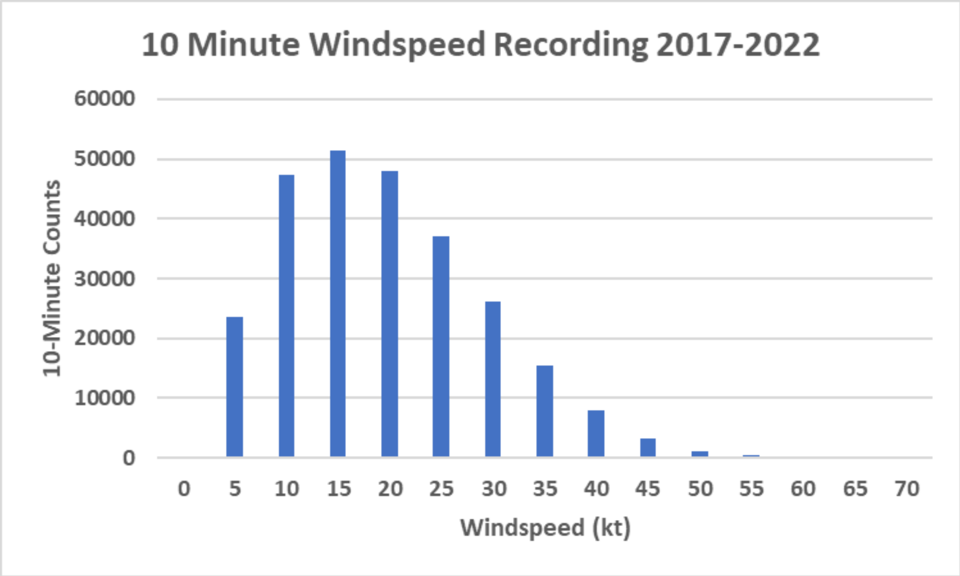

Figure 4.5 Distribution of Wind Speeds 2017-2022

47. The Mean windspeed was 17.0 kt and the Median was 15.8 kt.

48. The meteorological data showed the following distribution of ambient temperature.

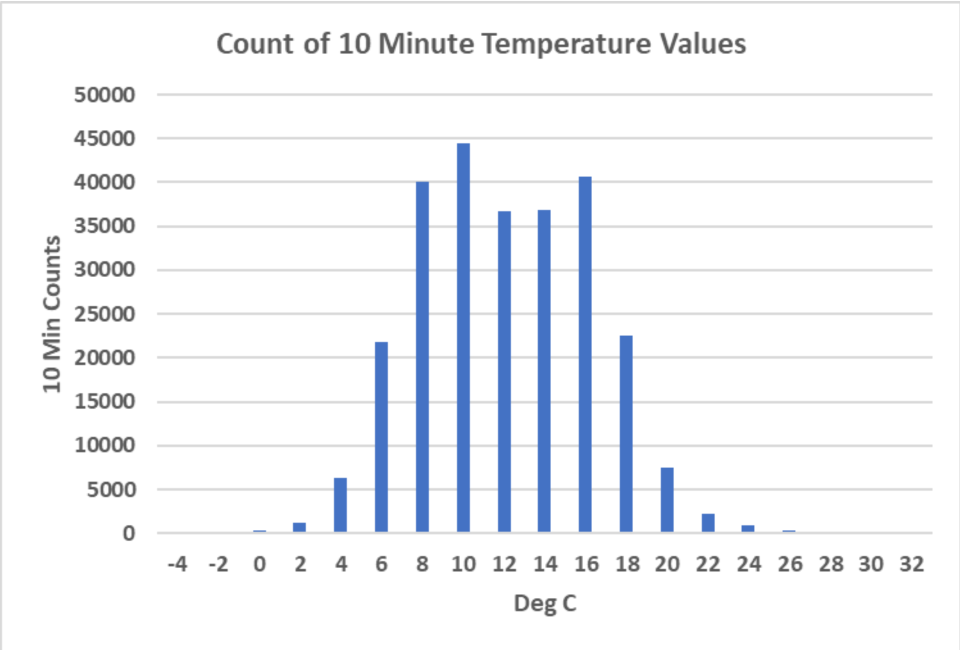

Figure 4.6 Distribution of All Temperature Recordings 2017-2022

49. As take-off into IMC is the more limiting flight condition, it is relevant to apply the temperature conditions applying in IMC.

