



# Noise

## Heathrow Expansion Factsheet 5

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### What impact would a new runway at Heathrow have on Noise?

Heathrow's noise impact dwarfs that of all European airports. It is estimated that 725,500 people are exposed to noise from Heathrow. The next noisiest airport, Frankfurt, exposes only around one third of this number. Heathrow night flights, from 4:30am onwards, currently impact at least 420,000 people.

Although World Health Organisation (WHO) guideline noise levels have been in place for over 15 years, they are not yet applied to Heathrow. If they were applied, the number of people exposed to Heathrow aircraft noise in 2050 could rise from 1 million to 1.5 million with a new Heathrow runway.

Heathrow expansion is likely to expose several hundred thousand Londoners to aircraft noise for the first time and the uncertainty of flight paths may blight London for several years.

### Why does it matter?

1. Aircraft noise harms people's health, causes serious annoyance, disturbs sleep, impedes learning, and interrupts peoples' daily lives. World Health Organisation (WHO) research shows the harmful effect that excessive noise has on the whole population, particularly on the vulnerable: children, the elderly and those with cardiovascular and mental health conditions [\[1\]](#). Noise matters especially at night when it can interrupt people's sleep.
2. Noise is especially important at Heathrow because the spread of flights is over a large, densely populated city, and one that is growing rapidly (the Mayor of London's Plan estimates 37% growth between 2011 and 2050) [\[2\]](#).
3. Noise impact is measured in terms of the number of people exposed to average levels of noise as described by LAEQ and LDEN indicators (see glossary at Annex 1 for definitions of noise indicators). But people's actual experience of noise is different: they do not experience average noise levels as depicted by noise contours. What matters to people under flight paths is:
  - the frequency of flights,
  - the level of noise, and
  - the amount of respite from flights and noise.
4. What people experience as noise is dependent on the type of aircraft, aircraft height, take-off or landing engine power, wind direction (westerly or easterly operations), location relative to the flight path, and time (day, evening or night). There can be considerable variation in the noise experience from one location to another and over time. These variations matter but are not fully reflected by average noise indicators or contours.
5. Even without Heathrow expansion, noise from the existing 2-runway airport exceeds the WHO guidelines and the gap is reducing slowly. So far the number of people exposed to noise has not been measured down to the WHO guideline levels.

### How many people are affected by noise from Heathrow expansion?

6. The data presented so far shows that:
  - In 2013 632,600 people were exposed to noise from Heathrow at or above 54 decibels averaged during the day. Estimates of future noise exposure combine assumptions about noise reduction from the design of less noisy aircraft, their rate of introduction into Heathrow's aircraft fleet and operational improvements, all offset by population growth. Based on these assumptions, the Airports Commission estimates that **460,600** people will be exposed to aircraft noise from the two-runway

airport in 2040 [3].

- This estimate should be qualified in a number of ways in addition to the usual questions of accuracy of the assumptions. Not only has the rate of reduction slowed considerably with each year in the past but is likely to continue to do so in the future. Little further improvement is predicted after 2040 without fundamental change to aircraft design. Furthermore, the rate of reduction in population exposed to noise is likely to be progressively less at higher noise levels (i.e. within the inner noise contours). As discussed later the population exposed to Heathrow noise is currently far higher than at other European airports and would be even greater were the measurements at more stringent WHO guideline levels – a situation unlikely to be materially improved in the future based on the figures presented.
- The Commission estimates that the Heathrow Northwest Runway (Heathrow NWR) expansion would result in the region of **455,700 to 593,900** people exposed in 2040 when the airport is full. The results depend on speculative and controversial design of flight paths intended to reduce noise under various options and so there is a risk the results could be materially higher. Furthermore, noise reduction benefits from similar re-design of the existing two-runway flight paths have not been assumed so the gap with the three-runway case could be larger than implied. As in the two-runway case there is little predicted improvement in noise levels after 2040 and they are likely to remain substantially above those at other airports and the WHO guideline values. Moreover, whatever improvements there might be in the noise climate, the expansion more than offsets these, which is contrary to the UK Aviation Policy Framework where benefits of noise reduction are meant to be shared between the community and aviation [4].
- The following table summarises the Commission’s estimates for the day and night:

