DfT Night Flight Consultation Response

Heathrow Airport Ltd

September 2021

Date: 3 September 2021

Version: v01.00.00

Status: **PUBLIC**

Executive Summary

Night flights at Heathrow are critical for the local and national economy. As the UK's only hub airport, Heathrow has a unique role to play in connecting the UK to global growth. Night flights facilitate this by transporting cargo, which in turn is crucial to delivering 'just-in-time' products and services; by enabling onward connections for same-day appointments and meetings that bring inward investment; and by facilitating unavoidable delays which would otherwise leave passengers stranded.

In a fiercely competitive global aviation market where the Government seeks to advance a Global Britain agenda, Heathrow is at the forefront of ensuring the UK has the international connections the country needs to succeed. After the COVID-19 pandemic, any further restrictions on night flights are likely to see the UK lose out to European competitors on the return of long-haul markets, damaging the UK economy but also the local ecosystem with thousands of people relying on these flights for jobs. Given the significance of these operations and in recognition of their effects on residents, the Government must strike the right balance in determining restrictions on the Night Period.

To ensure night flight restrictions deliver for all stakeholders, Heathrow would like to see:

- The Government establishing a clear objective and expected outcomes for night flights that balance minimising disturbance for local communities with the benefits that these flights bring to the UK economy. This should include guidance on determining a noise problem; setting an objective; and providing evidence-based progress metrics and indicators. To accompany this, there needs to be a better cost-effectiveness assessment tool and a research roadmap to ensure any existing gaps are filled.

- Flexibility in the flight schedule retained to enable operational resilience. There must be some provision for late-running operations rather than any hard stops. Retiming night flights to the day period at Heathrow is not possible given that, under pre-pandemic circumstances, the airport is already constrained by runway capacity, restrictions in runway use and annual movement limits.

- Night flight restrictions continuing to apply to an eight-hour Night Period. Heathrow supports the use of Quota Count (QC) as a management tool, given there is evidence that this has helped shrink noise contours. An aircraft movement limit would offer no incentive to invest in new technology and would be at odds with the Government's stated policy aim of sharing the benefits of new technology between the industry and impacted communities. It would also further weaken Heathrow's ability to compete with other major European hubs.

- The Government better communicating the benefits of the QC system by linking it to shrinking noise contours; and considering a reduction in QC totals when a significant and prolonged decline in usage has occurred.

- The limitation of further population encroachment into the 60dB(A) L_{night} contour. Managing population encroachment must be considered before any operational restrictions, given that such encroachment offsets some of the benefits of the billions of pounds that industry has invested to reduce the impact of noise on residents.

- High-level guidance provided for revised dispensation arrangements. This guidance should focus on the need to demonstrate the impact to flights and airport schedules, and outline the steps taken to mitigate the impact where practical. Local schemes should be formed to govern execution at each airport and this submission proposes a solution for Heathrow.

- The principles of the ICAO Balanced Approach upheld. Night flight restrictions are just one aspect of a much wider approach to noise management and other tools should be acknowledged when tackling issues of night noise.

The evidence provided in this submission demonstrates that a package of noise management measures, including the QC system and investment in quieter aircraft, has led to a reduction in night noise at Heathrow. This is reflected in a reduction in the geographic noise impact of the airport. Heathrow is cognisant of the impact that night noise has on local communities which is why the airport, and its partners, have made significant investments in quieter operating procedures, quieter aircraft, and extensive mitigation. The current system works effectively and should not be dismissed; however, the Government does need to better communicate when improvements are being made.

The Government should also recognise the huge contribution that night flights make to the UK economy and that many of their ambitions simply could not be achieved without them.

The impact of night flights

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1. Introduction

The benefits of flights during the Night Period are significant. In 2019, 31 million passengers and 593,000 tonnes of cargo travelled on night flights in the UK. This contributed £16.4 billion to the economy and supported 211,000 jobs. It is not just airlines and airports that benefit from these flights. In Heathrow's local communities these flights contribute to the employment of thousands of residents as well as linking the UK economy, and its regions, to global growth markets. However, Heathrow understands these flights are not without their impacts on the local communities and therefore supports the Government in striking a balance in determining restrictions on the Night Period.

Since the introduction of the night flight restrictions at designated UK airports in the mid-1990s, there have been notable improvements in the management of night flights. When the restrictions were first implemented it was not unusual for aircraft to depart after midnight at Heathrow and arrive well before 04:30, which meant there were no periods of predictable respite for residents.

Over time, and thanks to the relationships that have been developed with local communities, Heathrow has provided national leadership in the evolution of noise management with several voluntary initiatives helping to reduce the impacts of noise during the night. These include scheduling arrivals to land no earlier than 04:30, not scheduling departures before 06:00, not adding new runway slots prior to 06:00, scheduling cargo operations and QC4 aircraft outside of the Night Quota Period, reducing late-running departures after 23:30 and, most recently, developing a 'Quiet Night Charter' with industry partners.

These steps, along with the ongoing introduction of quieter aircraft, mean that the impact of Heathrow's night operation has significantly reduced.

Using the EU dose response functions, an indicative calculation of the number of people whose sleep is highly disturbed by Heathrow's night flights in the eight-hour Night Period shows a fall of around 30% between 2001 and 2019 (assuming no new housing development) and falls by about 10%, even when taking account of new housing development and population change[1]. Over the same period, there has been an increase in overall aircraft movements[2], passengers and cargo tonnage at night. This is illustrated in Figure 1 below.

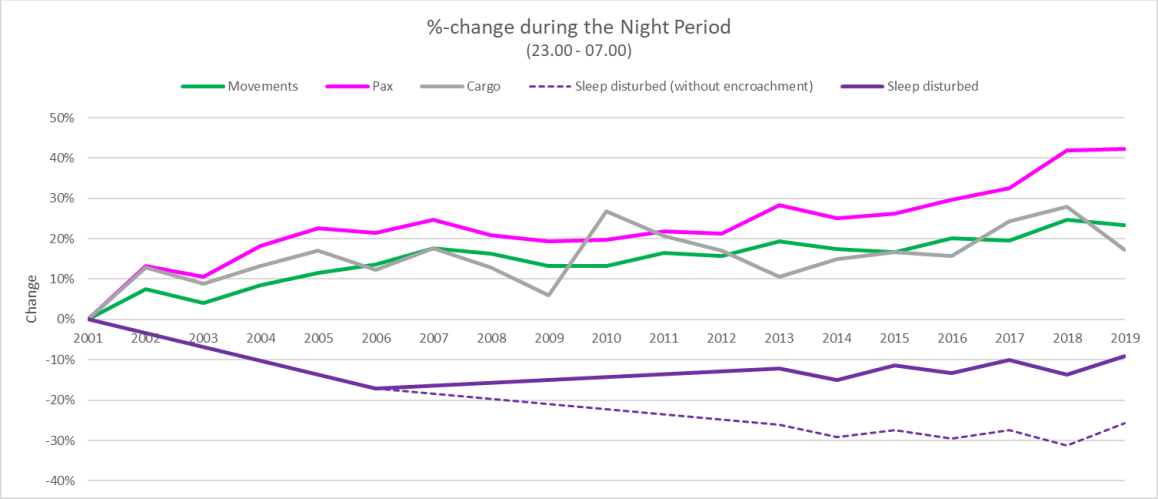


Figure 1: Percentage Change of Sleep Disturbance vs. Aircraft Movements

[1] Based on 2006 population database

[2] Movement limits between 23:30 and 06:00 have remained constant since the start of the Night Flying Restrictions in 1993, with small fluctuations largely as a result of differences in the number of dispensations.

The reduction in noise exposure and associated harmful effects is due to improvements in aircraft fleet technology and operating procedures. However, some of that benefit has been offset by an increase in movements during the Night Period, as well as new housing and population growth. Heathrow commissioned the CAA to provide an indicative assessment of the contribution of the aircraft fleet, aircraft movements and population change to the reduction in noise exposure (see Appendix E).

The assessment showed that if movements and population had remained at 2001 levels, fleet improvements would have reduced the population exposure above the 50dB(A) L_{night} 8-hour noise contour by over 50%. However, the reduction is reduced to 17% when population encroachment and additional movements are accounted for, shown in Figure 2.

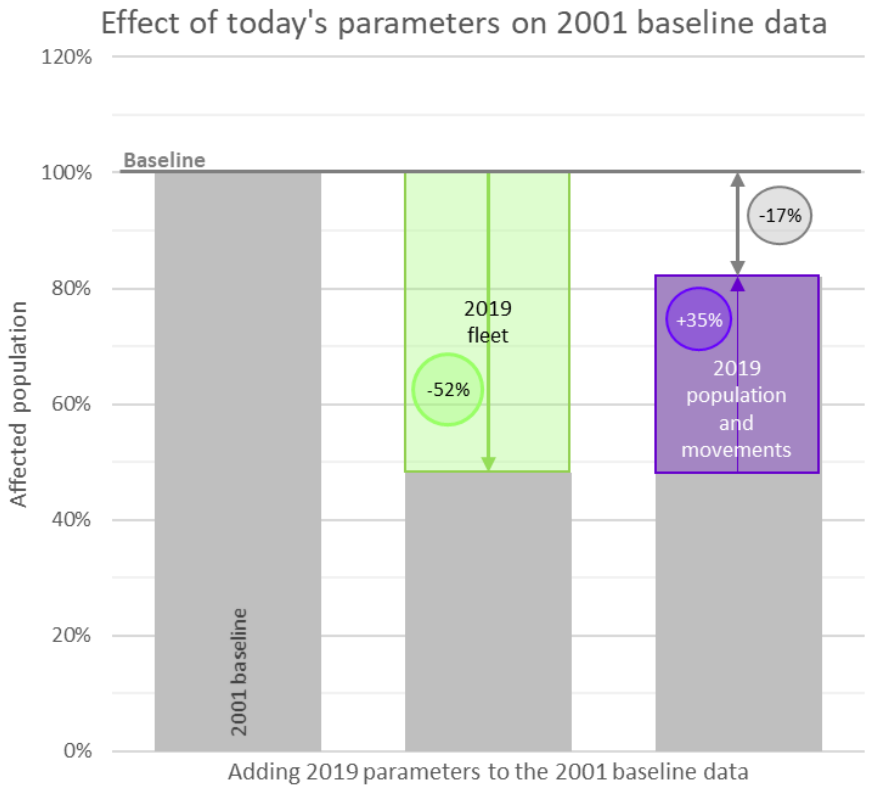


Figure 2: Effect of Today's Noise Parameters (2001 Baseline for Affected Population)

Heathrow welcomes the opportunity to respond to this consultation and appreciates the difficult challenge of striking the right balance between the benefits and impacts of night flying facing the Government. Although the aviation industry has been drastically affected by the pandemic and subsequently faces a difficult period of recovery with much reduced resources, Heathrow supports the Government's decision to undertake a fundamental review of existing night flight restrictions within national policy.

This document sets out Heathrow's response to the key questions raised by the consultation, together with an overview from the airport's perspective. It includes detailed responses to the specific questions in the body of the text where appropriate; and in Appendix A, a copy of Heathrow's response already given to Part 1 of this consultation is provided.

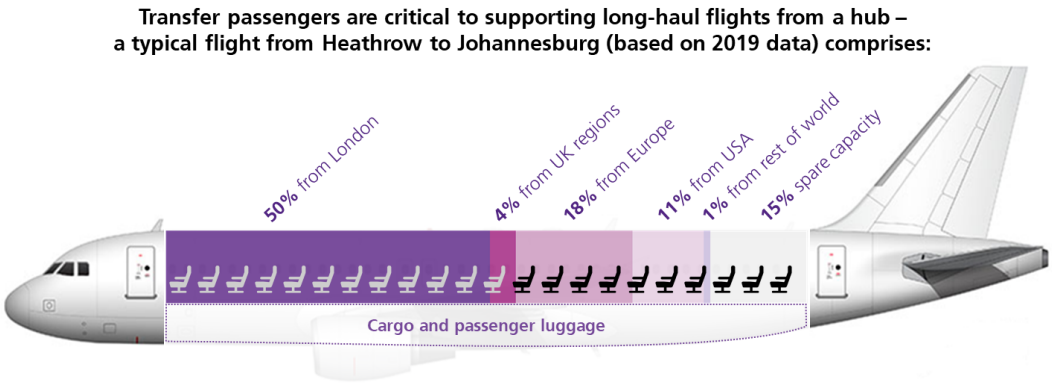
2. The Role of Night Flights

2.1 The Need for Night Flights

2.1.1 Why flights need to operate during the Night Period

As the UK's only hub airport, Heathrow has a unique role to play in connecting the UK to global growth. Hub airports play a different role than point-to-point airports, as they pool demand for global connections. This enables flights to more destinations than other airports are able to support. This brings competition and choice for consumers and access to markets for the UK. Other well-known hub airports include Singapore Changi, Dubai International, Amsterdam Schiphol, Paris Charles De Gaulle and Frankfurt. A global race is taking place between hubs to build connections with emerging economies across Asia and South America.

Night flights play a crucial role in making Heathrow a successful international hub airport, as transfer passengers play an important role in maintaining the range and frequency of destinations served by the airport by feeding in passengers from inbound flights. Moving early long-haul arrivals to a later time reduces the opportunity for transfer passengers to onward connect at a UK airport and impacts route viability, weakening UK connectivity and the Government's ambitions for 'Global Britain'.



Source: Heathrow internal data

Figure 3: Typical Load Factor Passenger Share at Heathrow

Night flights form an important part of operations at airports around the world. The zonal time differences in an inter-connected global transport system mean that it is inevitable for international airports to have flights late at night and early in the morning.

