

Chapter 16: Aviation

Contents

16.1	Executive Summary	16-1
16.2	Introduction	16-1
16.3	Legislation, Policy and Guidelines	16-1
16.4	Consultation	16-2
16.5	Assessment Methodology and Significance Criteria	16-3
16.6	Baseline Conditions	16-4
16.7	Effects scoped out of the assessment	16-4
16.8	Receptors Brought Forward for Assessment	16-4
16.9	Operation	16-6
16.10	Summary	16-6
16.11	References	16-6

16 Aviation

16.1 Executive Summary

- 16.1.1 This chapter describes the likely effects of the Proposed Development on aviation stakeholder interests and reports on consultation and potential mitigation solutions. It shows that the only aviation issues that will need to be addressed are the effect on the NERL Lowther Hill radar and the requirement for aviation lighting.
- 16.1.2 The non-aviation issue of the effect of the Proposed Development on the performance of the Eskdalemuir Seismological Array is beyond the scope of this chapter and discussed in Chapter 17.

16.2 Introduction

- 16.2.1 This chapter presents the findings of the assessment of likely significant effects of the Proposed Development in relation to aviation. The assessment considers likely significant effects on the aviation and air defence activities of the Ministry of Defence (MOD) as safeguarded by the Defence Infrastructure Organisation (DIO). It also considers the likely significant effects of the Proposed Development upon airports and the National Air Traffic Services En Route Ltd (NERL) communications, navigation and surveillance (CNS) systems which consist of a network of primary and secondary radars and navigation facilities around the country.
- 16.2.2 As well as examining the technical impact of the Proposed Development on Air Traffic Control (ATC) facilities, it is also necessary to consider the physical safeguarding of ATC operations to determine whether the Proposed Development will breach obstacle clearance criteria.
- 16.2.3 This assessment should be read in conjunction with the Wind Farm Aviation Lighting and Mitigation Report provided in Technical Appendix 16.1.
- 16.2.4 Wind turbines have the potential to affect civil and military aviation. This chapter presents the methodology used to undertake the aviation assessment, lists the aviation references used and describes the aviation baseline condition, consultation requirements and mitigations to be applied, if required and reaches a conclusion on the likely significant effects of the Proposed Development on aviation interests.
- 16.2.5 The author of this chapter is Cdr John Taylor RN (Ret) Director of Wind Power Aviation Consultants Ltd (WPAC). He served in the Royal Navy for 33 years, as an Air Traffic Controller and Fighter Controller. He was responsible for ATC service delivery, regulation, training, airspace policy, danger area regulation and safeguarding at a national level and represented the UK on a number of international committees and working groups. He was the RN lead on all aspects of on and offshore wind farm issues. Since 2006 he has been advising wind farm developers on the interaction of aviation and wind turbines and has from time to time advised Government working groups, The Crown Estate and a number of Local Planning Authorities on aviation issues as they relate to wind turbine proposals and other energy related proposals. Recent work has included wind farms in south-west Scotland, north-east Scotland, Shetland, South and Central Wales on behalf of a number of different developers. He has provided expert witness evidence at a number of Planning Inquiries.

16.3 Legislation, Policy and Guidelines

- 16.3.1 There are a number of aviation publications relevant to the interaction of wind turbines and aviation containing guidance and legislation, which cover the complete spectrum of aviation activity in the UK, as follows:
- Civil Aviation Authority (2006). Safeguarding of Aerodromes, Version 2, CAP774 CAA;
 - Civil Aviation Authority (2010). Safe Operating Practices at Unlicensed Aerodromes, Ed 1, CAP 783 CAA;
 - Civil Aviation Authority (2016) Policy and Guidance on Wind Turbines Version 6, CAP764 CAA;
 - Civil Aviation Authority (2017). CAA Policy Statement: Lighting of Onshore Wind Turbine Generators in the United Kingdom with a maximum blade tip height at or in excess of 150m Above Ground Level CAA;
 - Civil Aviation Authority (2017). Manual of Air Traffic Services, Part 1, Ed 7.0, CAP 493 CAA;
 - Civil Aviation Authority (2017). UK Flight Information Services, Ed 3, CAP 774 CAA;
 - Civil Aviation Authority (2019). ATS Safety Requirements, Version 3, CAP 670 CAA;
 - Civil Aviation Authority (2019). Licensing of Aerodromes, Version 11, CAP 168 CAA;

