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1. Introduction

1.1 Airspace and Noise Performance Team Annual Report
This report, produced by Heathrow Airspace and Noise Performance Team (formerly Flight Performance), contains detailed data on a range of key issues related to noise and air quality management, performance metrics and airspace projects, which the team are responsible for delivering. The report covers the calendar year of 2017, with the exception of the data relating to night flights as they are managed and reported as separate summer and winter seasons.

Further detailed information on our noise strategy, abatement procedures, targets and mitigation schemes can be found on our dedicated noise website, along with all our public reporting. Additional material on air quality, including how and what we monitor and our constant reporting, is available on our separate dedicated air quality website.

Websites: www.heathrow.com/noise and www.heathrowairwatch.org.uk

2. Key Roles and Responsibilities

2.1 Heathrow: the Airport Operator
Heathrow is the UK’s busiest international airport. From Heathrow, some 80 airlines fly direct to over 180 destinations worldwide. Heathrow owns and maintains airport facilities including stands, terminals and runways.

Heathrow issues Conditions of Use (https://www.heathrow.com/company/partners-and-suppliers/conditions-of-use) that airlines must adhere to in order to operate in and out of the airport. Heathrow administers the UK government’s night flight restrictions and other noise reduction measures (see below), and is responsible for monitoring and reporting on airport performance in relation to noise reduction.

2.2 Airspace and Noise Performance Team (ANPT)
The Airspace and Noise Performance Team has three key areas of responsibility. The team carries out daily/weekly/monthly monitoring, reporting and root cause analysis of specific issues to ensure compliance with statutory requirements and to enable Heathrow to continually assess the operational and environmental performance of its airspace and airfield operations.

What we do
• Manage aircraft-related environmental issues e.g. noise, air quality and climate change.
• Safeguard the capability and take actions to drive up the efficiency of the airfield.
• Feed into strategic areas relating to the long-term growth of the airport with historic data and reports depicting trends.

How we do it
• We lead on trials to improve environmental and operational efficiency and respond to consultations on matters relating to Air Traffic Management (ATM), airspace development and environmental issues. We undertake horizon scans and identify threats to our airfield performance, working to mitigate and limit the impact.
• We are ambassadors for Heathrow Airside Operations on matters relating to government policies and processes with the Department for Transport (DfT) and the Ministry of Defence.
• We ensure that aircraft noise and track keeping (NTK) are monitored in line with the DfT and our own requirements.
• We are accountable for aspects of operational environmental compliance and we deliver the Airside Operations facets of the Noise and Air Quality Action Plans.
• We work on research and development with groups such as Sustainable Aviation, the Airport Operators Association (AOA) and other European organisations.
• We provide technical analysis for the onward dissemination to members of the public regarding enquiries relating to how airport operations may affect them.
2.3 Airlines
Airlines transport passengers and freight. At Heathrow they have to follow the Conditions of Use which are issued annually by the airport. Airlines must file a flight plan for each flight which includes:

- origin and destination;
- proposed route, speeds and flight levels;
- type of aircraft and registration; and
- potential use of alternate airports.

It is the airlines that choose which departure route their aircraft will use when taking off from Heathrow and factors which influence this decision include destination, weather and any en-route airspace restrictions (European restrictions, capacity, strikes etc).

By operating into and out of Heathrow, all airlines must automatically adhere to the information set out in the UK Aeronautical Information Publication (UKAIP). It is this document that sets out the noise abatement procedures and other operational requirements mentioned later in this report. The UK AIP can be found by visiting the website below:

www.ais.org.uk

2.4 NATS – Air Navigation Service Provider
NATS is an Air Navigation Service Provider. It is responsible for the safe co-ordination of air traffic arriving and departing Heathrow. NATS also co-ordinates en-route air traffic as it passes through UK airspace.

NATS is regulated by the Civil Aviation Authority and adheres to national and international regulations.

2.5 Department for Transport (DfT)
The DfT is the UK government department responsible for all transportation including airports and aviation.

The DfT has overall responsibility for UK aviation and airport policy, sets the noise controls at Heathrow (Under Section 78 of the Civil Aviation Act 1982) and with regard to night noise, includes a restriction on the number of movements. The DfT also issues the Air Navigation Guidance (https://www.gov.uk/government/publications/uk-air-navigation-guidance-2017) which provides guidance to the CAA on environmental objectives and to the wider aviation industry on airspace and noise management.

2.6 Civil Aviation Authority (CAA)
The CAA is the UK’s national supervisory authority responsible for overseeing and regulating all aspects of civil aviation in the UK. The CAA is responsible for price regulation at Heathrow, and for safety regulation of airports, airlines, Air Traffic Control, pilots and aircraft engineers. It is the independent regulator and national supervisory authority responsible for the planning and regulation of national airspace.

The CAA controls and regulates the airspace change process, which covers the use of airspace and changes to airspace design.

The CAA implements the International, European and domestic legislation that covers aviation such as:

- the minimum safety standards laid down by the International Civil Aviation Organization (ICAO);
- European legislation protecting passengers’ rights;
- European legislation on safety issues such as pilot licensing and the domestic regulation on the use of airspace; and
- UK legislation as detailed in the Civil Aviation Act and the Air Navigation Order.

The CAA makes sure that passengers are protected and treated fairly when they travel. It also makes sure that the interests of local communities are captured in the design process of any airspace change, through engagement and consultation.
3. Monitoring

To enable us to monitor the performance of the Heathrow operation we make use of airport-wide systems, together with the following assets:

3.1. Airport Noise and Operations Management System (ANOMS)

ANOMS is the noise and track keeping system at Heathrow, which acts as a central data source for other IT software products mentioned later in this report. ANOMS receives radar data from NATS (Air Navigation Services Provider) Air Traffic Control (ATC) radars, which provides information about the height of an aircraft above airport elevation, the track it has flown, its ground speed at any particular point and the aircraft’s call-sign.

