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BRIEF FOR CONSULTANCY:

To undertake a noise impact assessment of the proposed drone port on the existing surrounding noise sensitive locations.

NOISE IMPACT ASSESSMENT MERCURY DRONE PORT, ZERO FOUR BUSINESS PARK MONTROSE CAA NO. ACP-2019-84

Technical Report No. R-8873-RGM-RRM
17th November 2020

PREPARED FOR:

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For the attention of Ravi Narayanan

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RMP is a consulting division of Edinburgh Napier University.

Contents

1.0 Introduction

1.1 We were instructed by Drone Technologies Limited to undertake a noise impact assessment for the proposed Mercury Drone Port at the Zero Four Business Park, Montrose in order to assess any impact from the operation on the existing surrounding noise sensitive locations.

1.2 The proposed drone port is subject to a Civil Aviation Authority application for a proposed change to UK airspace, application number ACP-2019-84.

1.3 The new drone port would be constructed to the north east corner of the proposed Zero Four Business Park as shown in Plate 1 below:

Plate 1: Aerial view of development site

1.4 There are existing noise sensitive locations with a potential line of sight to the airborne drones at the following locations:

- Residential property at Kinnaber Woods @ 690m
- Residential property of Charleton Road @ 800m
- Residential properties at Charleton Place @ 930m

1.5 The approach to this type of investigation is to evaluate the expected noise levels from the proposed activities. Predict the level at the nearest noise sensitive properties and assess the results against relevant planning guidance.

1.6 The existing area can be seen in the aerial photo (Plate 2) shown over leaf.

Plate 2: Aerial view of development site and residential properties

1.7 The masterplan location outline for the Zero Four Business Park is reproduced in Plate 3 over leaf.

Plate 3: Masterplan location outline for Zero Four Business Park

1.8 The Zero Four Business Park, owned by the Crown Estate Scotland, intend to develop the 123-acre site in Montrose for a mixed-use business park, with outline proposals that include:

- Industrial units
- Offices
- Food retail/services
- Heli-drone port
- Hotel and leisure
- Conference facilities

1.9 Once established the Business park which has been granted outline planning permission will contribute to the local noise environment. Each plot within the new park will require a separate detailed planning application and noise impact assessment. It is anticipated that a number of the future operators will operate 24hrs a day.

1.10 The exiting area to the south and east have established industrial activity such as Baker Hughes which operates 24hrs a day. There is also an operational scrap yard to the east. These all contribute to the exiting noise environment.

1.11 The field to the south of the new business park has been used for many by the Montrose Aero Modellers for the flying of petrol driven models.

2.0 Guidance on Noise Impact Levels

2.1 Guidance on fixed wing aircraft wing can be found in the Civil Aviation Authority document 'Survey of noise attitudes 2014:Aircraft' CAP 1506. This finds that 10% of people are likely to be highly annoyed if the aircraft noise exceeds 54dB $L_{Aeq\ 16hr}$.

2.2 UK government airspace policy sets 'LOAEL' Lowest Observed Adverse Effect Level at 51 dB $L_{Aeq\ 16hr}$.

2.3 Current guidance for local authorities with regard to noise affecting planning matters is given in the Scottish Government's recently introduced PAN 1/2011 'Planning and Noise' document, with further details on the assessment of noise provided in its associated Technical Advice Note (TAN): *'Assessment of Noise'*.

2.4 Paragraph 15 of PAN 1/2011 gives the following advice:

Issues which may be relevant when considering noise in relation to a development proposal include:

- *Type of development and likelihood of significant noise impact,*
- *Sensitivity of location (e.g. existing land uses, NMA, Quiet Area),*
- *Existing noise level and likely change in noise levels,*
- *Character (tonal, impulsivity etc),duration, frequency of any repetition and time of day of noise that is likely to be generated, and*
- *Absolute level and possible dose-response relationships e.g. health effects if robust data available.*

2.5 Paragraph 19 recommends that in order to assist in the preparation and consideration of planning applications, Noise Impact Assessments may be requested by the planning authority. Noise Impact Assessments are to *"demonstrate whether any significant adverse noise impacts are likely to*

occur and if so, identify what effective measures could reduce, control and mitigate the noise impact."

2.6 There is no reference to drone noise or drone ports in PAN 1/201, however Paragraph 27 deals with helicopter noise and is reproduced overleaf.

