



National Beyond visual line of sight Experimentation Corridor  
Airspace Change Proposal

**Acoustic Noise Measurements**

12 May 2021

# Acoustic Noise Measurements

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## Glossary

ACP	Airspace Change Proposal
AGL	Above Ground Level
AIP	Aeronautical Information Publication
ATC	Air Traffic Control
ATZ	Air Traffic Zone
BVLOS	Beyond Visual Line of Sight
CAA	Civilian Aviation Authority
DAA	Detect and Avoid
GA	General Aviation
ILS	Instrument Landing System
NATMAC	National Air Traffic Management Advisory Committee
NBEC	National Beyond visual line of sight Experimentation Corridor
TDA	Temporary Danger Area
NMT	Noise Monitoring Terminal
UAV	Unmanned Aerial Vehicle

## 1.0 Introduction

In the context of its Airspace Change Proposal (ACP) application, Cranfield Airport conducted a number of flight tests in order to quantify the acoustic noise that would be expected from the Unmanned Aerial Vehicle (UAV) that will be used.

This document presents the results from these tests.

## 2.0 Noise testing overview and method

It was stated during the Targeted Engagement process that ‘due to the quiet electrical propulsion it is unlikely that they will be heard’ with respect to the UAV generating acoustic noise.

Since the Engagement process, a specific exercise was conducted to gather representative real-world acoustic noise from the UAV that will operate in the National Beyond visual line of sight Experimentation Corridor (NBEC) Temporary Danger Area (TDA). This was completed at Cranfield Airport on 27 April 2021.

In order to ensure measurements were ‘real-world’, the UAV was flown straight and level a number of times and at different heights over a portable Noise Monitoring Terminal (NMT).

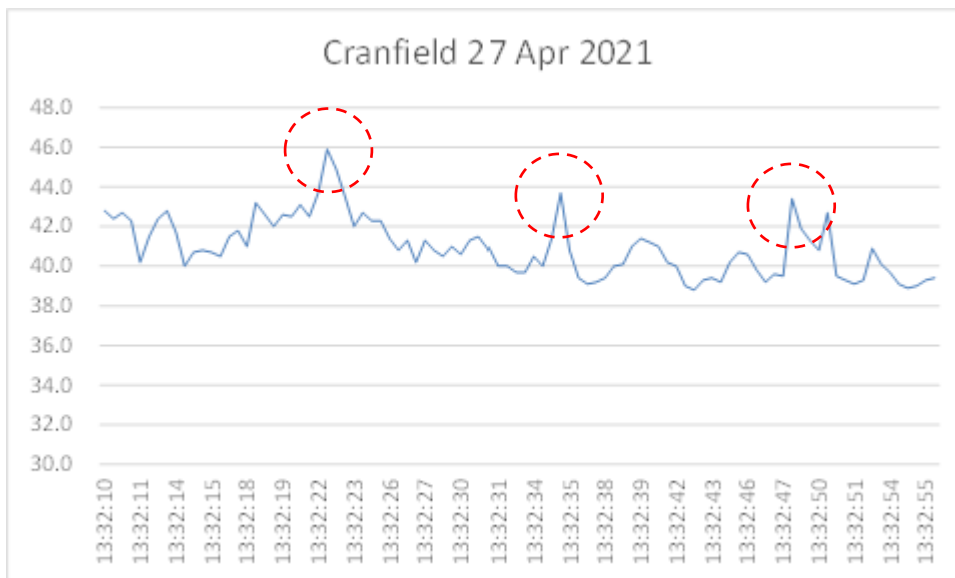
The NMT comprises of the microphone located 1.2m above ground level connected to a Bruel & Kjaer 3655 digital noise meter. Measurements taken were A weighted Leq captured every 500mS. The Audio signal was recorded at 8kHz sampling frequency with automatic gain control for audio monitoring. Data was collected and stored online from Envirosuite’s Sentinel. NMT’s such as the one used are routinely deployed in fixed installations at Airports, such as Heathrow, to monitor aircraft noise.

The photograph below show the general arrangement.