The call-sign is then cross referenced with air traffic logs, which provide data such as the aircraft operator, aircraft type and destination or origin. Additionally, the system automatically receives data from a series of permanent noise monitors located around the airport. The locations of the permanent monitors and the noise limits, which apply to departing aircraft only, are prescribed by the DfT. The noise events recorded at the monitors are then matched to the aircraft track details. Its primary purpose is to monitor airline performance against Key Performance Indicators. ANOMS measures aircraft against the following:

- adherence to the NPR (Noise Preferential Routes) corridors;
- adherence to the minimum 4% climb gradient requirement;
- adherence to the government-set noise limits for departing aircraft;
- 1000ft compliance;
- Compliance with the day and night Instrument Landing System (ILS) Joining Point procedures;
- Monitoring of Continuous Descent Approaches (CDA); and
- Reporting on the use of Night Jet Movements and reporting to internal and to external stakeholders on usage.

Additionally, ANOMS has the flexibility to track and report on any operational trials run by Heathrow. It is the sole system capable of reporting on the outcomes and facilitates the identification of trial benefits, and dis-benefits. Further details of the trials appear later in this report.

2017 saw a continuation of the project to refresh our NTK systems. The aim of this three-year project is to develop a ‘real time’ system capable of informing our airline partners of environmental compliance, better informing our local communities through new community tools, an enabler to assist us in driving airline performance and the ability to better analyse aircraft performance on the airfield.

3.2 WebTrak

WebTrak is an online system that allows those affected by aircraft operations at Heathrow to locate their residence and view how aircraft operate in their area. It has been in operation at Heathrow since 2008 and, following community feedback, can show flight tracks over the past 12 months.

WebTrak received two pieces of new functionality in 2017. First, we added a rainfall layer that allows greater understanding of aircraft flights paths during thunderstorms. Secondly, we have added the Noise Preferential Routes to give greater transparency around aircraft track keeping.

Once a user has identified the operation that caused them annoyance, they can complain via WebTrak where their complaint gets logged directly into the main NTK ANOMS. WebTrak can be viewed from www.heathrow.com/noise

3.3 WebTrak My Neighbourhood

In 2014 we launched a new online tool called WebTrak My Neighbourhood. This is in addition to our current WebTrak system. The system gives a general overview of where aircraft fly, allowing the user to get a better understanding of Heathrow’s operations over time. Aircraft operations can be looked at over various periods, monthly, quarterly or annually. In addition, the viewed data can be broken down by period of day, day-time, night-time, evening, work days and weekends.
3.4 AirTrak
AirTrak provides airports with a tool that measures carbon output from each phase of aviation activity. Airports can use this information to implement, monitor and measure the success of carbon-reducing activities over time. Heathrow acquired the system in mid-2012 to evaluate the product and check it for data accuracy and suitability. We enhanced this product during our NTK refresh project, mainly making changes to back end data feeds to improve accuracy.

3.5 xPlane
xPlane was launched in 2016 and allows the public to access flight data specific to their individual location and carry out their own analysis of flights over a selected area. Results include the numbers, heights, position and types of aircraft. xPlane uses data from the Noise and Track Keeping system operated by Heathrow, which captures data from the air traffic control radar.

3.6 Airfield Disruption and Delay Impact Calculation Tool (ADDICT)
The tool, first developed in 2014, has been used primarily for assessing the expected impact of unusual air activities on airfield performance ahead of the events taking place.

3.7 Volans
Volans is a new piece of software that helps to visualise instrument and flight procedures. It enables the user to replicate any existing published procedure and turn it into a 3D model to aid understanding of flight paths. This tool will be deployed to assist with upcoming airspace consultations in 2018.

3.8 OPAS (Operational Analysis System)
During our three-year Noise and Track Keeping (NTK) enhancement project, we developed a system called OPAS. This system will give Heathrow a greater insight into airfield operations and will enable us to target improving our environmental performance with regards to air quality and noise from aircraft APU, taxiing and engine ground runs.

3.9 Noise Monitoring
The Noise Action Plan requires Heathrow to maintain a community noise and track monitoring programme. This programme is designed to help Heathrow and the local communities better understand and explain how particular areas are affected by aircraft noise. This involves deploying mobile noise monitors to different sites around the airport. Data from sites is gathered and independently analysed.

In 2016 Heathrow purchase 50 higher specification noise monitors, which were deployed through 2017. 12 units have replaced the airport’s AIP monitors, which are used to measure regulatory requirements at 6.5km from start of roll. 12 further units are deployed for our steeper departure trial on the Easterly Detling route, with a further 19 long-term units deployed across a wide area. These monitors can be viewed by visiting the Heathrow Webtrak website. Heathrow will look to produce four community reports in 2018. Previous reports are available on the noise website.

www.heathrow.com/noise
4. General Operations

4.1 Direction of Operation

For safety and performance reasons aircraft typically take off and land into the wind. This is because in order to create lift, an aircraft’s wing relies on the speed of the air moving over it (airspeed).

A headwind (wind blowing from directly in front of the aircraft) means that more air is flowing over the wing, providing greater lift. The point at which an aircraft leaves the ground therefore occurs earlier if taking off into a headwind, giving better performance and a greater safety margin.

A tailwind (wind blowing from behind the aircraft and pushing it along) reduces the amount of air flowing over the front of the wing. Aircraft therefore must go faster and use more power to take off in a tailwind.

In the UK, the wind is mostly from the south west. That means the majority of aircraft (approximately 70% a year) make their final approach over London and take off towards the west. This is known as ‘westerly operations.’ Wind speed is measured both on the surface and at 3,000 feet, so if it is calm on the ground, the winds aloft will be very different.
When the wind blows from the east (and is over five knots), the direction of operation is switched and aircraft land from the west over Berkshire and take off towards the east. This is known as ‘easterly operations’ and occurs approximately 30% of the time.
During 2017, Heathrow recorded an 80.6%/19.4% split in favour of westerly operations.

### 4.2 Westerly Preference

During the day, a ‘westerly preference’ is operated at Heathrow. Westerly preference is government policy and means that even during periods of light easterly winds (up to five knots) aircraft will continue to land in a westerly direction, making their final approach over London.

Westerly preference was introduced in the 1960s to reduce the number of aircraft taking off in an easterly direction over London, the most heavily populated side of the airport. This was when departures were considered to be more disruptive to local communities than arrivals.