The relationship between flight times and clock times means that early morning arrivals at Heathrow are required to effectively serve flights from much of China, South East Asia, South Asia and southern Africa. An example of this is Singapore, where a flight departs at 23:15 local time and arrives at 05:50 at Heathrow. This early arrival enables a full day's business to take place at both ends of the route for some passengers, while others may transfer onto a connecting flight at Heathrow for onward travel to another destination.

Horizon Panel[3] research supports this with 63% of business travellers preferring night flight arrival times, 32% chose night flights due to it being easier to sleep, 31% due to being able to spend more time at their destination; and 23% due to more convenient onward travel options.

At busy airports such as Heathrow, unplanned night flights can also be required at the end of the scheduled day due to unavoidable delays to flights scheduled earlier in the day. Most of these flights will operate prior to 23:30 and will be a mix of delayed operations and flights scheduled close to the start of the Night Period. Flights after 23:30 are less frequent and although unplanned, there is provision made in the allocation of night flight movement and Quota Count budgets. Delays can be caused by many reasons outside of airlines' or airports' control including adverse weather, technical issues, industrial action, or disruption to the flight on arrival due to delays elsewhere. Therefore, for flights scheduled later in the day there can be a requirement for a flight to depart in the Night Period on occasion, even if the scheduled time for the flight is prior to the Night Period.

Without the ability to enable these delayed flights to operate, passengers would be stranded either here or around the world, and later airport slot timings are commercially compromised. In 2019, 418 departing flights scheduled prior to 23:00 were delayed beyond 23:30, carrying nearly 100,000 (94,758) passengers. Heathrow has worked collaboratively with airlines and air traffic control under the current regime to minimise the impact of night flights, and in 2019 a further 58 aircraft arrived or departed on a subsequent day and avoided a night flight, and 13 flights that were at risk of operating into the night were instead cancelled.

Night flights underpin the operation of a successful hub airport providing the UK with strong links to the world, thus advancing many of the Government's trade and diplomatic ambitions. Night flights are economically important to the UK, commercially critical for airlines and businesses, and provide operational resilience along with scheduling confidence and flexibility. They will be crucial to supporting the post-pandemic recovery and post-Brexit trade (see Section 2.1.7).

2.1.2 Economic Benefits for Global Britain

In 2019, there were 31 million passengers and 593,000 tonnes of cargo carried on night flights in the UK, contributing £16.4 billion to the economy and supporting 211,000 jobs[4]. In the same year, the period from 06:00 to 06:59 was the second busiest hour for departing passenger volumes (behind the 07:00 to 07:59 hour) and the busiest hour for arriving belly hold freight[5]. Night flying at Heathrow contributed £4.3 billion to the economy and 57,400 jobs.

Night flying is essential for UK connectivity. Many long-haul routes would become unviable without early morning arrivals. The commercial viability of many short-haul routes is reliant on the ability to have a high number of rotations per day, facilitated by early morning and late evening flying. A competitive short-haul market drives consumer benefit in terms of lower fares and greater route choice. It is also essential to hub dynamics to deliver long-haul connectivity, where thinner long-haul routes (those with less direct demand) are reliant on connections from the short-haul network to be commercially viable. York Aviation estimates that a 10% increase in UK connectivity would result in a 0.5% increase in UK GDP.

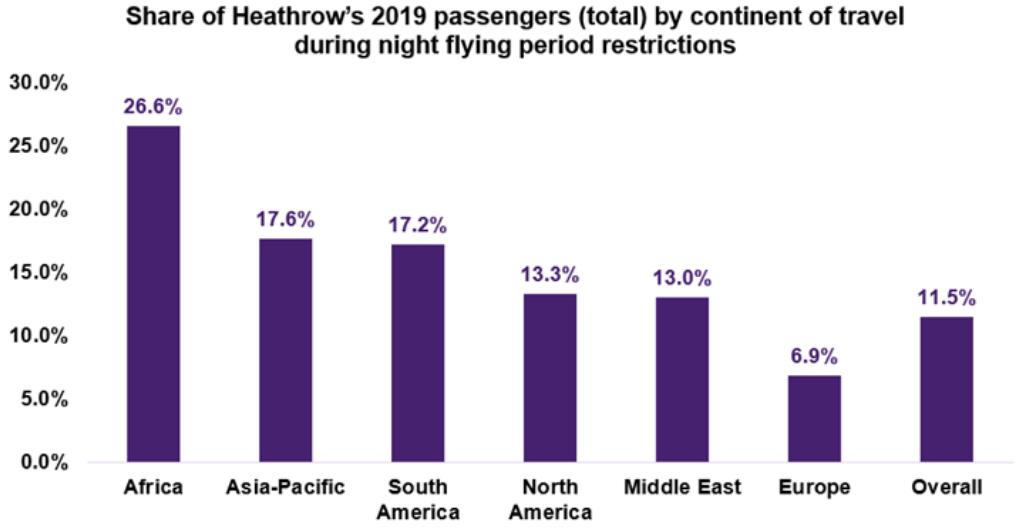
[3] Horizon is Heathrow's online insight community managed by Insites Consulting, launched in 2018. It comprises over 2,000 members from all over the world, both users and potential users of Heathrow, representative of the airport passenger profile. Members participate in weekly research topics that are sent to them throughout the year.

[4] York Aviation, The Economic Impact of Night Flying in the UK, July 2021

[5] York Aviation, The Economic Impact of Night Flying in the UK, July 2021

In 2019, the wider economic benefits of UK connectivity during the Night Period contributed £13.1 billon to the UK economy[6], including £3.6bn associated with night flying at Heathrow. Flights arriving in the early morning period are vital for business connections into London and the UK regions. Of all connecting passenger flows into Heathrow from British Airways' early morning flights, the strongest is Manchester (1st), Edinburgh (4th), Glasgow (6th) and Newcastle (12th). There is potential that without night flights, domestic connections to the UK's hub airport would be impacted.

Night flights make up a significant share of demand for long-haul travel, enabling foreign direct investment, tourism, and trade to flow into the UK. These flights are vital for Heathrow to connect to long-haul destinations outside of Europe. Figure 4 below shows that when the night flight passenger volumes are broken down by market, at least 11% of Heathrow's long-haul passengers are handled during the Night Period.



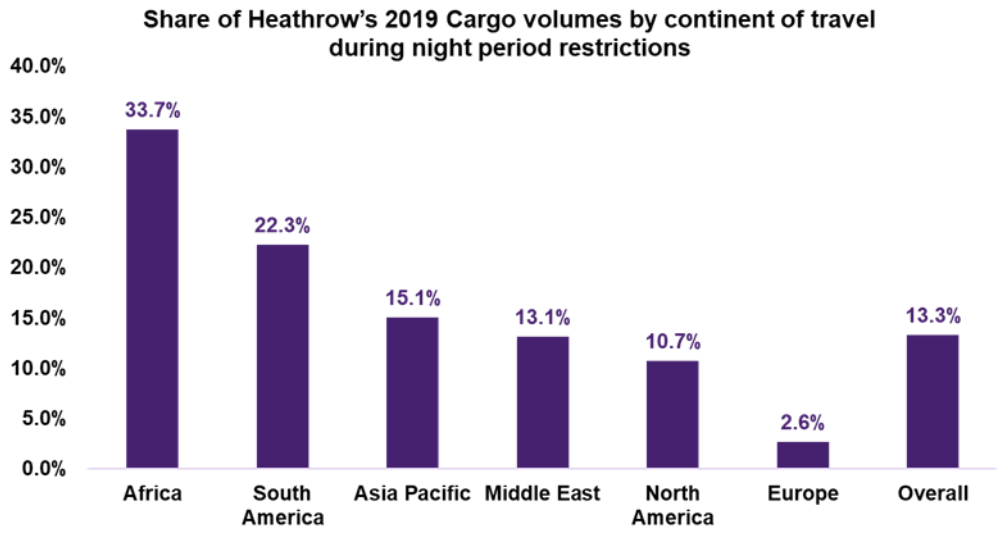
Source: Heathrow internal data

Figure 4: Share of 2019 Passengers by Continent during the Night Period

As the UK's largest port by value[7], night flying at Heathrow is also critical for the UK to maintain trade links outside of Europe, as shown in Figure 5 below.

[6] York Aviation, The Economic Impact of Night Flying in the UK, July 2021

[7] According to UK Trade Info, for exports with countries outside the EU and Switzerland, see: https://www.uktradeinfo.com/trade-data/ots-custom-table/



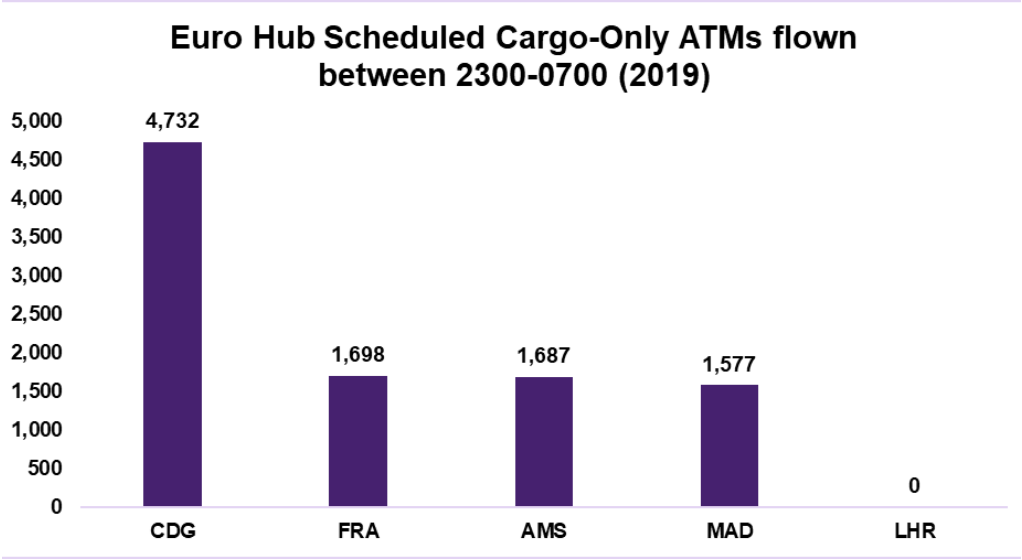
Source: Heathrow internal data

Figure 5: Share of 2019 Cargo Volumes by Continent during the Night Period

For cargo, both early mornings and late evenings are crucial in enabling 'just-in-time' product delivery, whether that is the express cargo category, or products with specialist handling requirements (such as food, pharmaceutical products or animal livestock). Late night departures also enable business connections in export markets as well as enabling critical overnight freight dispatch. Heathrow's key European cargo competitors Amsterdam (AMS), Brussels (BRU), Frankfurt (FRA), Madrid (MAD) and Paris (CDG) are significantly less constrained in their night operations than Heathrow (see Figure 6 and Figure 7 below).

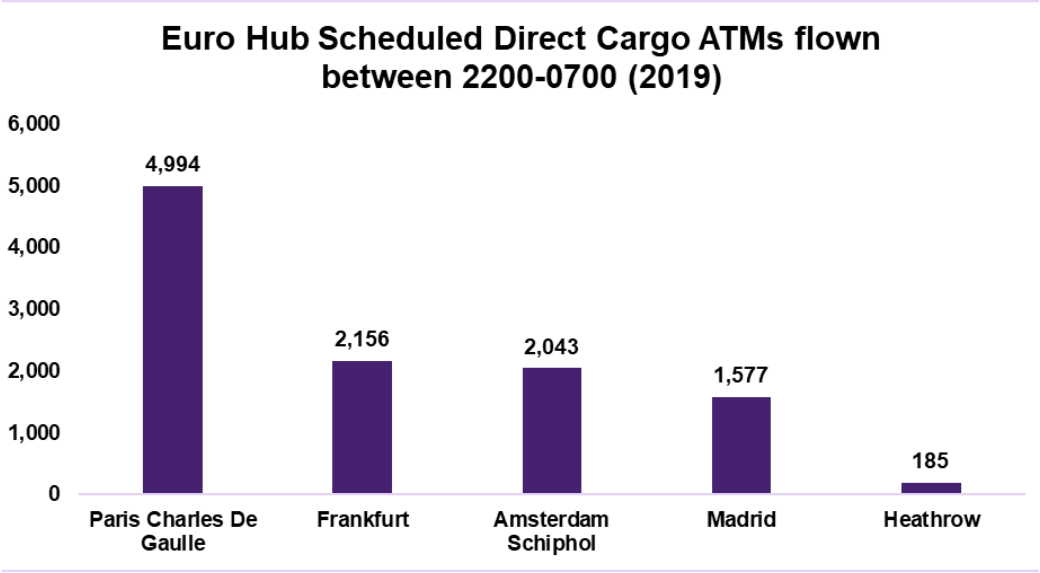
This enables them to attract cargo integrators such as DHL, FedEx and UPS, who rely on night flights to service their global hub network and connect cargo through UK airports to other domestic and international destinations.

Thanks to their strong freighter network, the majority of these airports have already returned to, or have exceeded pre-pandemic levels of trade, whilst Heathrow remains down 19% as of May 2021. Heathrow is already one of the most constrained hubs not only in Europe, but globally. This puts it at a disadvantage by reducing the number of slots available for cargo operators. Further restrictions would further damage the UK's ability to compete as a trading nation.