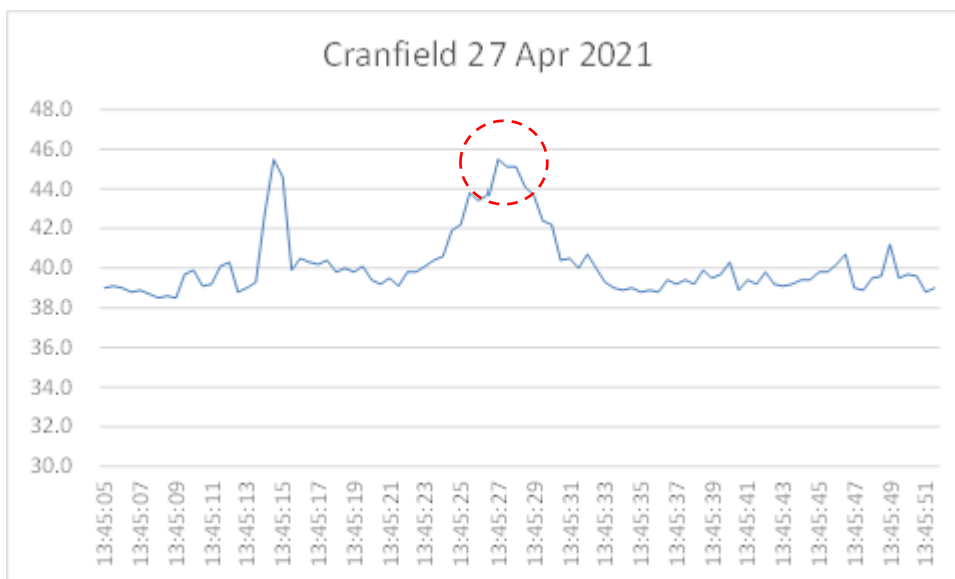
### 3.0 Results

The graph below shows the noise captured during three passes at 400 FT Above Ground Level (AGL) overhead the NMT. The UAV was heading into wind for the first two passes, and downwind for the last pass. The UAV's autopilot was engaged for these passes. The noise levels recorded due to the UAV passes are highlighted with red circles on the graph below.



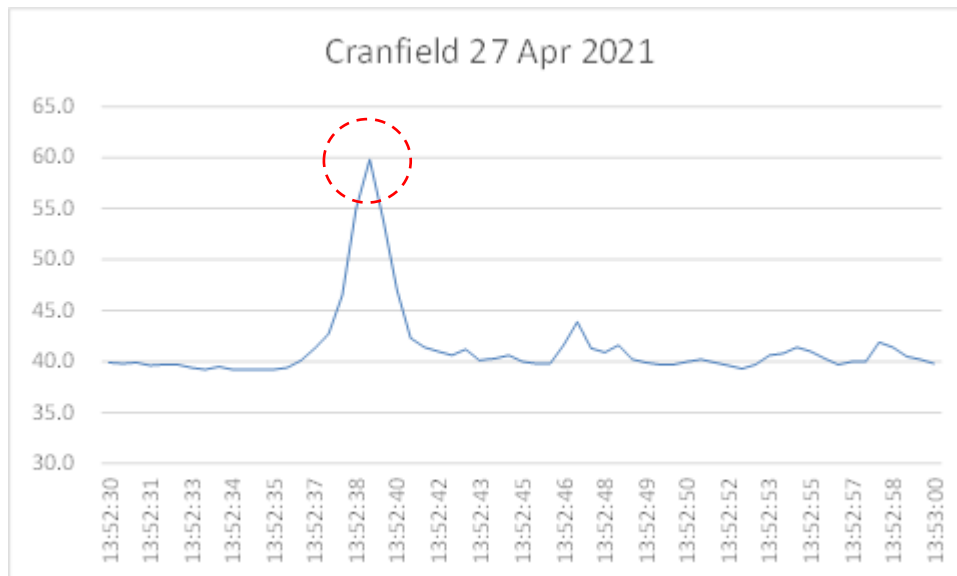
400 FT AGL two passes upwind then downwind pass (y-axis in dBA)

The graph below shows the noise captured during one pass at 200 FT AGL overhead the NMT. The UAV was heading into wind for this pass with its autopilot engaged. The peak highlighted is the result of the UAV noise. Listening to the recorded noise data shows the left hand peak to be the result of birds calling noise.



200 FT AGL upwind pass (y-axis in dBA)

The graph below shows the noise captured during one pass at approximately 50 FT AGL overhead the NMT. The UAV was heading into wind for this pass and was flown manually with a maximum power setting. The peak highlighted is the result of the UAV noise.



Approx. 50 FT AGL upwind (y-axis in dBA)

#### 4.0 Findings and Conclusions

Background noise varied between 39 and 43dB(A).

It was just possible to hear the UAV overfly the NMT when at 400 FT AGL.

The Sound Pressure Level (SPL) acoustic noise as heard by the 200 FT and 400 FT AGL overhead passes were <46dB(A), which is significantly less than the acoustic noise a standard fixed wing aircraft would emit . This is the expected height range of flight within the NBEC TDA.

Noise from nearby birds was clearly audible during the measurements and was seen at a peak of 45dB(A).

The SPL acoustic noise from the UAV at 400 FT AGL varied by approximately 2dB(A) between passes in different directions at the same height. This gives an indication of the range of SPL noise variation of the UAV when flying in different directions within the NBEC TDA.

The maximum SPL noise recorded in a typical take off / climb configuration was just under 60dB(A). This gives an indication of the SPL noise expected during the take-off over Cranfield Airport.

As indicated from the results, the UAV SPL acoustic noise is barely above background wildlife levels, with little variation in magnitude when at 400 FT AGL cruise height with the autopilot engaged.