

**OCCUPATIONAL AND ENVIRONMENTAL
MEDICINE WING**

NOISE AND VIBRATION DIVISION

Report: OEM/77/13

Dated January 2014

A REPORT ON AN ENVIRONMENTAL NOISE SURVEY
OF AIRCRAFT ACTIVITY AT RAF LEUCHARS

Approved for publication



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NOISE AND VIBRATION DIVISION**

ROYAL AIR FORCE CENTRE OF AVIATION MEDICINE

Report No: OEM/77/13

**A REPORT ON AN ENVIRONMENTAL NOISE SURVEY OF AIRCRAFT ACTIVITY AT
RAF LEUCHARS**

EXECUTIVE SUMMARY

1. The Noise and Vibration Division was tasked by [REDACTED] to carry out a Noise Amelioration Scheme (Military) assessment of aircraft activity at RAF Leuchars.
2. RAF Leuchars is home to two Typhoon squadrons as well as No 6 Force Protection Wing Headquarters, 58 Squadron RAF Regiment, Air Transportable Surgical Squadron, 71 Engineer Regiment, the East of Scotland Universities Air Squadron and Number 12 Air Experience Flight.
3. In addition to Typhoon aircraft, RAF Leuchars also has Tutor aircraft and a number of visiting aircraft including fast jets such as Tornado GR4 and Hawk.
4. Average Daily Movement numbers were calculated from Air Traffic Control movement logs for the period 1 Feb 11 to 31 Jan 12
5. Using the Federal Aviation Administration's Integrated Noise Model, 16-hour L_{Aeq} noise contours were produced. These contours were reviewed by the Defence Safety and Environment Authority.
6. It is recommended that the 72, 66 and 63 dB $L_{Aeq,16hr}$ contours should be used as the basis for the a Noise Amelioration Scheme (Military) at RAF Leuchars. However as air activities at RAF Leuchars are likely to cease in the near future a Noise Amelioration Scheme (Military) is not required.

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Author: [REDACTED]

INTRODUCTION

1. The Noise and Vibration Division was tasked by [REDACTED] at Reference A to carry out a Noise Amelioration Scheme (Military) (NAS(M)) assessment (Reference B) of aircraft activity at RAF Leuchars.

BACKGROUND

2. RAF Leuchars is situated on the north-east coast of Fife in Scotland with the town of St Andrews located approximately 6km to the south of the station. There are also a number of villages that surround the station which included the village of Leuchars to the north, Guardbridge to the south, and Balmullo to the west.

3. The station has two runways. The main runway designated 09/27 is 2588m long and 46m wide. The cross runway 04/22 is 747m long and 43m wide.

4. Runway 04/22 can be used on weekends by aircraft from the Leuchars Flying Club; however runway 09/27 operated as the main runway for 100% of the time during the movement log period. The dominant aircraft movements take place on runway 27 with 71% of movements and 29% on runway 09. There are no recorded night time movements during the movement log period.

5. The station is home to two Typhoon squadrons as well as No 6 Force Protection Wing Headquarters, 58 Squadron RAF Regiment, Air Transportable Surgical Squadron, 71 Engineer Regiment, the East of Scotland Universities Air Squadron and Number 12 Air Experience Flight.

6. The Typhoon aircraft is equipped with twin EJ200 engines, capable of producing 20,000lbs of thrust.

7. In addition to Typhoon aircraft, RAF Leuchars also has Grob Tutor aircraft and a number of visiting aircraft including fast jets such as Tornado GR4 and Hawk.

8. The last environmental noise survey of RAF Leuchars that involved noise measurements detailed at Reference C.

RELEVANT LEGISLATION

9. MOD policy regarding environmental noise is to mitigate as far as is reasonably practicable, the effects of the environmental noise which its activities produce. The MOD voluntarily introduced a Noise Insulation Grant Scheme (NIGS) to compensate those most affected by aircraft noise around military airfields in the United Kingdom. The scheme was suspended in April 2005 on cost grounds.

10. Reference B states an introduction of a NAS(M) where the running resides with the Top Level Budget operating the establishment producing the environmental noise disturbance. The parameters which the NAS(M) is based on are 16 hours equivalent sound pressure level ($L_{Aeq, 16h}$) noise contours of 72, 66 and 63 dB(A).

FLIGHT DATA COLLECTION

11. Circuits flown by fast jet aircraft are flown to the north of station at height of 1200ft. Light aircraft circuits are also flown to the north of the station at 800ft. Fast jet aircraft depart with a straight climb to a height of 1000ft before turning, avoiding overflying local towns and villages below 2000ft (Reference D).