Source: OAG

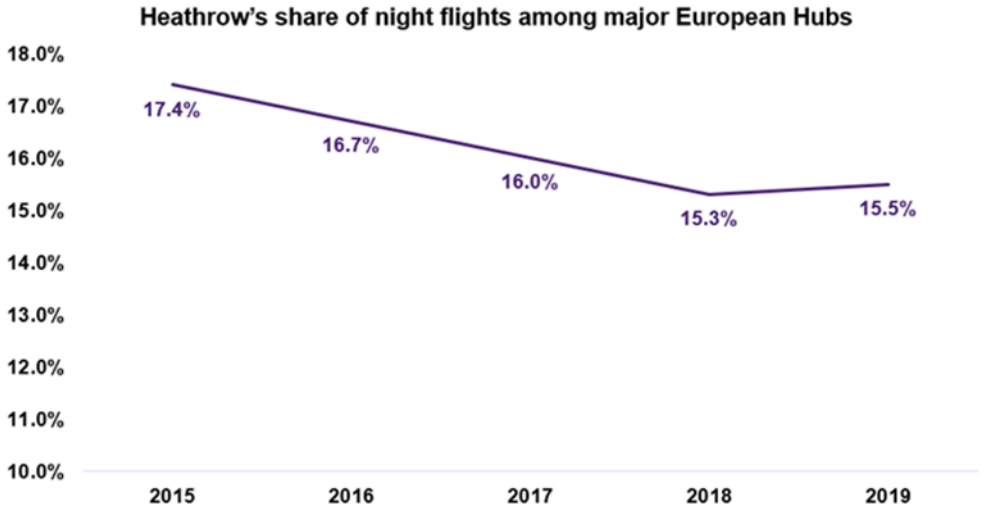
Figure 6: Euro Hub Cargo-only Aircraft Movements 2300-0700



Source: OAG

Figure 7: Euro Hub Scheduled Direct Cargo Aircraft Movements 2200-0700

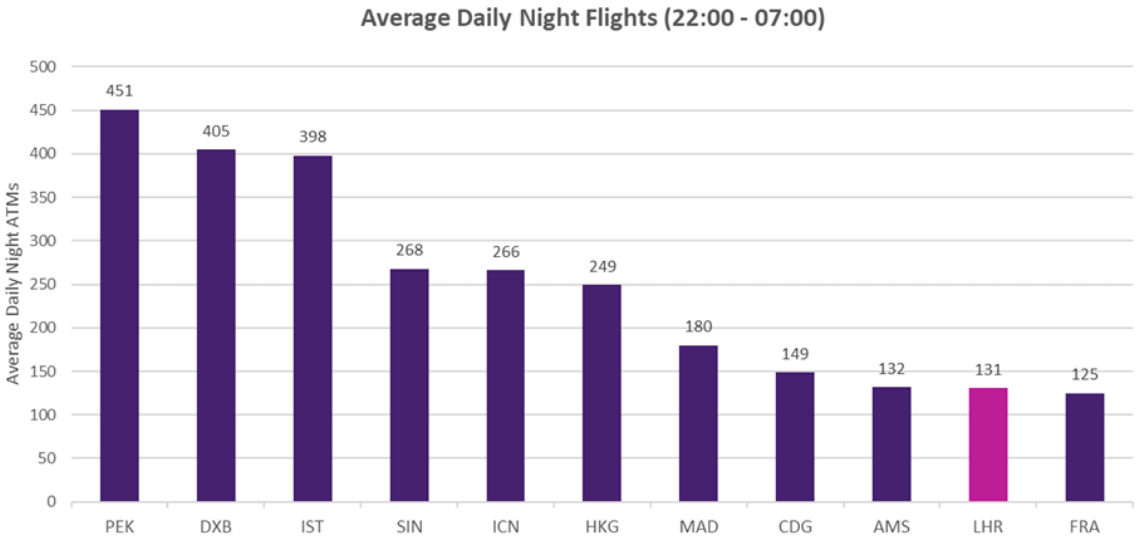
Among the five largest hub airports in Europe (Amsterdam Schiphol, Charles de Gaulle, Frankfurt and Madrid), Heathrow has progressively lost flight share of movements occurring between 23:00 and 07:00 as existing restrictions constrain the ability to compete (see Figure 8 below). Adding further restriction puts Heathrow at risk of becoming less competitive as airlines and passengers choose to fly through EU competitor airports where they are able to offer airlines to operate their ideal schedule.



Source: OAG

Figure 8: Heathrow's Share of Night Flights among European Hubs

Furthermore, when comparing against world hubs, some hubs in the Middle and Far East have up to four times the amount of night flights compared to Heathrow, where Heathrow has one of the lowest volumes of European hubs (Figure 9).

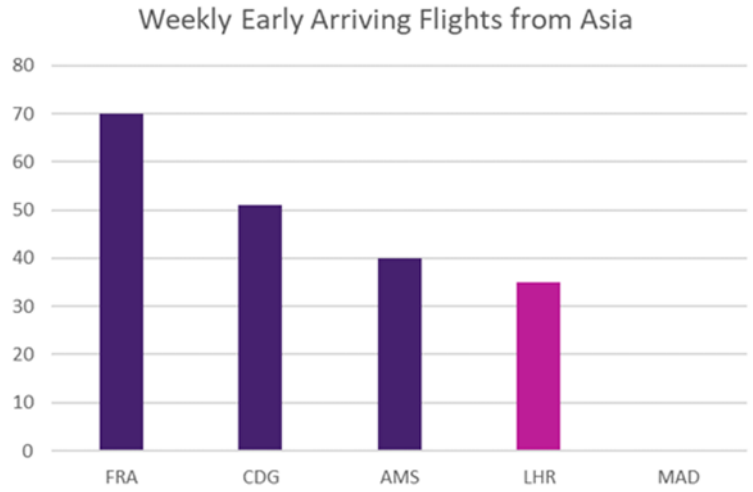


Source: OAG

Figure 9: Average Daily Night Flights at Global Airports, Typical Summer Peak Week 2019

With over 80% of Night Period flights, and therefore the majority of the £4.3 billion contribution to the UK economy from night flying at Heathrow, operating in the morning the competitive disadvantage is magnified when the UK's time difference to western Europe is considered. The main European hubs are an hour ahead in local time, with 05:30 in London equating to 06:30 at these airports, and there is little opportunity to take advantage of the hour's difference in the evening due to the night restrictions making the last couple of hours of operation less desirable. When looking at flights arriving before 06:30, Heathrow's competitive disadvantage is even worse for flight arrivals from fast-growing Asian economies.

Figure 10 below shows that Heathrow captures fewer arrivals from Asia than any other European hub during this period. If a ban on flights before 05:30 were in place, routes from Asia would be disproportionately affected – nearly half of the weekly flights that would be lost are from these vital markets. This disadvantage would be further compounded if the European Commission follows through on proposals to abolish seasonal time zone changes and adopt year-round summertime and, should the UK not change with it, then the time disadvantage could become two hours in the winter season.



Source: OAG data

Figure 10: Weekly Arriving Flights pre-05:30, Asia to European Hubs, Typical Summer Peak Week 2019

A Horizon panel[8] night flights survey in June 2021 showed that over 50% of respondents said that additional restrictions could impact their decision to book night flights at that airport. This is because convenient flight times play a key role in determining the airport of choice. Heathrow is competing with these European airports for lucrative corporate travellers and cargo business. Any more restrictive changes to the night flights regime will make it, and therefore UK businesses and the economy, less competitive.

In addition to providing vital connections, night flying also adds to airport capacity in the UK, contributing to UK Government policy to "make best use of existing runways." The Airports Commission suggested that there should be additional capacity in the Night Period:

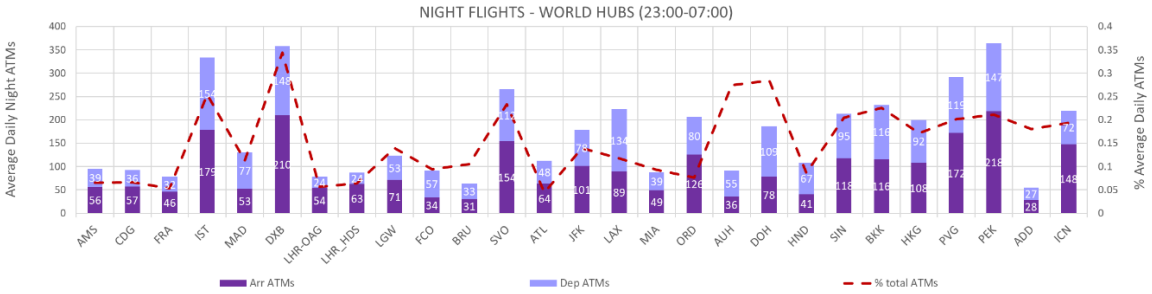
> *"There would be a powerful economic and commercial argument for increasing the core night flight quota in the longer term if Heathrow Airport… remains capacity-constrained.[9]"*

As Figure 11 below shows, Heathrow is already one of the most constrained hubs in the world. The prospect of retiming night flights into the day period not only has significant commercial and economic impacts for Heathrow, but it also further impacts the existing constrained operation at the world's busiest two-runway airport. While there are opportunities for slots within the busy daytime schedule, these are severely limited and unsuitable for early connectivity markets. Heathrow's daytime schedule is already constrained not only in terms of night-time restrictions, but also of runway capacity and other restrictions on runway use and annual movement limits – all of which have a significant impact on connectivity. As airlines would not be

[8] Horizon is Heathrow's online insight community managed by Insites Consulting, launched in 2018. The community comprises over 2,000 members from all over the world, both users and potential users of Heathrow, representative of the airport passenger profile. Members participate in weekly research topics that are sent to them throughout the year.

[9] Airports Commission: Final Report, July 2015, page 281

able to retime night flights and would therefore lose capacity, it is likely they would have to consolidate their route networks replacing their lower yielding, thinner routes with services to core destinations. This has the overall effect of reducing the UK's connectivity.



Source: OAG

Figure 11: Average Daily Night Flights at World Hubs, Typical Summer Peak Week 2019

2.1.3 Supporting the Local Economy

The impact of COVID-19 on aviation has been felt strongly in local communities that rely on Heathrow for their livelihoods. Through the Heathrow Local Recovery Plan the airport remains focused on finding ways of recovery that will help drive both airport and local economic recovery, whilst simultaneously enabling innovation and sustainable growth.

As the airport rebuilds, protecting the future security of its local economies and communities who rely on Heathrow is extremely important to the organisation. It aims to provide a pathway that allows Heathrow and its communities to build back better.

Flights that operate through the Night Period play an essential role in Heathrow's local recovery as they contribute towards local economic growth.

Supporting local businesses

Night-time flights have and will continue to support local businesses to access foreign supplies and markets. It will continue to generate local economic growth, to provide local jobs and to create more job opportunities in the future for our local communities. Night flights will continue to help to facilitate local trade and tourism for the local boroughs and communities that rely heavily on it.

Overnight delivery has become an increasingly important element in the global supply chain with many local companies establishing themselves around the airport to take advantage of the high passengers and cargo that come in on night flights. Without night flights many of these companies would cease to exist. Night flights will also encourage new start-up businesses to locate themselves next to the airport which will also support local investment and local jobs.

> *"Local businesses often depend on night flight departures and arrivals to allow business connections in export markets as well as permitting vital overnight freight activities. Flights during the night period are also significant as they contribute to the employment of many residents within the local community."* ***Louise Punter – CEO, Surrey Chambers of Commerce***

Family Business Case Study

Exporting flavour

With the mission to create the best-tasting popcorn in the world, Joe & Seph's gourmet popcorn is hand-made in small batches using all-natural ingredients.

Founded six years ago, the family business employs fifty people at their North London home, producing 40 "air-popped" award-winning flavours.

All-natural ingredients mean a shorter shelf life compared to other brands on the market, so time to market is critical - and with over 2,500 stockists globally, air freight has become an increasingly important part of Joe & Seph's growth strategy.

Using forwarders including Bolloré and Kuehne Nagel, they now export to over 25 countries from Heathrow, including the UAE, Nigeria, Maldives, Japan, Suriname, Australia, and the United States, delivering popcorn to Hong Kong in less time than it takes to transport it to Germany by other methods.

Supporting employment

Heathrow makes a significant contribution to the local economy by employing thousands of local residents from boroughs surrounding the airport.

Oxford Economics (OE) estimates that Heathrow directly supported 88,900 workplace-based jobs in 2019. In the London Borough of Hillingdon, OE estimates that 9,300 local residents have direct 'on-airport' jobs at Heathrow with a further 9,100 jobs in the borough that are 'off-airport', directly sustained by the presence of Heathrow. These include sectors such as hotels, cargo and freight services, airline services and couriers. When accounting for wider supply chain and consumer spending effects, Heathrow supported 133,600 jobs, equivalent to one in six jobs within the local workforce in 2019.

Local residents that surround the airport heavily depend on the jobs that are created simply because of the Heathrow night flights.

York Aviation estimates that in 2019 the direct impact of night flying at Heathrow, supported by activities related to the operation of air services and related activities, was £325m in GVA and 6,300 jobs. Gross value added (GVA) is an economic productivity metric adjusting GDP for any subsidies or taxes, that measures the contribution of a corporate subsidiary, company, or municipality to an economy, producer,

sector, or region. These direct impacts, in turn, generate £425m in GVA through indirect and induced effects and a further 10,000 jobs.

However, the impact of COVID-19 on aviation has had a significant impact on employment in the local community. OE estimates that workplace-based employment relying on Heathrow will have 37,000 fewer jobs in 2021 than in 2019, or a loss of £4 billion gross-value added (GVA) contribution to GDP in the local economies of Ealing, Hillingdon, Hounslow, Slough, South Buckinghamshire and Spelthorne. This will result in 16,000 fewer resident jobs in 2021 in the local area[10].