- Civil Aviation Authority (2020). Parachuting, Ed 5, CAP660 CAA;
- Civil Aviation Authority (2022). Implementation of Safeguarding of Instrument Flight Procedures (IFPs) in the UK, Ed 2, Version 2, CAP 785B CAA; and
- Ministry of Defence (MoD) (2022). Military Aviation Authority Regulatory Article 2330 (Low Flying).

16.3.2 The above noted publications have also been considered in the aviation lighting assessment.

16.4 Consultation

16.4.1 Aviation consultation to date is summarised in Table 16.1.

Table 16.1 – Consultation

Consultee and Date	Consultation Response	Applicant Response
MOD DIO Ref DIO10057243 30 January 2023	<i>“At this time, there is no noise budget available in respect of this Section 36 application. Therefore, the MOD must object to this application due to the unacceptable impact the proposed wind energy development would have upon the array. If the developer is able to overcome the issues stated above, to address the impact up on low flying given the location and scale of the development, the MOD would require that conditions are added to any consent issued requiring that the development is fitted with aviation safety lighting and that sufficient data is submitted to ensure that structures can be accurately charted to allow deconfliction. As a minimum the MOD would require that the development be fitted with MOD accredited aviation safety lighting in accordance with the Air Navigation Order 2016.”</i>	Noted, discussions are ongoing in relation to the Eskdalemuir noise budget, refer to Chapter 17 for further information. An aviation lighting and mitigation report is provided in Technical Appendix 16.1 which identifies those turbines to be fitted with 2000 candela medium intensity aviation lighting. The report also provides details of which turbines will be fitted with MOD approved infra-red lighting.
MOD DIO 25 March 2024	<i>“Thank you for your email and advising the MOD of the revised scheme for the above named wind farm. Due to caseloads and resourcing, I have decided not to revise the records we hold from scoping at this time and will instead wait for the EIA application to be submitted where I will then complete a new assessment.”</i>	Noted.
Edinburgh Airport 12 December 2022	An Instrument Flight Procedure Assessment will be required.	The Applicant instructed an IFP Assessment through Edinburgh Airport who instructed Osprey Consulting Service (a CAA Approved Procedure Design Organisation). The report demonstrated that there will be no impact upon the procedures from the Proposed Development.
Edinburgh Airport 05 May 2024	Attached the IFP report produced by Osprey Consulting Service and confirmed that “no impact on published or future IFPs” from the Proposed Development.	Results included in this chapter. No further assessment required.
Glasgow Prestwick Airport 06 December 2022	<i>“On behalf of Glasgow Prestwick Airport (GPA) I have reviewed the available documentation regarding Oliver Forest Wind Farm ECU00004669). The proposed wind farm lies outwith GPA’s safeguarding area or instrument flight procedures, and is fully shielded from the GPA primary surveillance radars. As such, we would have no comment to make, or valid objection should the development proceed to a full Section 36 planning application.”</i>	Radar modelling of the finalised layout has been undertaken and reported in this chapter which confirms that the turbines remain screened by terrain from the GPA radars and VHF radios. No likely significant effects on GPA’s primary surveillance radar are predicted

Consultee and Date	Consultation Response	Applicant Response
NATS Safeguarding 13 December 2022	NATS objects to the proposal due to the effect on the Lowther Hill radar.	Discussions were initiated with NATS to identify a suitable technical mitigation. (see para 16.8.5)
NATS Safeguarding 08 April 2024	<i>“Thank you for your email, the coordinates are currently being checked by the Safeguarding Team and I will get back to you shortly with an update. There is already a signed off Mitigation for the original application (Indra) if this is still suitable after the checks NATs would look to move to Contract Discussions at this point rather than enter a SOCU agreement.”</i>	NATS have been provided with the updated and finalised coordinates and once confirmed the Applicant will agree a mitigation contract with NATS.

