Technical Appendix

Swarclett Wind Farm

Appendix 14-3: Crane Requirements Review (Regulatory)

Swarclett Wind Energy Limited

December 2023

Crane Requirements Review (Regulatory)

Swarclett Wind Farm

Caithness

22 September 2023

CL-5976-RPT-003 V1.0

www.cyrrus.co.uk

info@cyrrus.co.uk

Document Information	
Document title	Crane Requirements Review (Regulatory)
Author	Peter Foulsham
Reviewed by	Lucy Dale
Produced by	[redacted]
Document reference and Version	CL-5976-RPT-003 V1.0
Date of release	22 September 2023

Change History Record

Issue	Change Reference	Date	Details
1.0	Initial Issue	22 September 2023	Initial Issue

Executive Summary

The crane/s proposed for use at the Swarclett Wind Farm will require notification to the UK Civil Aviation Authority. The CAA in turn will notify the relevant parties that may be affected by the crane operation. This may be several different sectors of aviation, both civil and military.

Aerodrome operators may require additional assessments, procedures or limitations to be conducted or agreed to in the course of safeguarding the flight operation at the airport(s).

Should a crane in the vicinity of an aerodrome be deemed a hazard to aircraft it will **require** lighting during the night which will be requested by the airport authority in line with International Civil Aviation Organisation guidance and in accordance with the UK Air Navigation Order 2016.

Cranes outside the vicinity of the airport and having a height of 150 metres or more above ground level **must** also display lighting at night. If a crane is between 45 metres and less than 150 metres above ground level it is **recommended** by the CAA that lighting is used. It is **recommended** that cranes less than 45 metres above ground level should also have a lighting scheme.

In all cases when lighting is used, be it mandatory or a recommendation, the lighting is **recommended** to be used during the hours of daylight.

Again, in all cases, but especially when the crane is not permanently lit, it is recommended that **consideration** is given to making the crane conspicuous by its colour. The use of banding is recommended to provide contrast from the air.

Aerodrome operators may require assessment, at the crane operators expense, of aerodrome-specific procedures or protected areas such as Obstacle Limitation Surfaces or Instrument Flight Procedures.

Whilst many airports have the capability to assess potential impact to their obstacle limitation surfaces, specialist assessment of instrument flight procedures are required in the UK to be completed by an Approved Procedure Design Organisation.

The developer has instructed such an organisation to conduct assessment of the procedures at Wick airport and, at the time of writing, are being completed.

Abbreviations

AGL	Above Ground Level
AMSL	Above Mean Sea Level
ANO	Air Navigation Order
AOA	Airport Operators Association
CAA	Civil Aviation Authority
CAP	Civil Aviation Publication
ICAO	International Civil Aviation Organisation
IFP	Instrument Flight Procedure
M	Metre
NM	Nautical Mile
NOTAM	Notice to Airmen
OLS	Obstacle Limitation Surface
OSGB	Ordnance Survey National Grid reference system
WGS-84	World Geodetic System 1984

References

[1] Civil Aviation Publication (CAP) 1096 *Guidance to crane users on aviation lighting and notification*

[2] CAP 738 *Safeguarding of Aerodromes*

[3] CAP 168 *Licensing of Aerodromes*

[4] Air Navigation Order (ANO) 2016

[5] Construction Plant-hire Association (CPA) Technical Information Note **TIN 039** '*Operating Tower Cranes in the Vicinity of Aerodromes, Notification and En-route Obstacle Lighting*'

Contents

EXECUTIVE SUMMARY **2**

ABBREVIATIONS **3**

REFERENCES **4**

CONTENTS **5**

1. CAP1096- GUIDANCE TO CRANE USERS ON AVIATION LIGHTING AND NOTIFICATION **6**

1.1. Overview 6

2. INTRODUCTION **7**

2.1. History and reference 7

3. NOTIFICATION PROCESS **8**

3.1. Overview 8

4. OBSTACLE LIGHTING AND MARKING **10**

4.1. Overview 10

4.2. Lighting 10

4.2.1. Vicinity of an Aerodrome 10

4.2.2. En-Route 10

4.2.3. Other 10

4.3. Marking 11

5. WHAT HAPPENS NEXT? **12**

5.1. Overview 12

6. CONCLUSION **14**

A. ANNEX A: CRANE NOTIFICATION FORM (DAP1924) **15**

1. CAP1096 - *Guidance to Crane Users on Aviation Lighting and Notification*

1.1. Overview

1.1.1. Civil Aviation Publication (CAP) 1096 sets out the process by which a developer / crane operator complies with Civil Aviation Authority (CAA) requirement to notify the use of cranes at a site and, if necessary, to light the crane.

1.1.2. The document is divided as follows:

- Introduction;
- Notification Process;
- Obstacle Lighting and Marking; and
- What happens next?