In 2001, following consultation, the DfT decided that the westerly preference should be removed at night, to provide a more equitable distribution of aircraft noise.

Modern technology means aeroplanes have got quieter and climb more quickly, and therefore questions have been raised as to whether the westerly preference is still relevant today. In Heathrow’s submission to the Airports Commission in May 2013 we proposed the ending of the westerly preference and the Airports Commission supported a ‘no preference’ policy in its Interim Report.

Because the westerly preference is current government policy, the ending of it would have to be subject to government approval and public consultation.

In the interests of fairness, our view is that the ending of the westerly preference should not be introduced until there is full runway alternation on easterly operations. We estimate that removing the westerly preference would increase the percentage of easterly operations (aircraft arriving from the west and departing to the east) by around 5%.
4.3 Annual Movements by Runway

The total number of Aircraft Movements (including general aviation, helicopter movements etc) was 475,867. The total number of Air Transport Movements (scheduled passenger traffic -- ATM) was 474,033. The 480,000 movement cap only applies to ATMs.

Annual Aircraft Movements by Runway 2017
Source: NATS

![Annual Movements by Runway 2017 Diagram]

4.4 Movements by Aircraft Type

Boeing 787 movements continued to increase as airlines replaced their fleets for cleaner and quieter aircraft. Boeing 747 aircraft usage remained relatively flat with a decline of 107 movements vs 2016. A319 and A321 usage also fell, whereas the A320 saw a slight rise in operations. Older aircraft types such as the A340, B767 and older variants of the B737 continued to fall.

Movements by Aircraft Type 2017
Source: ADB

![Movements by Aircraft Type 2017 Diagram]
4.5 Night Flights

There is no ban on night flights at Heathrow but since the 1960s, the government has placed restrictions on them. Heathrow has some of the strictest restrictions of any hub airport in Europe in terms of movements permitted between 23:30 and 06:00. Heathrow is restricted to 5,800 take-offs and landings a year during these times.

Around 80% of the night flights at Heathrow are between 04:30-06:00, with on average around 16 aircraft scheduled to arrive each day between these hours. Heathrow also has a voluntary ban in place that prevents flights from landing before 04:30. There is also a night quota limit, which caps the amount of noise the airport can make at night.

Why do we have night flights?

Night flights are an important part of operations at airports around the world. The time differences in an inter-connected global transport system mean that it is difficult to avoid night flights.

The relationship between flight times and clock times means that early morning arrivals at Heathrow are particularly suited to serving flights from much of China, South East and South Asia. The early arrival permits a full day's business to be undertaken in the UK and maximises the timing opportunities for those making onward flight connections from London. By feeding other flights, these transfer passengers play an important role in maintaining the range and frequency of destinations served by Heathrow, and in maintaining connectivity with key destinations.

Night flight restrictions

Restrictions on night flights have been in place at Heathrow since 1962 and the structure of the current night flying restrictions at Heathrow has been in place since October 2017. The Night Flight restrictions are part of the government-defined noise measures under the Civil Aviation Act 1982.

Overview of restrictions:
- there are two time periods: 23:00–07:00 and 23:30–06:00, both with restrictions on certain types of aircraft;
- the more restrictive period (23:30–06:00) is known as the Night Quota Period (NQP) and has limits on the number of movements, which are set by the DfT. The limits are set on a seasonal basis: summer and winter;
- Heathrow is currently limited to 5,800 night flights a year: 3,250 in the summer season and 2,550 in the winter season.

Government's approach to night flights

The government consults on their night flight regime for Heathrow every five years. One of the objectives is to limit or reduce the number of people significantly affected by aircraft noise at night, for example by encouraging the use of quieter aircraft, while maintaining the existing benefits of night flights.

Quota Count (QC)

As well as limits set on the number of movements during the night period, aircraft are classified into nine bands according to the amount of noise they make when taking off and landing. The noisier the aircraft, the higher the band it is placed in. These bands are called quota counts (QC). Every aircraft is given a QC number between 0 and 16.

Under the QC system, each aircraft type, including different versions of the same model, is assigned a QC according to its noise performance, separately for arrival and departure, as determined by the ICAO noise certification process. For example, a Boeing 737-800 is classified as QC/0.5 on arrival and as QC/0.5 or QC/1 on departure (depending on its maximum certificated take-off weight), whereas a much larger and older Boeing 747-200 will vary between QC/2 and QC/8 on arrival, and between QC/4 and QC/16 on departure, depending on engine fit and maximum take-off weight (MTOW).
### Quota Count Limits

<table>
<thead>
<tr>
<th>Quota count</th>
<th>Arrival examples</th>
<th>Departure examples</th>
<th>Allowed in shoulder periods (23:00-23:30 &amp; 06:00-07:00)</th>
<th>Allowed in night quota period (23:30-06:00)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Embraer 195</td>
<td>Gulfstream 4</td>
<td>Yes</td>
<td>Yes</td>
</tr>
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<td>0.125</td>
<td>A320 NEO</td>
<td>A320 NEO</td>
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<td>Yes</td>
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<td>0.25</td>
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<td>Yes</td>
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<td>0.5</td>
<td>A320, B738, B777, A330, A380, A320, B738, B787, A359</td>
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<td>Yes</td>
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<tr>
<td>1</td>
<td>B777, B767</td>
<td>A320, B738, B777, B788</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>2</td>
<td>B744</td>
<td>A330, A340, A380, B767</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>4</td>
<td>B743</td>
<td>B744, B777</td>
<td>Yes</td>
<td>Not permitted to be scheduled, late runners allowed</td>
</tr>
<tr>
<td>8</td>
<td>B741, B707</td>
<td>B743</td>
<td>Only in very exceptional cases</td>
<td>No</td>
</tr>
<tr>
<td>16</td>
<td>N/A</td>
<td>B741, B743</td>
<td>Only in very exceptional cases</td>
<td>No</td>
</tr>
</tbody>
</table>

The number of points for each aircraft is added up and must be within the limit for that season.

In July 2017, following public consultation, the government announced their new five-year regime, running from October 2017 to 2022. The new regime includes a reduction of the QC limit for Heathrow from 4,080 to 2,415 (winter) and from 5,100 to 2,735 (summer).