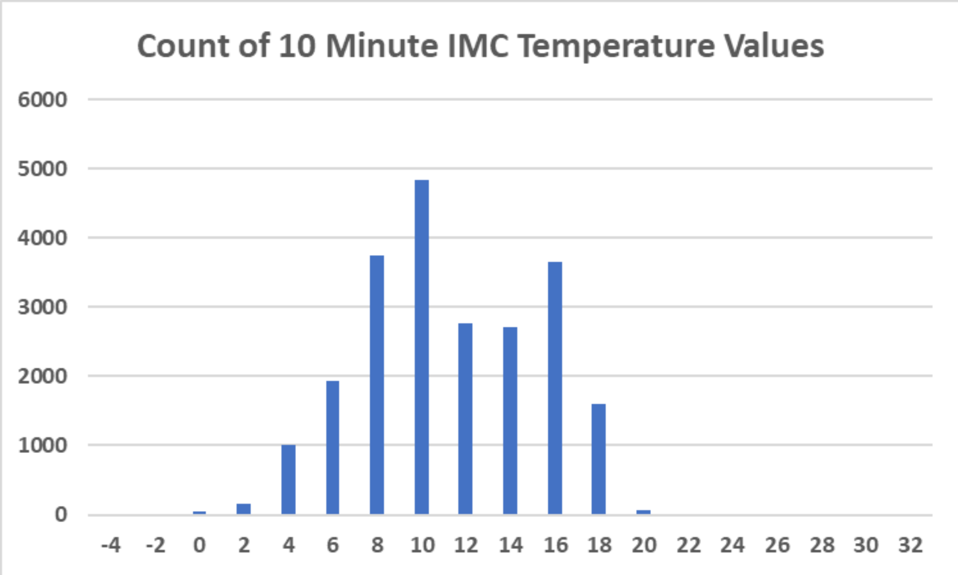

Figure 4.7 Distribution of IMC Temperature Recordings 2017-2022

50. The mean temperature was 10.3^{o}C, with a Median temperature of 9.8^{o}C.

51. As shown in Figure 4.7, the Mean temperature for IMC was 10.3^{o}C, with a Median temperature of 9.8^{o}C. For this assessment a conservative approach has been taken and a temperature of 15^{o}C used.

52. As pressure data was not available in the meteorological data supplied by Harbour Energy, the International Standard Atmosphere sea level value of 1013 hPa was used in the calculations of the take-off distance required.

53. The main helicopter type used in the Morecambe Bay gas fields is the Leonardo AW169. This has a maximum certified mass of 4800kg. Other types, such as the larger AW139, have also been used in Morecambe Bay; the AW139 has similar performance to the AW169.

54. The AW169 was initially certified with a maximum take-off mass of 4600kg. This was then extended to 4800kg. Due to the increase in maximum take-off mass to 4800kg, additional power upgrades were made available to compensate for the increased mass. For this assessment, the "Enhanced" performance data has been applied, which is available as a retrofit and is already being used by another AW169 offshore operator in the UK. A further upgrade to "Superior" performance is an option but has not been applied to this assessment.

55. For this assessment the AW169 was assumed to be at a mass of between 4400kg and 4800kg. Although a mass of 4800kg has been assessed, a more realistic mass is 4650kg and lower because it is likely that the AW169 will depart Blackpool Airport with a full complement of 8 passengers at a take-off mass of 4800kg. As there is no fuel offshore, the mass of the aircraft will continue to reduce as fuel is burned, until it returns to Blackpool Airport where it can refuel. If Spirit Energy could supply

Vantage data with payload information included, then it would be helpful in confirming this assessment.