1.1.3. This brief report will look at each section individually.

2. Introduction

2.1. History and reference

2.1.1. Tall objects have the potential to cause safety issues in various aviation activities. As tall objects, cranes are handled in a similar way to any obstacle to aviation, however due to the differences that characterise crane construction and operation, the process is handled through a separate process.

2.1.2. The guidance in CAP 1096 is relevant to users of all cranes exceeding a height[1] of 10 metres above ground level (AGL) or that of the surrounding structures or trees (if higher).

2.1.3. The guidance in CAP 1096 has been implemented in Phases:

- **Phase 1**
  Stage A - 1st TRIAL - 1 October 2020 to 31 May 2021
  Stage B - Trial Reflection– 1 June 2021 to 30 September 2021
- **Phase 2**
  Stage A - 2nd Trial - 1 October 2021 – 31 March 2022
  Stage B – Confirmation of Readiness – Q1/Q2 2022
- **Phase 3**
  Full Implementation which will occur not earlier than 1 April 2022. This time frame will be informed from the implementation plan established in Phase 2, Stage B.

2.1.4. It is anticipated that full implementation of the process will be achieved in the first quarter of 2024.

2.1.5. Several documents may be read in conjunction with this CAP when considering a crane operation. They are:

- *Construction Plant-hire Association (CPA) Technical Information Note **TIN 039** 'Operating Tower Cranes in the Vicinity of Aerodromes, Notification and En-route Obstacle Lighting', available at http://www.cpa.uk.net*
- *BSI BS 7121 Code of practice for the safe use of cranes. Multi-part document available to purchase at https://shop.bsigroup.com*
- *Civil Aviation Publication **CAP 738** (Safeguarding of Aerodromes), **CAP 168** (Licensing of*
- *Aerodromes) and UK **Air Navigation Order 2016 (ANO)** – **CAP 393** available at: http://www.caa.co.uk/*
- *Airport Operators Association, Safeguarding of Aerodromes, Advice Note 4 - Cranes and Other Construction Issues (**AOA Advice Note 4**)*
- *European and international regulations.*

[1] Crane falls into this scope if at any point during the planned lifting operation the highest point of the crane structure or load will exceed 10m AGL or that of the surrounding structures or trees (if higher). If a crane is located on top of another structure, it is the overall height (structure + crane) above ground level that is relevant.

3. Notification Process

3.1. Overview

3.1.1. *'The operation of cranes could present a serious hazard to air navigation, particularly during the approach and departure phases of flight when aircraft are at low altitudes. In addition to the creation of an obstacle, cranes could also interfere with navigation and/or communication equipment'*.

3.1.2. The position of the proposed Swarclett Wind Farm places it beneath several Instrument Approach Procedures. An Instrument Flight Procedure (IFP) assessment is being conducted to determine the extent of any impact (if any) of the turbines. Any crane operation would presumably be at a higher physical level than the turbines so it is *possible* that, dependant on the outcome of the IFP assessment on the turbines, a further IFP assessment or updated report, may be necessary.

3.1.3. It is highly unlikely that a crane at Wick, in the position envisaged, will interfere with *'….navigation and/or communication equipment'*. Wick does not have airport radar that could potentially be impacted. HIAL is working on a surveillance strategy for its airports. This is a far-reaching future strategy that may not include traditional radar systems, especially at its more rural airports.

3.1.4. Advance notification of the crane operation to the CAA. The CAA will, in turn, process and share the crane notification with relevant parties which require this information.

3.1.5. The recommended initial notification period is **at least 8 weeks before erection of the crane.** This allows correct identification of local aerodromes and allows consultation time and possibly further instructions from aerodrome operators.

3.1.6. The CAA also recognises that due to the nature of (some) crane operations, additional notification periods have been created;

1. ***PLANNED LONG-TERM PROJECTS****: Notification to be sent to the CAA at least eight weeks (40 working days) before the erection of the crane. The CAA will then identify parties that may be affected by the crane and inform the crane user and affected parties about the next steps.*
2. ***AD-HOC PROJECTS****: Notification to be sent to the CAA not later than 5 working days in advance. The CAA will then identify parties that may be affected by the crane and inform the crane user and the affected parties about the next steps.*

   Note: *It is important that crane users who can notify their operations 40 working days or more before the erection of the crane (scenario II) are not using scenario 2 (delayed notification) as it has been created to allow the CAA to prioritise crane notifications which due to the character of their operations cannot be notified earlier.*

3. ***UNFORESEEN AND URGENT PROJECTS****: If there is an unforeseen and urgent requirement to erect a crane within 5 working days from the notification, the crane user is required to contact all aerodromes whose perimeters are within 10 Nautical miles (NM) (18.5km) of the crane and submit the notification form (Annex A) to the CAA as soon as*

possible and advise which aerodrome operators have been contacted and the reason for less than 5 working days' notice. As the operation of the crane may have an implication to other airspace users, where no aerodromes are located within 10NM (18.5km) from the location of the crane, notification form (Annex A) should still be submitted to the CAA, who will process such notifications at the earliest opportunity.