By far the largest contribution to night flights is arrivals, which tend to be in the early morning. There also tend to be more night flights during the summer season than the winter. However, as can be seen from the graphs below, Movement and Quota Count Usage continue to be lower than the permitted limit.

#### Summer Seasons Quota Usage

Source: ANOMS

![Quota Usage Graph](image-url)
### Summer Season Movement Usage

Source: ANOMS

<table>
<thead>
<tr>
<th>Month</th>
<th>Movement Limits</th>
<th>Actual Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>S07</td>
<td>3250</td>
<td>3047</td>
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<tr>
<td>S08</td>
<td>3250</td>
<td>2922</td>
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<td>S09</td>
<td>3250</td>
<td>2848</td>
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<tr>
<td>S10</td>
<td>3250</td>
<td>3033</td>
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<tr>
<td>S11</td>
<td>3250</td>
<td>2958</td>
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<tr>
<td>S12</td>
<td>3250</td>
<td>2853</td>
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<tr>
<td>S13</td>
<td>3250</td>
<td>2802</td>
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<tr>
<td>S14</td>
<td>3250</td>
<td>2714</td>
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<td>S15</td>
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<td>2802</td>
</tr>
<tr>
<td>S16</td>
<td>3250</td>
<td>2938</td>
</tr>
<tr>
<td>S17</td>
<td>3250</td>
<td>2949</td>
</tr>
</tbody>
</table>

### Winter Seasons Quota Usage (including carry over)

Source: ANOMS

<table>
<thead>
<tr>
<th>Month</th>
<th>Quota Count Limits</th>
<th>Actual Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>W06</td>
<td>4420</td>
<td>4266</td>
</tr>
<tr>
<td>W07</td>
<td>4514</td>
<td>4200.25</td>
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<tr>
<td>W08</td>
<td>4916</td>
<td>3947.5</td>
</tr>
<tr>
<td>W09</td>
<td>4647</td>
<td>3863.25</td>
</tr>
<tr>
<td>W10</td>
<td>4682</td>
<td>3735.25</td>
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<tr>
<td>W11</td>
<td>4638</td>
<td>3734.5</td>
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<td>W12</td>
<td>4620</td>
<td>3301.75</td>
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<td>W13</td>
<td>4488</td>
<td>3070.5</td>
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<td>W14</td>
<td>4488</td>
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<td>W15</td>
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<td>W16</td>
<td>4335</td>
<td>2595.25</td>
</tr>
<tr>
<td>W17</td>
<td>4335</td>
<td>2414.5</td>
</tr>
</tbody>
</table>

*Note: Quota usage includes carry over from the previous winter season.*
• **End of season flexibility**
Up to 10% of the current season's movement limit may be carried over if unused. At Heathrow, there is often a carry-over from the summer to the winter season, but rarely from the winter to the summer season.

• **Overrun of movements**
Up to 10% of the next season's movement limit may be anticipated in the event of an overrun. Any excess overrun is penalised in the following season at double the amount of the excess. The same arrangements apply to the noise quotas.

• **Exempt aircraft**
Aircraft are exempt from the movements limits and noise quotas if their noise certification data is less than 84 EPNdB, i.e. less than QC 0.25.

• **Dispensations**
The Secretary of State has the power to state circumstances in which movements may be disregarded from the night restrictions. These are in exceptional circumstances only and disregarded movements include emergencies, delays which are likely to lead to serious congestion at the airport or serious hardship or suffering to passengers or animals or which result from widespread and prolonged disruption of air traffic. Heathrow Airport strictly monitors compliance with all current government restrictions, reporting regularly to the DfT. A full list of dispensation reasons can be found in section 9 of this report.

The movements shown below were exempt from the restrictions, or dispensed either due to delays, emergencies, or by the DfT.
### Winter Disregarded Movements

Source: ANOMS

- **Exempt**
- **Delays**
- **DfT**
- **Emergency**

### Summer Disregarded Movements

Source: ANOMS

- **Exempt**
- **Delays**
- **DfT**
- **Emergency**
4.6 Noise Action Plan

Although the DfT has direct control over noise at Heathrow, HAL has a detailed noise management strategy in the form of our Noise Action Plan (NAP). Our current NAP covers the period 2013-2018 and our new draft NAP is under development and will be subject to a public consultation, before submission to the Department for Environment, Food & Rural Affairs (DEFRA) for adoption in early 2019. Our noise management framework has a structure similar to the Balanced Approach with a fifth pillar on community engagement. The framework covers the following.

- Quieter Planes
- Quieter Procedures
- Land-use Planning and Mitigation
- Operating Restrictions and Voluntary Measures and
- Working with Local Communities.

4.7 Air Quality

Heathrow is Europe’s busiest international airport and the UK’s biggest port by value. With record passenger volumes and strong cargo growth year on year, Heathrow is delivering for Britain’s economy but it is also aware of the impacts its operations have on the local environment and local community. We recognise that local air quality and potential effects on public health are a significant concern to communities around Heathrow. We remain fully committed to playing our part in improving local air quality, hence why it is an important goal within Heathrow 2.0, our business plan for sustainable growth published in 2017. Heathrow aims to be a world leading airport in reducing emissions from all sources of activity, both on and off the airport and helping others reduce their impact too so that we can all benefit from breathing in better air. The Emissions Strategy and Action Plan (to be published in 2018) has been produced to help implement our ambitious strategy for sustainability. It details how we will drive down harmful emission, by improving the efficiency of operations to minimise fuel use, and by employing the latest technologies to ensure that we are at the forefront of developments in aviation. The Heathrow Air Quality Action Plan supports our Air Quality Strategy, which was published in December 2011. The ANPT team continues to provide operational and technical support for the wider air quality debate and initiatives.
5. Arrivals

5.1 Holding Stacks and Stacking
Because Heathrow is so busy, aircraft coming in to land at Heathrow are frequently held in holding stacks.

Aircraft usually come into a holding stack, where they fly in an oval pattern to wait for a landing slot. From the holding stack they follow a set of instructions issued by Air Traffic Control (ATC). These instructions direct the aircraft towards the final approach.

