wood.

Appendix 8B
Noise - Modelling report

LONDON LUTON AIRPORT

A11060-N57-DR

21 December 2020

SECTION 73 – NOISE CONTOURING METHODOLOGY

1.0 INTRODUCTION

London Luton Airport Operations Limited (LLAOL) are making a Section 73 application to Luton Borough Council (LBC) to increase their annual passenger limit to 19 million passengers per annum (mppa), and for an increase in the limits on the area of the 57 dB daytime and 48 dB night time noise contours. For both contours there is a short term limit that applies until the end of 2027 and a lower long term limit that applies from 2028 onwards.

Chapter 7 of the Environmental Statement accompanying the application contains aircraft noise contours for a number of scenarios. This appendix details the methodology for the production of these noise contours. It follows the same format as the corresponding appendix in the 2012 ES, specifically *Appendix H Appendix N03 Detailed Noise Input Data, Methodology and Airport Noise Contours*.

The latest contours and those in the 2012 ES, have been prepared by Bickerdike Allen Partners LLP (BAP) based on actual and forecast future movements provided by London Luton Airport Operations Limited (LLAOL). These include the actual and expected number of movements by the individual aircraft types.

Chapter 7 contains contours for the following scenarios:

- Existing Short Term Limit
- 2021 18mppa (Proposed Short Term Contour Area Limit)
- 2022 18mppa (Worst Intermediate Year)
- 2023 18mppa
- 2024 19mppa
- Existing Long Term Limit
- 2028 19mppa (Proposed Long Term Contour Area Limit)
- 2028 12.5mppa (Future Baseline)

Details of the noise contour methodology for these scenarios are given below. The 2028 12.5mppa scenario is based on the forecast movements from the 2012 ES, but using the latest methodology.

2.0 SOFTWARE

The overall $L_{Aeq,T}$ contours were produced using the version 7.0d of the Federal Aviation Administration (FAA) Integrated Noise Model (INM). This is relatively minor update of version 7.0c which was used to produce the contours presented in the 2012 ES.

To produce the number above contours (N65 and N60) the INM software was used in conjunction with the Transport Noise Information Package (TNIP Expert v2.3b) from the Australian Government Department of Transport and Regional Services.

3.0 GEOGRAPHICAL INFORMATION

Geographical information about the location and height of the runway have been taken from the UK Aeronautical Information Package (AIP) for London Luton Airport. This is unchanged from the information used in the 2012 ES.

As before the INM study includes the effect of local topography. The data is based on the Ordnance Survey Landform Panorama product and then processed for input into the INM model.

4.0 AIRCRAFT OPERATIONS

The basis for the summer noise contours are the aircraft movements during a 92 day summer period. Specifically, the movements from the 16th June to the 15th September inclusive were used. This is the standard summer period used when producing noise contours in the U.K. This period represents a worst case as it includes the peak period at the airport due to holidays. For annual contours, the movements across the whole year are considered.

4.1 Traffic Distribution by Aircraft Type

The forecast of future aircraft operations used within this assessment are presented in Appendix 3A of the ES.

4.2 Flight Tracks and Dispersion

Arrivals at London Luton Airport (LLA) use Standard Arrival Routes (STARs), which involve straight final approaches with the aircraft typically joining the extended centreline of the runway around 8 nautical miles from the thresholds. Arrivals are therefore modelled as straight approaches, along the runway centreline.

Departures use the published Standard Instrument Departures (SIDs) given in the UK Aeronautical Information Publication (AIP). The use of the departure flight tracks is monitored by the Airport's track keeping system. The tracks flown are also available to view via the Airport's web site using the TraVis system.

A number of the SIDs are initially similar close to the airport. Therefore, a set of six modelled representative departure tracks, three from each runway end, for use in the INM model were generated based on actual tracks flown. The traffic has then been dispersed from these representative tracks as described below.

The dispersion model has the assumption that there are three "dispersed" tracks associated with each departure route; these comprise the representative track of each route and one sub-track either side. The allocation of departure movements to each track is as follows:

• 68.26 % along the representative track;

• 15.87 % along each of the two sub-tracks either side of the representative track.

This dispersion model is that assumed by the INM software when it generates the sub-tracks from the actual tracks. These assumptions are identical to those used for the previous contours.

The same set of modelled flight tracks were used to produce all of the noise contours. These are the same as those used to produce the contours for the *2011 Current Aircraft Noise Baseline* scenario with the exception of the departure routes to the west. These have been revised since the 2012 ES to reflect an airspace change and also the adjustments to an on route bearing to counter the natural drift in magnetic north.

4.3 Flight Profiles

For the departure movements the INM model offers a number of standard flight profiles for most aircraft types, particularly for the larger aircraft types. These relate to different departure weights which are greatly affected by the length of the flight, and consequently the fuel load.

In the INM the weight is referred to as the stage length. Stage lengths occur in increments of 500 up to 1500 nmi and then in increments of 1000 nmi. The INM model assumes all aircraft take off with a full load irrespective of stage length. As the stage length increases the aircraft has to depart with greater fuel and so its flight profile is slightly lower than when a shorter stage length is flown.

Following long term measurement of aircraft departures in southern Luton and discussion with airlines the standard flight profiles were supplemented with custom profiles for the Airbus A319 and A320 and the Boeing 737-800. These better reflected the operational procedures flown and also improved the correlation between measured and predicted noise levels, when considering both the results from southern Luton and the fixed monitors of the airport’s noise and track keeping system. This change occurred after the 2012 ES, so the earlier contours used standard flight profiles.