The boroughs surrounding Heathrow have all seen dramatic increases in unemployment since the onset of the pandemic. The proportion of residents claiming Universal Credit continued to increase in the first three months of 2021, reflecting the ongoing significant impact that the virus is having on Heathrow's business, as well as those companies operating at the airport. Prior to March 2020, the six local boroughs of Ealing, Hillingdon, Hounslow, Slough, South Buckinghamshire and Spelthorne had an average claimant count below the national average. As a result of the COVID-19 crisis, the average claimant count across these boroughs now sits noticeably higher than the national average.

As Heathrow, and the businesses that depend upon it, begin to recover it is important that airports are able to provide flexibility in their schedules, including hours of operation, to accommodate changes in growth in the market. Any new restrictions that impact Heathrow's already limited flexibility could hinder the rate at which jobs return and local communities recover.

> *"Night flights at Heathrow alone contribute £4.3 billion to the UK economy and around 57,400 jobs. Servicing night flights provides jobs to local people around the airport. Night flights also provide local businesspeople with night flights for timely connections to export markets, as well as enabling vital overnight freight dispatch. These substantial benefits must of course be balanced with the need to manage the noise impact of night flights on communities living around airports as the government is seeking to achieve, but a sensible volume of critical night flights in shoulder periods are clearly a vital part of operating a globally competitive hub airport."*
> **Andrew Dakers – Chief Executive, West London Business**

Night flights at Heathrow are crucial to the local economy and to the communities it is part of. The livelihoods of local communities and residents that depend on the jobs created by night flights as well as the local businesses relying on the airport to export their goods and services throughout the night in order to stay open, are, and will remain, paramount.

2.1.4 Commercial Importance of Responding to Market Demand

Like any other commercial entity, it is important for airlines and airports to be able to respond to consumer and business demand. Night flights facilitate trade and business with global markets by providing the most attractive timing of flights for business and leisure travellers and cargo operators.

They are the most economically valuable flights for airlines at Heathrow. Typical yields on flights arriving before 06:00 are £50 higher per passenger and £2,100 higher per tonne of freight than those arriving in the 06:00-07:00 hour – demonstrating the higher demand from both passengers and freight customers. Late evening flights also have higher freight yields of £250 per tonne for long-haul and £1,100 per tonne for short-haul flights.

[10] Oxford Economics, The economic impact of reduced activity at Heathrow Airport, September 2020, page 3

They allow more routes to be commercially viable by providing optimal timings, increased cargo revenue and connections. This broadens the UK's international route network and brings in high-spending Asian passengers who support local businesses and retailers. This in turn improves the UK's competitiveness with other European countries and their hub airports.

Night flights contribute significantly to retail businesses at the airport, also benefitting businesses in the UK and the national economy. When measuring the average spend per passenger at Heathrow in 2019, the top nine airlines all have flights either arriving before 08:00 or departing after 21:00. This shows the value of these passengers travelling near the night flight period to the airport's retailers, all of whom also operate on the UK high street.

Responding to Consumer Demand

The majority of airlines and routes that currently operate night flights are from the Asia-Pacific region, including the world financial centres of Hong Kong and Singapore. These night flights are particularly popular for business travellers as it allows them to have a full night's sleep (and therefore not waste a day travelling), with the flight landing early enough for the start of the business day. It also allows passengers to connect on to the first wave of UK and European short-haul flights where London is not the passenger's final destination. However, it is important to recognise that night flights are not only about the business traveller. Leisure passengers also want to maximise their time at their destination, preferring early or late flights for short-haul or overnight flights for long-haul travel. Holidays and visiting family were more often cited as the reason for taking a night flight in our recent Horizon panel survey.

The survey also indicates that from a passenger perspective night flights are a key offer in the overall flight schedule. It found that 94% of those surveyed had taken a flight between 21:00 and 07:00. These flights are utilised by all passenger groups and convenience is most likely to be cited as the key reason for selecting a night flight. If Heathrow is to remain competitive, providing the convenience of night flights will be important.

More than a third of passengers said that if a night flight was not available, they would do something else over choosing a different time, including using an alternative airport further away or switching airlines. This would have a significant impact on Heathrow's ability to compete with other hubs and would have implications for the network connectivity offered by UK airlines.

Most passengers also understand the need for restrictions on flights at night to protect communities, with almost half of passengers surveyed recognising that Heathrow already has some of the toughest restrictions in place. Around half also felt that the existing restrictions were fair, however around 28% felt that if Heathrow were to be truly considered a global hub, it should have more flexibility.

Supporting Express Freight Business Models

Night flying is essential for cargo, which is high value, time sensitive and requires certainty of delivery, for example, medical supplies, financial, legal or business documents, critical manufacturing components and perishable goods. In 2019, 49% (268,000 tonnes) of express freight was carried during the Night Period in the UK[11].

Heathrow is the UK's largest cargo hub airport with 60% (by tonnage) of all UK air freight passing through the airport in 2020, the majority of which was in the belly hold of passenger aircraft. Despite tonnage being

[11] York Aviation, The Economic Impact of Night Flying in the UK, July 2021

down 28% in 2020 compared to 2019 as a result of reduced belly hold capacity, Heathrow still enabled £161 billion of cargo trade – only 2% lower than 2019. This is indicative of the value of Heathrow cargo to Global Britain and the resilience of cargo to external shocks. Despite night flights only making up around 5% of the total flights, the amount of cargo carried on these flights is almost double that at around 9% (see summary data provided in Appendix B) – which shows the criticality of night flights in enabling Britain to trade with the world.

Airline Connectivity & Commercial Success

Night flights have helped Heathrow and the UK in general broaden its route network, including having the only non-stop route between Europe and Australia – thus supporting the Government's Free Trade Agreement with Australia.

Airline Connectivity Case Study

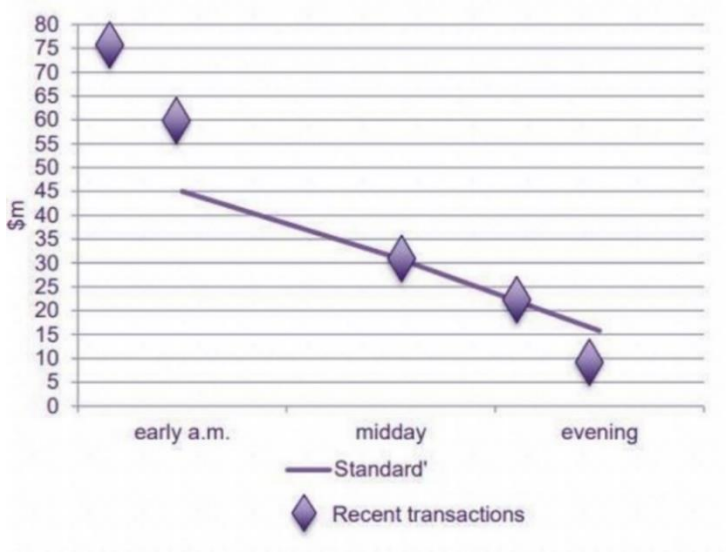
QF9 Perth to London Non-Stop

This flight, operated by the Australian flag carrier Qantas, lands during the Night Period when arrivals are less busy and means the flight departs Australia in the evening, which is ideal for both passengers and cargo for the reasons mentioned above.

Heathrow has been informed by Qantas that this route would likely be cancelled if night flight restrictions were extended. This is because it would not be safe to arrive after 06:00 when flight arrival demand becomes busier and the length of the route means the aircraft would have insufficient fuel reserves if airborne holding were required prior to landing, which is normal at that time of the morning. It would also reduce the amount of cargo they could carry which would impact the route viability. Qantas tested a flight from Sydney to Heathrow in 2019 in anticipation of launching non-stop flights from Sydney and Melbourne in the next few years, but these are also unlikely to materialise if night flights were not able to continue for that same reason.

Early morning arrivals also maximise connection opportunities. By feeding other flights, transfer passengers play a critical role in maintaining the range and frequency of destination served by Heathrow, providing high feed connectivity volumes onto key European and UK domestic departures which must start from 6:00 am to allow a full day's business away from London. Moving the first long-haul arrivals later removes essential feed for these 1st wave short-haul (UK/European) destinations and therefore reduces route viability for both long-haul and short-haul, weakening UK connectivity and the hub network. BA, for example, estimates that annual traffic losses would potentially be up to half a million passengers for any routes rendered unviable as a consequence of forced re-times.

The value airlines put on early morning arrivals can also be seen in the amount they are prepared to pay to gain access at Heathrow for runway slots. Figure 12 below shows that the value of slots decreases as the day progresses, mainly driven by the arrival time. The record purchase amount ever made for a daily slot at Heathrow was in 2017 by Oman Air, for an 05:30 arrival slot.



Source: Published press articles

Figure 12: Value of Heathrow Runway Slots by Time of Day 2015-2019

2.1.5 Enabling Operational Resilience

As a busy hub airport with a level schedule throughout the day, flexibility of operations is required at each end of the core schedule (before 06:00 and beyond 23:00) to enable operational resilience.

There will always be events that cannot be planned for, and therefore some flights will run late beyond the planned departure time, and others will need to land earlier. While some of these occasions might be foreseen hours or days in advance (e.g., some weather conditions, strike action), others cannot be (equipment failure, terrorist threats, last minute changes in weather). Even where forecasts of disruption can be made in advance, the impact on the day's operating schedule is not always predictable (for example weather forecasts are uncertain by nature). While flights can be cancelled, or for some airline operations with multiple flights to a destination the flights can be combined/consolidated, this is not always practical for an airline, has commercial implications, and is disruptive for passengers, especially the closer to the departure time any decision is made.

Figure 13 below provides an overview of the existing night flight arrangements at Heathrow.

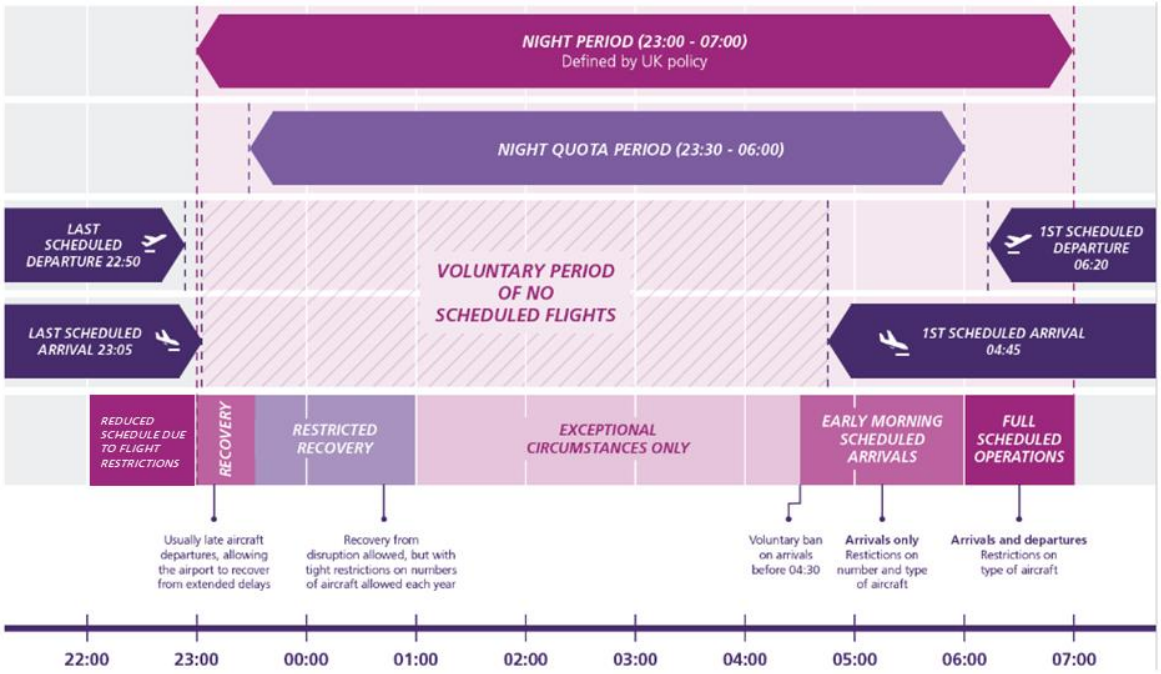


Figure 13: Hourly Timeline of Heathrow Daily Schedule & Operating Restrictions

Flights Before 06:00

The majority of flights operating in the Night Quota Period at Heathrow are scheduled to arrive early in the morning between 04:30 and 06:00.

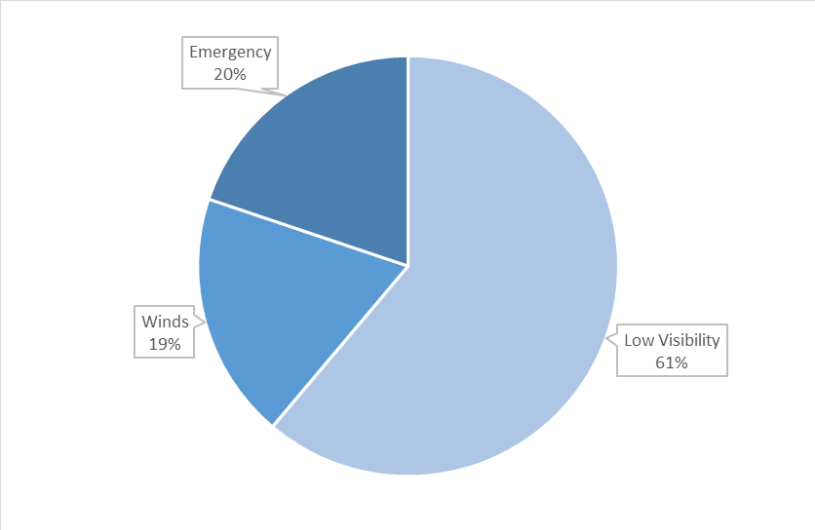
However, there are occasions when aircraft scheduled after 06:00 are authorised to land or take off prior to 06:00. These flights are permitted to operate in **exceptional circumstances only** and for reasons of significant operational disruption, medical emergencies, or if the flight was determined by the DfT to be in the national interest.