56. As shown in Figure 4.5, the Mean windspeed was 17.0 kt and the Median was 15.8 kt. Values of windspeed of 10kt and 15kt will be applied in this assessment. As is standard practice in calculating performance, credit will only be taken for 50% of the windspeed, e.g. for a 10 kt wind the 5kt values shown in the graphs will be used. The results show the full wind speed but the assessment has used the 50% factored windspeed.

57. The AW169 helicopter's Rotorcraft Flight Manual was consulted:

- The maximum take-off weight for a helipad take-off is shown in Figure S4T-D13-15 G&E H/H Vertical Take-off Procedure- Weight Limitations. These graphs show the dropdown, if any, below helideck height.
- Figure S4-19-21 shows the climb gradient for Flightpath 1 (First Sector) at the 2 ½ Minute OEI rating.
- Figure S4-31 showed a fixed value of 660m to be used for the level acceleration from the Take-Off Safety Speed (V_{toss}) of 45 kts to Best Rate of Climb Speed (V_y) of 75kts. The distance shown in the graph is still air, so the distance was modified to take account of the reduced ground speed due to flying into a 10kt or 15kt headwind.
- Fig S4-40-42 Path 2 Gradient Continuous OEI Power was used to determine the climb gradient from 200ft Above Mean Sea Level (AMSL) to 500ft AMSL in the case of VMC and to 1,000ft AMSL in the case of IMC. The distance was modified to take account of the reduced ground speed due to flying into a 10kt or 15kt headwind.
- A Rate 1 turn (standard turn rate of 3^{o} per second) at 75 kt result in a radius of turn of 0.4nm
- For VMC the Standard European Rules of the Air avoidance criteria of 500ft (150m or 0.08nm) was applied.
- For IMC a 1nm buffer was added to the OEI take-off distance.

58. The conditions and aircraft mass selected were input to the graphs identified, resulting in the take-off distances shown in Table 4.2 and Table 4.3..

4.3.1 Day VMC

59. In VMC an OEI take-off would typically be straight ahead to 500ft AMSL before turning. A turn at 500ft AMSL permits the pilots to remain 100ft clear of cloud under the current definition of VMC (600ft cloud base), and has been agreed with operators on previous projects. Offshore, pilots use their barometric altimeter and radio altimeter which both show the height above the sea. All heights are referenced against sea level, such as the ARA profile shown in Figure 4.2, and the cloud base limits shown in Section 2.2. Table 4.2 presents the take-off distance required for VMC for two values of wind speed.

Table 4.2 OEI Distance Required to Climb to 500ft above Sea Level and then Make a Rate 1 Turn Through 90⁰ (VMC Case). 1013 hPa and 15⁰C

Take-off Mass (kg)	Distance (nm) 10kt Factored Windspeed	Distance (nm) 15kt Factored Windspeed
4400	1.21	1.14
4600	1.29	1.21
4800	1.38	1.28

60. Current VMC operations include landing on platforms inside the Hornsea One and Two Wind Farms, with wind turbines 0.65nm (1,200m) from the helideck: these flights use a combination of AW169 and AW139 helicopters. The Dudgeon and Sheringham Shoals Extension Project Development Consent Order[11] (DCO) states a distance of 1.26nm from the Waveney platform was acceptable for day VMC operations. The Hornsea Four DCO[12] Protected Provisions for the Johnston Welheads, located inside the windfarm, include an obstacle free radius of 1,600m (0.86nm) for day VMC operations.

4.3.2 IMC

61. For IMC take-off, it has to be assumed that the engine will fail on take-off and so sufficient distance must be available to climb to 1,000ft AMSL before turning away from obstacles. The additional height (1,000ft AMSL versus 500ft AMSL) compared to VMC is due to the increased pilot workload in IMC. Throughout the take-off the aircraft must remain 1nm away from obstacles until at the Minimum Safe Height of 1,000ft above the obstacle.

