

OCCUPATIONAL AND ENVIRONMENTAL MEDICINE WING

NOISE AND VIBRATION DIVISION

Report: OEM/12/26

Date: Apr 26

A REPORT ON A MILITARY AVIATION NOISE CONTOUR OF AIRCRAFT ACTIVITY AT RAF MARHAM



(Original signed)



Wing Commander
Officer Commanding
Environmental and Occupational Health Wing

(Original signed)



SEO
Head of the Noise and Vibration Division

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

ROYAL AIR FORCE CENTRE OF AEROSPACE MEDICINE

Report No: OEM/12/26

**A REPORT ON A MILITARY AVIATION NOISE CONTOUR OF AIRCRAFT ACTIVITY
AT RAF MARHAM**

Executive Summary

1. The Noise and Vibration Division of the Royal Air Force (RAF) Centre of Aerospace Medicine was tasked by Chief Environmental and Safety Officer (CESO) RAF to produce a Military Aviation Noise Contour (MANC) for RAF Marham. This was undertaken in accordance with Joint Service Publication 418 and included station-based and visiting aircraft activity.
2. A MANC was created using the US Department of Defense's Noisemap Suite software. The final model was run in Noisemap.
3. The MANC shown at Annex A should be used as a basis for assessing the noise environment around RAF Marham. The contours show the combined impact of the station-based F-35B and visiting fast jet aircraft in 2021. This baseline year was chosen as it is considered a representative year of normal operations.

Distribution

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	AW Cdr	[REDACTED]
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Annex

A. RAF Marham Military Aviation Noise Contour for $L_{Aeq,16hr}$ without night movements and $L_{Aeq,16hr}$ with night movements.

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Authors: [REDACTED]

Introduction

1. The Noise and Vibration Division (NVDiv) of the Royal Air Force Centre of Aerospace Medicine (RAF CAM) was tasked by Chief Environmental and Safety Officer (CESO) RAF to produce a Military Aviation Noise Contour (MANC) for RAF Marham.

Background

2. RAF Marham is located near the village of Marham in the county of Norfolk, East Anglia. It is the home of the F-35B Lightning, a 5th Generation, multi-role stealth fighter with Short Take-off and Vertical Landing (STOVL) capabilities. Several other military aircraft also visited RAF Marham during 2021 (the year on which the MANC in this report is based).

3. RAF Marham has two runways (06/24 and 01/19). Runway 06/24 is 2783m long and 45m wide, and runway 01/19 is 1864m long and 45m wide¹. In 2021, runway 01/19 aircraft movements were insignificant compared to runway 06/24 movements.

4. An environmental noise model of RAF Marham was produced by NVDiv in 2014 under the Noise Amelioration Scheme (Military) (NAS(M)). This was done using Integrated Noise Model (INM) software and is detailed in report OEM/52/14². The station was home to the Tornado GR4 at the time.

Relevant Legislation and Guidance

5. The primary legislation regarding environmental noise is set out in the Environmental Protection Act 1990³. The Ministry of Defence (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 Joint Service Publication (JSP) 418 Leaflet 04-1: Environmental Noise⁴, which states that the MOD must mitigate, as far as reasonably practicable, the effects of the environmental noise which its activities produce. To support this aim, Military Aviation Authority (MAA) Regulatory Article (RA) 1800 requires Heads of Establishment (HoEs) to ensure MANCs are produced and maintained for their Aerodrome or Air Weapon Range⁵.

¹ UK MIL AIP, MARHAM, AD 2-EGYM-1-1, date: Jul 20.

² NVDiv Report: OEM/52/14, 'A Report on an Environmental Noise Survey of Aircraft Activity at RAF Marham'.

³ Environmental Protection Act 1990.

⁴ JSP 418 Leaflet 04-1: Environmental Noise.

⁵ MAA RA 1800 – Aerodrome and Air Weapon Range Aviation Activity – Management of Environmental Impacts and Risks.

6. The MANC at Annex A was created in accordance with the Environmental Noise Regulations 2006, No. 2238, Statutory Instruments⁶.

Scope

7. The MANC at Annex A includes combined total aircraft flight movements for the station-based F-35B and visiting fast jet aircraft at RAF Marham during 2021. No other visiting aircraft have been included due to their relative low noise or movement numbers. The MANC includes Engine Ground Run (EGR) operations for the station-based F-35B.

Analysis

8. The MANC at Annex A was created using the US Department of Defense's (DoD's) Noisemap Suite software. This is an internationally recognised noise prediction package that is used for the modelling of military aircraft operations. BaseOps (the Noisemap Suite Graphical User Interface (GUI)) 7.370 was used, which allows a three-dimensional geometric model of the airfield to be constructed including the runway, flight tracks, and aircraft flight profiles⁷. Aircraft noise models work by taking a core dataset of Noise-Power-Distance (NPD) source levels and predicting the noise levels emitted from the modelled aircraft. The final model was run in Noisemap.