Population exposed to Heathrow aircraft noise within Day and Night contours – NWR option				
	Day: 7am – 11pm (54 decibels (LAEQ) 16 hr)		Night: 11pm – 7am (48 decibels (LAEQ) 8 hr)	
	2 runway	3 runway	2 runway	3 runway
2013	632,600		421,300	
2040	460,000	455,700 - 593,000	337,000	308,500 - 385,300

Source: Airports Commission Consultation Nov 2014 – Technical papers, noise – local assessment: 4.1, 4.3, 4.7, 4.28, 4.29, 4.48 & 4.70 [5]

- Transport for London (TfL) estimated, based on relatively conservative modelling assumptions, including no population growth, that the number of people exposed at or in excess of 55 decibels (LDEN) averaged over 24 hours would rise from **725,100 people in 2012 to 1,097,200 in 2050** with a third runway. The higher numbers compared to the numbers estimated by the Airports Commission are due in part to the 55 decibel LDEN measurement being more stringent but they are still less stringent than the WHO guideline values [6].
- In the case of the Heathrow Extended Northern Runway option (Heathrow ENR) the Airports Commission estimates that there would be 726,000 people exposed to noise levels in 2040. This is materially above the levels from the Heathrow NWR option but it seems that the flight paths have not been optimized so as to reduce noise, as in the case of the Heathrow NWR estimates, so the figures are not comparable and it may be possible to reduce this number of people [5].

## What about night noise?

7. Night flights are a particular concern for many people. 421,300 people were exposed to noise from Heathrow night flights in 2013. The Airports Commission estimates that **337,000 people** will be exposed to Heathrow noise between 11pm and 7am from the existing two-runway airport in 2040 and in the range of **308,500 to 385,300 people** from a three-runway airport (see table above). These figures are based on the 48 decibels (LAEQ) noise contour. As discussed above little improvement is predicted after 2040 and the population exposed would be higher if measured using WHO Guideline values. In both the two- and three runway cases no increase in the number of flights during the night quota period 11:30pm to 6:30am is assumed. Where there are higher noise levels in the case of the three-runway case compared to two-runways, the reason is possibly due to the increased number of flights between 6am and 7am. This suggests that reduced noise levels through less noisy aircraft, etc., are not retained by the community but offset by more flights and hence more noise. In other words there is little or no sharing of noise improvements with the community, which is sought by the UK Aviation Policy Framework [\[4\]](#).

## How does Heathrow compare with other Airports?

8. No other country in Europe allows these levels of noise. The most recent data comparing Heathrow with other European airports is based on 55 decibels (LDEN) 24 hours in 2006. 725,500 people were exposed to noise from Heathrow flights compared to the airport with the next highest impact, Frankfurt, which exposed 238,700 people. The next highest impact in the UK was Manchester, which exposed 94,000 people. Gatwick exposed 11,900 people [\[7\]](#).

## What are Heathrow's longer term noise trends?

9. There is already a problem with noise levels even without expansion. Existing noise levels remain substantially in excess of WHO noise guidelines levels (see below), and the levels are reducing only slowly as can be seen from the above table. Furthermore, Heathrow Airport Limited (HAL) has told the All Party Parliamentary Group on Heathrow and the wider economy (APPG) that they will not stop expanding after a third runway [\[7\]](#).
10. The Airports Commission estimates that in 2030, Heathrow's throughput of a three-runway airport will range between 625,000 and 740,000 flights with most scenarios at the upper end. Heathrow will be running at or close to capacity of 740,000 flights a year. Resilience issues may arise as they have done with the existing two runways, resulting in pressure to add night flights and a fourth runway, both of which would have a major impact on noise [\[8\]](#).