HELICOPTERS AND HELIPORTS

27. Account should be taken of local circumstances, including the existing level of noise disturbance in the area surrounding the site and factors such as whether the area is already exposed to noise from fixed wing aircraft. Planning applications for heliports should be accompanied by information about the proposed take-off/landing flight paths, and air traffic routes where appropriate. Preferably, these paths should have been discussed and agreed in principle with National Air Traffic Services (NATS) beforehand. Planning conditions relating to flight routes are likely to be inappropriate.

2.7 The Technical Advice Note to PAN 1/2011 provides guidance for the format and approach of Noise Impact Assessments.

2.8 The noise from ground based maintenance and start up of the drones can be likened to an industrial noise source activity. Advice on the assessment of industrial noise generating operations is given in PAN 1/2011. Paragraph 31 states:

> *Due to its variable character industrial noise is difficult to assess. Since background noise levels vary throughout the 24 hour period it will usually be necessary for Noise Impact Assessments to assess the acceptability of noise level for separate periods (e.g. day, evening, night and weekend) chosen to suit the hours of operation of the proposed development. Noise that may result from traffic generated by new industrial developments is likely to be a relevant consideration.*

2.9 TAN provides examples of Noise Impact Assessments for a handful of scenarios including industrial noise and presents Table 3.4 (reproduced overleaf) as a method for assessing the magnitude of change in noise level as a result of a new development.

3.22 In this example, a quantitative assessment is based on an estimate of the change in noise level, $L_{Aeq,T}$ before and after the industrial development is operational. Table 3.4 shows the criteria used to define the magnitude of noise impacts for this example.

Table 3.4: Assigning Magnitudes of Noise Impact

Magnitude	Change in noise level, $L_{Aeq,T}$ dB (After – Before)[1]
Major	≥ 5
Moderate	3 to 4.9
Minor	1 to 2.9
Negligible	0.1 to 0.9
No change	0

[1]when evaluating noise levels for magnitude of impact purposes, all levels should be rounded to 1 decimal point i.e. when the 2nd decimal is 5 or more, round up.

2.9.1. As no assessment of the existing noise environment at the nearest residential properties has been undertaken to date, an assessment of the predicted drone noise against the existing noise environment cannot be completed at this stage.

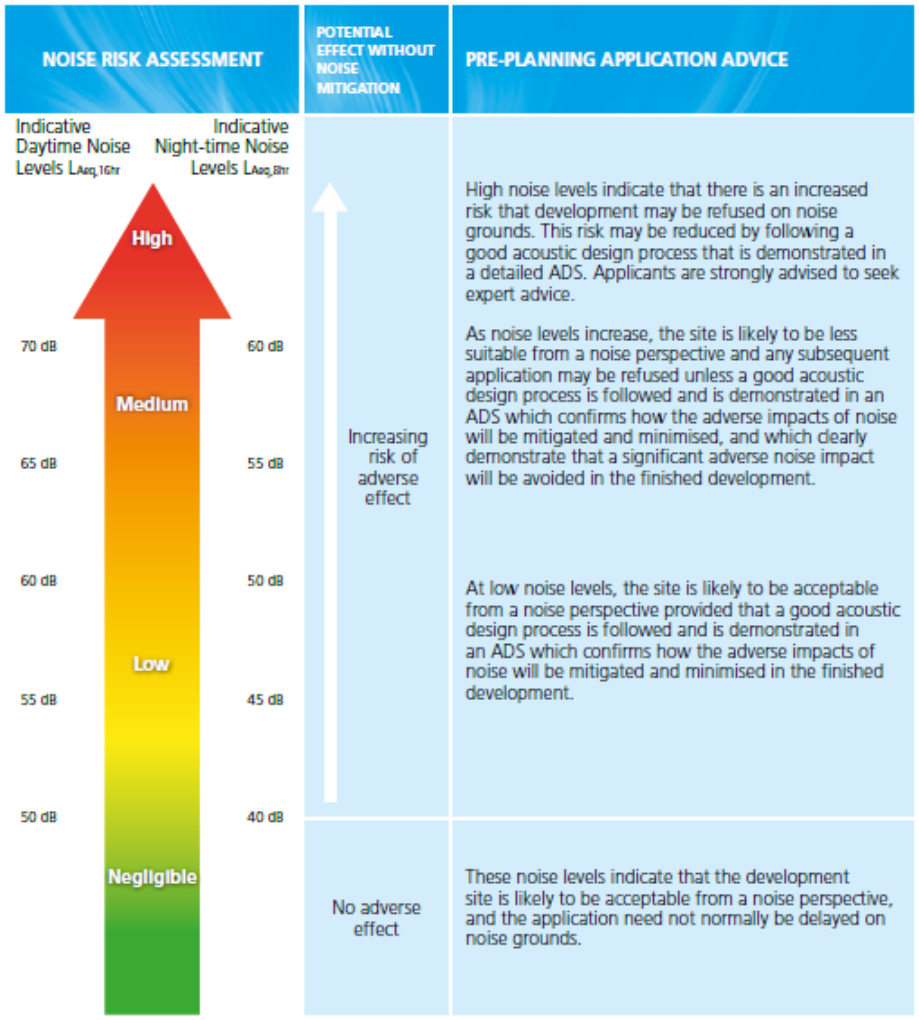
2.10 BS 8233:2014 'Sound Insulation and noise reduction for buildings' provides guidance appropriate for a residential assessment. The recommended external day time noise levels are outlined in Table 1. These are generally considered appropriate for noise that contains little character such as road traffic.