3.1.7. **Any crane erected without having received a positive response from the CAA or the aerodrome operator may be considered a hazard to air navigation**. Such a crane would be operated at the user's risk of endangering the safety of an aircraft.

3.1.8. Crane users have a duty of care and must therefore ensure the crane is operated safely. If the safety of flight operations are in any doubt then the CAA should be contacted for further guidance.

3.1.9. Crane operations are very often synonymous with larger projects requiring planning consent. The Local planning Authority will likely be involved, along with any local aerodrome authority with general consultation regarding the application. However involved the consultations with an LPA may be, notification, as per CAP1096, to the CAA is still required.

4. Obstacle Lighting and Marking

4.1. Overview

4.1.1. Cranes should be conspicuous to airspace users. Obstacle lighting and, if necessary, marking of the crane will accomplish this conspicuity requirement.

4.1.2. The requirement for lighting on vertical objects such as cranes is dependent on the cranes location relative to an aerodrome as well as the cranes height above ground.

4.1.3. There are best practices associated with lighting and marking of obstacles which will enable users to fulfil their duty of care whilst the crane is erected at the location.

4.2. Lighting

4.2.1. Vicinity of an Aerodrome

4.2.1.1. The following applies to a crane of any height.

4.2.1.2. Any obstacles (including cranes) that affect aerodrome operations will be lit and/or marked as directed by the aerodrome operator in accordance with ICAO Annex 14. Once the CAA have been notified of the intended crane operation and a response received, the aerodrome authority will liaise directly with the crane operator regarding the lighting and marking required.

Note: Lighting aids should be supplied with alternate secondary power unless otherwise agreed with the airport operator.

4.2.2. En-Route

4.2.2.1. This applies to cranes with a height of 150 metres AGL or more.

*4.2.2.2. En-route obstacles (including cranes) must be fitted with lighting in accordance with the ANO. Medium intensity (generically **2000 candela**) steady red lights must be displayed by night[2] and be visible from all directions (omnidirectional).*

4.2.2.3. Additionally, it is recommended that lights should also be displayed by day.

Note: Lighting aids should be supplied with secondary power unless agreed otherwise with the CAA (arops@caa.co.uk , phone: 01293 983 880).

4.2.3. Other

4.2.3.1. This applies to cranes *less* than 150 metres AGL.

[2] 'Night' is defined for civil aviation purposes as the time from half an hour after sunset to half an hour before sunrise.

4.2.3.2. It is recommended that:

- all cranes with a height 45 m to a height less than 150 m AGL are lit in accordance with the details specified in Paragraph 4.2.2 of CAP1096.
  all cranes with a height less than 45 m are lit in accordance with the details specified in CAP1096, Paragraph 4.2.2, except that low intensity (generically 32 candela) steady red lights should be used.

4.2.3.3. *'In **all** cases (all 3 categories above), lights must be positioned as close as possible to the top of the crane'*.

4.2.3.4. *'Where the top of the crane is more than 45 m AGL, additional lights should be provided at intermediate levels spaced as equally as practicable, between the top lights and ground level or the level of tops of nearby buildings, as appropriate, with the spacing not exceeding 52 m'.*

4.2.3.5. *'Lights should also be applied to display the general definition and the extent of the object (crane). This means that lights should provide an indication of the height and the shape of the crane (i.e. lights installed on both ends of the jib)'*

4.3. Marking

4.3.1. The CAA, in **all** cases, recommends that consideration be given to the colour of cranes in respect of conspicuity – especially if the crane is not permanently lit.

4.3.2. *'When markings are applied to cranes it is recommended that they are coloured to show alternating contrasting bands. The colours of the pattern should contrast each with the other and with the background against which they will be seen. The bands should be perpendicular to the longest dimension and have at least 5 meters in width'.*

***'Note**: The objective is to use markings of contrasting colours which will be conspicuous against the background and a review conducted by the CAA determined that the use of a yellow and black (or dark blue) pattern (especially in urban areas) provides the best contrast with the background from the air'.*

5. What Happens Next?

5.1. Overview

5.1.1. The crane/s should be notified using the link to the form shown in Annex A below.

5.1.2. The CAA will identify all parties that may be affected by the crane operation (if any) and will notify them accordingly.

5.1.3. Such parties include, but are not limited to, the following:

- Aerodrome operators (safeguarded civil and military aerodromes, aerodromes with Instrument Flight Procedures (IFPs) and all aerodromes published in the UK Aeronautical Information Publication (AIP));
- Defence Geographic Centre (responsible for UK en-route obstacle data set published in UK AIP section ENR 5.4);
- RAF Low Flying Operations Flight (LFOF).