9. To produce a representative MANC, station held data is required (e.g. aircraft movement figures). In accordance with JSP 418, this data must cover a period of at least 12 months. The RAF Marham station data used to produce the MANC at Annex A was taken from 01 Jan 21 – 31 Dec 21. The baseline year of 2021 was chosen as it is considered a representative year of normal operations. The total number of aircraft flight movements over this period was obtained from Air Traffic Control (ATC) and broken down into Average Daily Movement (ADM) figures.

10. F-35B flight tracks, profiles, and EGR data was supplied to NVDiv by RAF Marham station personnel.

11. Noisemap contains built-in aircraft flight profiles, which were used to model visiting fast jet departures and arrivals. Visiting fast jet circuit movements were modelled on F-35B as there were no built-in profiles available for this operation type.

12. General airfield data such as runway end locations and elevations was obtained from AIDU publications⁸.

Results

13. The RAF Marham MANC is shown at Annex A. This includes contours for the following time domains and noise indices:

- $L_{Aeq,16hr}$ without night – 16-hour averaged noise metric, excluding night movements.
- $L_{Aeq,16hr}$ with night – 16-hour averaged noise metric, including night movements to allow comparison with NVDiv historical contours.

⁶ Environmental Noise Regulations 2006, No. 2238, Statutory Instruments.

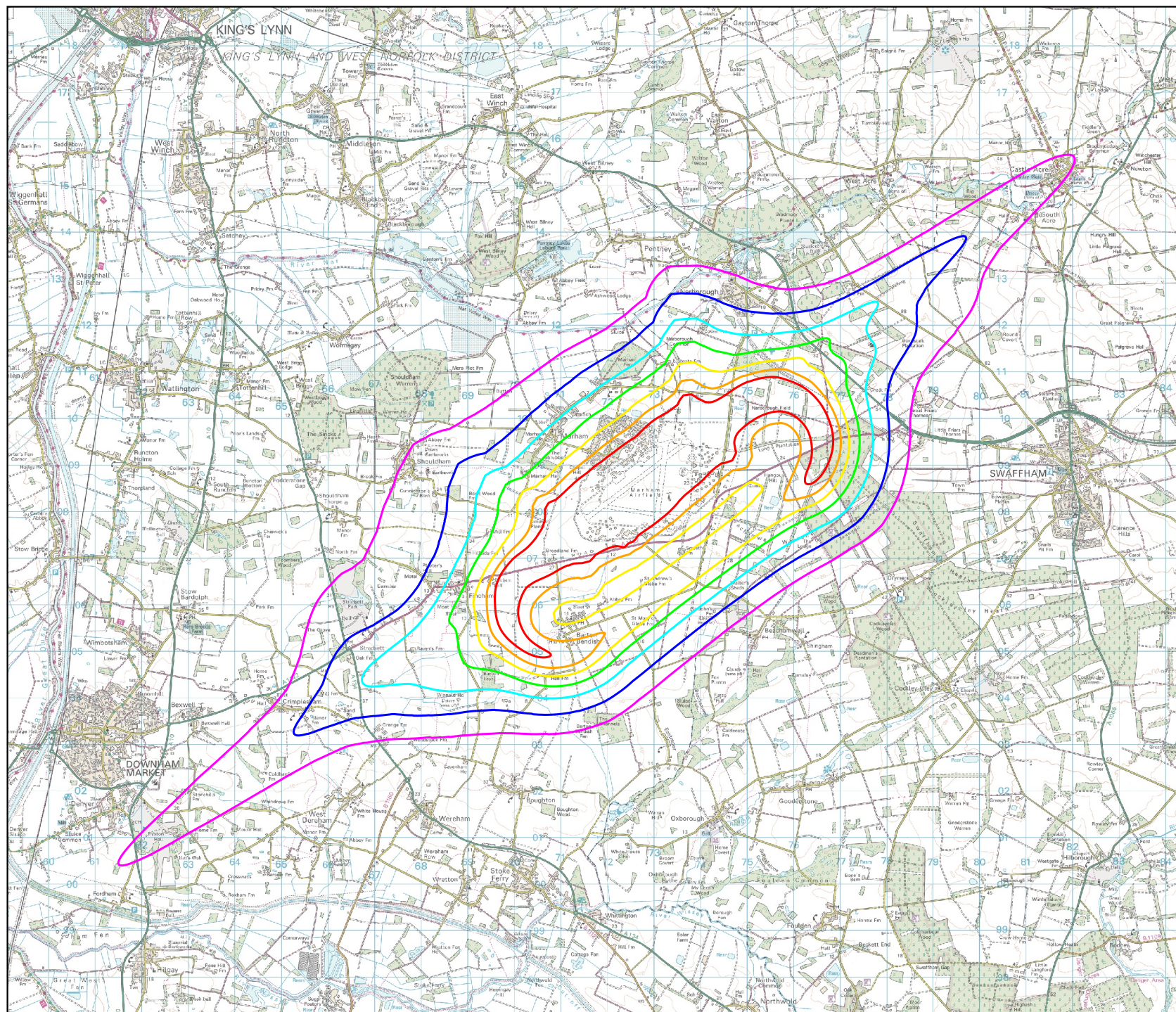
⁷ Altitude, speed, and engine power at different distances from the runway threshold.

⁸ UK MIL AIP, MARHAM, AD 2-EGYM-1-1, date: Jul 20.