Operational disruption can include, for example, periods of poor weather that will adversely impact operations by reducing the rate at which aircraft can land or take-off. For Heathrow, given its busy schedule, operational disruption in the morning can lead to significant knock-on delays throughout the rest of the day. On occasions where the impact is significant and/or risks leading to night movements, Heathrow will consider enabling flights scheduled to arrive after 06:00 to land in the less busy period between 04:30 and 06:00 if they are able to[12]. This spreads demand over a longer period – thereby reducing the delays. Under the current regime these flights would usually be dispensed and permitted to land early, which means that the night flight would not be included in the airline's allocated night quota or movement count. Without the ability for these flights to land early there would either be:

- A significant lack of operational resilience leading to increased delays and disruption throughout the day, impacting all airlines and passengers and risking night flights at the end of the day; or
- Cancellations and inequality of commercial impact for some airlines, especially for those with scheduled flights between 06:00 and 06:30.

[12] For example, flights arriving earlier than planned due to favourable tail winds

In 2019, there were 121 additional flights authorised to land before 06:00 that were dispensed in line with DfT guidance. These flights operated over 35 days, with the predominant reason being adverse weather conditions at Heathrow – as detailed in Figure 14.



Source: Heathrow internal data

Figure 14: Flights Scheduled After 06:00 but Dispensed to Land Earlier in 2019

Flights After 23:00 and 23:30

Flights can be delayed arriving at, or more commonly departing from, Heathrow beyond the hours of the scheduled operating day. Delays can come about for many reasons beyond the airlines or airports control, most commonly adverse weather conditions (either at Heathrow or elsewhere) leading to lower rates of arrival or departure than planned, and/or technical issues preventing aircraft boarding or departure. Technical issues can arise either with the aircraft itself, the airlines' processing system(s), or with systems associated with air traffic control required to ensure the safe separation between aircraft.

The majority of delayed flights will typically operate at the start of the Night Period before the more restrictive Night Quota Period begins at 23:30. There are also occasions when aircraft encounter longer delays (late runners) and therefore seek to operate after 23:30 within the Night Quota Period (described here as restricted recovery period). Typically, these aircraft will operate before midnight and certainly before 01:00. Only exceptional circumstances would allow a flight to operate between 01:00 and 04:30.

In 2019 there were 418 flights delayed on departure and 269 arrivals delayed beyond 23:30. Of these flights, 161 departures and 138 arrivals were dispensed under the current regime. Dispensed flights are not deducted from airlines' night quota or movement count. However, they are included for the purposes of generating annual night noise contours and included in our counts of overall night flights.

If late runners and evening dispensed flights past 23:30 were not permitted under any circumstance, the only alternatives would be to divert arriving passengers to another airport or delay departing passengers to flights on following days. This would cause inconvenience for passengers and commercial impact for airlines, such as requiring overnight accommodation to be found and, in some circumstances, waiting for several days for another flight. In 2019 for example, cancelling the delayed departing flights alone would have prevented nearly 100,000 passengers from departing on their scheduled day along with the associated cargo, unable to reach planned destinations until at least the following day.

Of the 418 flights departing beyond 23:30 in 2019 nearly a third (28%, 119) departed within ten minutes by 23:40; 59% (248) departed before midnight, and all but 6% departed by 01:00. Similarly, on arrival, nearly 60% (157) of delayed flights landed before midnight. Over the years Heathrow has worked alongside airlines and air traffic control to effectively reduce and minimise both the numbers and periods of night flights operating to and from the airport. This is described in further detail later in Section 2.3.2 under 'Operational Management Procedures to Minimise Impact'.

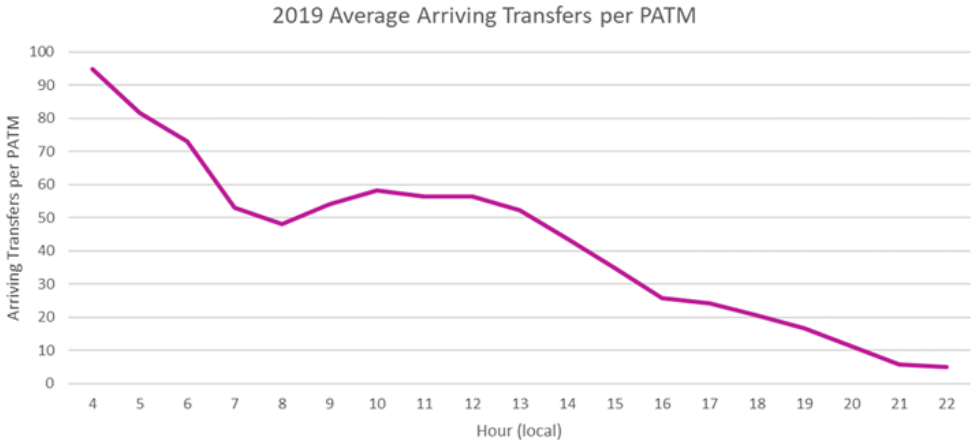
2.1.6 Scheduling Certainty & Flexibility

All major airports have some level of night-time operation and this is illustrated in Appendix B which provides examples of scheduled night-time operations from around the world. Around 80% of all movements operating during the Night Quota Period at Heathrow are early morning arrivals, arriving between 04:30 and 06:00. Compared to the rest of the day, these early morning arrivals typically have higher passenger yields and volume of transfers, due to the reasons highlighted above.

2019 Arrivals	04:00 – 04:59	05:00 – 05:59	06:00 – 06:59	07:00 – 22:59	Daily Average
Load Factor	90%	90%	86%	80%	81%

Source: Heathrow internal data

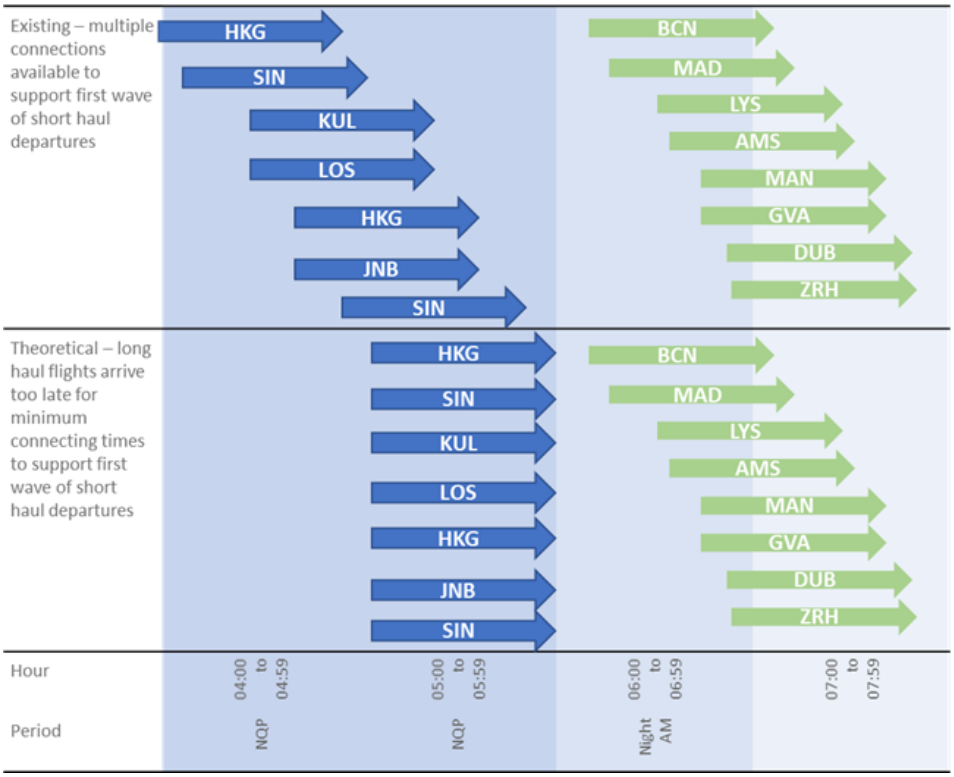
Table 1: Arrival Load Factors by Hour in 2019



Source: Heathrow internal data

Figure 15: Average Arriving Transfers per Passenger Air Traffic Movement in 2019

To illustrate the importance of early morning arriving transfer passengers, York Aviation presented a case study of the impact of lost connections between early arriving long-haul arrivals and the first wave of short-haul departures for British Airways at Heathrow.

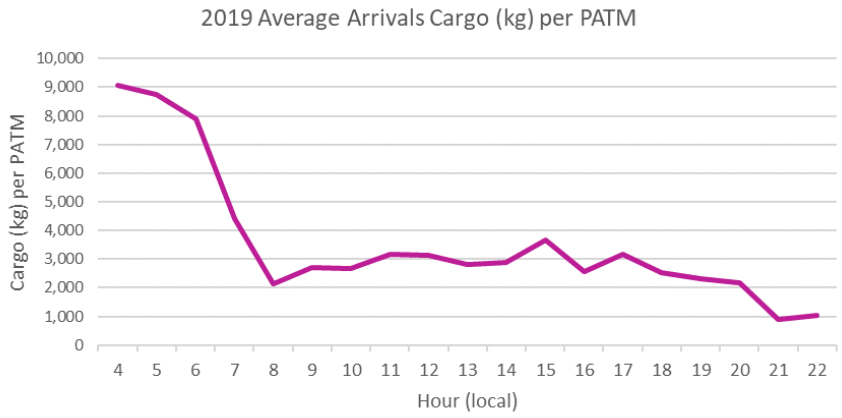


Source: York Aviation

Figure 16: Impact on BA Connections without NQP Arrivals

Early morning arrivals are particularly important for onward connections for same-day appointments and meetings, or for rapid freight delivery. This applies especially to regional connectivity. Heathrow's first wave of departures includes six routes to UK regional airports which go on to arrive before 09:00 and where typically 42% of passengers on these flights are connections (based on 2019). Without early morning arrivals, it would not be possible for connecting passengers to be on these flights. Morning business appointments and early cargo deliveries would be impossible. The economic viability of these regional connections would be called into question without these transfer passengers.

Although the early morning arrivals are passenger flights, these flights also carry a significant amount of cargo in their belly holds – more than double the amount compared to other hours of the day.



Source: Heathrow internal data

Figure 17: Average Arrival Cargo per Passenger Air Traffic Movement in 2019

As discussed above, the ability to operate after 23:00 is important to airlines to accommodate delays and to support their operations. Heathrow is aware that some community groups believe there should be no flights after 23:00 with no period of operational 'recovery' after this time. There would be a significant impact to airlines and passengers if there was no recovery period. Passengers would be forced into overnight accommodation, inbound flights diverted, and fuel burn increased owing to unnecessary taxiing if aircraft leave the stand and are unable to take off. If a flight is forced to remain overnight, then rescheduling for the next day is difficult due to capacity restrictions and the subsequent impact on operational performance, with knock-on delays for regular flights scheduled the following day.

To reduce the risk of airlines operating after 23:00, Heathrow's Scheduling Committee ensures that no new passenger departure slots are allocated to airlines after 22:40. While this limits Heathrow's available capacity in the 22:00 hour, it is something the airport supports (although airline views will vary). There are examples of airlines requesting earlier slots because of concerns about being night-stopped (for example, El Al) whilst others such as Avianca and Aeromexico would actually like to move to later slots as their 22:40 and 22:30 departures arrive in Columbia and Mexico at 03:40 and 04:25 in the morning (local time) respectively.

During Heathrow's expansion programme, the airport surveyed airlines in relation to the buffer period they would build into their schedules before the start time of any runway ban, after which flights would not be permitted. Table 2 below provides a summary of responses. Experience from two other airports with a curfew, Frankfurt and Sydney, is demonstrated. Airlines commented that night-stopped flights have knock-on effects in terms of the cancellation of subsequent flights, flight and cabin crews in the wrong locations and associated logistical problems.

	Short-Haul Arrival	Long-Haul Arrival	Short-Haul Departure	Long-Haul Departure
Low	50 mins	1 hour	1 hour 20 mins	1 hour 15 mins
High	1 hour 10 mins	1 hour 30 mins	1 hour 20 mins	2 hours 15 mins
FRA*	1 hour 5 mins		45 mins	
SYD**	20 mins	30-55 mins	55 mins	35-50 mins

** Frankfurt analysis excludes charter flights, which occasionally schedule closer to the runway ban. Frankfurt provides for an hour recovery period for arrivals only. ** Sydney short-haul refers to domestic flights only. Low/High refers to range of responses from airlines.*

Table 2: Airline Buffer Times Required Prior to Night Restrictions

The short-haul market is also reliant on a recovery period as its business model places large value on it. It allows an airline to maximise its operational day without risking aircraft being night-stopped, placing passengers and crew in the wrong locations. It also exposes airlines to the risk of EU Regulation 261 (retained in UK law following withdrawal from the EU), making them liable for compensating passengers for delays into subsequent days or cancellations.