Aircraft circle at different levels within the stacks until there is space for them to land into Heathrow. The levels are separated by 1,000ft, and the lowest level (i.e. the bottom of the stack) is around 7,000ft.

There are four holding stacks at Heathrow, known as ‘Bovingdon’, ‘Lambourne’, ‘Ockham’ and ‘Biggin’. The locations of the stacks have been the same since the 1960s.

There are no set routes for aircraft moving from the holding stacks to the final approach. While the overall patterns have remained similar for many years, the position of aircraft in the skies varies from flight to flight and day to day.

| Holding stacks |
During 2017, aircraft on average spent 4.2 minutes in a stack prior to landing at Heathrow.

### Stack holding 2016

Source: Heathrow Airport

<table>
<thead>
<tr>
<th>Month</th>
<th>Average Stack Holding (mins)</th>
<th>Maximum Holding Time (mins)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan 17</td>
<td>3.4</td>
<td>80</td>
</tr>
<tr>
<td>Feb 17</td>
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</tr>
<tr>
<td>Dec 17</td>
<td>4.3</td>
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</tr>
</tbody>
</table>

#### 5.2 Continuous Descent Approaches (CDA)

Continuous Descent Approaches have been used at Heathrow for many years. Once they have been directed out of the stack, CDA involves aircraft maintaining a steady angle of approach until they reach the final approach. The intention of CDA is to reduce arrival noise by keeping aircraft higher for longer. In addition, CDA reduces fuel burn and emissions, which leads to an overall environmental benefit.

**Did you know?**

10,000 tonnes of CO2 and £2m in fuel costs will be saved by increasing Continuous Descent Approaches in the UK by just 5%.

As a pioneer in the technique, over 85% of Heathrow arrivals achieve the feat.

CDA also helps to reduce noise by keeping aircraft higher for longer and using their engines less, before the final stages of landing.

This is just one of the many initiatives Heathrow is using to reduce noise and improve environmental performance.

Source: Sustainable Aviation, Flight Performance Annual Report 2014 (Heathrow)
The specific CDA profile for Heathrow is deemed to be continuous provided that no segment of level flight longer than 2.5 nautical miles occurs below 6,000ft above sea level. A level segment can be defined as having less than 50ft variance over a distance of two nautical miles. This is measured by ANOMS.

CDA – Continuous Descent Approach
Source: ANOMS

5.3 Joining Point

Although there are no set heights for arriving aircraft, the government has specified the minimum heights at which the aircraft must be established on the final approach. The aim of these requirements is to keep aircraft higher for longer and avoid prolonged periods of level flight, therefore benefiting communities close in to the airport.

- **Westerly operations**
  Between 06:00 and 23:30 hours local, aircraft are required to be established on the ILS not below 2,500ft above mean sea level. This equates to a distance of about eight nautical miles. Between 23:30 and 06:00 hours local, the altitude is raised to 3,000ft above mean sea level together with an additional requirement to join the ILS no closer to the runway than 10 nautical miles.

- **Easterly operations**
  Between 07:00 and 23:00 hours local, aircraft are required to be established on the ILS not below 2,500ft above mean sea level. This equates to a distance of about eight nautical miles. Between 23:00 and 07:00 hours local, the altitude is raised to 3,000ft above mean sea level, together with an additional requirement to join the ILS no closer to the runway than 10 nautical miles.

The peaks seen below during the summer months are due to the way in which pressure changes affect the altitude readout shown on the NATS radar. They do not reflect an actual increase in aircraft which are low when joining the ILS. These flights, whilst not strictly low, are included in the data in the interests of transparency.

The joining point figures all remain within the range that is typical for Heathrow.
5.4 Runway Alternation and Arrivals out of Alternation

During the day, and when we are operating on westerly operations, we use a procedure known as ‘runway alternation’. This is to provide local communities living under the final approach into the airport with periods of relief from aircraft noise. Residents place great importance on the alternation system at Heathrow and every effort is made to adhere to it.

The alternation pattern means that for part of the day we use one runway for landings and the other for take-offs, then halfway through our day at 15:00, we switch over.

On easterly operations, Heathrow does not alternate the runways at 15:00 because of the ‘Cranford Agreement’ (see section 6.5) which prevented us from using the northern runway for departures during the day. Although the Cranford Agreement has now ended, Heathrow needs to undertake works to the airport’s infrastructure before runway alternation on easterly operations will be possible.
Daytime runway alternation operates on a two-week cycle.

In the morning we use one runway for take-offs and the other for landings. At 15:00 (roughly halfway through Heathrow’s working day), we swap over. We continue this morning and evening pattern of runway use for the rest of the week, and the following week we switch. What we did in the evening during the previous week, we now do in the morning. And vice-versa.

Night-time runway alternation
Since there are very few aircraft that take off or land at night, there is more scope for runway alternation, whether we are on easterly or westerly operations. We can switch landings between the northern and southern runways and, if the weather allows it, we can bring in aircraft from the east or the west.

Those four options allow us to operate night-time runway alternation on a four-weekly cycle:
Week 1: Aircraft fly in from the west to land on the northern runway;
Week 2: Aircraft fly in from the east to land on the northern runway;
Week 3: Aircraft fly in from the west to land on the southern runway;
Week 4: Aircraft fly in from the east to land on the southern runway.
Using both runways for arrivals

We make every effort to adhere to the published runway alternation schedule. However, sometimes there may be a build-up of flights being held in the holding stacks. When this happens, the government has set rules permitting NATS to land aircraft out of alternation, i.e. on the departures runway. In these circumstances, both runways will be used for arrivals for a temporary period.

This is called Tactically Enhanced Arrivals Mode (TEAM) and is allowed after 07:00 on westerly operations when severe inbound congestion occurs, or is anticipated to occur, involving delays to arriving flights of 20 minutes or more. Under these circumstances we can land up to six aircraft an hour on the runway designated for departures.

These rules have been in place since the alternation system was introduced in the 1970s.

Although not described as TEAM, we are also able to use both runways for arrivals between 06:00-07:00 without being limited to a set number because this hour is the busiest time of day for arrivals into Heathrow.