Table 1. BS 8233:2014 Residential noise criteria (dB re 2 x 10^{-5} Pa)			
Condition	Typical situation	*Design range: $L_{Aeq,T\ 16hr}$* (dB)	
		Good	*Upper limit*
Criterion for residential amenity	Garden areas	50	≤ 55

2.11 The World Health Organisation (WHO) also produced guidelines for community noise in 1999 which formed the basis for the advice and criteria in BS 8233:2014.

2.12 Similar guidance levels as BS 8233:2014 and WHO 99 are promoted within the Royal Environmental Health Institute for Scotland Briefing Note 017 'Noise and Guidance for New Developments'.

2.13 The recent ProPG: Planning & Noise 'Professional Practice Guidance on Planning & Noise' published by the Institute of Acoustics and Association of Noise Consultants, provides the following guidance table, which again is promoting levels $L_{Aeq\ 16hr}$ 50-55 dB as likely to have no or low impact on a residential environment.



2.14 Taking the above documents into account, RMP would consider that an appropriate fixed criteria for this assessment, to avoid significant impact on the existing residential properties would 50 dB $L_{Aeq\ 16hr}$.

2.15 For night time operations we would consider that the noise level inside residential bedrooms should be controlled to below 30 dB $L_{Aeq\ 8hr}$.

2.16 The above criteria are the cumulative total noise level from all drones operating during the given periods at the residential properties. This criteria is related to the number of drone flights and the drone noise level, but do not stipulate a noise criteria for individual drones.

3.0 Noise Sources

3.1 Drone Technologies Limited do not at this stage have information on the manufacturer and model of drones that will be used at the facility. It is likely that there will be a range of different operators with different sizes and specifications of drones.

3.2 Drone Technologies Limited have provided RMP with a number of example drones types that can be used for the assessment. Further assessment maybe required once the operational proposals have been developed further.

3.3 The noise source associated with the drone is caused by the rotating blades as they pass through the air. For each drone movement, there will be a period of ground running prior to take off and after landing. The ground running of the motor is likely to up to 10-15 minutes per flight. We have used 15 minutes as a conservative figure in calculations.

3.4 Due to the orientation of the buildings around the site, there should be no line of sight from the take-off/landing area to the residential properties identified. The buildings will provide an acoustic barrier effect to the noise.

3.5 Once airborne, there will be a line of sight to the residential properties. We understand that the drones will take off to a height of 80-100m and then proceed immediately east over the beach to the North Sea. The proposed flight path is shown between the blue lines in Plate 4. The take off and flight out to sea will take approximately 3 minutes.