2.1.7 Supporting the UK through COVID-19 Recovery & Post-Brexit

The global COVID-19 pandemic has had an unprecedented impact on aviation with a resulting drop in demand that is likely to be followed by a prolonged downturn. Although Heathrow believes that demand for aviation will recover, there is the potential for long-term structural changes to the industry as a result of the COVID-19 crisis. On 3 February 2021 the International Air Transport Association (IATA) announced full-year global passenger traffic results for 2020, showing that demand (measured in RPKs, revenue passenger kilometres) fell by 65.9% compared to the full year of 2019. This is by far the sharpest traffic decline in aviation history[13].

Although vaccines are now available, the restoration of global air travel has been further stalled by new outbreaks, mutations and vaccine supply. Recovery is now primarily in the hands of governments around the world, meaning passenger demand will only decouple from the effects of COVID-19 impact once an effective vaccine has been widely deployed, with virus immunity leading to the lifting of travel restrictions. Demand is thereby sensitive to the efficiency with which governments support the deployment of vaccines and the speed in which the restrictions are lifted. Already, vast differences can be observed between countries in the speed of worldwide vaccine administration and uptake (see Figure 18 and Figure 19 below).

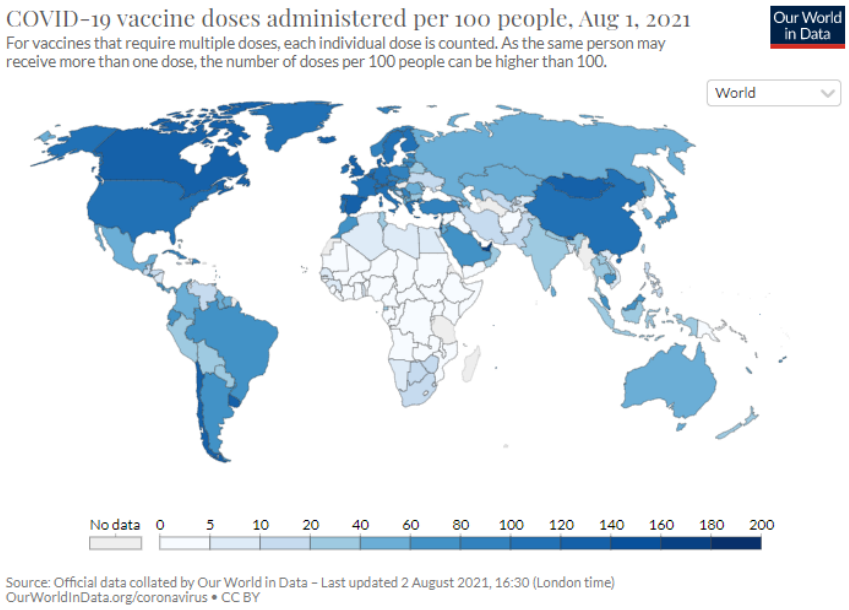
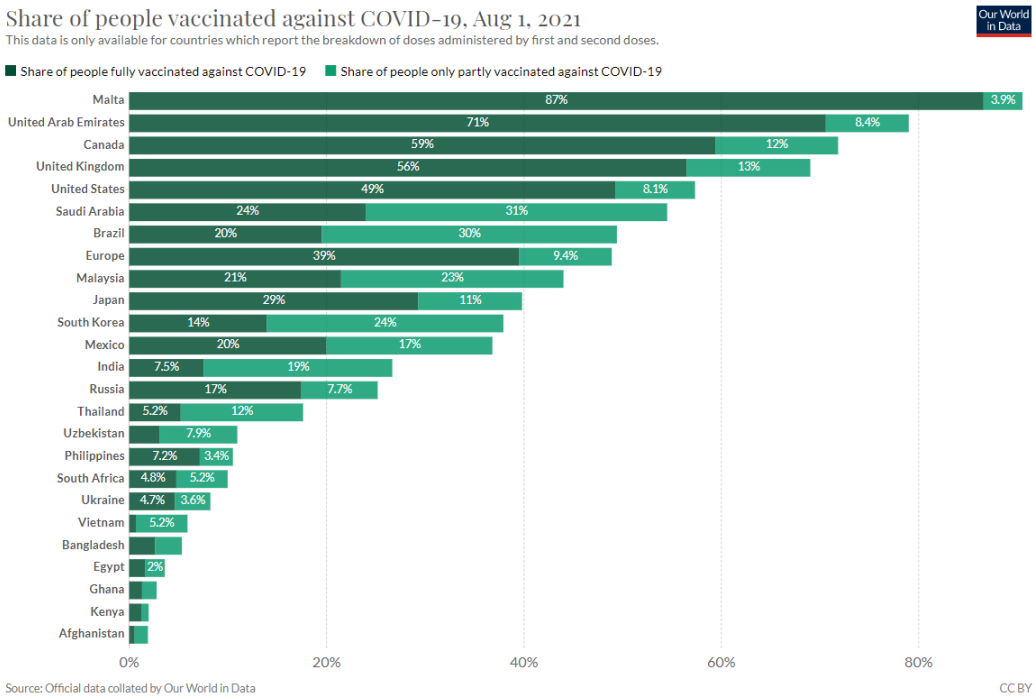


Figure 18: COVID-19 Vaccine Doses Administered per 100 People Globally by August 2021

[13] 2020 Worst Year in History for Air Travel Demand



Source: Our World in Data, 1 August 2021

Figure 19: Percentage of Population (Selected Countries) Vaccinated by August 2021

Equally, significant differences in the speed in which travel restrictions are being lifted are being seen. The UK Government has set out a cautious approach where testing is required for all international travel, regardless of whether a passenger has been fully vaccinated. Leisure travel is only advised for a handful of countries and for some countries, direct flights to/from the UK have been banned altogether. Entry requirements vary widely; ranging from countries like North Macedonia which does not require a test or proof of vaccination to enter, to countries like Singapore which, on arrival, requires a two-week quarantine period in a government designated hotel in addition to testing.

Economists and forecasters have tried to liken the pandemic and its impact on aviation to previous shock events such as the Icelandic ash cloud of 2010 or the SARS crisis of 2003. However, it is the economic impact that will have a longer-lasting effect once travel restrictions are lifted and consumer confidence returns, making it more akin to the global financial crisis of 2008 – which took three further years to recover. The shock of COVID-19 is deeper and more prolonged than this, so previous shocks can only be used as a guide for determining a recovery period. This generates significant unpredictability around the rate of recovery and in particular, the timing that will see aviation return to 2019 levels of activity and revenue. The UK has additional uncertainty following Brexit and how this will affect the global appetite to trade with Britain.

There are still a number of possible scenarios for how long it will take for passenger numbers to recover from COVID-19. Heathrow's forecasts suggest that the earliest it could return to 2019 levels would be in 2024, but that this may take until 2029. Others in the industry have similar expectations.

IATA's baseline forecasts indicate that passenger volumes will return to 2019 levels in 2023. However, by 2025 there is a mathematical confidence range of around 4 trillion revenue passenger kilometres (RPKs) in this, illustrating the scale of uncertainty.

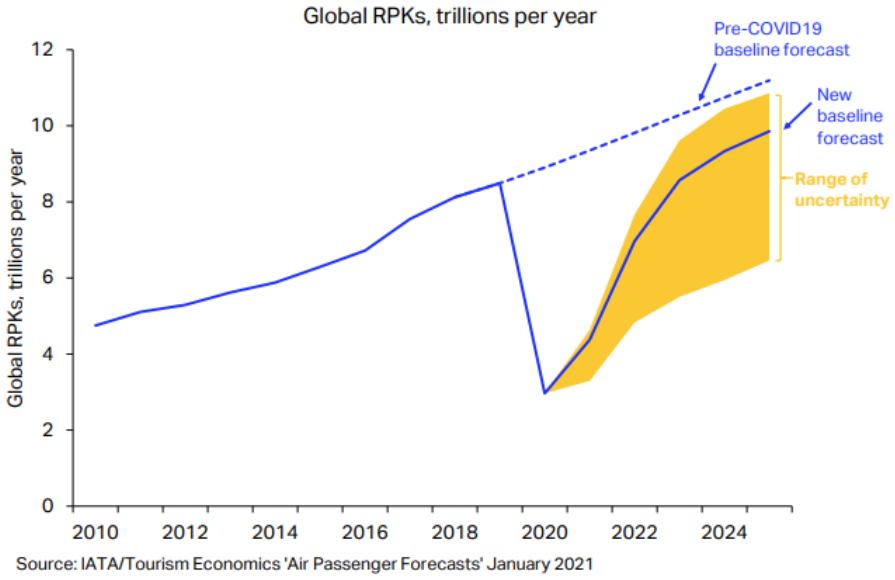
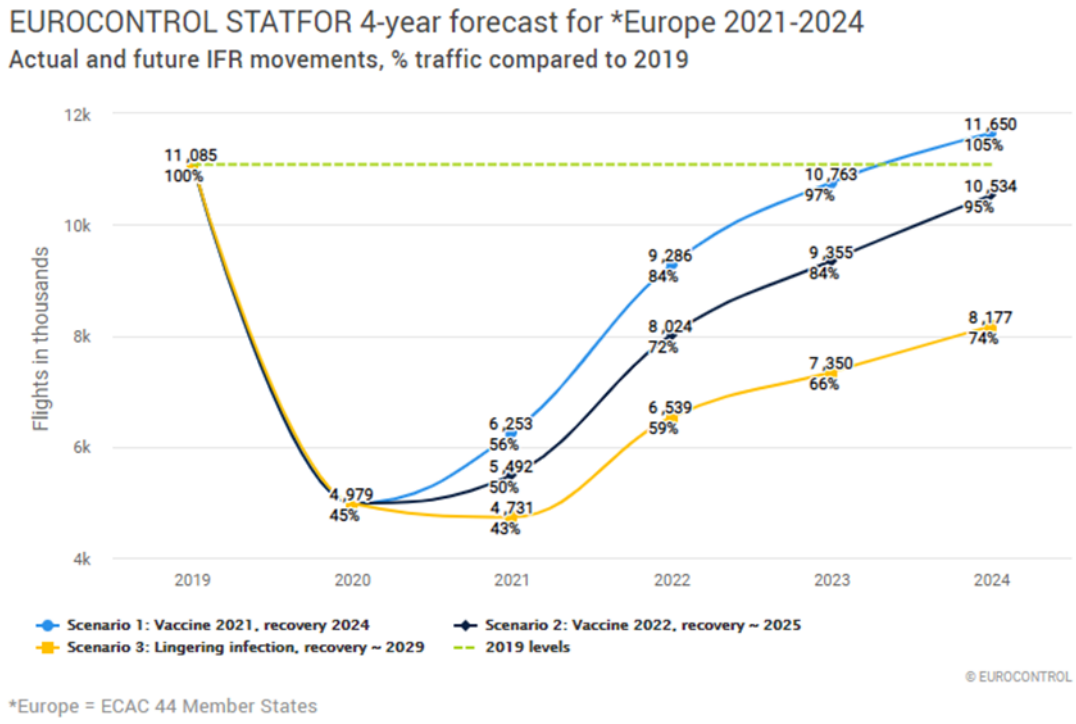


Figure 20: Global Revenue Passenger Kilometres (RPKs) 2010-2025

Forecasts from EUROCONTROL consider three scenarios, where the level of recovery by 2024 ranges from 74% to 105% – again indicating the wide-ranging view on the expected rate of recovery.

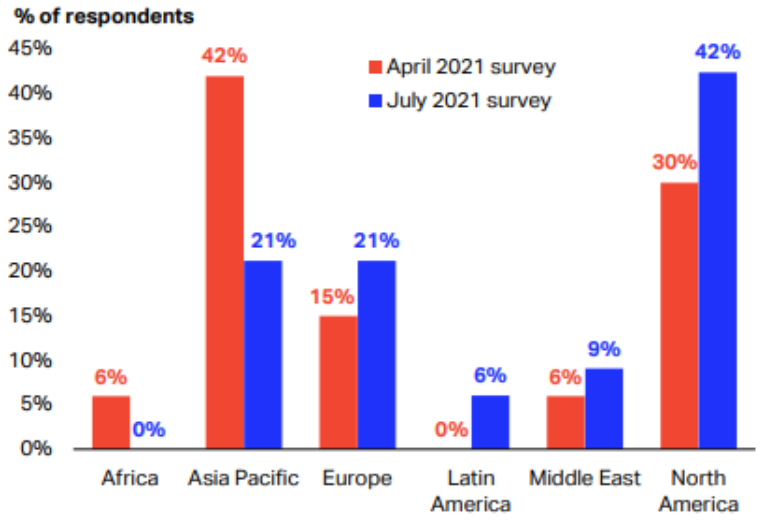


Source: EUROCONTROL May 2021

Figure 21: EUROCONTROL Aircraft IFR Movement Forecast 2021-2024

In addition to the uncertainty of the timing of traffic recovery, there remains the uncertainty of how and where it will recover. The type of passenger demand is likely to change over this period, depending on the rate of recovery within each country. This could result in the traffic mix changing: if Europe recovers more

quickly than other continents then it would drive a short-haul, high frequency schedule at Heathrow. IATA's Business Confidence Index[14] survey of airline CFOs and Heads of Cargo shows how views on market recovery have changed in just three months, with 42% of July 2021 respondents expecting the first region to recover to 2019 levels to be North America, however Asia Pacific was the front-runner in the April 2021 survey (Figure 22 below).