12. Information regarding Typhoon aircraft performance, flight paths and flight variables were obtained from MILFLIP documents and discussions with the Typhoon aircrew.

MOVEMENTS REVIEW

13. The average daily movement (ADM) numbers were calculated from Air Traffic Control (ATC) movement logs for the period 1 Feb 11 to 31 Jan 12. Table 1 below shows the total calculated ADM numbers which are based on a flying year of 220 days. Helicopter movements were not included in this review. Table 2 contains the ADM figures for the period Mar 03 to Feb 04 from Reference C converted to the same format to allow a direct comparison. Table 3 shows the percentage change for each identifiable type.

Table 1 – Calculated Average Daily Movements for 12 Month Period Feb 11 to Jan 12

	Take-Off	Roller	Overshoot
Typhoon	8	4	3
Grob Tutor	11	10	1
Visiting Fast Jets	2	1	1

Table 2 – Average Daily Movements for 12 Month Period Mar 03 to Feb 04

	Take-Off	Roller	Overshoot
Tornado	37	16	11
Grob Tutor	15	11	2
Visiting Fast Jets	5	1	2

Table 3 – Percentage Change in Average Daily Movement Figures

	Take-Off	Roller	Overshoot
Home Fast Jets	-78%	-75%	-73%
Grob Tutor	-26%	-9%	-50%
Visiting Fast Jets	-60%	0%	-50%

14. When an aircraft is going to perform an overshoot or roller it approaches the airfield as if it is going to land. Overshoots are performed when an aircraft enters the landing pattern and continues straight down the line of the runway before climbing again into the circuit. A roller is similar however it involves the aircraft touching its wheels onto the ground and rolling down the runway before accelerating and climbing again into the circuit.

ANALYSIS

15. Noise contours for the station are produced using the Federal Aviation Administration's Integrated Noise Model (INM) which is an internationally recognised noise prediction package and is used extensively within the UK for civil/commercial aircraft operations. INM 7 is the latest version which allows a 3 dimensional geometric model to be constructed including the runway, flight tracks, ground heights and receiver. Aircraft noise models work by taking a core data set of aircraft Noise-Power-Distance (NPD) source noise levels and then predicting the noise impacts beneath the flight track using the flight profiles of the aircraft.

16. Typhoon aircraft was modelled from measured NPD source noise levels given in Reference E.

17. For modelled Grob Tutor and visiting aircraft the information regarding aircraft performance and flight variables built into INM was used.

ASSUMPTIONS

18. All departing aircraft have been modelled as using standard instrument departures (SIDs) as published in Reference D.

19. The majority of visiting fast jets to the station during the logging period was Tornado GR4 aircraft; therefore all visiting fast jets have been modelled using the Tornado flight variables built into INM.

20. All overshoots and rollers are recorded as rollers. This is due to rollers being more consistent to model, as an overshoot can be performed at a range of altitudes.

21. Observations of fast jet approaches have shown that fast jet aircraft perform an overshoot then climb back into a circuit before making a landing. Therefore an additional overshoot has been included for every recorded approach by fast jets.

RESULTS

22. Annex A presents the 72, 66 and 63 dB $L_{Aeq,16hr}$ noise contours as produced by INM. The contours consider noise from aircraft only; It may be that in any particular area there may be other noise sources such as busy roads, railway lines etc that dominate the noise environment.