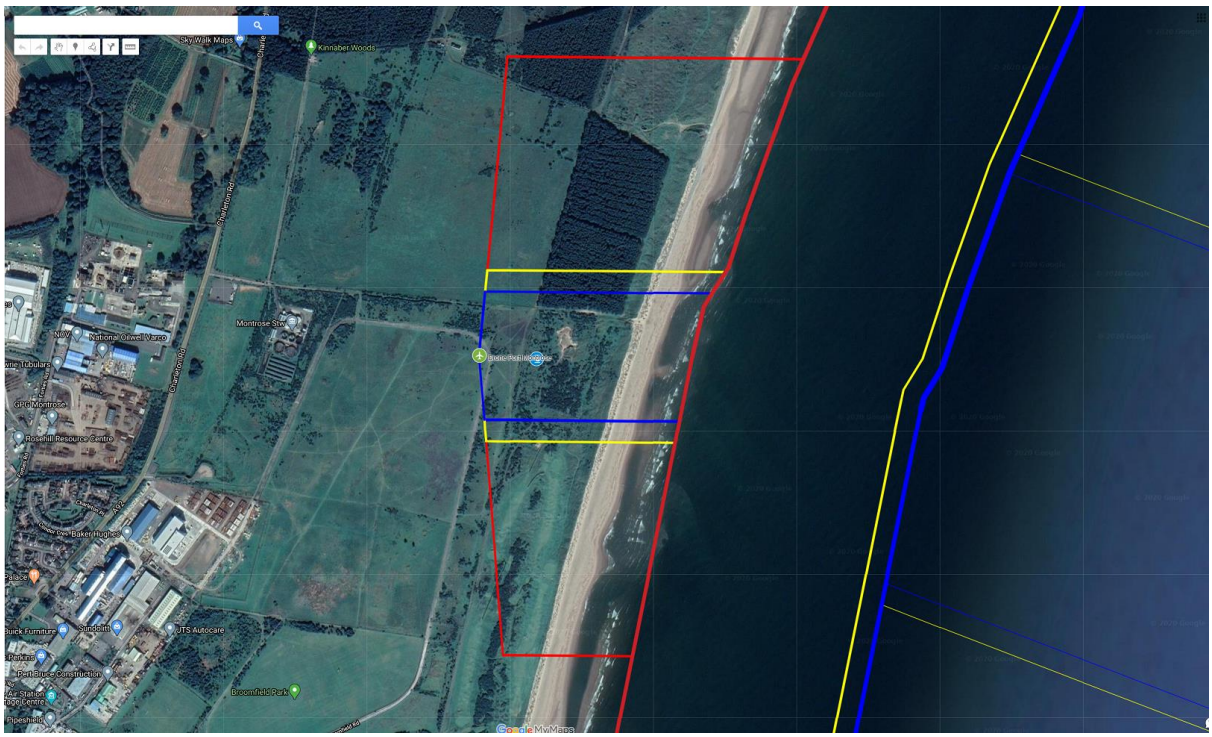


Plate 4: Drone flight path between blue lines

3.6 To undertake the impact assessment we have allowed for 10, 20 and 40 flights during the day and 5 and 10 flights during the night.

3.7 The source noise levels provided by Drone Technologies Limited are reproduced in Table 2 below.

Table 2: Sound pressure level dB, for three drone manufacturers at 5m from operating drone

Distance from source	Austars (Hybrid engine)	Foxtech	Octocopter	Robinson UVA
5m	95 dB	80 dB	90 dB	98

3.8 For the assessment in Section 4 we have assumed a worst case scenario where the Robinson drone is being used for all flights.

4.0 Noise Impact Assessments

4.1 The noise assessment has been undertaken to the nearest residential property, located at 690m to the north at Kinnaber Woods. All other residential locations will be subject to lower levels of drone noise.

4.2 As the ground and airborne running noise will only last for a limited period over a typical day, an on time correction should be applied when calculating the likely daily ($L_{Aeq\ 16hr}$) and ($L_{Aeq\ 8hr}$) noise level.

4.3 We have predicted the total ground engine running and flight time over a typical day for 5, 10, 20 and 40 drone flights in Table 3.

Table 3: Cumulative on time for ground and air activity for a typical day

Number of flights per day	Ground running	Take off	Landing
5	75 min	15 min	15 min
10	150 min	30 min	30 min
20	300 min	60 min	60 min
40	600 min	120 min	120 min

4.4 Barrier attenuation is included for the period of ground running due to the intervening buildings between the take-off/landing area and the residential properties.

4.5 Distance attenuation is included as the noise will reduce as it travels from the source to the receiver. This is based on point source attenuation [$Att_D = 20\log(r_1/r_2)$ dB].

4.6 Tables 4, 5 and 6 below predicted the cumulative noise level from drone ground running and take-off/landing at the noise sensitive residential properties for 10, 20 and 40 flights per day.