There are other occasions when unforeseen circumstances mean that arriving aircraft need to land on the departures runway. For example, this can occur if an aircraft landing on the designated runway develops a problem which prevents it vacating the runway in time for the next aircraft to land. Subsequent aircraft will then need to use the other runway until the aircraft on the designated runway is able to vacate safely.

De-alternation

There are other times when it is not possible to stick to the published runway alternation schedule. We refer to this as ‘de-alternation’ or ‘out of alternation’.

Routine maintenance of runways, taxiways or associated equipment is often scheduled to coincide with the pattern of runway alternation. However, there will be occasions when it is not possible to stick to the published runway alternation schedule. For example, this may be to facilitate maintenance or works of a longer duration (e.g. the 2014 runway resurfacing) or work of an unforeseen, urgent nature.

Weather can also affect the use of alternation. For example, strong south-westerly winds can blow across the various buildings in Heathrow’s maintenance area and affect the approach for aircraft landing on the northern runway on westerly operations. When this occurs, we switch to landing on the southern runway. ATC may also decide to switch the use of runways for safety reasons, for example if visibility on one runway is temporarily impaired by patchy fog or a nearby off-airport fire. Runway alternation for 2017 remains broadly consistent with previous years.

Adherence to Runway Alternation Plan 2017

Source: NATS
5.5 Missed Approaches (Go-Arounds)
Occasionally it is necessary for the pilot of an aircraft to abort a landing. There is an established procedure to follow when this occurs, known as a ‘go-around’. This is where the pilot aborts the landing and then re-joins the landing pattern. A go-around is a well-practiced and safe procedure which pilots and air traffic controllers are trained and prepared for.

Although there are many reasons for a go-around, the most common is because the aircraft that has landed previously is slow to fully vacate the runway.

In 2017, there were 582 go-arounds, a reduction on the previous five years.

5.6 Arrival Trials
Following on from a trial conducted in September 2015 to March 2016, Heathrow ran a second ‘Slightly Steeper Approach’ trial. This initiative saw aircraft arriving into Heathrow utilising a 3.2° approach. Aircraft normally arrive on a 3° glideslope. The slightly steeper approach is based on an RNAV procedure. This procedure complements the Instrument Landing System (ILS), which remained at 3°.

This elective trial was carried out to understand and quantify the noise benefits associated with this type of approach and to understand if there was any impact to operational performance. Following the planned end of the trial in October 2017, the airport took the decision to extend the trial whilst working with the CAA to introduce the approach on a permanent basis.
6. Departures

6.1 Standard Instrument Departures (SIDs)
Aircraft taking off from Heathrow follow pre-defined routes known as Standard Instrument Departures (SIDs). The choice of SID used is decided by the airline and is predominately dictated by the destination of the aircraft.

A SID includes a profile and a minimum rate of climb. It avoids obstacles (e.g. tall buildings, radio masts, high ground) and also avoid SIDs from other airports which means that they don’t always follow the most direct route. The SIDs are also based on the historic positioning of ground-based navigational aids.

6.2 Noise Preferential Routes (NPRs)
Either side of the SID is a 1.5km corridor known as the Noise Preferential Route (NPR). Aircraft do not have to follow the centreline of the SID precisely but have to stay within the 3km wide NPR up to 4,000ft, unless directed off for safety or operational reasons.

These corridors are necessary because aircraft perform differently and so there will be some variation as to where aircraft fly relative to the centreline of the SID.

Once aircraft reach 4,000ft, NATS air traffic controllers can direct them from the SID on to a more direct heading towards their destination.

Westerly operations NPRs
Source: ANOMS
6.3 Track Keeping

Track keeping refers to how well aircraft stay within the NPR up to 4,000ft. The Heathrow Noise and Track Keeping (NTK) system is used to detect any aircraft which deviate from an NPR.

Track keeping on Heathrow’s departure routes is very high overall, with about 96% of all departures staying within the published routes. The exception is the easterly Compton route: track keeping compliance is much lower on this route and has been for many years (see section below for more details).

Information regarding track deviations is sent to the airlines and statistics showing track keeping performance are shared regularly. Data shows good levels of achievement and this has remained broadly consistent across recent years.

Track deviations occur for a variety of reasons. They may be necessary for weather avoidance or strong winds, and the speed and weight of the aircraft are also significant factors. For example, modern faster aircraft have a wider radius of turn than older, slower aircraft.
6.4 The Compton Easterly Departure Route

As described above, track keeping compliance for the Compton easterly departure route is much lower than our other departure routes. Over time, as the number of flights using Heathrow has increased, the route has become challenging to manage because of its proximity to the Ockham holding stack to the south of the airport.

This requires NATS air traffic controllers to manually direct aircraft on this route to separate them from the stream of arrivals making their way from the holding stack to the airport.

Heathrow is exploring options to introduce a new Compton route on easterly operations that will enable aircraft to achieve better track keeping compliance.

Annual On Track Departures
Source: ANOMS

![Bar Chart]

Track keeping performance for 2017 remains at a similar level for the previous five years.

6.5 The Cranford Agreement (taking off from the northern runway on easterly operations)

The Cranford Agreement was established in the 1950s. Cranford is a village at the eastern end of the northern runway. The agreement prevented aircraft from taking off over the village except in exceptional circumstances and applied when Heathrow was on easterly operations.

The agreement favoured residents of Cranford at the expense of other communities such as Windsor and southern parts of Hounslow. Although the agreement is no longer in place we cannot implement full runway alternation on easterly operations as we do not have the appropriate taxiways in place to support a full service.

In 2010, the government confirmed that the Cranford Agreement should be removed and that Heathrow should take the necessary steps to implement easterly alternation as soon as possible to ensure a fairer distribution of noise when operating on easterlies. Heathrow submitted a planning application to the London Borough of Hillingdon in 2013 to construct an additional taxiway at the western end of the northern runway to enable full runway alternation on easterly operations.

In 2014, the London Borough of Hillingdon refused our planning application, which we appealed. Following a public inquiry in 2015, our planning appeal against the London Borough of Hillingdon's refusal was eventually allowed on the same date that the government published the draft Airports National Policy Statement (2 February 2017) on Heathrow expansion and a third runway.