62. Table 4.3 presents the take-off distance required for IMC for two values of wind speed.

Table 4.3 OEI Distance Required to Climb to 1000ft above Sea Level and then Make a Rate 1 Turn Through 90⁰ Maintaining 1nm Clear of Obstacles (IMC Case). 1013 hPa and 15⁰C

Take-off Mass (kg)	Distance (nm) -10kt Factored Windspeed	Distance (nm) - 15kt Factored Windspeed
4400	2.82	2.73
4600	3.02	3.01

[11] https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010109/EN010109-002343-SADEP%20DCO%20DESNZ%20170424.pdf Part 14
[12] https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010098/EN010098-002330-DCO%20Hornsea%204%20OWF%20signed.pdf Part 11

Take-off Mass (kg)	Distance (nm) -10kt Factored Windspeed	Distance (nm) - 15kt Factored Windspeed
4800	3.26	3.26

63. At windspeeds of 10kt or lower, the helicopter can take-off out of wind (providing it is not downwind), permitting an option of take-off directions away from the wind farm.

4.3.3 Offshore Take-off Mass

64. There are not any offshore refuel facilities in the Morecambe Bay gas fields. It is assumed that the AW169 will normally depart Blackpool for CPC-1 with a full load of passengers as the helicopter only has 8 passenger seats and the CPC-1 has circa 170 people onboard who will need transporting to and from the platform due to their work patterns. Assuming the AW169 departs Blackpool with 8 passengers, then that is the heaviest it can be during the flight, and during any subsequent shuttle flights, before returning to Blackpool. Assuming a take-off from Blackpool at 4800kg, then the take-off from CPC-1 will be circa 4650kg, or lower, due to the fuel burned during the transit, approach and time on the helideck, during which passengers are changed over. If a limited number of sectors are scheduled for a flight then the crew will not require a large fuel load and so the aircraft mass will be lower than maximum on the initial take-off from Blackpool. Figure 4.8 shows the number of sectors per flight recorded in Vantage. There was a total of 6,719 flights recorded in Vantage between January 2019 and September 2023; each flight comprises of two or more sectors.

65. The most probable take-off mass from CPC-1 is circa 4650kg or lower, and will reduce further during any shuttle flights as fuel is burned, whilst transporting staff to NUIs from CPC-1. Lower masses result in lower distances required for take-off.

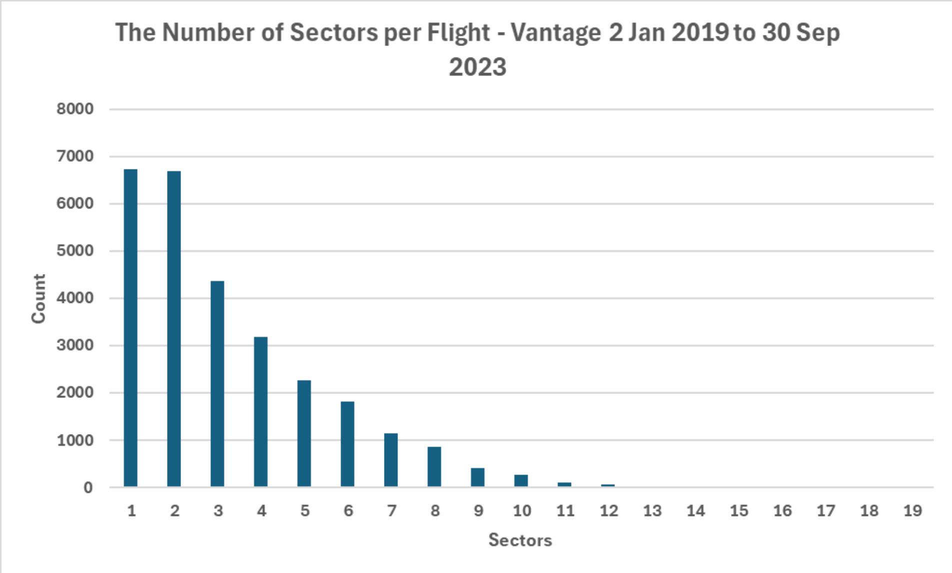

Figure 4.8 Number of Flight Sectors

66. It is seen that just over half of the flights had four sectors or less, and a very small proportion (4%) had 10 or more sectors.