Table 4 – Predicted noise level from drone ground running & take-off/landing, 10 flights per day		
Description	**Ground running dB**	**Take off & Landing**
Drone noise level	98	98
Barrier attenuation	-10	0
Distance attenuation 5m/690m	-43	-43
On time correction for 10 flights, see Table 3	-8	-12
Predicted daytime drone noise ($L_{Aeq\ 16hr}$)	38	43
Cumulative level ($L_{Aeq\ 16hr}$)	**44 dB**	
Adopted noise criteria ($L_{Aeq\ 16hr}$)	**< 50 dB**	

Table 5 – Predicted noise level from drone ground running & take-off/landing, 20 flights per day		
Description	**Ground running dB**	**Take off & Landing**
Drone noise level	98	98
Barrier attenuation	-10	0
Distance attenuation 5m/690m	-43	-43
On time correction for 20 flights, see Table 3	-5	-9
Predicted daytime drone noise ($L_{Aeq\ 16hr}$)	41	46
Cumulative level ($L_{Aeq\ 16hr}$)	**47**	
Adopted noise criteria ($L_{Aeq\ 16hr}$)	**< 50 dB**	

Table 6 – Predicted noise level from drone ground running & take-off/landing, 40 flights per day		
Description	**Ground running dB**	**Take off & Landing**
Drone noise level	98	98
Barrier attenuation	-10	0
Distance attenuation 5m/690m	-43	-43
On time correction for 40 flights, see Table 3	-2	-6
Predicted daytime drone noise ($L_{Aeq\ 16hr}$)	43	49
Cumulative level ($L_{Aeq\ 16hr}$)	**50**	
Adopted noise criteria ($L_{Aeq\ 16hr}$)	**< 50 dB**	

4.7 Tables 7 and 8 below predicted the cumulative noise level from drone ground running and take-off/landing at the noise sensitive residential properties for 5 and 10 flights per night.

Table 7 – Predicted noise level from drone ground running & take-off/landing, 5 flights per night		
Description	**Ground running dB**	**Take off & Landing**
Drone noise level	98	98
Barrier attenuation	-10	0
Distance attenuation 5m/690m	-43	-43
On time correction for 5 flights, see Table 3	-8	-12
Correction for open window of houses	-15	-15
Predicted daytime drone noise ($L_{Aeq\ 8hr}$)	22	28
Cumulative internal level ($L_{Aeq\ 8hr}$)	**29 dB**	
Adopted noise criteria ($L_{Aeq\ 8hr}$)	**< 30 dB**	

Table 8 – Predicted noise level from drone ground running & take-off/landing, 10 flights per night		
Description	**Ground running dB**	**Take off & Landing**
Drone noise level	98	98
Barrier attenuation	-10	0
Distance attenuation 5m/690m	-43	-43
On time correction for 20 flights, see Table 3	-5	-9
Correction for open window of houses	-15	-15
Predicted night time drone noise ($L_{Aeq\ 8hr}$)	25	31
Cumulative internal level ($L_{Aeq\ 8hr}$)	**32 dB**	
Adopted noise criteria ($L_{Aeq\ 8hr}$)	**< 30 dB**	

4.8 The predictions in Tables 4 to 6 indicate that the total daytime drone noise should be below the guidance levels discussed in Section 2 of this report and therefore should not give rise to any significant impact at the nearest residential property for up to 40 flights per day time. The noise level at residential properties located at a greater distance will be lower than those predicted in Tables 4-6.

4.9 The predictions in Tables 7 and 8 indicate that the total drone noise should be below the guidance levels discussed in Section 2 of this report and therefore should not give rise to any significant impact at the nearest residential property for up to 5 flights per night. The noise level at residential properties located at a greater distance will be lower than those predicted in Tables 7-8.

5.0 Conclusions

5.1 We were instructed by Drone Technologies Limited to undertake a noise impact assessment for the proposed Mercury Drone Port at the Zero Four Business Park, Montrose in order to assess any impact from the operation on the existing surrounding noise sensitive locations.

5.2 Appropriate noise guidance has been discussed and a noise criteria proposed to avoid the risk of noise disturbance to adjacent residential properties.

5.3 Predictions of noise impact from the drone ground running and flight have been undertaken for representative numbers of daily flights.

5.4 The predicted noise level at the nearest noise sensitive properties have been found to be below the adopted noise criteria and therefore the proposed development is unlikely to cause disturbance to the existing residential properties for up to 40 flights per day and 5 flights per night.

5.5 In the event that higher numbers of drone flights are proposed or drone's with higher noise levels (>98dB @ 5m) or longer running times are required, we would recommend that a further assessment be undertaken. Measurements of the existing noise environment would also assist in quantifying any potential impact at higher levels of activity/ noise level.

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