

**OCCUPATIONAL AND ENVIRONMENTAL
MEDICINE WING**

NOISE AND VIBRATION DIVISION

Report: OEM/06/20

Date: Apr 20

**A REPORT ON A MILITARY AVIATION NOISE
CONTOUR OF STATION-BASED AIRCRAFT
ACTIVITY AT RAF LAKENHEATH AND RAF
MILDENHALL**



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**OCCUPATIONAL AND ENVIRONMENTAL MEDICINE WING
NOISE AND VIBRATION DIVISION**

ROYAL AIR FORCE CENTRE OF AVIATION MEDICINE

Report No: OEM/06/20

**A REPORT ON A MILITARY AVIATION NOISE CONTOUR OF STATION-BASED
AIRCRAFT ACTIVITY AT RAF LAKENHEATH AND RAF MILDENHALL**

Executive Summary

1. The Noise and Vibration Division (NVDiv) of the Royal Air Force Centre of Aviation Medicine was tasked by [REDACTED] to work in collaboration with U.S. based external contractors, HMMH, to produce a Military Aviation Noise Contour (MANC) for RAF Mildenhall and combine the output with the existing MANC for RAF Lakenheath. This was undertaken in accordance with the required noise contour levels specified in Joint Service Publication (JSP) 418 and included station-based aircraft activity only.
2. NVDiv produced a baseline MANC for RAF Lakenheath alone in 2017 due to concerns raised about the noise levels generated by aircraft activity. Due to the close geographical proximity of RAF Lakenheath and RAF Mildenhall, the customer subsequently raised a task request for a combined MANC of the two airfields, so that the noise environment in the surrounding areas could be fully understood.
3. Using the Federal Aviation Administration's Aviation Environmental Design Tool (Version 3b), in conjunction with Noisemap and Advanced Acoustic Model software packages, 16-hour, A-weighted, equivalent sound pressure level ($L_{Aeq, 16h}$) noise contours of 72, 66 and 63dB were produced, in accordance with JSP 418.
4. It is recommended that the MANC shown at Annex A is used as a basis for assessing the noise environment around RAF Lakenheath and RAF Mildenhall.

Distribution

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Authors: [REDACTED]

Introduction

1. The Noise and Vibration Division (NVDiv) of the Royal Air Force Centre of Aviation Medicine (RAF CAM) was tasked by [REDACTED] to work in collaboration with U.S. based external contractors, HMMH¹, to produce a Military Aviation Noise Contour (MANC) for RAF Mildenhall and combine the output with the existing MANC for RAF Lakenheath². This was undertaken in accordance with the required noise contour levels specified in Joint Service Publication (JSP) 418 and included station-based aircraft activity only.

Background

2. RAF Lakenheath is a U.S. flying station situated in Suffolk, approximately 20 miles northeast of Cambridge, 6 miles north of RAF Mildenhall and 26 miles south of RAF Marham. It is home to Europe's only F15 fighter wing. RAF Mildenhall is also a U.S. flying station and is home to the C-130J Hercules, CV-22 Osprey and KC-135R Stratotanker.

3. RAF Lakenheath has a single runway (06/24), which is 2743m long and 46m wide. RAF Mildenhall also has a single runway (11/29), which is 2811m long and 61m wide.

4. The last combined environmental noise survey of RAF Lakenheath and RAF Mildenhall was conducted in 2015 by NVDiv. This was drawn using measured data and is detailed in report OEM/47/15³. NVDiv later produced a baseline MANC for RAF Lakenheath alone in 2017 because of concerns raised about the noise levels generated by aircraft activity. This was done using more up to date computer modelling and is detailed in report OEM/08/17⁴.

5. Due to the close geographical proximity of RAF Lakenheath and RAF Mildenhall, [REDACTED] subsequently raised a task request for a combined MANC of the two airfields, so that the noise environment in the surrounding areas could be fully quantified.

6. Due to the complexity and specialist resources associated with modelling the CV-22 aircraft (operated exclusively by the U.S. Armed Forces), NVDiv worked in collaboration with U.S. based acoustic consultants, HMMH, to produce the combined MANC.

¹ HMMH: Environmental and Transportation Planning Consultants. [REDACTED]

² MOD Contract: 700009568, The Provision of a Military Aviation Noise Contour, dated 06 November 2019.

³ NVDiv Report: OEM/47/15, dated October 2015.

⁴ NVDiv Report: OEM/08/17, dated January 2017.