4.3.4 Potential Mitigations

67. The AW169 is offered with a further power upgrade to "Superior" power. This would reduce the take-off distances required, although the difference in the additional OEI take-off performance is relatively small.

68. As is common operational practice, the wind was factored by 50%, e.g. for a 10kt wind only credit was taken for 5kt. Subject to accurate anemometers being placed on an installation, and subject to a safety assessment, the operational regulations allow for credit to be taken for up to 75% of the ambient wind, e.g. for a 10kt wind credit could be taken for 7.5kt. This would allow the operator to take-off with a higher passenger payload for a given take-off distance available.

69. The data shows that the predominant wind direct for IMC is from the south-west. If a take-off area from CPPC-1 was provided into the prevailing wind, then IMC access would be increased and yet the impact on the Morecambe Wind Farm would be reduced, compared to a 360⁰ obstacle free area. This is discussed further in a separate note "A5035-FLO-TN-04".

70. Installing a refuel facility on CPC-1 would permit the AW169 to be flown at a lower mass whilst still meeting all the regulatory and client requirements. When required, the helicopter could refuel offshore. Operating at a lower mass would require a shorter take-off distance than necessary if the helicopter had to depart from shore with sufficient fuel for multiple offshore shuttle flights to NUIs.

5 Search and Rescue

71. The methodology used so far in this Note addresses helicopter access under CAT Regulations. Emergency down manning of any installation, critical Medevacs and Search and Rescue (SAR) are not constrained by CAT Regulations as these flights are generally flown by the Coastguard SAR aircraft operating under CAP 999. The Coastguard helicopters are operated as State Aircraft under National Regulations and are not constrained by the higher weather limits in CAT Regulations. CAP 999 defines the SAR operating minima as:

> *Operating minima for the dispatch and continuation of a SAR operational flight are at the discretion of the aircraft commander. However, he is to consider the urgency of the task, crew and aircraft capability and the requirement to recover the aircraft safely.*

72. Due to the SAR autopilot modes and enhanced sensors fitted to the Coastguard SAR helicopters, a shorter distance is required to approach and manoeuvre to land on platforms, even in poor weather or at night. The Morecambe Offshore Windfarm will be designed in accordance with Marine Guidance Note 654, which permits helicopter SAR operations within a turbine array, and so SAR access will also be available to platforms adjacent to the windfarm.

73. Although SAR and CAT helicopters are usually the preferred means for an emergency evacuation, they cannot be the primary means of an emergency evacuation in all cases. For example, helicopters cannot be used when the approach, take-off, or helideck are affected by a hydrocarbon release, fire or explosion. In the event of an emergency on the platform resulting in an explosion, fire or release of hydrocarbons, helicopters would be unable to land and so other means of evacuation, such as Totally Enclosed Motor Propelled Survival Craft (TEMPSC) or Seascape escape systems would be required.

74. CAT helicopters may have a role to play in non-emergency situations, such as precautionary down manning of an installation following a loss of power. However, these incidents are usually for crew comfort and welfare reasons and not for urgent safety requirements. CAT helicopters may also be used for medevac flights, but if the passenger is impaired or cannot wear a survival suit then the flight is conditional on a risk assessment being conducted: some operators limit these flights to day VMC to reduce the risk to the passenger who might have difficulty in escaping from a ditched helicopter and surviving immersion in a cold sea.

75. Icing conditions will not affect the Coastguard SAR helicopters as they are certified and equipped for flight in icing conditions.

76. In summary, although a reduction in helicopter access under CAT Regulations will impose a logistic restriction on a gas installation, it will not result in a reduced level of SAR access, as SAR helicopters will still be able to access an installation.