23. The contours were reviewed by the Defence Safety and Environment Authority.

RECOMMENDATIONS

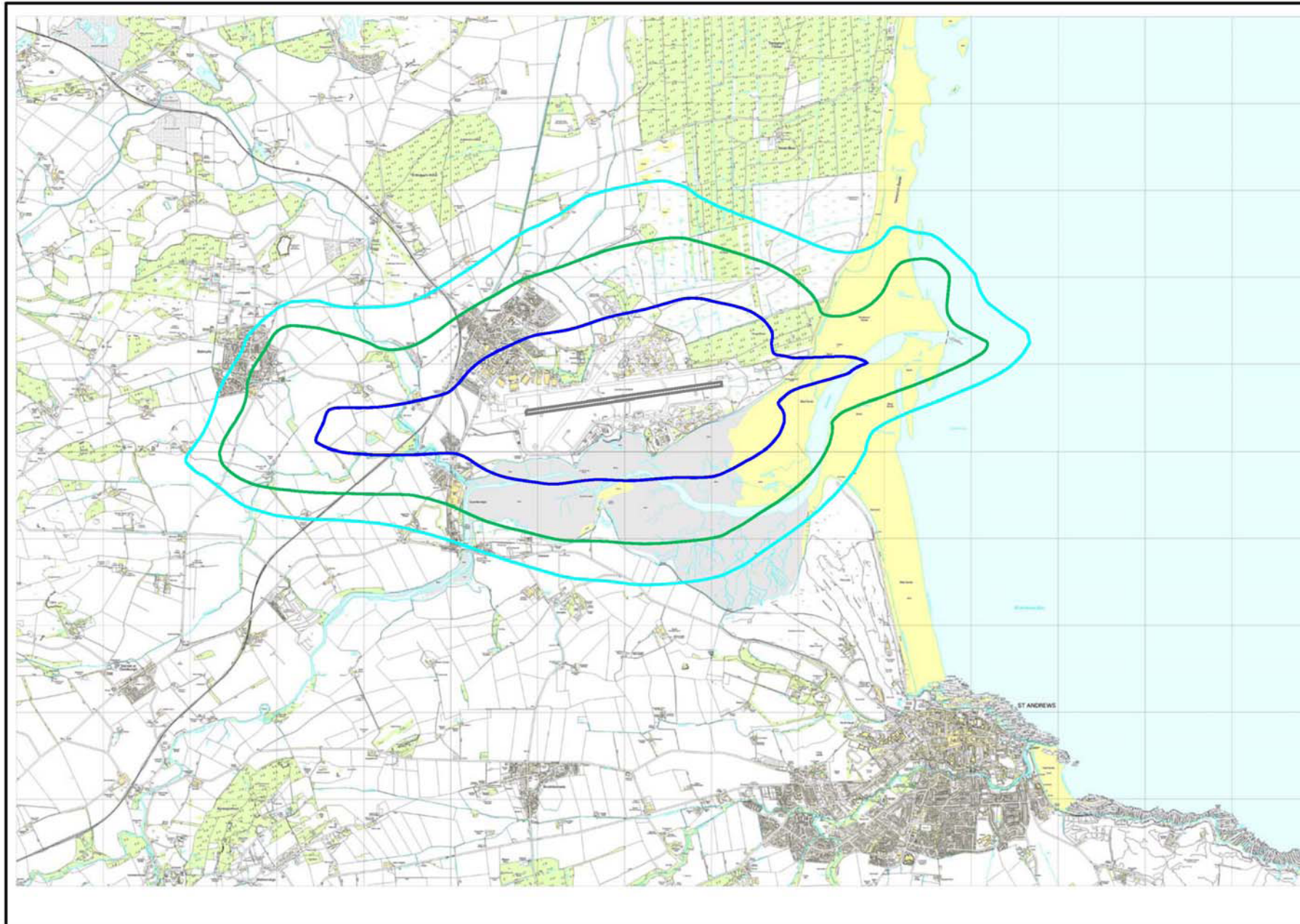
24. It is recommended that the 72, 66 and 63 dB $L_{Aeq,16hr}$ contours detailed at Annex A, should be used as the basis for the NAS(M) at RAF Leuchars. However as air activities at RAF Leuchars are likely to cease in the near future a NAS(M) is not required.

ACKNOWLEDGEMENTS

25. The Noise and Vibration Division would like to thank the personnel of RAF Leuchars who assisted with data collection that enabled the production of the contours.

REFERENCES

- A. RAF CAM Tasking Proforma 0409100404
- B. JSP 418, Volume 2, Leaflet 04.1. Dated June 2010
- C. RAF CAM Report OEM/50/08 dated August 2008
- D. Royal Air Force Leuchars, Flying Order Book, Dated September 2011
- E. Typhoon Noise Characterisation – Final Technical Report. QinetiQ. Dated 15 Oct 10



KEY

- - 72dB(A) L_{Aeq,16h} Contour
- - 66dB(A) L_{Aeq,16h} Contour
- - 63dB(A) L_{Aeq,16h} Contour



PROJECT
Annex A to OEM/77/13

TITLE
RAF Leuchars LAeq 16h Contours

DRAWING NUMBER	DRAWN BY
OO1	[Redacted]

DATE	REVISION
Jan 14	1

CAD FILE
LEQ 16h Contours.dwg

CAN FILE REFERENCE
[Redacted]

CLASSIFICATION
Unclassified