Noise Action Plan (draft)

Aircraft noise

Noise from aircraft is caused by air going over the aircraft's fuselage (body) and wings – known as airframe – and its engines. When air passes over the aircraft's airframe, it causes friction and turbulence, which results in noise. The level of noise generated varies according to aircraft size and type, and can differ even for identical aircraft. Engine noise is created by the sound of the engine's moving parts and by the sound of air being expelled at high speed.

To help address noise we work collaboratively with the Civil Aviation Authority (CAA) who set the Airspace Policy, airlines themselves and Air Traffic Control (ATC) who advise the aircraft where to fly.

What measurements do we use – and why?

The measurement of noise is very complex and noise measurements are taken in different ways depending on what it is that you want to measure. There are a number of different ways of measuring noise from aircraft, with the measurement used dependent on what the measurement will be used for.

L_{max}, measured in decibels (dB), is the measurement of the maximum noise level during one noise event or, in this case, during one aircraft movement. The levels of individual noise events using Lmax are useful for many purposes including aircraft certification and noise fining.

LA_{eq} is measured in decibels (dB), and is the 'Equivalent continuous sound level' over a period of time. It is used to predict or measure the average noise level and disturbance caused and is commonly used in environmental noise measurements.

For aviation purposes, as a flight increases in altitude the noise from the aircraft disperses and dissipates outwards in a cone shape, with noise levels decreasing as the height of the aircraft increases. In order to assess environmental noise exposure, it is necessary to consider and take into account the impact of many events over longer periods – days, months, years – when living near an airport. These events will generally differ in magnitude; there will be different numbers in each hour or day; and they will occur at different times of day. Most indices for these assessments are L_{eq}-based.

Parameters – Scientific Description of noise

L_{max} – L_{max} is the highest value of the time weighted sound pressure level, which occurs during the measurement period. It is commonly used to measure the effect of very short duration bursts of noise, such as for example sudden bangs, shouts, car horns, emergency sirens etc. which audibly stand out from the general level of, say, traffic noise.

'A' weighting – The human ear responds better to some tones better than to others, so you can hear somebody talking but cannot hear the very low tones of a car travelling in the distance or the very high tones made by a dog whistle or bat. To account for this a sound level meter is fitted with filters, the most common being "A" weighting which is similar to the response of the human ear.

dBA – Decibels A-weighted.

LA_{max} – the L_{max} measurement A-weighted to represent weighting for human hearing.

L_{eq} or **LA_{eq}** – Equivalent continuous sound level or L_{eq} is defined as the level of hypothetical steady sound which, over the measurement period, would contain the same (frequency-weighted) sound energy as the actual variable sound. L_{eq} can be measured over any scale in practice. LA_{eq} is A-weighted to represent weighting for human hearing and is the most commonly used and is widely accepted as the most accurate parameter to use for determining nuisance and disturbance.

$LA_{eq}T$ – This is the Equivalent continuous sound level or L_{eq} weighted for both human hearing and over a specified time period.

Noise contour maps are used to predict which geographical areas will likely be the most disturbed by noise. They are provided to us by our regulator the CAA and help Edinburgh Airport to predict areas where noise disturbance may occur and determine areas that may be entitled to extra insulation in their homes to help reduce the noise disturbance from aircraft.

Noise contour maps within our draft NAP use **LA_{eq}**, **L_{den}** and **L_{night}** as measurements. These parameters are explained in detail on the following pages.

LA_{eq} or L_{eq} dBA contour maps

The LA_{eq} is A-weighted (see Parameters section) to represent weighting for human hearing and is the most commonly used parameter for predicting and measuring nuisance and disturbance.

The parameter used in noise insulation contour maps is **LA_{eq} 16hour**. The LA_{eq} 16hour contours are based on the average summer day, where 'summer' is the 92-day period from 16 June to 15 September, and 'day' is the 16-hour period 07:00-23:00 (local time). They are produced in 3 dB steps from 57 dBA to 72 dBA. From these maps, a database of all properties within each contour is produced which assists in determining eligibility for noise insulation grants.

The parameter used in **L_{eq} dBA** our draft NAP LA_{eq} 16hour (yearly average) is based on a full year's average noise when measured over the whole year in this case 2016, 16-hour period refers to 07:00-23:00 (local time). This is the time period and parameter set out by legislation – The Environmental Noise (Scotland) Regulations 2006 and LA_{eq} and L_{eq} are described in further detail in the parameters section of this fact sheet.

L_{den} Contour Maps

Unlike the conventional summer 16-hour L_{eq} dBA contours, the regulations require a different range of noise parameters: L_{day}, $L_{evening}$, L_{night}, LA_{eq}16hr, and dB L_{den}. L_{day} represents the L_{eq} measured over the time period 07:00-19:00, $L_{evening}$ represents the L_{eq} measured over the time period 19:00-23:00, L_{night} represents the L_{eq} measured over the time period 23:00-07:00. A full definition of these terms is provided in the glossary of the draft NAP. L_{den} is based on air traffic movements over the entire year, unlike dB LA_{eq} contours which are based on air traffic during the busiest summer months. In addition, an arbitrary weighting of 5 dB is applied to each of the evening (19:00-23:00) movements and 10 dB for each of the night (23:00-07:00) movements, to take into account the greater perception of disturbance at night. Contours for strategic noise mapping are presented in 5 dB steps from 55 dBA to 75 dBA. L_{night} differ in that they are presented between 50 dBA and 70 dBA.