Relevant Legislation

7. The primary legislation regarding environmental noise control is set out in the Environmental Protection Act 1990⁵. The MOD has exemption from clause 79(1)(g) of this Act [smoke and noise emitted from premises for operational and training activities so as to be prejudicial to health or a nuisance (this exemption extends to Scotland and Northern Ireland)]. MOD policy regarding environmental noise is outlined in JSP 418 Leaflet 04-1: Environmental Noise⁶, which states that the MOD must mitigate, as far as reasonably practicable, the effects of the environmental noise which its activities produce.

8. The MANC at Annex A was created in accordance with the Environmental Noise Regulations 2006, No. 2238, Statutory Instruments⁷ and is based on the 16-hour, A-weighted, equivalent Sound Pressure Level (SPL) ($L_{Aeq,16h}$) noise contours of 72, 66 and 63dB, in accordance with JSP 418.

Limitations and Exclusions from the Scope

9. The MANC at Annex A includes station-based aircraft activity only as this is considered to be the dominant source of aviation noise emitted at RAF Lakenheath and RAF Mildenhall. For RAF Lakenheath, this included the F15 Mk C and F15 Mk E. For RAF Mildenhall, this included the C-130J, CV-22 and KC-135R. Visiting aircraft activity was excluded from the model, as was transit activity between the two stations.

10. The MANC includes Engine Ground Run (EGR) operations as well as flight operations.

Analysis

11. As stated in Paragraph 4, a baseline MANC was produced for RAF Lakenheath alone in 2017⁸. Therefore, to meet the customer requirement, a baseline MANC for RAF Mildenhall was initially created using the Federal Aviation Administration's Aviation Environmental Design Tool (AEDT), in conjunction with Noisemap and Advanced Acoustic Model (AAM) software packages. AEDT was then used to combine the output of the RAF Mildenhall MANC with the RAF Lakenheath 2017 model.

12. AEDT is an internationally recognised noise prediction package and is used extensively within the UK for the modelling of civil/commercial aircraft operations. AEDT 3b is the latest version which allows a three-dimensional geometric model of the airfield to be constructed including the runway, flight tracks, aircraft flight profiles⁹ and EGR operations. Aircraft noise models work by taking a core dataset of Noise-Power-Distance (NPD) source levels and then predicting the noise impacts emitted from the modelled aircraft.

13. Due to the complexity of the CV-22's flight characteristics, this aircraft could not be modelled directly in AEDT. Instead, U.S. military modelling software packages Noisemap and AAM were used to fulfil this specific requirement.

⁵ Environmental Protection Act 1990.

⁶ JSP 418 Leaflet 04-1: Environmental Noise.

⁷ Environmental Noise Regulations 2006, No. 2238, Statutory Instruments.

⁸ NVDiv Report: OEM/08/17, dated January 2017.

⁹ Altitude, speed and engine power setting at different distances from the runway threshold.

14. In order to produce a representative MANC, station held data is required (e.g. aircraft movements and EGR operations figures). In accordance with JSP 418, this data must cover a period of at least 12 months. The RAF Mildenhall station data used to produce the MANC was taken from 01 August 2018 – 31 July 2019. The total number of aircraft flight movements over this period was obtained from Air Traffic Control (ATC) logs and broken down into Average Daily Movement (ADM) figures, based on a standardised flying year of 220 operational days (discounting weekends, bank holidays etc.). The total number of EGRs for the same period was also obtained and broken down into ADMs, before being input into the modelling software.

15. Custom flight profiles were used to model all aircraft, as opposed to using the pre-set, International Civil Aviation Organisation (ICAO) profiles that are built into the software packages; the ICAO profiles are generally more applicable to civil/commercial aircraft operations. Custom, station-specific profiles are more accurate for military aviation and were obtained from the respective operating Squadrons for each aircraft type.

16. General airfield data such as runway end locations and elevations were obtained from Aeronautical Information Documents Unit (AIDU) publications¹⁰.

Results

17. The RAF Lakenheath and RAF Mildenhall MANC is shown at Annex A.

Recommendations

18. It is recommended that the MANC with noise contour levels of 72, 66 and 63dB $L_{Aeq,16hr}$, which is shown at Annex A, is used as a basis for assessing the noise environment around RAF Lakenheath and RAF Mildenhall.