## How does Heathrow compare with World Health Organisation Guidelines?

11. WHO publications determine the present WHO guideline noise levels:
  - *Environmental Health Criteria 12 - Noise 1980* [\[9\]](#)
  - *Guidelines for Community Noise 1999* [\[10\]](#)
  - *'Night Noise Guidelines for Europe 2009'* [\[11\]](#)
12. WHO guideline levels are 50 decibels (LAEQ) outdoors during 16 daytime hours from 7am to 11pm and 40 decibels (LAEQ) indoors with window open during 8 hours at night from 11pm to 7am. An additional 55 decibels (LAEQ) guideline was issued in 2009 as an interim target at night where 40 decibels cannot be achieved in the short term "for various reasons, and where policy-makers choose to adopt a stepwise approach." (See Glossary at end of this Fact Sheet for noise indicators). The population figures in the above table are those exposed

to noise levels at or in excess of 54 decibels during the day and 48 decibels during the night so the impact at the lower WHO levels is likely to be greater.

13. The WHO guideline noise levels are not measured despite the existence of the guidelines for 15 years. The APPG said in its report *Noise from Heathrow Airport December 2014* [\[12\]](#) (based on responses to its consultation) that “There has been a serious failure of policy in not translating the guidelines into active management of aircraft noise. There is no practical reason for not doing so.”
14. The gap between the WHO guidelines and levels actually measured using existing less stringent indicators can only be guessed at but is likely to be significantly adverse. It is conceivable that if the WHO guideline of 50 decibels were applied, the number of people exposed to Heathrow aircraft noise in 2040 could be at **least 1 million** for the existing two-runway airport and **1.5 million** for a three-runway airport. The impact at the WHO 40 decibels guideline for night flights is also likely to be significantly greater.

### Is the impact of noise affected by the number and frequency of flights?

15. The number of flights, and not just the total noise generated as represented by noise contours, impact people’s perception of aircraft noise. An increase in the number of flights, for example, when a three runway airport adds 54% to Heathrow’s existing capacity and reaches 740,000 flights a year, would likely result in a disproportionate level of disturbance. Often people hear noise from more than one flight path. For example, people under the existing northern runway arrivals flight paths would probably hear flights approaching all three runways.

### Is the impact of noise affected by periods of respite from flights?

16. Respite is generally valued by the community but it is not a simple matter because, for a given number of flights, respite for one person means more noise for another as flight paths are alternated. The overall noise at source is unchanged by respite – merely its allocation.
17. Currently arrivals at Heathrow on westerly operations (i.e. from the east) alternate between the northern and southern runways over 8 hour periods during the day (7am to 3pm and 3pm to 11pm). Some people are exposed to both runways so do not get full respite. In addition, westerly operations depend on wind direction and occur approximately 77% of the time over a year. So depending on whether people live east or west of Heathrow they will have either arrivals or departures depending on the wind direction. Some people though may be exposed to both departures and arrival flight paths so do not get full respite.
18. A three-runway airport means that during the day there will always be two streams landing and taking off at the same time. Operations will need to cycle through four modes as shown in the table below. M=mixed mode (i.e. landings interspersed with departures using the same runway); L=segregated mode landings (i.e. a runway is only used for landings) and D=segregated mode departures (i.e. a runway is only used for departures)

Operating modes	MDL (4hrs)		MLD (4rs)		LDM (4hrs)		DLM (4hrs)	
	Landng	Departure	Landng	Departure	Landng	Departure	Landng	Departure
New 3 <sup>rd</sup> runway	M	M	M	M	L			D
Northern runway		D	L			D	L	
Southern runway	L			D	M	M	M	M

