

Aircraft noise

Noise from any source is often an emotive subject; noise that has no effect on one person may be a disruption or nuisance to another. Noise can be defined as 'a sound that causes a disturbance'. There are many ways in which 'sound' can be measured but measuring 'noise' is more difficult. Noise can be predicted through sound measurements and calculations, taking into account how likely a sound is to cause annoyance or disturbance. A person's perception of noise can vary and be dependent on the time of day, location, personal circumstances e.g. illness, background noise levels and the level of the sound experienced.

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.

Aircraft have been getting progressively quieter as designs and engine technology have advanced and it is expected that today's airlines will be operating even quieter models in the future.

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. Changes to the flight paths flown by Edinburgh Airport detailed within this consultation document will further reduce the number of people affected by Noise, by overflying less people through the use of more precise flight-paths made possible by RNAV technology.

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_{Amax}, measured in decibels (dB), is the measurement of the maximum noise level during one noise event or in this case during one aircraft movement.

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

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.

The levels of individual noise events using Lmax are useful for many purposes including aircraft certification. However, 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 - 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 Leq-based

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 use LAeq as a measurement; it is A weighted to represent weighting for human hearing and is the most commonly used parameter for predicting and measuring nuisance and disturbance. The parameter used in the contour maps is LAeq 16hr - The LAeq16 hour 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. LAeq and Leq are described in further detail in the parameters section below.

What Edinburgh Airport does to prevent Excessive noise from Aircraft

Noise Monitors and Noise Fining - Aircraft flying to and from Edinburgh Airport are monitored by 3 permanent and fixed noise monitoring stations located at Cramond, Uphall/Broxburn and Livingston. There are maximum allowed levels for Daytime noise (06:00 – 23:30) and Night time noise (23:30 - 06:00), these are 94dBA LMAX and 87 dBA LMAX respectively. Flights must not exceed these levels and airlines are fined for all exceedances. This is a voluntary policy introduced by Edinburgh Airport to mitigate against noise nuisance in our communities.

Scientific Description of noise Parameters

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

L_{Amax} is the L_{max} measurement A weighted to represent weighting for human hearing and the Slow time weighting

Leq or LAeq - Equivalent continuous sound level or Leq 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. Leq can be measured over any scale in practice. LAeq 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.

LAeqT- This is the Leq weighted for both human hearing and over a specified time period. The levels of individual noise events are useful for many purposes including aircraft certification, however 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 - 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 Leq-based (note in this proposal we are using Leq 16 hours, which aggregates the noise from the flights during the busy hours of the airport operation (07:00-23:00) and averages it over that period).

SEL - Sound Exposure Level. SEL is defined as that constant sound level which has the same energy in 1 second as the original sound event. The total sound energy is integrated over the measurement period, but instead of then averaging it (as you would with LAeq) over the entire measurement period, a reference period of 1 second is used.