16.5 Assessment Methodology and Significance Criteria

Study Area

- 16.5.1 The assessment of effects of the Proposed Development is based upon the guidance outlined in CAP 764 Edition 6. Consultation criteria for aviation stakeholders is defined in Chapter 4 of CAP764. The following distances inform the size of the study area and have been adopted in undertaking this assessment which comprise:
- Airfield with a surveillance radar – 30 km;
 - Non radar licensed aerodrome with a runway of more than 1100 m – 17 km;
 - Non radar licensed aerodrome with a runway of less than 1100 m – 5 km;
 - Licensed aerodromes where the turbines would lie within airspace coincidental with any published Instrument Flight Procedure (IFP);
 - Unlicensed aerodromes with runways of more than 800 m – 4 km;
 - Unlicensed aerodromes with runways of less than 800 m – 3 km;
 - Gliding sites – 10 km; and
 - Other aviation activity such as parachute sites and microlight sites within 3 km – in such instances developers are referred to appropriate organisations.
- 16.5.2 CAP 764 further states that these distances are for guidance purposes only and do not represent ranges beyond which all wind turbine developments will be approved, or within which they will always be objected to. These ranges are intended as a prompt for further discussion between developers and aviation stakeholders; which are reported upon in this chapter. For example, Edinburgh and Glasgow Airports have stated a requirement to be consulted in relation to wind farms out to 40 km or even further if it is likely to affect their operations.
- 16.5.3 It is necessary to take into account the aviation and air defence activities of the Ministry of Defence (MOD) as safeguarded by the Defence Infrastructure Organisation (DIO).
- 16.5.4 It is also necessary to assess the likely significant effects of wind turbines upon the National Air Traffic Services En Route Ltd (NERL) communications, navigation and surveillance (CNS) systems – a network of primary and secondary radars and navigation facilities around the country.
- 16.5.5 In addition to examining the technical impact of wind turbines on Air Traffic Control (ATC) facilities, it is also necessary to consider the physical safeguarding of ATC operations, using the criteria laid down in CAP 168 Licensing of Aerodromes, to determine whether a Proposed Development will breach obstacle clearance criteria. In this case, there are no physical safeguarding issues associated with the Proposed Development.

Assessment Methodology

- 16.5.6 The radar calculation results referred to in this chapter were produced using specialist propagation prediction software (RView Version 5). Developed over a number of years by WPAC, it has been designed and refined specifically for the task. RView is used to identify potential aviation impacts of the Proposed Development. The results are then used as a basis for consultation and liaison with relevant aviation bodies, as detailed below. RView models terrain using the Ordnance Survey (OS) Terrain 50 digital terrain model, which has a post spacing of 50 m and has a root mean square (RMS) error of 4 m. The results are verified using the Shuttle Radar Topography Mission (SRTM) dataset, a separate smoothed digital terrain model with data spacing of 3 arc seconds. By using two separate and independently generated digital terrain models, anomalies are identified and consistent results assured.

RView models the refractive effects of the atmosphere on radio waves and the First Fresnel Zone¹. A feature of RView is that as well as performing calculations in the manner believed to be most appropriate, it also allows comparison with results from simpler models. For example, RView can perform calculations using the true Earth Radius at the midpoint between the radar and the wind turbine or the simplified 4/3 Earth Radius model. If needed, RView is also capable of modelling a range of atmospheric refractive conditions. RView models the trajectory of radar signals at different elevations allowing modelling of both volume surveillance and pencil beam radars as well as the effects of angular sterilisation as applied, for example, in Met Office radars.