19. Over a 16 hour day, for example, the 3<sup>rd</sup> and southern runways would operate in mixed mode (landings and departures) for 8 hours and in segregated landing mode for 4 hours and in segregated departure mode for 4 hours. In mixed mode, flights run at approximately two thirds the frequency of segregated mode because operationally landings and departures have to be interspersed (e.g. an arrival every 135 seconds instead of every 90 seconds). The existing northern runway retains segregated mode throughout and hence 8 hours of respite. The mode cycle might in practice need to rotate over a longer period, say over two days.
20. Historically, the community has resisted the introduction of mixed mode because of the potential increased number of flights and loss of 8 hours of respite from runway alternation.
21. The noise impact of the four modes is as follows:
  - New 3<sup>rd</sup> runway. Noise exposure: 12 hours, respite: 4 hours;
  - Northern runway. Noise exposure: 8 hours, respite: 8 hours (no change from 2-runway airport except some people may be exposed to noise from all three runways, depending on their location - so the benefit of respite is reduced);
  - Southern runway. Noise exposure: 12 hours, respite: 4 hours (noise period increased by 4 hours and respite reduced by 4 hours compared to 2-runway airport but during 8 eight hours of mixed mode, flight frequency is reduced by about one third).
22. Respite is about sharing the noise impact but needs to be considered in the light of the overall impact from an increase of around 50% in the number of flights.

### **What's the impact of current air space redesign on noise?**

23. London's airspace is being redesigned under the London Airspace Management Programme (LAMP) with stage one planned for completion in 2020. While operational capacity, efficiency and safety are at the heart of LAMP, there are major noise implications. Several hundred thousand people could be overflowed for the first time, while others could have the number of overhead flights reduced or removed entirely.
24. The noise at source is unchanged by re-designing the flight paths, other things being equal, and the issue is about noise and respite allocation. Government policy is to concentrate movements over relatively few flight paths but this could change and result in more flight paths and dispersal of noise. More paths facilitate periodic rotation and hence more respite. Potentially, dispersal results in more people exposed to noise, but less of it. In addition, by re-directing flights to less densely populated areas, the number of people exposed could be reduced. For example, during westerly operations (arrivals from the east), curved arrival paths from the northeast and southeast instead of straight-line paths could reduce movements over the more densely populated centre of London. Trials are being planned for LAMP but so far there has been no broad discussion between stakeholders on principles of dispersal versus concentration or the precise location of the flight paths.
25. LAMP could result in many winners and losers and the community could be polarised, which raises doubts as to its deliverability. Furthermore, the uncertainty of flight path changes over the next five years or so creates substantial blight over London.
26. Aircraft, especially the larger ones, need to stabilise their approach on a straight line at least 5 miles from touch down. So any noise benefits from LAMP, such as flight path rotation and increased respite, would not extend to communities within 5 miles of Heathrow. Over this distance the flight paths are of necessity well defined and not subject to uncertainty.

27. The flight paths published by HAL for the NWR option take advantage of some of the LAMP concepts. But the published flight paths are indicative only and may change thus creating considerable uncertainty for people on the ground.
28. The APPG in its report *Noise from Heathrow Airport December 2014* [12] highlighted the problem of uncertainty and sought confirmation of flight paths for all three runways. So far this has not happened. The APPG pointed out that it will be impossible to take a view on expansion without this information. Consensus on increasing the number of flight paths in a two-runway situation will be hard but even more difficult with three runways.
29. The APPG estimated in its Noise Report, in approximate terms, the impact of flight path changes with the NWR option as proposed by HAL. The last 15 miles for arrivals from the east were examined and it was concluded that several hundred thousand people could be exposed to aircraft noise for the first time as the result of flight path changes and a 3<sup>rd</sup> runway.