Recommendations

14. It is recommended that the MANC at Annex A is used as a basis for assessing the noise environment around RAF Marham.

ANNEX A-1 TO OEM/12/26 DATE: APR 26



L_{Aeq},16hr contours

- 72dB
- 69dB
- 66dB
- 63dB
- 60dB
- 57dB
- 54dB

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RAF CENTRE OF AEROSPACE MEDICINE
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PROJECT
RAF Marham MANC

TITLE
L_{Aeq},16hr Without Night Noise Contours

DRAWING NUMBER
1

DRAWN BY
NV1 & HdNVD

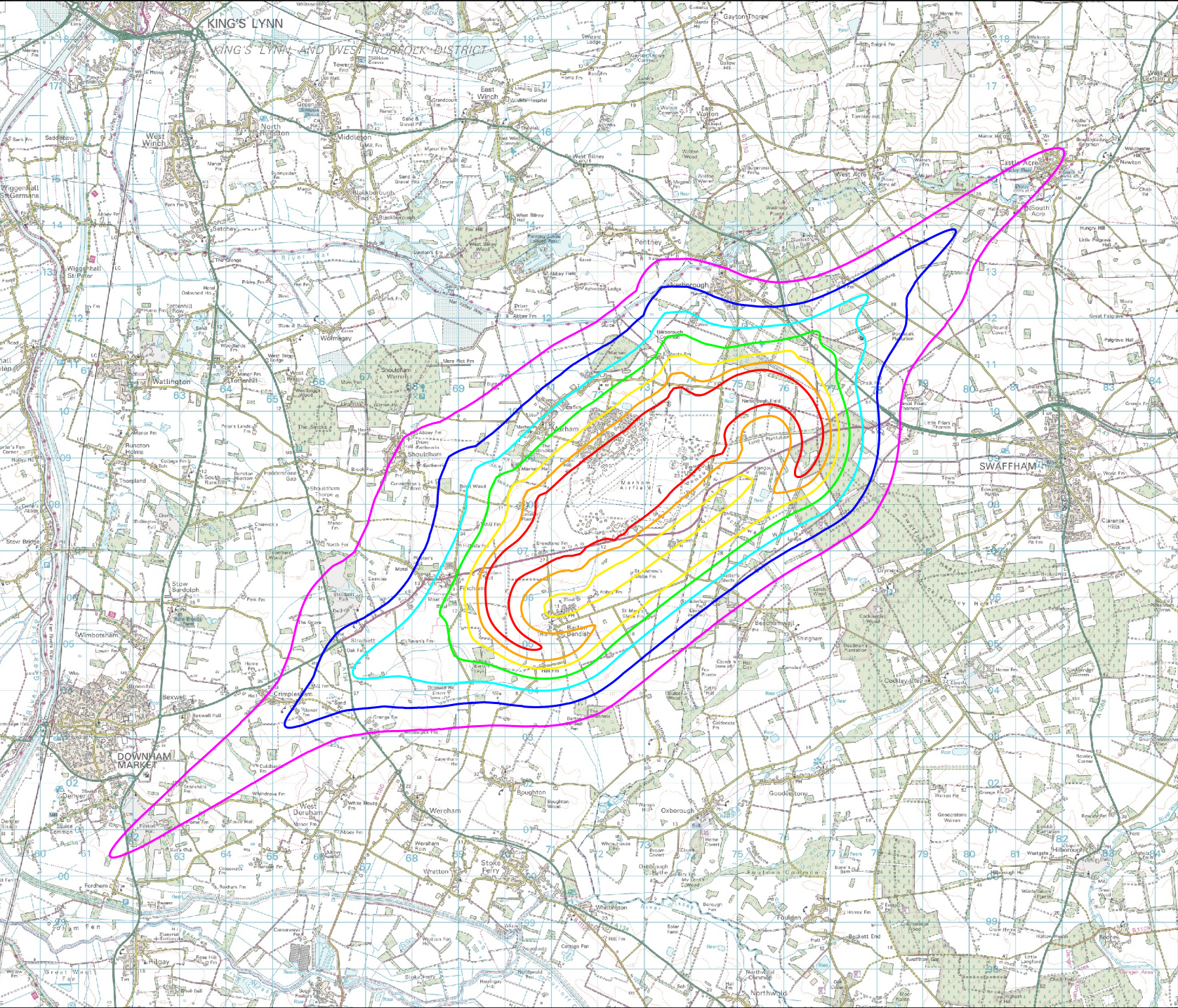
DATE
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REVISION
1

CAD FILE
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TECHNICAL REVIEW
DepHdNVD

CLASSIFICATION
Unclassified



L_{Aeq},16hr contours

- 72dB
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NOISE AND VIBRATION DIVISION
OEM WING
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SG16 6DN

PROJECT RAF Marham MANC	
TITLE L _{Aeq} ,16hr With Night Noise Contours	
DRAWING NUMBER 1	DRAWN BY NV1 & HdNVD
DATE Apr 26	REVISION 1
CAD FILE N/A	
TECHNICAL REVIEW DepHdNVD	
CLASSIFICATION Unclassified	