

CAA Policy on Minimum Standards for Noise Modelling

CAP 2091

Published by the Civil Aviation Authority, January 2021

Civil Aviation Authority
Aviation House
Beehive Ring Road
Crawley
West Sussex
RH6 0YR

You can copy and use this text but please ensure you always use the most up to date version and use it in context so as not to be misleading, and credit the CAA.

First published 2021

Enquiries regarding the content of this publication should be addressed to: noise@caa.co.uk

The latest version of this document is available in electronic format at: www.caa.co.uk

Contents

Contents	3
Chapter 1	5
Introduction	5
Background	5
The proportionality principle	5
About this policy	6
Chapter 2	7
The Categories of Noise Modelling	7
Noise models	7
Noise modelling Categories	8
Chapter 3	13
CAA duties which may require provision of noise modelling	13
i) When an airport is designated by the Secretary of State for noise	13
ii) When a sponsor wants to change the design of airspace	14
iii) When an ANSP wants to change an ATC operational procedure and the proposal meets the criteria for a 'relevant PPR'	15
iv) When there are changes to the operational use of the civil airspace around an airport	16
v) When an airport submits a planning application for a development where the CAA is a statutory consultee	17
Chapter 4	18
Minimum requirements for noise modelling	18
Thresholds	18
Exceptions to our application of a category's requirements	20
No decrement criterion	20
No radar criterion	20
Chapter 5	22
The minimum noise modelling requirements that apply to each of our relevant duties	22

Designation	22
Airspace Change	22
How these requirements fit in with the CAP 1616 process: demonstrating to the CAA the correct category for a particular airport	23
Secretary of State's Call In Criteria	24
Changes to the operational use of the civil airspace around an airport	25
Development Consent Order (DCO) applications	25
Implementation Date and Transition Arrangements	26
Implementation date	26
Transition arrangements	26

Chapter 1

Introduction

Background

- 1.1 In order to carry out certain of its regulatory duties, the CAA requires stakeholders (usually 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.
- 1.2 All noise modelling is based on data about the noise emitted by flights into and out of an airport. At its most basic, these inputs can be taken from data published by ICAO² and other bodies. However, the data can also be adjusted to reflect actual local experiences by the use of various techniques. Implementation of the techniques to achieve this extra sophistication for noise modelling range in cost and resources required.
- 1.3 In this policy, the CAA specifies the minimum acceptable level of sophistication of noise modelling that can be used to provide the CAA with the outputs required for us to carry out our duties. We are publishing these requirements to provide clarity to those stakeholders that propose to make changes which may affect the noise at airports (or have other reasons to provide the CAA with noise calculations) and to provide clarity to stakeholders potentially impacted by such changes about the methodology sponsors should use to collect the data to undertake noise modelling. Publishing these requirements will also ensure a consistent approach is taken across different types of airport.

The proportionality principle

- 1.4 Our requirements in this policy document are proportionate; that is, in recognition of the costs involved, the sophistication with which we require an airport to model noise depends on the number of people exposed to noise at that airport. The more people exposed, the greater the sophistication that is required to be used. 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.

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

² The International Civil Aviation Organisation. www.icao.int

About this policy

- 1.5 This policy document defines Categories of noise modelling sophistication, describes the different situations where our duties require us to be provided with noise calculations, and sets out our requirements of the minimum Category which different stakeholder or sponsor groups should use when providing noise calculations to the CAA in order for the CAA to carry out the identified duties.
- 1.6 The remainder of the document consists of the following chapters:
- Chapter 2 describes the Categories of noise modelling which the CAA has defined.
 - Chapter 3 describes the CAA duties which require noise calculations to be provided to us.
 - Chapter 4 describes our requirements (and, in some cases, recommendations) for the appropriate Category of noise modelling which individual stakeholders or change sponsors should use to provide noise calculations to the CAA for each of those duties.

Chapter 2

The Categories of Noise Modelling

- 2.1 In this chapter, we describe in general how noise models are used to calculate the impact of noise on communities around airports. We also define five Categories of noise modelling to reflect the different levels of sophistication which can be used. All Categories provide valid representations on noise if applied correctly.