### What's the source of the noise and how can it be controlled better?

30. Noise from aircraft in flight is a much bigger issue for many people than ground noise from the airport, although the latter is an important issue requiring improvement. Engine noise has been reduced over the years and while still a problem the more intractable airframe noise is a key issue. Attention has been focused on departure noise rather than arrival noise over recent years leaving the latter as a key issue but faster noise reduction on departures is still expected. There tends to be a trade-off when designing aircraft between reducing CO<sub>2</sub> emissions and reducing noise; tension between the two aims is increasing.
31. The rate of noise reduction of individual aircraft has slowed considerably over recent years. The APPG found that it was around 6.25% a year between 1980 and 2003 but only 1.5% a year between 2004 and 2009. The source of aircraft noise varies with type of aircraft and the composition of the aircraft fleet using Heathrow. The introduction of less noisy aircraft and fleet turnover are essential to the reduction in noise. The APPG and the Airports Commission have both pointed to HAL's seemingly optimistic estimates of fleet turnover and introduction of less noisy aircraft.
32. Respondents to the APPG consultation said that noise reduction achieved by new aircraft is not as great as sometimes implied by their certification and they provided the example of an older Boeing 747-400 that has an LAMAX (single event noise impact) when arriving at 1,000 feet of 86 decibels whereas the newer Airbus A380 has an LAMAX arriving at 1,000 feet of 85 decibels. It was said that a 1 decibel difference in terms of a single event level would not be perceptible on the ground.
33. Flight operations can be improved to reduce noise on the ground. These include steeper approaches (meaning higher off the ground) and deferred landing gear (landing gear when deployed increases noise). However, respondents to the APPG consultation expressed the view that changes to operational procedures were likely to deliver only marginal noise reduction benefits, if they were indeed feasible at all. The impact of flight path changes is discussed above in paragraphs 23 to 29 above and in *Fact Sheet 8 - Safety*.

### Where does it matter?

34. Noise levels on the ground depend in part on the noise emitted at source. Where it matters depends on how the emitted noise is dispersed which in turn depends on the aircraft height and lateral position in relation to the number of people on the ground. The topic is described above in relation to flight paths.

35. Specific issues such as the location of schools and hospitals and quiet areas such as parks require specific consideration as to where noise matters. Aircraft noise can be especially intrusive outdoors in gardens but also indoors in bedrooms. Absolute noise levels in relation to the WHO guidelines are important but levels relative to background noise levels are also important and background levels vary spatially (e.g. parks tend to be relatively quiet).
36. The area over which Heathrow aircraft noise is noticeably audible is usually defined by noise contours at different levels of noise at ground level. The contours' size and shape in relation to the population within the contours determines where noise matters and to what extent in an average sense. However, as described above flight paths are especially important in determining where the impact matters.
37. Currently the 55 LDEN contour outlines the principal area of concern but the Government still relies on the 57 LAEQ as the official indicator and this defines a smaller area. The 48 LAEQ is used to define the area of concern during the night (11pm to 7am). Noise complaints arise well beyond these contours, which highlights the need to produce contours at the lower WHO guidelines levels. The 55 LDEN contour area was 217 km<sup>2</sup> in 2013 and stretches from east to west of Heathrow, i.e. Camberwell to Maidenhead. Departures as they spread out on their various routes give the contours a north/south dimension, which ranges in places up to 10 miles north and south of Heathrow.

### When does it matter?

38. Noise from Heathrow's flight paths can impact at any time but at night it is a major concern for residents and some regard it as the most important noise issue.
39. The APPG consultation showed there are broadly two opposing views as to the need for night flights. Some argued night flights are essential for business and passengers. Others argued that even with two runways Heathrow has capacity to absorb all night flights between 11pm and 7am into the daytime. Views varied as to whether a 3<sup>rd</sup> runway would or should result in more or less night flights.
40. HAL's proposal for a third runway claims that there are no plans to increase the number of flights between 11:30pm and 6pm (16 flights) and that with three runways these flights can be rotated over six approaches (3 runways from east and west) instead of four at present. However, this would involve people exposed to night flights for the first time.
41. It seems likely that a third runway would result in a large increase in flights between 6am and 7am.
42. The current noise regime and restrictions were, in effect, a roll-over for three years from the previous regime ending October 2014 to 2017 on the grounds that the Airports Commission should make its views known first. Many residents seek a ban on all night flights between 11pm and 7am.