6 Access Assessment

77. Helicopter access to the South Morecambe (CPC-1 Platform) and Calder Platforms is presented in this section. The South Morecambe Platform is a permanently manned installation, which in addition to operations conducted onboard, also serves as a hub from which personnel are flown to NUIs to conduct maintenance. The Calder Platform is a NUI and so personnel are flown to the platform when maintenance work is required. The loss of access to a permanently manned platform will be more significant than a similar level of reduced access to a NUI. In both cases, the loss of access will have a logistical and economic impact and will not reduce safety.

6.1 Assessment Methodology

78. The Helicopter Access Report (A5035-FLO-HAR-01) utilised meteorological data and flight data to assess the impact of the Morecambe Wind Farm on helicopter access to installations within 9nm. The report assessed the conditions at the time of landing and applied a worst-case assessment that the CAA rule change had occurred, i.e. only day VMC operations were permitted within 3nm of a wind farm.

79. The approach assesses the impact at the time of the flights within 3nm of the platforms and assumes that the CAA regulatory change is implemented without any alleviations. Interested Parties have requested that the whole flight period, i.e. from the initial take-off at Blackpool Airport until the final landing at Blackpool Airport is taken into account. However, this latter approach to assessing the impact requires the whole flight to be day VMC otherwise the flight is cancelled. This overly conservative approach takes no account of the ability of helicopters to fly IMC or at night, which is standard practice offshore.

80. The Helicopter Access Report Appendix A provides a detailed breakdown of the flight data. Additional work was conducted and reported in Technical Note (A5035-FLO-TN-02). The Technical Note provides a monthly breakdown of day, night, VMC and IMC access and considers access restrictions that would be imposed by the wind farm under current CAA regulations.

6.2 South Morecambe (CPC-1 helideck)

6.2.1 Current Access

81. Currently access to the CPC-1 can occur by day and night under both VMC and IMC. The current access is an average of 99% (94.2% VMC and 4.8% usable IMC) of daylight conditions and 98.4% (88.4% VMC and 10.0% usable IMC) of night conditions.

6.2.2 Future Access (Current Regulations)

6.2.2.1 Day VMC

82. Day VMC access is not considered to be impacted by the presence of the wind farm with the mitigation of a 1.5nm buffer, as secured by Protective Provisions within the draft Development Consent Order.

6.2.2.2 Day IMC

83. During an IMC approach or take-off all obstacles have to be avoided by a minimum lateral distance of 1nm. Under the current CAA regulations, ARAs could be flown to the CPC-1 with a south westerly or south easterly wind; approaches when the wind is from a northerly direction would be obstructed by the wind farm for a small percentage of flights.

84. A take-off into IMC is normally conducted into wind. During the take-off and climb the helicopter must remain 1nm clear of obstructions. Any take-offs in IMC into the arc from 263º clockwise to 090º would be permitted under the current CAA regulations as they would remain outside the 1nm buffer of the wind farm. Conversely, any take-offs into IMC with a wind direction from 090º clockwise to 263º, i.e. towards the wind farm would not be permitted as the 1nm buffer would be infringed before the helicopter could turn away at a safe height. The Vantage data shows that 408 flights (76.7%) of take-offs in IMC would have infringed the 1nm buffer and so would not be permitted. This corresponds to 6.9% of all flights.

6.2.2.3 Night

85. Night approaches in VMC require a longer stabilisation distance, typically 2nm or more compared to the 0.5nm for day VMC. Although night VMC approaches and take-offs are permitted to infringe the 1nm buffer around the wind farm, applying the same 1nm lateral avoidance criteria to night VMC and IMC would be a reasonable worst case assumption. This is due to the degraded visual environment at night and the difficulty in judging distances from obstacles in poor light. Therefore, night approaches and take-offs should only be conducted when the wind direction permits take-offs and departures that remain clear of the 1nm (red line) buffer.

86. The predominant wind direction for night approaches is from the south west and so any mitigation for day IMC flights will also be relevant for night VMC and IMC flights.

6.2.3 Future Access (Proposed Rule Change)

87. Under the proposed CAA rule change, access would be restricted to day VMC only. Table 6.1 identifies the impact on the South Morecambe Platform, assuming that the proposed rule change is implemented. Further details are provided in the Helicopter Access Report Appendix A Section A.3.1.