Source: IATA Business Confidence Index Survey, 2021

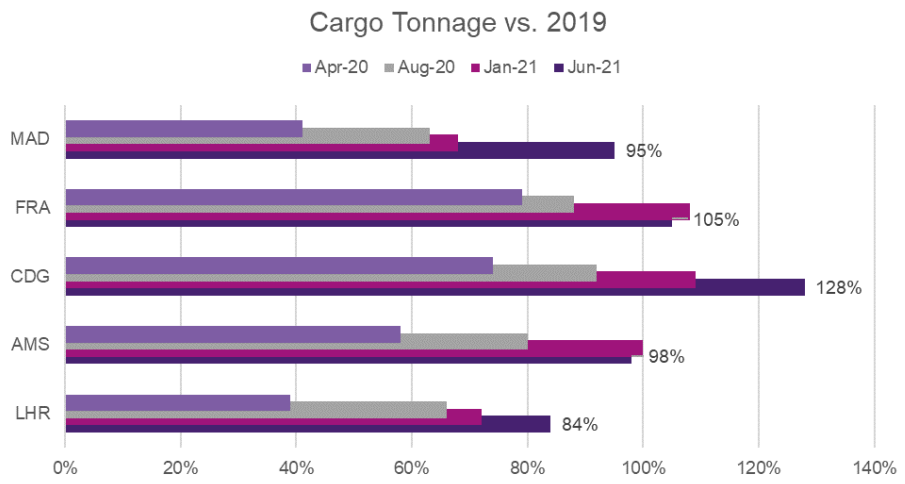
Figure 22: IATA Survey on Aviation Industry COVID-19 First Region to Recover

Even once it reaches 2019 levels, the traffic mix may be quite different in the future. It is important therefore for airports to provide flexibility in their schedules, including hours of operation, to accommodate changes in growth in the market. Any new restrictions impacting this flexibility could hinder the rate of recovery.

Heathrow and the aviation industry in general have had limited support from the Government or the CAA during this crisis and any recovery remains highly uncertain. Decisions such as the removal of VAT refunds on tax-free shopping from January 2021 will further impact industry recovery. As night flights are the most economically valuable and have the highest passenger and freight customer demand, they will be vital in rebuilding the UK's aviation network. Any further restrictions will impact the UK's economic recovery and, regardless of a COVID-19 recovery, will limit the UK's ability to be the desired global trading nation post-Brexit.

The performance of cargo operations has held up better than passenger operations although not as well as other European hubs. Figure 23 shows how Heathrow (in June 2021) had recovered to 84% of 2019 levels. However, Frankfurt, Schiphol and Charles-de-Gaulle had fully recovered by the end of 2020.

[14] IATA Airline Business Confidence Index July 2021 Survey



Source: Available monthly traffic reports for European airports

Figure 23: Monthly Cargo Tonnage in 2020 & 2021 vs. 2019 by European Airports

IATA forecasts that air cargo generally should recover significantly faster than commercial passenger operations, reaching 2019 levels potentially as early as 2021. Despite this, the volatile operating outlook for aviation is likely to continue for several more years.

2.2 Health & Quality of Life Impacts

2.2.1 Relationship between Transportation Noise Exposure & Health Impacts

It is important to recognise that much of our understanding of the health effects associated with transportation noise relates to exposure from road, rail and air transport sources. The World Health Organisation (WHO) recognises that the scale of impact from road transport noise exposure is many times higher than from rail and air transport; understandably this has been where much of the academic research has been focused.

The research has also been focused on exploring and debating 'dose-response' relationships between different health outcomes and noise metrics. An example of this is shown in an academic paper from 2018 (and subsequent response papers) issued following the publication of the WHO Environmental Noise Guidelines for the European Region[15].

The body of research conducted over several decades leaves little doubt that there are health effects associated with transportation noise exposure. Heathrow's understanding of the status this research has reached is summarised in Table 3 below.

[15] A Systematic Review of the Basis for WHO's New Recommendation for Limiting Aircraft Noise Annoyance

EFFECT	SPECIFIC OUTCOMES	KEY METRICS USED	CURRENT STRENGTH OF THE EVIDENCE
Cardiovascular	Hypertension Coronary Heart Disease (CHD) Acute Myocardial Infarction (AMI) Stroke	L_{den}, L_{eq}16hr and L_{eq} 24hr	Sufficient
Self-reported sleep disturbance	Interference with falling asleep Awakening/Interference with staying asleep	L_{night} and L_{max}	Sufficient
Objective sleep disturbance	Awakenings	L_{night} and L_{max}	Sufficient
Cognitive development	Reading Standardised test scores	L_{eq}, L_{den} and, for a few studies, L_{max}	Sufficient
Annoyance	Bothered, disturbed or annoyed by noise at home	L_{eq} 24hr, L_{den} and L_{dn}	Sufficient
Hearing impairment	Loss in hearing	L_{eq} 8hr (individual exposure)	None at <75dB(A)
Mental health, wellbeing and quality of life	Wellbeing Quality of life Psychological symptoms Psychological illnesses e.g. depression, anxiety Medication for psychological illnesses	L_{eq} 8hr (individual exposure) L_{eq}16hr and L_{eq} 8hr	Inconclusive

Table 4.1 Strength of evidence for health and quality of life effects from environmental noise

Table 3: Strength of Evidence for Health & Quality of Life Effects from Environmental Noise

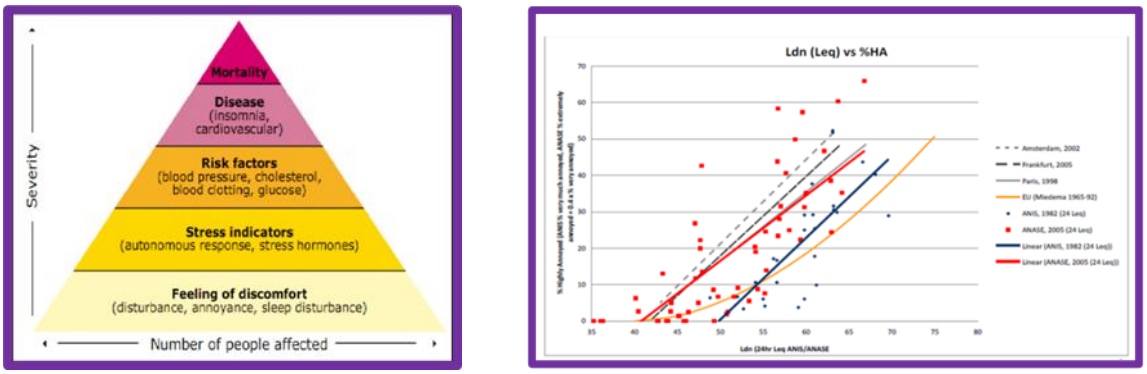
Heathrow also notes that over the course of this consultation period the CAA has published CAP2161, entitled "Survey of Noise Attitudes 2014: Aircraft Noise and Sleep Disturbance". It is noted that the study is described as exploratory and the findings considered only indicative, since the original survey was not designed to investigate sleep disturbance and noise. The study does make some general points in relation to sleep disturbance that provide helpful context. It states, for example, that achieving the WHO 40dB(A) L_{night} target would require almost the complete closure of all transport systems. It also highlights that studies based on self-reported sleep disturbance can result in an overestimate of the impacts and previous UK research on aircraft noise and sleep disturbance have relied upon objective measures of sleep using actigraphy and EEG (electroencephalogram). It cites a few studies based on objective measures and starts to consider how these could inform future UK studies.

There are several findings within the study that are of interest to the night flight policy discussion. Heathrow noted that:

- around 90% of the households surveyed had chosen to live where they do and more than half had done so in the past decade;
- there was no significant relationship between self-reported health ratings and sleep disturbance or with summer night $L_{Aeq,\ 8\text{-}hour}$ and the same was true for the relationship between self-reported mental well-being and summer night $L_{Aeq,\ 8\text{-}hour}$;
- there is potentially a relationship between self-reported mental well-being and self-reported sleep disturbance;
- there is a need to better understand the impact of non-acoustic factors;
- there was insufficient evidence to change from the current practice of using average summer night $L_{Aeq,\ 8\text{-}hour}$ noise exposure for UK assessments; and
- the authors made recommendations of areas for further research.

Heathrow supports the need for further research to help inform and evolve policy and this is now discussed below.

The concept of a pyramid of health effects has existed since the early 1970s and was first developed by WHO in the context of air pollution impacts. Later adapted by Babisch and published in documents such as the EEA technical report "Good practice guide on noise exposure and potential health effects", the pyramid conceptually represents the scale of health effects for a given exposed population. This essentially reflects the relationship or pathways between noise exposure and the 'established' dose-response relationships for increasingly severe impacts in relation to a certain exposure time. The dose-response relationship represents a mathematical line of best fit, often calculated from the results of many different studies in different locations and with different local circumstances and cultures. Figure 24 illustrates this point.



Source: WHO 1972, modified Babisch 2002

Figure 24: Health Effects Modified for Noise Exposure & Sample Dose Response Relationships

These diagrams don't illustrate the gaps in understanding that currently exist or show how they potentially impact on the scale of harmful effects. In Heathrow's view there are two essential areas that require better understanding.

1. First, for a given population exposed to a noise level, what are the non-acoustic factors that determine whether they are likely to 'join the pyramid pathway' and can these be modified?
2. Second, how effective are existing and potential interventions at reducing the numbers at risk of any particular health impact?

The diagram in Figure 25 below adapts the pyramid concept to illustrate this point, showing that the effectiveness of any intervention needs to be measured to determine its reduction of the severity of impact and the overflown population, as well as understanding the effects of non-acoustic factors.

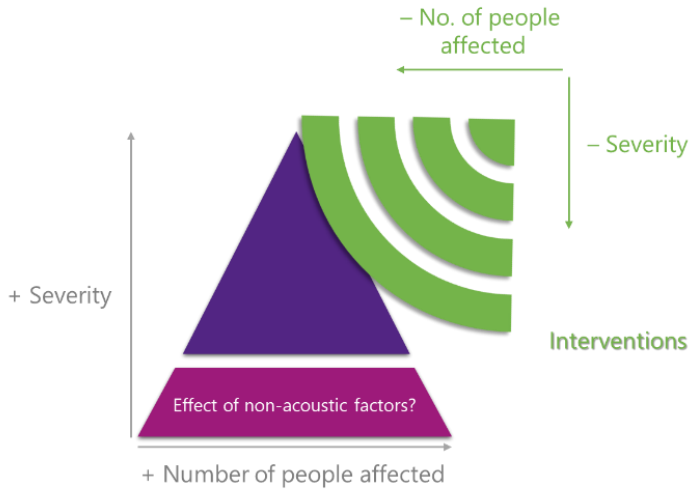


Figure 25: The Effect of Non-Acoustic Factors & Noise Management Interventions

2.2.2 The Need for More Research to Support Policy Development

Whilst the academic debate is of interest and should continue, it has been at the cost of not focussing research in areas that could be of most help to policy makers. There has been much less attention given to the non-acoustic factors (see Figure 26 below) that influence how individuals respond to different sound levels and sources. Yet these are increasingly cited as being as, if not more, influential in shaping the human response to noise levels. Of even more significance to policy makers and airport (or wider transportation) noise managers is the lack of research into the effectiveness of potential management interventions to mitigate harmful effects, for example, the effectiveness of runway rotation or noise insulation schemes.

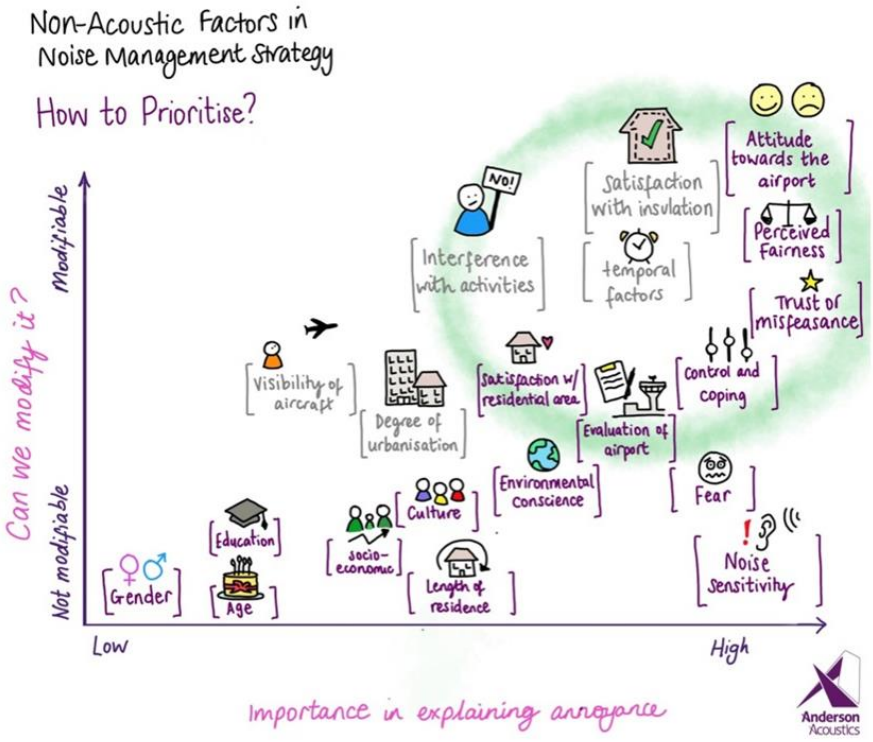


Figure 26: Non-Acoustic Factors in Managing Noise Annoyance

Equally there is little research into the overall impacts of aviation on quality of life and wellbeing. It is Heathrow's view that a more holistic assessment of the impacts of aviation is needed. This is a view shared with other airports, academics and experts which resulted in a paper for Inter-Noise 2018[16], the 47th International Congress and Exposition on Noise Control Engineering held in Chicago, Illinois. It set out collective thoughts on a 'Research Roadmap for Airport Noise'. Figure 27 below provides a simple summary of the paper.

