

Consultation on CAA Minimum Requirements for Noise Modelling

CAP 1875

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Introduction

1. In order to carry out certain of its regulatory duties, the CAA requires stakeholders (usually from airports) to provide us with outputs from noise modelling. Such outputs are typically in the form of sets of 'noise contours'¹, along with the area they cover and/or the number of residents living within them. Currently, different stakeholders use different levels of sophistication in this modelling, which is as expected since they have different numbers of residents affected by aviation noise, and may respond to the CAA in regard to different of our duties. Up until now, it has been the responsibility of each stakeholder to decide on the level of sophistication of noise modelling appropriate for its circumstances.
2. The CAA now believes that it is appropriate to specify the minimum acceptable level of sophistication of noise modelling required for us to carry out our duties, to provide clarity to sponsors and stakeholders about the methodology they should use and therefore reduce ambiguity, and to provide consistency across different groups of airports. In general, the CAA will expect the noise analysis to be sufficient for it to carry out its duties but also proportionate to the size and likely noise effects of the airport or the proposal under consideration. In most circumstances, some form of noise analysis will be presented to the CAA. However, we appreciate that installation of noise monitoring infrastructure and modelling of results informed by noise monitoring and track data can involve some expenditure, and in some cases, this level of expense would not be proportionate.
3. In this document, the CAA defines Categories of noise modelling and puts forward its proposals for the minimum Category which different stakeholder or sponsor groups should achieve in order for the CAA to carry out its duties. We invite comments on our proposals and will consider any response we receive before publishing our final requirements. The remainder of the document consists of the following chapters:
 - The first Chapter describes the Categories of noise modelling which the CAA has identified.
 - The second Chapter describes these duties of the CAA for which we require noise modelling to be provided to us.

¹ A noise contour is an area within which the modelled average noise is greater than or equal to a particular value.

- The third Chapter describes our proposals for the appropriate Category of noise modelling which individual stakeholders or change sponsors should use for each of those duties.
- The final Chapter describes how to respond to this consultation

Chapter 1

Noise modelling

- 1.1 The purpose of estimating aircraft noise levels in the vicinity of an airport is to provide a quantitative assessment of the noise experienced by those living near an airport. The CAA's Environmental Research and Consultancy Department (ERCD) has significant expertise on aircraft noise issues and provides technical advice and support on such issues to the Department for Transport (DfT) to assist in the development of Government policy. ERCD developed the UK civil aircraft noise contour model (ANCON), which calculates noise contours from data on aircraft movements, routes, noise generation and sound propagation. Other noise models exist (for example, the FAA's Aviation Environmental Design Tool - AEDT) and these can also be used by stakeholders provided they meet the standards set out in international best practice guidance².
- 1.2 All modelling of aircraft noise is based on assessing the noise on the ground generated by each aircraft type using the airport (or airspace), then combining these in the proportions of the various different aircraft types that fly along the various different flight paths that are observed or expected, usually for an average summer³ day or night. At its most basic level, noise can be modelled using standardised reference values provided by ICAO (for noise by aircraft type), NATS (for standard flight paths), ECAC (for standard dispersion either side of those flight paths) and the airport stakeholder for the mix of aircraft types and usage of flightpaths. This approach does not require the collection of actual noise levels, flight paths or flight dispersion. A noise model such as ANCON or AEDT is then required to convert these data into noise contours within which the number of residents can be calculated from population databases.
- 1.3 The above method does not take into account certain local factors, which can make a difference to the actual noise experienced on the ground. Many airports use aircraft track keeping data in order to have a record of, and sometimes make available to residents, exactly where each aircraft flies and its height above ground. It also shows how concentrated or dispersed typical flight paths are around the standard arrival and departure routes at the airport. These data can be used to make the noise calculation much more accurate. However, such a system can cost a significant sum (likely over a hundred thousand pounds) to

² European ECAC Doc 29 4th Edition Volume 2 and international ICAO Doc 9911.

³ Summer is often used, since, in the UK, airports are likely to be busier in the summer season than in the winter season, and because residents are more likely to be outside or with windows open in the summer than in the winter, and so will be more affected by any aviation noise. Summer is defined here as the 92-day period between 16 June and 15 September inclusive.

install and incurs annual costs to run and maintain. It also requires a level of radar infrastructure to be in place at the airport. It is therefore only proportionate for airports above a certain size or whose noise effects on residents are sufficiently widespread to have such a system.