We have been assessing whether the taxiway works approved at appeal fit with the airfield design for an expanded Heathrow. The work has indicated the potential need to reposition the taxiway works further to the east for an expanded Heathrow.
Moving the location of the taxiway works will change the noise impacts from departing aircraft. Taken together, this will require a new planning application to account for these changes.

After careful consideration we have taken the decision to pursue this work through the planning process for expansion: the Development Consent Order (DCO) application (https://your.heathrow.com/localcommunityinformation/next-steps/planning-process/).

This decision has been taken because we believe that there would be little practical difference in the timescales for delivery of easterly alternation, whether we pursued this through a new local planning application or through the DCO for expansion.

Following two rounds of consultation, we plan to submit our DCO in 2019 with a decision expected in 2021. We would plan to move ahead with this project as quickly as possible following DCO consent and the approval of the necessary airspace changes. Our current view is that runway alternation on easterlies could then be introduced in 2022/23.

### 6.6 Noise Infringements Day/Night

The Airspace and Noise Performance Team has historically assessed aircraft noise in two different ways: annual air noise contours and departure noise limits. Noise contour reports are available on our website.

Aircraft departing from Heathrow are subject to noise limits set by the DfT. The current limits were introduced early in 2001. There are three limits in place for the day, shoulder and night-time periods.

The limits are (all times local):

- Day (07:00 – 23:00 hours) 94dBA Lmax
- Shoulder (23:00 – 23:30, 06:00 – 07:00 hours) 89dBA Lmax
- Night (23:30 – 06:00 hours) 87dBA Lmax

Heathrow has 12 permanent noise monitors which are used to monitor adherence to the departure noise limits. The noise limits are based on the assumption that the noise monitors are exactly 6.5km from the start of the roll point on the runway and at the same elevation as the airfield. In practice, this is rarely possible and so adjustments are made to the limits to take account of any variances in the monitor position.

Furthermore, each monitor has an additional calibration allowance of 0.7dBA added to the limit to provide a margin of error for the microphone. An aircraft is deemed to have infringed the limits for the time period if it exceeds the limit at any of the permanent monitors.

Additionally, if the aircraft was required to take off with a tailwind (measured at the airfield anemometers and wind vanes according to the formula: \((\text{wind speed} \times \cos \text{runway heading minus wind direction}) \times -1\)) an amount of up to 2dBA of the noise recorded at the noise monitor should be disregarded. The amount to be disregarded is:

- 0.4dB for a tailwind of up to 1 knot;
- 0.8dB for a tailwind exceeding 1 knot but not exceeding 2 knots;
- 1.2dB for a tailwind exceeding 2 knots but not exceeding 3 knots;
- 1.6dB for a tailwind exceeding 3 knots but not exceeding 4 knots;
- 2.0dB for a tailwind exceeding 4 knots.

In the event that an airline infringes one of the limits, they are charged a noise supplement, with all proceeds going to the Community and Environment Awards, Large Grants Scheme, which funds community projects in areas affected by the airport’s operations. Details concerning the allocation of funds can be found at [www.heathrowcommunityfund.com](http://www.heathrowcommunityfund.com)

The higher number of infringements during the night-time seen below is reflective of the number of large, heavy, long haul aircraft which depart later to fit schedules around the world or are disrupted from their planned schedule of operation (e.g. a spike in infringements will be seen during storms, snow, security threats etc.) and so depart in the periods with decreased limits.

In 2017 there were 22 noise infringements, a reduction from 36 in 2015/16. ANPT continues to work with airlines to reduce this figure.
Noise fines are charged based upon the table below.

### Noise Infringements 2017

*Source: ANOMS*

<table>
<thead>
<tr>
<th>Day-time</th>
<th>Shoulder</th>
<th>Night</th>
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<tr>
<td>0.1 to 3.0dBA excess</td>
<td>£500 per dBA excess</td>
<td>£1500 per dBA excess</td>
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<tr>
<td>More than 3.0dBA excess</td>
<td>£1000 per dBA excess</td>
<td>£4000 per dBA excess</td>
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<tr>
<td>£500 per dBA excess</td>
<td>£1500 per dBA excess</td>
<td>£4000 per dBA excess</td>
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#### 6.7 4% Climb Gradient

Aircraft departing Heathrow are required to maintain a 4% minimum climb gradient between 1,000ft and 4,000ft. This is a requirement under our noise abatement procedures. This requirement is monitored using ANOMS and the system will allow full analysis of departure profiles. The Airspace and Noise Performance Team work with airlines to improve performance. During 2017, 99.8% of all departures met or exceeded a 4% climb gradient.

#### 6.8 Departure Trials

During 2017, the Airspace and Noise Performance Team worked with NATS and airline partners to investigate the potential to raise the 4% climb gradient as described in section 6.7 following a community request.

The project team carried out in-depth analysis of current procedures and aircraft capabilities to work up a trial procedure. Considering all aircraft types and capabilities, a climb gradient of 5% will be trialled on the easterly DETLING SID, commencing on 4 January 2018 and will run for one year.

The trial will seek to understand what impact a steeper gradient has on the noise environment around the SID as well as understanding what airlines need to do to ensure their aircraft can make the climb gradient. An array of 12 noise monitors have been deployed along the route to gather noise data. An interim report will be released detailing the first six months of the trial in 2018.

All trial reports can be found on our noise website at [www.heathrow.com/noise](http://www.heathrow.com/noise)
7. Airspace and Noise Performance

Team Engagement

External and Internal Meetings
ANPT continued throughout 2017 to support the following regular stakeholder meetings.

7.1 Flight Operations Performance and Safety Committee (FLOPSC)
The committee meets to discuss Heathrow airside operational and safety performance. In 2017 ANPT had a significant input providing regular updates on airport operational performance, updates on runway occupancy engagement, briefings on the SID improvement programme and discussion around improving the airports operational performance.

Frequency: Quarterly
Stakeholders: Internal, External; Airline Pilot reps, NATS, CAA, BALPA.

7.2 HAL/NATS Meetings
Operational meetings run by ANPT on a monthly basis, in order to disseminate and garner pertinent short term operational information regarding Heathrow’s air traffic performance.