### What controls exist?

43. Measurement and monitoring are crucial to reducing the impact of aircraft noise. However, the WHO guidelines are not mandated by European or UK law and are not measured, despite their existence for 15 years.
44. The WHO guidelines are based on extensive research and the issue is not a knowledge gap requiring further research to assess the impact of noise. Rather the urgent matter at hand is about government policy needed to implement the WHO guidelines with a timetable and targets. In the first instance noise levels need to be measured at WHO guideline values.

45. The European Union Environmental Noise Directive was adopted in 2002 [\[13\]](#) for the purpose of assessing and managing environmental noise from major noise sources, including air traffic. The Directive requires the noise indicators LDEN (noise averaged over twenty-four hours) and LNIGHT (noise averaged over eight-hour night) to be used for assessing the number of people and dwellings that are exposed to the noise levels at or above 55 decibels for LDEN and 50 decibels for LNIGHT. These still exceed the WHO guidelines levels.
46. The Noise Directive encourages the use of Supplementary noise indicators where appropriate. The UK has one Supplementary indicator LAEQ (noise averaged over sixteen hour day and evening) for assessing the number of people that are exposed to noise above 57 decibels. Respondents to the APPG consultation “generally were dissatisfied with the Supplementary LAEQ indicator and were surprised by, and opposed to, the Government continuing its official status in the new Aviation Policy Framework (2013) [\[4\]](#). There was concern that its use in conjunction with the Framework’s overall objective on aircraft noise - to limit and where possible reduce the number of people in the UK significantly affected by aircraft noise - rendered the objective effectively meaningless, because it lacks quantitative targets and baseline reference points to protect health, prevent annoyance, and tackle existing noise problems; and it does not prevent an increase in noise.”
47. The Airports Commission uses five indicators to assess population exposure: Day: > 54 dB LAEQ 16hr; N70>20; Night: >48 dB LAEQ 8 hr; N60>25 and the European Measure >55 dB LDEN. (See the Glossary at Annex 1 for definitions).
48. The APPG recommended in its report a Supplementary indicator that measures the number of aircraft movements per hour in the day/evening period (7am to 11pm) and the night period (11pm to 7pm) per flight path. The WHO guidelines recognise that average noise indicators do not fully capture the impact of intermittent noise.
49. The Richmond Heathrow Campaign in its response [\[14\]](#) to the Airports Commission’s Discussion paper 05: Aviation Noise suggested vertical cross sections in addition to the usual horizontal contours as a means of better displaying the height and lateral location of aircraft for people on the ground.
50. The current system of restrictions on night flights at Heathrow between 11:30pm to 6am (the ‘night noise quota period’) have operated since 1993, with limits on the number of scheduled aircraft movements and the noise level (as measured by noise quota points), below which the permitted number of movements must operate: The permitted number of movements across the winter and summer seasons has been 5,800 since 1993/94. The actual number of movements has increased from 5,257 in 1993/94 to 5,434 in 2011/12. The permitted number of noise quota points has decreased from 12,000 in 1993/94 to 9,180 in 2011/12. The actual number of points used has decreased from 9,493 in 1993/4 to 7,321 in 2011/12. There is no limit on the number of movements or noise quota points between 11pm and 11:30pm or 6am and 7am, despite a recommendation from the Heathrow Terminal Five Public Inquiry that there should be a limit between 6am and 7am. The number of movements in this hour has increased steadily since the early 1990s.



## What mitigation measures are available?

**51.** The balanced approach to reducing the impact of aircraft noise is based on International Civil Aviation Organisation (ICAO) recommendations [\[15\]](#).

It consists of reducing noise through four principal elements in the order presented below, namely:

- reduction at source (quieter aircraft),
- land-use planning and management,
- noise abatement operational procedures, and
- operating restrictions.