- 1.4 Some airports also use a Noise and Track-Keeping (NTK) system, which includes noise monitors to measure the actual noise experienced on the ground when aircraft fly overhead. Aircraft noise can be affected by factors such as the amount of power delivered by the engines (which can depend on the load of the aircraft or the flight path being followed), whether the undercarriage is lowered, or particular qualities and configurations of the airframe. Combining noise monitoring and track keeping data (the latter is needed to determine the position of the aircraft relative to the noise monitor when it is measured) allows a noise model to be adjusted to reflect noise from aircraft more accurately at a given airport. Noise monitors typically cost tens of thousands of pounds and need to be sited appropriately and regularly maintained in accordance with ISO standards to be of greatest use.
- 1.5 Airports for which the increased accuracy in modelling offered by the installation and use of an NTK system does not justify the expense can still improve their noise modelling through comparison to similar airports which have made such investments. Clearly such 'similar' airports are likely to be bigger, but if they use similar aircraft or are served by similar airlines, then factors such as the variation of flight paths around the standard are likely to be more accurately estimated from comparison to them than simply using standard international databases.

Categories of noise modelling

- 1.6 From reviewing the different methods used to model airport noise currently, the CAA has identified the following noise modelling Categories of sophistication, with Category A as the most sophisticated and Category E as the least. All the different methodologies provide valid representations of noise if applied correctly,
- 1.7 **Category A.** The noise model is adapted based on noise monitoring and track-keeping data provided by the airport. The noise monitors are sufficient in number and appropriately positioned such that track-keeping data can be used to identify noise caused by specific types of aircraft and used to make amendments to data from the ICAO sponsored Aircraft Noise and Performance (ANP) database⁴ to reflect these local effects. Where possible, noise monitors should be located to confirm with guidance provided in ISO 20906⁵ and SAE-ARP-4721⁶. The track-

⁴ <https://www.aircraftnoisemodel.org/>

⁵ ISO 20906:2009, Amended 2013. Unattended monitoring of aircraft sound in the vicinity of airports.

⁶ SAE-ARP-4721:2006. Part 1: Monitoring Aircraft Noise and Operations in the Vicinity of Airports: System

keeping data is used to calculate the mix of aircraft traffic on each departure and arrival route, the actual tracks flown along each route, the dispersion of aircraft either side of the mean track and vertical flight profiles at the airport. The model uses this local data and the known or expected flight schedule to calculate noise exposure (and therefore noise contours) or other metrics.

- 1.8 **Category B.** The noise model is adapted based on data from noise monitors and track-keeping radar provided by the airport. Aircraft flight profiles are adapted from the standard ICAO dataset and verified against local noise measurements for the main noise dominant aircraft types, which will typically cover more than 75 percent of the total noise energy produced by aircraft at that airport⁷. Limiting the use of local noise measurements is likely to mean that fewer noise monitors are required than for Category A. The track-keeping data is used to calculate the mix of aircraft traffic on arrival and departure routes, the actual tracks used for each route, the dispersion of aircraft either side of the mean track and the flight profiles at the airport. The model uses this local data and the known or expected flight schedule to calculate noise exposure (and therefore noise contours) or other metrics.
- 1.9 **Category C.** The noise model is adapted based on track-keeping data provided by the airport. Aircraft flight profiles are adapted from the standard ICAO dataset for the main noise dominant aircraft types, which will typically cover more than 75 percent⁸ of the total noise energy. The track-keeping data is used to calculate the mix of aircraft traffic on each arrival and departure route, the actual tracks used for each route, the dispersion of aircraft either side of the mean track and the flight profiles at the airport. The model uses this local data and the known or expected flight schedule to calculate noise exposure (and therefore noise contours) or other metrics.
- 1.10 **Category D.** The noise model is adapted based on data from other, similar (in terms of fleet mix, size or range of destinations) airports which meet the Category B or Category A standard (or Category C where applicable – i.e. where sufficient appropriate data exists). Data on flight profiles, noise data and dispersion from these other airports is used, whilst data reported from the Category D airport (rather than track-keeping data) is used to identify the arrival and departure routes and their usage for a typical day.

Description, Acquisition, and Operation. Part 2: Monitoring Aircraft Noise and Operations in the Vicinity of Airports: System Validation.

⁷ The loudness of sound is generally measured in terms of decibels (dB). Long term average A-weighted decibels (dB L_{Aeq}) take account of the frequencies people are most sensitive to, and are often used in measurements of aviation noise.

⁸ Adapting flight profiles can be a labour-intensive process and so limiting the number of aircraft types covered keeps costs down.

- 1.11 **Category E.** There is no adaptation of the noise model and standardised reference values only are used. The standard ICAO dataset is used (flight profiles, noise data), with no amendments for local effects. Data reported from the modelled airport (rather than track-keeping data) is used to identify the usage of arrival and departure routes for a typical day. The track over the ground for each arrival and departure route is derived from the published coordinates in the UK AIP or as advised by the airport. Dispersion around the nominal track of each such route is based on the dispersion guidance contained in ECAC Doc. 29 4th Edition 2015⁹.
- 1.12 A summary of the Categories is shown in Table 2.1. We would consider that a stakeholder's noise modelling can only be declared to be in a particular Category if it meets **all** the criteria in the table for that Category.

⁹ <https://www.ecac-ceac.org/ecac-docs>