Frequency: Monthly
Stakeholders: NATS.

7.3 Heathrow Airport Consultative Committee (HACC)
The HACC is an independent committee, set up in 1948, which includes representatives of airport users, local authorities and other bodies concerned within the locality of Heathrow. HAL meets a statutory obligation by consulting with the committee on the airport’s development and operational plans. ANPT provides reports directly to the HACC on matters including the management of the night flight restrictions and compliance with runway alternation. In addition, we support Heathrow’s Chief Executive Officer and the Director of Policy and Political Relations with respect to operational questions.

Frequency: Bi-monthly
Stakeholders: External, public forum.

7.4 Heathrow Community Noise Forum (HCNF) and Working Groups
The HCNF was set up in response to the Airspace Trials carried out in 2014. The HCNF has been set up to:
• keep community representatives and local authority stakeholders informed and seek their input in preparing for and consulting on future airspace modernisation as part of the government’s Future Airspace Strategy;
• improve understanding of industry and government representatives of the key concerns of communities living around Heathrow and use these to influence government aviation policy and guidance to the CAA;
• keep members abreast of all airspace trials and procedural changes that are being planned by NATS and Heathrow where they are expected to have a discernible impact on the ground;
• be a key channel through which Heathrow and NATS will communicate with communities and stakeholders on actions being taken to address community concerns about aircraft noise;
• be a means by which Heathrow communities affected by noise from the airport’s operations provide feedback to the airport’s management, the DfT, CAA, NATS and the airlines on problems they are experiencing;
• be a focal point for stakeholder involvement in the planning, consultation and communication of the modernisation of Heathrow’s airspace.

Frequency: Six times a year
Stakeholders: External; NATS, airlines, local community.
7.5 Sustainable Aviation Operational Improvements Working Group
ANPT represent Heathrow within this cross-industry working group. Under the Sustainable Aviation umbrella, the group investigates and studies initiatives that may have environmental gains in terms of noise and air quality.

Frequency: Bi-monthly
Stakeholders: External; airports, airlines, environmental bodies.

7.6 Noise and Emissions Working Group
The Noise and Emissions Working Group is an internal HAL meeting to discuss and work on aircraft noise, emissions and air quality. The group considers new technology and monitors NAP adherence ANPT represents Heathrow Airside Operations

Frequency: Monthly
Stakeholders: Internal.

7.7 Airside Governance Group
The Airside Governance Group is responsible for driving the strategic debate on airspace, facilitating decision making to enable delivery. The group considers business and strategic priorities and decides how airspace should be best managed for today and into the future. Members use evidence to balance the priorities of operational efficiency, noise impact mitigation and community relations.

Frequency: Monthly
Stakeholders: Internal meeting. External by invitation: CAA, AOC, NATS, IATA.

7.8 Heathrow Noise Performance Meeting
- To improve the general understanding of noise and track keeping issues between the local authorities and the airport
- To review the noise and track keeping output of ANPT so as to ensure that changes in performance and trends are shared with the local authorities
- To identify specific areas of concern, improvements or significant changes in performance in order to inform noise action planning and strategy development.
- To ensure that the various elements of the system are used in a co-ordinated way to achieve the best overall benefit for the community.
- To ensure the Group’s activities remain within the overall framework of noise management as determined by the DfT.
- That where the confidential nature of discussions and documentation is clearly expressed or indicated, this will be respected by all the group members.
- To provide the committee of HACC with an overview of the activities of the meeting together with a statistical analysis of aircraft noise and track keeping as and when required.

Frequency: Quarterly
Stakeholders: External, Environmental Health Officers.
# Glossary

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tr>
<td>ADDICT</td>
<td>Airfield Disruption and Delay Impact Calculation Tool</td>
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<td>AMSL</td>
<td>Above mean sea level</td>
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<td>ANOMS</td>
<td>Airport Noise and Operations Management System</td>
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<td>ANPT</td>
<td>Airspace and Noise Performance Team</td>
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<td>ATC</td>
<td>Air Traffic Control</td>
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<td>ATM</td>
<td>Air Transport Movement</td>
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<td>BA</td>
<td>British Airways</td>
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<td>CAA</td>
<td>Civil Aviation Authority</td>
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<td>CDA</td>
<td>Continuous Descent Approach</td>
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<td>dBA</td>
<td>A-weighted decibel</td>
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<td>DfT</td>
<td>Department for Transport</td>
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<td>EPNdB</td>
<td>Effective Perceived Noise decibels</td>
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<td>FLOPC</td>
<td>Flight Operations Performance Committee</td>
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<td>HACC</td>
<td>Heathrow Airport Consultative Committee</td>
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<td>HAL</td>
<td>Heathrow Airport Ltd</td>
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<td>Heathrow Community Noise Forum</td>
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<td>ICAO</td>
<td>International Civil Aviation Organization</td>
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<td>ILS</td>
<td>Instrument Landing System</td>
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<td>LMax</td>
<td>Maximum Sound Level</td>
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<td>Noise Action Plan</td>
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<td>National Air Traffic Services</td>
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<td>Night Quota Period</td>
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<td>NPR</td>
<td>Noise Preferential Routes</td>
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<td>Noise and Track Keeping System</td>
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<td>Quota Count</td>
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<td>RNAV</td>
<td>Area Navigation</td>
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<tr>
<td>SID</td>
<td>Standard Instrument Departure</td>
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</table>
9. DfT Flight Dispensation Reasons

**Emergencies**
- Medical
- Diversion
- Low visibility
- Risk to life

**Serious Airfield and Terminal Congestion**
- Hardship to passengers
- Long delays
- Terminal overcrowded and facilities strained
- Insufficient hotel accommodation
- Hardship to animals
- Single runway operations

**Widespread and Prolonged ATC Delays**
- ATC flow restrictions
- Thunderstorms/strong winds
- Snow and ice
- ATC strike or computer problems

**DfT Dispensation**
- Heads of state
- Royal families (Inc Foreign)
- Senior ministers on official business
- Relief flights
- Civil aircraft affected by hostilities
- Military flights on compassionate grounds