**52.** Noise at source can be reduced by design and there are initiatives supported by the EU and others. HAL operates incentives, penalties and restrictions on airlines regarding noisy aircraft, fleet composition and operations. Limited restrictions on land-use exist but with pressure from London's growth it is difficult to apply to great effect. There are questions as to how effective these measures are. Redesign of flight paths is a possibility but with potentially many winners and losers it is controversial.

**53.** Insulation to be effective would have to be applied to a very large number of houses, schools, etc., at prohibitive cost. In early 2015 HAL finished installing noise insulation at the 42 schools and other community buildings (31 in Hounslow) where it promised in 2005 to carry out the work. It has taken 10 years, and it cost HAL £4.8 million. If HAL gets a 3rd runway, it has promised to spend £700 million insulating homes, schools and other buildings affected by aircraft noise – more than 20 times the £30 million currently on offer. There are questions as to how satisfactory the insulation provided is, and if it took 10 years to invest £4.8 million on insulation how long would it take to invest £700 million. Insulation only helps indoors and can have no effect outdoors.

**54.** Restricting the operation of Heathrow to its current legal limit of 480,000 flights a year in segregated mode is considered in some quarters as the only option if noise levels are to be contained and more importantly reduced in a timely manner to WHO Guideline levels.

## Annex 1: Glossary of Terms

dB: Decibel	This is a unit for measuring the relative magnitude of noise on a logarithmic scale. An increase or decrease of 3dB(A) represents a doubling or halving of noise energy.
dba	'A' weighted decibel. This is a system of adjustment applied to sound of different frequencies to take account of the way the sensitivity of the human ear varies with sound frequency.
Easterly operations (easterlies)	When aircraft make their final approach to land from the west (over the Windsor area) and take-off towards the east (over London).
HAL	Heathrow Airport Limited.
LAEQ, 8 hour night	Equivalent continuous sound level of aircraft noise in dB during an average summer night. The indicator uses average movements that take place during an 8 hour night-time period (23.00-07.00 hours local time) during the 92 day period between the 16 June and 15 September inclusive.
LAEQ, 16 hour day	Equivalent continuous sound level of aircraft noise in dB during an average summer day. For conventional historical contours this is based on the daily average movements that take place in the 16 hour period (07.00-23.00 hours local time) during the 92 day period between the 16 June and 15 September inclusive.
LAMP	London Airspace Management Programme.
LDAY	Same as LAEQ, 16 hour day but assessed over an annual average day.
LDEN	The day, evening, night level, LDEN is a composite of a 12-hour annual average daytime noise level (LDAY), a 4-hour annual average evening noise level (LEVENING) with a penalty of 5 dB added, and an 8-hour annual average night-time noise level (LNIGHT) with a penalty of 10 dB added.
LEQ	A measure of long term average noise exposure and is shorthand for 'equivalent continuous noise level'. For aircraft it is the level of a steady sound, which if heard continuously over the same period of time would contain the same total sound energy as all the aircraft noise events.
LEVENING	Covers the period 1900 – 2300 hours in any 24 hour period.
LNIGHT	Same as LAEQ, 8 hour night but assessed over an annual average night.
Mixed mode	A method of operating two runways allowing for a mix of both take-offs and landings on each. (see also segregated mode).
N60 (night-time)	Number of times a threshold level (in this case 60 dB) is exceeded within the 8-hour night period 2300-0700.
N70 (daytime)	Number of times a threshold level (in this case 70 dB) is exceeded within the 16-hour period 0700-2300.
Night Quota period	6 ½ hour period between 2330-0600. The number of aircraft movements are restricted and there are noise quotas set for each summer and winter season.
Segregated mode	A method of operating a pair of runways where one runway is used for departing aircraft and the other for arriving aircraft. (see also mixed mode).
TfL	Transport for London.

Westerly operations (westerlies)	When aircraft make their final approach to land from the east (over London) and take-off towards the west (over the Windsor area).
Westerly preference	Maintaining operations in a westerly direction when there is a light easterly tail-wind up to five knots.

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