Acknowledgements

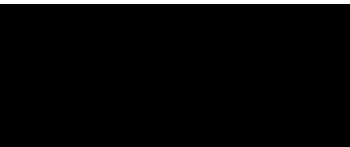
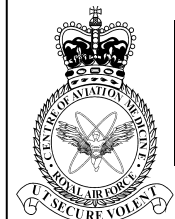
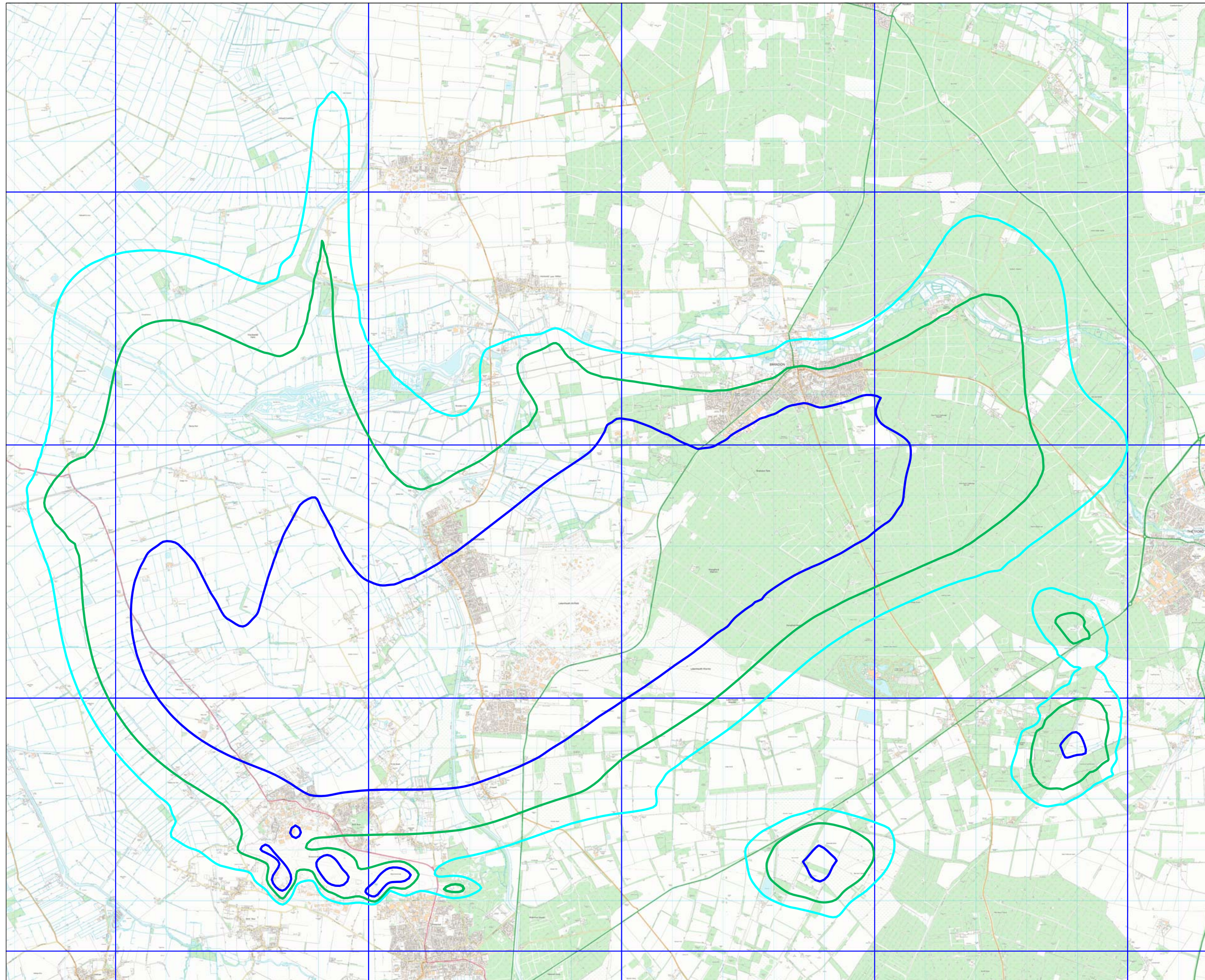
19. NVDiv would like to thank [REDACTED] and [REDACTED] from HMMH. NVDiv would also like to thank the personnel of RAF Lakenheath and RAF Mildenhall who assisted with the data collection to support the production of the MANC.

¹⁰ UK MIL AIP, Mildenhall, AD 2-EGUN-1-1, dated 02 January 2020.

Annex A to
OEM/06/20
dated Apr 20

Key

-  - 72dB L_{Aeq, 16h} Contour.
-  - 66dB L_{Aeq, 16h} Contour.
-  - 63dB L_{Aeq, 16h} Contour.



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RAF Lakenheath and RAF Mildenhall

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LAeq,16 Hour Noise Contours

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