Assessment of Likely Significant Effects

- 16.5.7 There is no agreed or mandated definition of significance when assessing development proposals for wind farms in relation to aviation. It is sufficient in this context to identify any technical effects and then, taking into account the statements in CAP 764 regarding the status of aviation stakeholders, in general to accept the judgement of those stakeholders in assessing the significance of the effects. For example, CAP 764 states:

“Where an ANSP determines that it is likely that a planned wind turbine development would result in any of the above effects on their CNS infrastructure, this may not, in itself, be sufficient reason to justify grounds for rejection of the planning application. The ANSP must determine whether the effect on the CNS infrastructure has a negative impact on the provision of the ATS. The developer should pay for an assessment of appropriate mitigating actions that could be taken by the ANSP and/or wind energy developer to deal with the negative impact. The position of an ANSP at inquiry would be significantly degraded if they had not considered all potentially appropriate mitigations.”

- 16.5.8 Therefore, it is not considered to be appropriate for the Applicant to make an assessment of the significance of an effect in relation to aviation interests. Also, it is often the case that different Air Navigation Service Providers (ANSP) take a different view of the same scenario and may disagree with the assessment findings; this can require further post submission consultation, to confirm the findings of the assessment and/or agree to the need for and extent of mitigation. Therefore, this assessment does not make a judgement of effect significance, but is focussed on identifying potential impacts and agreeing mitigation with aviation stakeholders as required.

16.6 Baseline Conditions

- 16.6.1 The Proposed Development is located 50 km south of Edinburgh Airport, 75 km to the south-east of Glasgow Airport and 75 km to east of Glasgow Prestwick Airport. The site is located under the southern part of the Scottish Terminal Area (TMA), Class D regulated airspace with a base of 5500 ft Above Mean Sea Level (AMSL) in this location. It is also 7 km to the west of the Talla (TLA) radio navigation beacon, making this a busy section of controlled airspace used to protect traffic operating to and from the airports in the region. In a military context there are no airfields in the region, the closest military ATC radar is located at the Electronic Warfare Training Facility at RAF Spadeadam, over 60 km to the south-east.
- 16.6.2 Airspace evolves continuously and is subject to wide ranging consultation processes similar to a planning application. At the time of writing there are no published proposed future airspace changes that may affect the baseline.

16.7 Effects Scoped out of the Assessment

- 16.7.1 On the basis of the desk-based work undertaken, and feedback received from consultees, potential effects on the following have been scoped out of detailed assessment:
- MOD Air Defence Radar (turbines are not visible to any Air Defence Radars);
 - Met Office Radar (no Met Office radars are effected);
 - Non-radar equipped CAA licensed aerodromes; and
 - Unlicensed aerodromes, gliding, microlight and parachute sites.

16.8 Receptors Brought Forward for Assessment

- 16.8.1 The turbine layout of the Proposed Development has changed since EIA Scoping and initial consultation was completed and it is, therefore, essential to reassess what the effect of the application layout will be on aviation receptors. The following section assesses the effect on relevant radar facilities, in accordance with the guidance in CAP 764.

¹ 3D elliptical region between the transmit antenna and the receive antenna the dimension of which are based upon the wavelength of the transmission

Edinburgh Airport

16.8.2 The Proposed Development is located 50 km to the south of Edinburgh Airport. Radar modelling has been undertaken which shows that radar line of sight is in excess of 1400 m AGL and there is no possibility of the turbines being visible to the radar and there will be no effect on radar performance.

Glasgow Prestwick Airport

16.8.3 The Proposed Development is located 71 km to the east of the airport. Radar modelling has been undertaken with the results in Table 16.2. Where radar line of sight exceeds the height of the turbine tips this demonstrates that the turbines are screened by terrain from the radar and there will be no effect on radar performance. In this case these results show there is no possibility of the radar at Prestwick being affected as radar line of sight is in excess of 1000 m AGL and there will be no effect on GPA.

Table 16.2 – Glasgow Prestwick Airport PSR

Turbine	Distance (km)	Radar Line of Sight (m AGL)
1	71.10	1103.20
2	70.60	1071.90
3	70.18	1037.50
4	70.57	1028.10
5	71.01	1061.30
6	71.55	1069.80
7	71.48	1125.10

RAF Spadeadam Deadwater Fell Radar

16.8.4 The radar at Deadwater Fell has recently been replaced with a Thales Star 2000NG radar. Radar modelling has been undertaken with the result in Table 16.3. These results confirm that the turbines remain screened by terrain from the Deadwater Fell radar. Radar modelling also confirms that none of the ‘threat radar’ locations associated with RAF Spadeadam training activities would be affected by the Proposed Development. There is no effect on radar performance or the provision of threat radar training at RAF Spadeadam.