For the departure movements the appropriate stage lengths were determined from the destinations, which were provided in the forecasts. For the 2012 ES contours the stage length was similarly set for each departing aircraft based on its destination. In some cases, particularly for smaller aircraft, profiles do not exist in the INM model for the stage lengths flown. In these cases the closest available stage length was used.

4.4 Traffic Distribution by Route

For all scenarios, the modelled route usage is the average of the summer activity in the last five years (2015-2019). This five year average split of departures by route is summarised in Table 1.

Runway	Modelled Departure Route	Percentage of Runway Departures
08	E1	11%
	E2	52%
	E3	38%
26	CPT_260	38%
	DVR_9Y	51%
	OLY_260	11%

Table 1: Modelled departure route usage (2015-2019 average)

4.5 Traffic Distribution by Runway

For all of the scenarios, the modelled runway usage is the average of the summer activity in the last five years (2015 to 2019). This five year average split by runway is given in Table 2.

Runway	Percentage of Movements
08	22%
26	78%

Table 2: Modelled runway usage (2015-2019 average)

4.6 Future Aircraft Types

For all the scenarios, the modelled performance of the modernised aircraft types has been based on current aircraft types available in the INM, but with an allowance for their expected lower noise levels.

For all of the scenarios the modelled change in noise for the A320neo compared with the A320ceo has been derived from measured noise levels.

When the *Current Short Term Limit* contours were produced measured results were not available for the A321neo. The modelled change in noise for the A321neo compared to the A321ceo was therefore based on a comparison of certification values. For the other scenarios, which were produced later, the modelled change in noise levels for the A321neo are based on measured results in 2018.

For all of the scenarios the modelled change in noise for the Boeing 737 MAX compared with the 737-800 are based on a comparison of certification noise levels. The modelled changes in noise levels for the modernised aircraft are detailed in Table 3.

Scenario	Modernised Aircraft Type	Current Aircraft Type	Change in Modernised Aircraft Noise	
			Arrivals	Departures
All	Airbus A320neo	Airbus A320ceo	-1 dB	-3.8 dB
Current Short Term Limit	Airbus A321neo	Airbus A321ceo	-1.8 dB	-6.3 dB
All Other	Airbus A321neo	Airbus A321ceo	0 dB	-1.9 dB
All	Boeing 737 MAX	Boeing 737-800	-2.2 dB	-3 dB

Table 3: Latest modelled change in noise produced by modernised aircraft types

At the time of the 2012 ES none of the modernised aircraft types had flown, let alone been certificated or entered service. Consequently, assumptions were made on their expected performance, and these are detailed in Table 4.

Modernised Aircraft Type	Current Aircraft Type	Change in Modernised Aircraft Noise	
		Arrivals	Departures
Airbus A319neo	Airbus A319	-3 dB	-3 dB
Airbus A320neo	Airbus A320	-3 dB	-3 dB
Airbus A321neo	Airbus A321	-3 dB	-3 dB
Boeing 737 MAX	Boeing 737-800	-3 dB	-3 dB

Table 4: 2012 ES modelled change in noise produced by modernised aircraft types

Comparing Tables A3 and A4 shows a similar overall modelled improvement from departures, but a decrease in the modelled improvement from arrivals. The Airbus A319neo has only sold in very limited numbers and does not feature in the latest forecast so is not included in Table 3.

5.0 VALIDATION OF INM MODEL

To provide a check of the methodology used for producing the regular noise contours for London Luton Airport (LLA) a validation exercise has been conducted annually for several years. This involves the comparison of predicted noise levels for individual operations by key aircraft types with the measured noise levels obtained from the Noise and Track Keeping (NTK) system.

For all the scenarios the results of the validation exercise used to produce the actual contours for 2019 at the airport were used and are summarised below.

The validation exercise for the 2019 actual contours was based on the then most recent set of annual measured results from the airport's NTK system, the data for 2018. The exercise considered the most common and loudest aircraft types. The measured sound exposure levels (SELs) obtained for the three main aircraft types operating at Luton Airport, the Airbus A319ceo, Airbus A320ceo, and the Boeing 737-800, from the fixed Noise Monitoring Terminals (NMTs) in 2018 are shown in Table 5. These are the averages of thousands of results in 2018 for each operation. Table 5 also includes the noise levels from the Validated INM Prediction. These are generally very similar to the measured noise levels, being less than 1 dB different.

Aircraft Type	Operation	Movement-Weighted NMT Noise Level, SEL dB(A)	
		2018 Average[1]	Validated INM Prediction
Airbus A319ceo	Arrival	84.7	84.5
	Departure	83.6	84.2
Airbus A320ceo	Arrival	84.4	84.2
	Departure	83.9	84.5
Boeing 737-800	Arrival	85.7	86.5
	Departure	86.2	86.0

Table 5: Comparison of Measured Sound Exposure Levels – Fixed NMTs

[1] Average based on results from specific NMTs exposed by each operation.

Measured noise levels for each aircraft type vary to some degree year on year. BAP have reviewed the average measured arrival and departure noise levels for the A320ceo, the most common type, over the period 2014-2018. The highest arrival noise levels occurred in 2018, the highest departure noise levels occurred in 2014.

To allow for this variation in noise level, for all the future scenarios except the *Current Short Term Limit* the modelled noise level for the A320ceo on departure has been increased to the 2014 level, which is 0.7 dB higher than that in 2018. The arrival noise levels have not been altered. For the *Current Short Term Limit* scenario the A320ceo noise levels are based on the measured results in 2018 as described above.