

LONDON LUTON AIRPORT

A11060-N38-DC

31 July 2019

Noise Contour Area Assessment

1.0 INTRODUCTION

The area of the noise contours due to airborne aircraft is used as an element of the noise management at several U.K. airports, e.g. London Heathrow, London Gatwick and London Luton. Contours are determined annually based on the activity in the previous summer period, mid-June to mid-September. The other common contouring activity is to provide forecast noise contours and their areas for planning purposes.

Both types of contour are computed using either the ANCON software developed and operated the Civil Aviation Authority (CAA) or software from the Federal Aviation Administration, historically the Integrated Noise Model (INM) but often now the replacement Aviation Environmental Design Tool (AEDT), which are widely available.

Consequently due to the need to make assumptions and uncertain or incomplete data contours have some inherent uncertainties which remain despite measures being taken to minimise them. These are discussed with regard to historic contours in Section 2.0 and forecast contours in Section 3.0.

2.0 HISTORIC CONTOURS UNCERTAINTIES

For past activity details will be available of the number of aircraft, the specific types of aircraft, the runways used and routes flown, and for some locations the actual individual noise levels arising at a few locations from some of the aircraft types. The uncertainties arise from the need to make assumptions over:

- the assignment of representative aircraft types, for which data is contained in the modelling software, to the actual aircraft types that operated,
- the departure flight profiles to be used as airlines operate different confidential procedures which are modified depending on the weather conditions at the time of the flight, for example if the runway is wet,
- the dispersion assumptions to be adopted, as it is generally not practical to model each flight individually,
- the landing profiles to be used.

As a result of these combined effects there will be some differences between the modelled and the actual noise levels.

The magnitude of the difference between the modelled and the actual noise levels has been investigated by the Environmental Research and Consultancy Department (ERCD) of the CAA. Edition 2 of their report *ERCD REPORT 1006 Measurement and Modelling of Aircraft Noise at Low Levels* dated 2 July 2019 includes differences between measured and modelled noise exposure. Specifically Table 2 of the report contains a comparison of measured and predicted noise levels at Heathrow at a range of monitoring locations. In most cases the differences are less than 1 dB although larger differences of 1 to 2 dB are reported in some cases. It should be noted that the predicted noise levels are from ANCON which has been specifically developed over many years using information on activity and measured noise levels from London Heathrow.

Regarding the differences, those less than 1 dB are considered to be negligible, despite a 1 dB change in the predicted noise contour level corresponding to approximately a 20 percent change in contour area. The associated footnote states *In aircraft noise modelling, a generally accepted margin of error is ± 1 dB. In terms of noise measurements, the error margin even on high specification noise measurement devices is likely to be of a similar level.*

An analysis of historic forecasted and actual contour areas for Luton is attached, note A11060-N35-DR.

3.0 FORECAST CONTOUR UNCERTAINTIES

Forecast contours have all the uncertainties of historic contours in addition uncertainties arising from the difficulty of forecasting the details of future flying activity. This is illustrated from the recent history at Luton Airport by the sudden collapse of Monarch, and the unprecedented growth in overall activity. There currently is also the ongoing issue with the Boeing 737 MAX which has led to the type being grounded and deliveries being halted.

With regard to the noise contour area forecasting, modelling uncertainties arise from:

- how many aircraft will operate at night and during the day, due to
 - BREXIT
 - Air Traffic Control delays
 - passenger choice which determines the destinations airlines fly to,
- the split of movements by aircraft type, due to
 - the introduction of new airlines and the departure of others
 - the decision of the airlines over which of their aircraft types to operate a particular service,

- what the noise levels from new aircraft types will be, due to
 - differences between aircraft noise certification data and in service performance,
- how aircraft will be flown
- weather.

An example of the difference between forecast and actual contour areas is given by the published experience at Heathrow, where the forecast made in 2007 for daytime contour area in 2015 was different by 17% than that which was subsequently determined based on the actual activity.

4.0 DISCUSSION

Before deducing the appropriate headroom that is necessary when setting a contour limit the Luton information is noted. In the Annual Monitoring Reports, 2015 - 2018, a maximum difference between the actual and the forecast, made just over 6 months in advance of the following summer period, was 1.7 km² [2017 daytime], a difference of about 9%. The four year average differences were;

DAYTIME	4%
NIGHT-TIME	2%

Recently two forecasts have been made for this year [2019 summer] they differ in contour by;

DAYTIME	13%
NIGHT-TIME	15%

There have been various assessments for 2028, they differ by greater amounts;

DAYTIME	40%
NIGHT-TIME	28%

The underlying reason for these large differences for 2028 is the challenge of taking into account the number and the noise performance of the re-engined twins, from the Airbus A320 and Boeing 737 families. On the latter, the short term future of the Boeing 737 MAX is unclear. With regard to the Airbus A320neo the table below illustrates the difficulty of assessing future noise characteristics.

The table shows the assumptions taken for the noise performance of the Airbus A320neo in five separate assessments. On departure there is a range of 2.7 dB and on arrival it is 2.0 dB. The last row of entries are those used for the latest modelling at Luton Airport and are based on the in service performance at the airport. Currently there is not sufficient similar data on the other main aircraft types.

Noise Benefit of Airbus A320neo Compared to Existing Type		
Source	On Departure (dB)	On Arrival (dB)
ERCD (2007)	4.0	3.0
BAP Luton E.S. (2012)	3.0	3.0
ERCD Stansted E.S. (2018)	5.2	2.6
WOODS Heathrow Consultation (2019)	5.7	3.0
Luton Measured	4.0	1.0

These facts show that the operator cannot forecast with complete accuracy the future contour area as many of the matters causing difference between them and what will actually occur are not under the control of the operator. As a result if a contour area is to be used as a fixed limit [such as in Condition 10] an allowance for the inherent uncertainties is appropriate.

With regard to such an allowance, historic differences are expected to be smaller than what might arise in future years. This arises as the main types of aircraft used at the airport are expected to change, e.g. less Airbus A319s, more Airbus A320neos and A321neos, and potentially some Boeing 737 MAXs but the details are not certain. Also the noise characteristics used in the recent historic contouring is supported by many thousands of actual noise results from the three fixed noise monitors at Luton Airport, whereas for some of the new aircraft performance is based estimates.

With regard to making an allowance the concern has been raised as to whether it should be the same for daytime and night-time contour areas. As the night-time period is also subject to additional controls, such as quota count limits, a lesser allowance might be adopted. The current forecasts indicate in the period up to 2024, that the headroom between the proposed Condition 10 and the forecast annual summer contour area range from;

DAYTIME	24% - 44%
NIGHT-TIME	16% - 22%

5.0 SUMMARY

There are a number of uncertainties with modelled noise contours. For historic contours where detailed information is available on the activity being considered, even with careful attention to minimise them, there are differences between measured and predicted noise levels. In aircraft noise modelling the generally accepted margin of error is ± 1 dB.

For forecast noise contours there are additional uncertainties, principally due to the difficulty in predicting what activity will occur in the future. As a result if a contour area is being used as a limit based on forecasts an allowance for the inherent uncertainties is essential. The current application includes an adequate allowance, whilst ensuring that any noise increase arising if the allowance is used is one usually considered insignificant.

Jeff Charles
for Bickerdike Allen Partners

David Charles
Partner

ATTACHMENT

SECTION 73 – Analysis of Differences between Actual and Forecast Contours
A11060-N35-DR – 08 July 2019