Table 6.1 Day VMC Access to South Morecambe (CPC-1 helideck)

Year	Count of Day VMC Landings	Count of all CPC 1 Flights	% Day VMC
2018	2470	2879	85.8%
2019	2282	2440	93.5%
2020	1021	1094	93.3%
2021	1399	1491	93.8%
2022	2003	2118	94.6%

88. Table 6.1 summarises the day VMC access that would remain following the construction of the Morecambe Wind Farm and the imposition of the CAA regulatory change without any alleviations.

6.3 Calder Platform

6.3.1 Current Access

89. Currently access to the Calder Platform can occur by day and night under both VMC and IMC. The current access is an average of 99% (94.2% VMC and 4.8% usable IMC) of daylight conditions and 98.4% (88.4% VMC and 10.0% usable IMC) of night conditions.

6.3.2 Future Access (Current Regulations)

6.3.2.1 Day VMC

90. Day VMC access is not considered to be impacted by the presence of the wind farm with the mitigation of a 1.5nm buffer, as secured by Protective Provisions within the draft Development Consent Order.

6.3.2.2 Day IMC

91. During an IMC approach or take-off all obstacles have to be avoided by a minimum lateral distance of 1nm. Under the current CAA regulations, ARAs could be flown to Calder with an easterly wind; approaches when the wind is from a westerly direction would be obstructed by the wind farm for a small percentage of flights.

92. A take-off into IMC is normally conducted into wind. During the take-off and climb the helicopter must remain 1nm clear of obstructions. Any take-offs in IMC into the arc from 235^{o} clockwise to 017^{o} would be permitted under the current CAA regulations as they would remain outside the 1nm buffer of the wind farm. Conversely, any take-offs into IMC with a wind direction from 017^{o} clockwise to 235^{o}, i.e. towards the wind farm would not be permitted as the 1nm buffer would be infringed before the helicopter could turn away at a safe height.

6.3.2.3 Night

93. Night approaches in VMC require a longer stabilisation distance, typically 2nm or more compared to the 0.5nm for day VMC. Although night VMC approaches and take-offs are permitted to infringe the 1nm buffer around the wind farm, applying the same 1nm lateral avoidance criteria to night VMC and IMC would be a reasonable worst case assumption. This is due to the degraded visual environment at night and the difficulty in judging distances from obstacles in poor light. Therefore, night approaches and take-offs should only be conducted when the wind direction permits take-offs and departures that remain clear of the 1nm buffer.

94. The predominant wind direction for night approaches is from the south west and so any mitigation for day IMC flights will also be relevant for night VMC and IMC flights.

6.3.3 Future Access (Proposed Rule Change)

95. Under the proposed CAA rule change, access would be restricted to day VMC only. Table 6.2 identifies the impact on the Calder Platform assuming that the proposed rule change is implemented. Further details are provided in the Helicopter Access Report Appendix A Section A.3.2.

Table 6.2 Day VMC Access to Calder

Year	Count of Day VMC	Count of all Calder Flights	% Day VMC
2018	173	212	81.6%
2019	330	349	94.6%
2020	243	260	93.5%
2021	168	177	94.9%
2022	134	156	85.9%

96. Table 6.2 shows a similar level of access to Table 6.1, which is unsurprising as the platforms are located in the same area.

6.4 Mitigations

97. As detailed in paragraph 3.3, it is standard aviation practice to utilise an AltMoc with the regulations. If the CAA regulatory change did occur, an AltMoc could be used by the helicopter operator(s) to increase the available access by identifying safe approach and take-off arcs for night and IMC operations.

98. The provision of a helicopter access corridor into the direction of the prevailing wind would increase the available access in IMC and at night. This is discussed further in a separate technical note[13].

[13] *Morecambe Offshore Windfarm Helicopter Access IMC Take Off Corridor*, document reference *A5035-FLO-TN-04, Rev02*