Noise models

- 2.2 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. A variety of noise models are used by the aviation industry, but they all calculate noise contours from data on aircraft movements, routes, noise generation and sound propagation.
- 2.3 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), NATS⁴ (for standard flight paths), ECAC⁵ (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 is then required to convert these data into noise contours within which the number of residents can be calculated from population databases
- 2.4 The above method does not take into account local factors, which can make a difference to the actual noise experienced on the ground. For example, flight path dispersion at a particular airport may be different to that assumed in the

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.

⁴ The air traffic service provider for all the UK's upper airspace and 14 UK airports. www.nats.aero

⁵ The European Civil Aviation Conference. www.ecac-ceac.org

ECAC data, or operating procedures and passenger and fuel loading for an aircraft type may be different to that assumed in the ICAO noise data.

- 2.5 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 additional data can be used to make the noise calculation much more representative of the noise experienced. However, such a system can cost a significant sum to install and incurs annual costs to run and maintain. It also requires a level of radar infrastructure to be in place at the airport.
- 2.6 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 need to be sited appropriately and regularly maintained in accordance with ISO standards to be of greatest use.
- 2.7 Currently, the noise model used by each airport in the UK is an individual choice made by the airport, except for those airports designated for noise by the Secretary of State, where the choice is made by the CAA on behalf of the Department for Transport (DfT).

Noise modelling Categories

- 2.8 This CAA policy document will refer to five Categories of noise modelling. Category A is the most sophisticated, reflecting the most accurate description of the noise experienced by those living near an airport, and Category E is the least. Notwithstanding our implementation of different required levels, the methodologies described in all the Categories provide valid representations of noise if applied correctly.
- 2.9 **Category A.** The noise model is adapted using noise monitoring and track-keeping data collected by the airport. The noise monitors are appropriately positioned and sufficient in number⁶ such that noise and aircraft position data

⁶ We require noise monitoring at a minimum of two different distances from the runway for arrivals and

can be used to identify noise caused by specific types of aircraft and used to make amendments to both flight profile and noise data within the ICAO sponsored Aircraft Noise and Performance (ANP) database⁷ to reflect these local effects. Where possible, noise monitors should be installed to conform with guidance provided in ISO 20906⁸ and SAE-ARP-4721⁹. Flight track-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.

- 2.10 **Category B.** The noise model is adapted using noise monitoring track-keeping and flight profile data collected by the airport. The noise monitors are sufficient in number and appropriately positioned, as for Category A. For Category B, aircraft flight profiles are adapted from the standard ICAO dataset and verified against local noise measurements, as for Category A, except that this is done only for the main noise dominant aircraft types, which must cover more than 75 percent of the total noise energy produced by aircraft at that airport¹⁰. 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.
- 2.11 **Category C.** The noise model is adapted using 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 must cover more than 75 percent¹¹

departures respectively. The distances shall be selected to cover the extent of the 51 dB $L_{Aeq,16h}$ average summer day noise contour and capture both arrival and departure noise. This will require a minimum of four noise monitor positions. However, in practice, if arrival and departure routes overfly the same point on the ground, a single monitor position will be able to cover both arrival and departure noise, such that the practical minimum number of monitors could be two. Overflight of a position on the ground is defined in CAP 1498. This should be applied at the noise monitoring position using a minimum elevation angle of 60 degrees.

⁷ <https://www.aircraftnoisemodel.org/>

⁸ ISO 20906:2009, Amended 2013. Unattended monitoring of aircraft sound in the vicinity of airports.

⁹ SAE-ARP-4721:2006. Part 1: Monitoring Aircraft Noise and Operations in the Vicinity of Airports: System Description, Acquisition, and Operation. Part 2: Monitoring Aircraft Noise and Operations in the Vicinity of Airports: System Validation.

¹⁰ 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.

¹¹ Adapting flight profiles can be a labour-intensive process and so limiting the number of aircraft types