Table 16.3 – RAF Spadeadam Deadwater Fell Radar

Turbine	Distance (km)	Radar Line of Sight (m AGL)
1	60.7	318
2	61.2	356.5
3	61.6	321
4	61.4	222.9
5	61.1	308.7
6	60.8	347.7
7	60.6	342.7

NATS En Route (NERL) Radars

16.8.5 In their scoping response NERL stated that there would be an unacceptable effect on the performance of the Lowther Hill (Indra Lanza) radar. They also stated that a technical mitigation would be available utilising the capabilities of the Indra Lanza radar. For completeness radar modelling has been undertaken with the result in Table 16.4 below. These show that the effect on the Lowther Hill remains the same and that the mitigation already identified should be feasible. The Applicant is in dialogue with NERL who are expected to confirm the mitigation will remain applicable and a radar mitigation contract will be agreed.

Table 16.4 – Lowther Hill Radar

Turbine	Distance (km)	Radar Line of Sight (m AGL)
1	23.1	90.9
2	22.6	89.6
3	22.4	23.7
4	22.9	7.1
5	23.4	33.8
6	24.0	36.8
7	23.7	117.8

16.9 Operation

MOD Physical Obstruction Concern

- 16.9.1 As stated in the MOD EIA Scoping response, the MOD would require that conditions are added to any consent issued requiring that the development is fitted with aviation safety lighting and that sufficient data is submitted to ensure that structures can be accurately charted to allow deconfliction. “As a minimum the MOD would require that the Proposed Development be fitted with MOD accredited aviation safety lighting in accordance with the Air Navigation Order 2016.” In fact, the Proposed Development will also be fitted with Infra-Red lighting to the MOD specification. Aviation lighting is addressed in Technical Appendix in 16.1. CAA approval for the reduced lighting scheme was received on 22 May 2024.

16.10 Summary

- 16.10.1 The aviation assessment shows that there are only two aviation issues to address: the effect on the NATS Lowther Hill radar and the requirement for aviation lighting.
- 16.10.2 The Applicant has engaged with NATS and a radar mitigation scheme has been identified.
- 16.10.3 In the case of aviation lighting, an aviation lighting and mitigation report has been included as Technical Appendix 16.1. CAA approval for the reduced lighting scheme was received on 22 May 2024
- 16.10.4 In conclusion, in aviation terms there will be no significant effects arising from the Proposed Development in accordance with the EIA Regulations.

16.11 References

- Civil Aviation Authority (2006). Safeguarding of Aerodromes, Version 2, CAP774 CAA;
- Civil Aviation Authority (2010). Safe Operating Practices at Unlicensed Aerodromes, Ed 1, CAP 783 CAA;
- Civil Aviation Authority (2016) Policy and Guidance on Wind Turbines Version 6 CAP764 CAA;
- Civil Aviation Authority (2017). CAA Policy Statement: Lighting of Onshore Wind Turbine Generators in the United Kingdom with a maximum blade tip height at or in excess of 150m Above Ground Level CAA;
- Civil Aviation Authority (2017). Manual of Air Traffic Services, Part 1, Ed 7.0, CAP 493 CAA;
- Civil Aviation Authority (2017). UK Flight Information Services, Ed 3, CAP 774 CAA;
- Civil Aviation Authority (2019). ATS Safety Requirements, Version 3, CAP 670 CAA;
- Civil Aviation Authority (2019). Licensing of Aerodromes, Version 11, CAP 168 CAA;
- Civil Aviation Authority (2020). Parachuting, Ed 5, CAP660 CAA;
- Civil Aviation Authority (2022). Implementation of Safeguarding of Instrument Flight Procedures (IFPs) in the UK, Ed 2, Version 2, CAP 785B CAA; and
- Ministry of Defence (MoD) (2022). Military Aviation Authority Regulatory Article 2330 (Low Flying).