5.1.4. The provision of crane position and heights are especially important in the notification process. Of particular importance is the format in which the position is notified – this should be in **WGS-84** and, should the aerodrome operator require it, **OSGB36** formats. Heights Above Mean Sea Level (**AMSL**) and Above Ground Level (**AGL**) must be provided. These are standard survey requirements.

5.1.5. '*Aerodrome operators are responsible for safeguarding the Obstacle Limitation Surfaces (OLS) as well as other surfaces associated with the aerodrome including IFP. Lateral boundaries of these extend far beyond the OLS*'

The developer has instructed the assessment of Wick Airport's Instrument Flight Procedures (IFP) and results of this are expected in November.

5.1.6. Aerodromes are accountable to the CAA for the safeguarding of their airfields under terms of the aerodrome licence. The airport authority may take such actions it deems necessary to comply with those terms. These actions may include, but are not limited to, the following:

- Survey of the crane position and height;
- restrictions on crane operating times;
- fitting of obstacle lights;
- restrictions depending on the runway in use;
- restrictions on crane operating heights;
- restrictions during low visibility conditions;
- publication of Notice to Airmen (NOTAM)[3]

5.1.7. Aerodrome operators may impose additional crane permit limitations for cranes which affect airport operations and which require assessment. Such additional procedures will be

[3] A means of disseminating safety information to pilots, operators and airports worldwide.

initiated as part of the notification process described in CAP1096. The crane operator will be informed of the requirement for such additional aerodrome-specific procedures. Aerodrome specific charges may be applied should this be necessary [for example, an IFP assessment conducted by the airport's Approved Procedure Design Organisation (APDO)].

5.1.8. '***The crane user once informed about being in the vicinity of the aerodrome should make sure that the crane does not impact on aerodrome operations***. *The crane should be as low as possible for the intended job. It is also recommended to use cranes capable of being lowered in the vicinity of the aerodrome. When possible and practical, the crane should be lowered when not in use, or when requested by an aerodrome operator (i.e. during low visibility conditions). The aerodrome operator may also request parking the jib in a particular direction when not in use*'.

5.1.9. Aerodrome operators will request the fitting of obstacle lighting should the crane constitute a hazard to aircraft and lighting is considered necessary to ensure its avoidance.

6. Conclusion

6.1. The cranes proposed for use in the construction/installation of the wind turbines at Swarclett in Caithness must be **notified** to the UK Civil Aviation Authority.

6.2. The crane/s associated with construction of the Swarclett Wind Farm near Wick Airport may constitute a hazard to aircraft operating in the vicinity of the airport.

6.3. Lighting would, in that case, be requested by the aerodrome operator. The lighting would be required to have a secondary power supply, unless otherwise agreed with the aerodrome operator.

6.4. Should the crane operate to a height of **150m or more** AGL it **must** be fitted with lighting in accordance with the Air Navigation Order (ANO). **Medium intensity**, steady red lights (**2000 candela**) must be displayed at night and it is additionally *recommended* that they are also displayed during the day.

6.5. Should the crane be a height of less than 150m AGL but more than 45m, it is *recommended* that it should be lit as stated in 4.2.3.2 above.

6.6. If the crane is less than 45m AGL it is also *recommended* to be lit, however, the lighting requirements (should the crane operator wish to follow the recommendation) is for **low intensity** (32 candela) steady red lights.

6.7. In all lighting cases, mandatory and recommended, lights should be positioned as close as possible to the top of the crane.

6.8. Where the crane is higher than 45m AGL, additional lights should be positioned at intermediate levels, equally spaced where possible, with the spacing not exceeding 52 metres.

6.9. The lighting scheme should define the general shape and extent of the crane. For example, a light should be placed at both ends of the jib.

6.10. *Consideration* should be given to the conspicuity of the crane through its colour. It is *recommended* that alternating coloured banding be used of at least 5 metres in width. The CAA have determined that alternating colours of Black (or Dark Blue) and Yellow bands provide the best contrast when viewed from the air.

6.11. The CAA will determine which aviation parties may be affected and will notify them accordingly.

6.12. Additional requirements and/or limitations may be imposed by the aerodrome operator.

6.13. The developer has engaged with Cyrrus (APDO) and instructed the assessment of Wick Airport IFPs. This is being conducted at the time of writing.

A. Annex A: Crane Notification Form (DAP1924)

A.1. The **Notification Form** is available from the CAA at www.caa.co.uk/dap1924

A.2. Whenever possible this form should be completed electronically and submitted as a pdf file.

A.3. This form is applicable to all fixed and mobile cranes and can also be used to notify the CAA about other mobile plant equipment should it be recommended by the aerodrome operator.

This Page Is Intentionally Blank