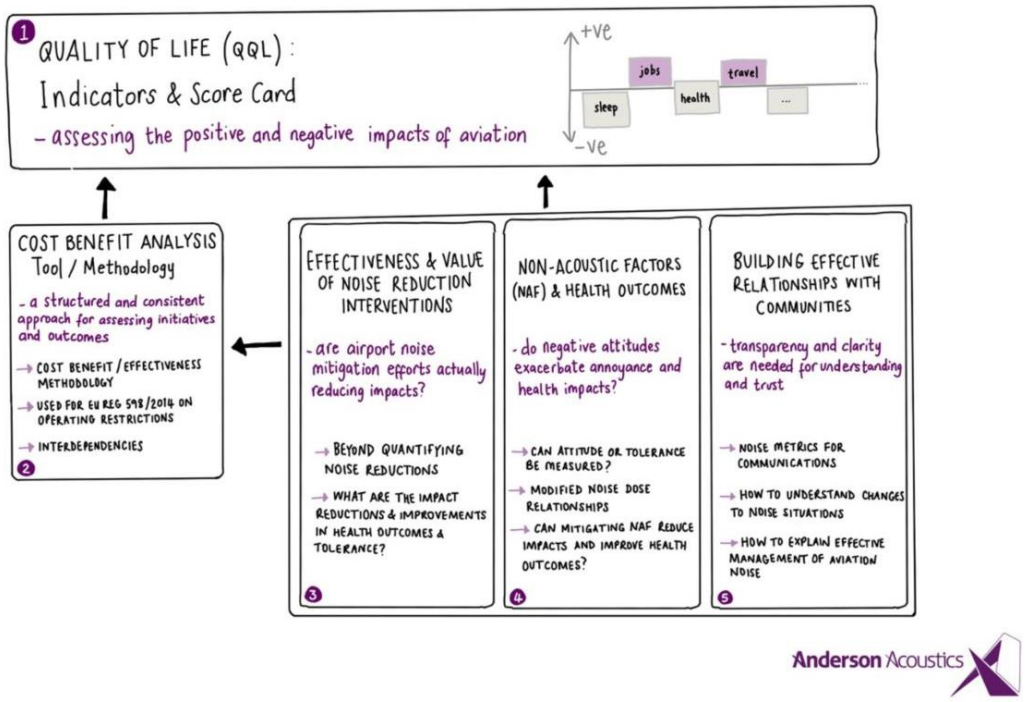


Figure 27: Inter-Noise 2018 Research Roadmap for Airport Noise

Of course, there are wider considerations for policy makers as they need to weigh up the impacts of noise policy within a wider social, economic and environmental context. This is highlighted within European legislation under EU Regulation 598/2014 (amended and retained in UK law through the Aviation Noise (Amendment) (EU Exit) Regulations 2019), which sets out in its introductory text (recital (1)) that the key objective of transport policy is sustainable development and states that:

> *"this requires an integrated approach aimed at ensuring **both** the effective functioning of … transport systems and protection of the environment."*

This provides a useful context in which to consider potential policy options for aviation noise exposure at night and, given that much higher numbers of people are impacted by road and rail noise, the potential policy implications for other transport noise sources operating at night.

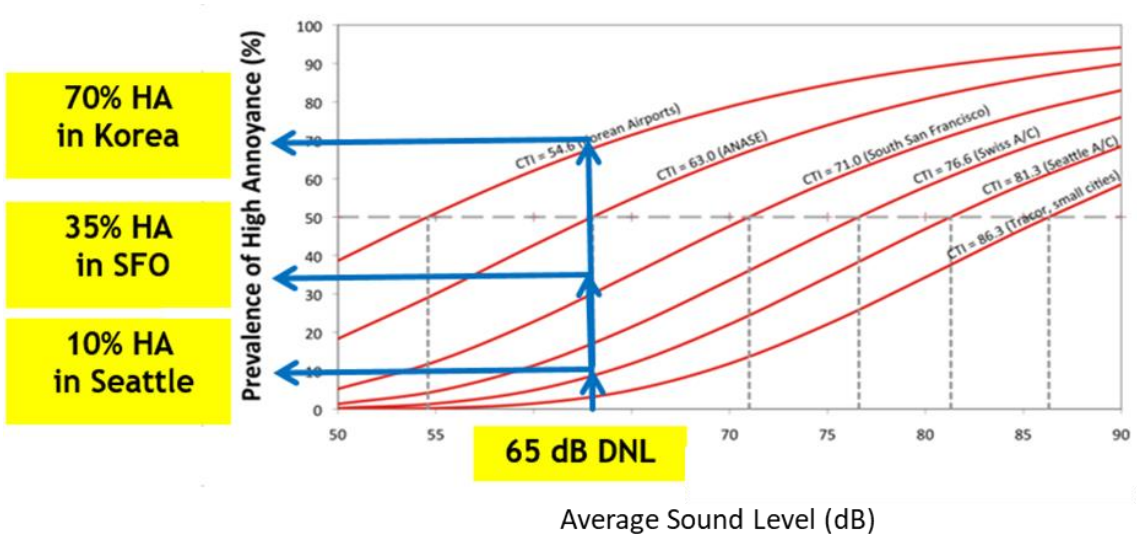
2.2.3 Different Locations Require Different Solutions

Figure 28 below highlights the importance of understanding the local situation, as well as demonstrating that levels of annoyance (and potentially other associated health impacts) within a given population are a response to acoustic as well as non-acoustic factors. In relation to night flights this could, for example, be the difference in subjective versus objective sleep disturbance studies (potentially eliminating some non-

[16] https://internoise2018.org/

acoustic factors) and/or the effectiveness of sound insulation in reducing sleep disturbance. These are two areas to explore but there are several others suggested by this consultation which are of equal interest.

Given the WHO recommendation that where possible local studies should be used, there is a clear need to articulate a structured research programme to help address these issues and in doing so, provide better evidence for policymakers and stakeholders. That is not to say that no progress is made while awaiting this type of research, but many interventions to date have no objective evidence upon which to quantify their value. Without a better understanding of these matters, it is difficult to identify the best interventions to adopt in reducing the harmful effects, or to understand how effective existing interventions have been at managing aviation noise (or noise from other transport sources) at night.



Source: Lochard User Conference

Figure 28: Prevalence of Annoyance for Selected Global Locations

The consultation identifies noise management interventions that are currently, or could be, used to mitigate the noise impacts. However, it does not provide the supporting evidence to enable respondents to objectively determine the most cost-effective measures. Heathrow would like to see the DfT provide the direction for a research programme aimed at improving the ability to assess noise management options at the airport.

Without this work the debate will remain entrenched and focused on either tighter operating restrictions as the only solution, or passive reliance on natural fleet replacement. The work could be led by ICCAN, which has expressed its intention to focus on research as one of its three strategic priorities. It could be supported by a balanced panel of experts and stakeholders in the way ICCAN has suggested. Measures such as night-time runway rotation, noise insulation, operating procedures, and time sensitive interventions are amongst those that require better understanding. Heathrow would welcome the opportunity to be part of a balanced stakeholder group supporting this work.

2.3 The Existing Regime

It is important to acknowledge that night flying restrictions represent only one aspect of the ICAO Balanced Approach for any noise management strategy. This provides an important context to the need for, and assessment of, the existing night flight regime.

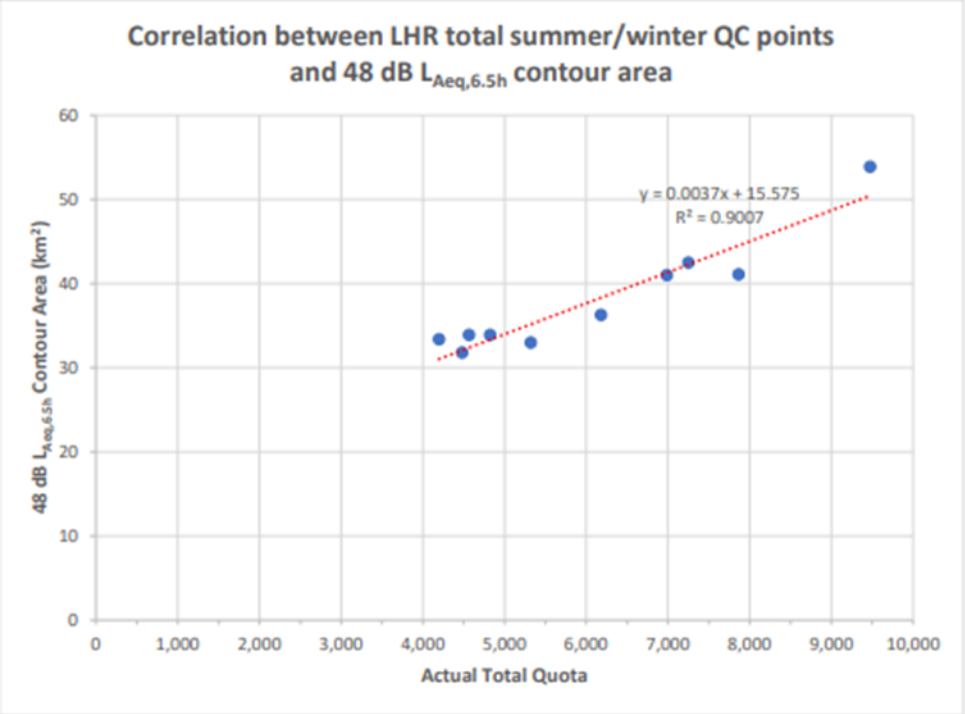
The current Quota Count system has been in place at Heathrow since 1993 and although the core structure of the regime has remained, there have been several amendments and voluntary initiatives that have helped deliver an improved night noise climate at the airport. Heathrow's view on the structure and its effectiveness is set out below.

2.3.1 Structure of the Existing Night Flying Restrictions Regime

The QC system is internationally widely recognised as an effective noise management tool and has the advantage of enabling both proactive day-to-day management of operational performance and seasonal schedule planning within a noise budget.

The QC system assigns a single numeric value to an individual aircraft based on the noise level generated by that aircraft. For example, a QC4 aircraft is noisier than a QC2, which is noisier than a QC1 etc. Values may differ for an arrival or departure for the same individual aircraft. The same type of aircraft may have a range of QC values based on its engine and weight configuration.

By summing the individual points across all flights from an airport, it is possible to correlate this with noise contour area outputs (see Figure 29 taken from Appendix E), making the QC system a good tool for proactively managing aircraft noise in an operational environment. Operational noise levels do not need to match the certification levels used to calculate the QC value, since it is the relative relationship that is important in this context.



Source: CAA data (see Appendix E)

Figure 29: Correlation between Heathrow Summer/Winter QC Points & Noise Contour Area

As Figure 29 shows above there is a strong correlation between the changes in total QC points used and the 48dB $L_{Aeq, 6.5\text{-hour}}$ contour area. Heathrow also analysed data for the 8-hour Night Period and found that there were also good correlations with the 50dB(A) and particularly the 60dB(A) L_{night} contour areas[17].

This relationship enables limits to be set and proactively managed to support goals to limit or reduce contour areas. The fact that it has been replicated at several other major airports around the world demonstrates that it is widely considered as a robust system. One of the challenges Heathrow sees is that the connection between QC budgets as a management tool, and the reduction in the number of people who are sleep-disturbed, for example, is rarely made – meaning that community stakeholder groups often have little faith in the QC system. Heathrow's view is that the Government could do more to draw out and demonstrate this relationship by for example, illustrating how changes in the QC budget would result in changes to the noise exposure contour areas.

Heathrow recognises that there is general support for an aircraft movement limit from community noise groups and equally that some industry stakeholders highlight that there has been no increase in scheduled movements between 23:30 and 06:00 since the regime began, despite significant changes to flight timings and reduction in noise exposure levels. This means that any benefit of investment in new technology used between 23:30 and 06:00 has accrued to local communities. At the same time, there has been an increase in scheduled movements in the 06:00 to 07:00 hour of the Night Period and this is well known as the busiest hour for arrival demand at Heathrow. It means that the airport will routinely operate in Tactical Enhanced Arrivals Mode (TEAM) during this hour, which allows both runways to be used for arriving aircraft. The opportunity to provide predictable respite in this period, therefore, is limited.

Over the past few years, Heathrow has commissioned independent consultants[18] to conduct focus groups involving residents without strong views in favour of, or against expanding Heathrow. These sessions included discussions on the structure of night flight restrictions, the need for night flights to occur and the construct of a noise objective. Residents were able to grasp the concept of a noise budget in the form of a QC system and how that could be used to reduce noise. They recognised that this could mean more aircraft movements. They also saw the need for some sort of recovery period, acknowledging the relatively small number of flights involved, versus the economic and passenger impacts.

[17] See Appendix B

[18] Stonehaven research used for internal policy development

Residents Focus Group Case Study – Night Flight Bans

The idea of introducing a fixed and inflexible ban on night flights worried focus group participants, both as residents and as passengers. Their feedback focused on the economic impacts and the emotive prospect of delayed holidays, and subsequently a fixed night regime (i.e., no flexibility or period of recovery) was perceived negatively across all groups. They were concerned it would be too disruptive to passengers – identifying delayed flights, cancellations, diversions and increased costs as potential risks.

It was also considered as an unrealistic option for Heathrow to implement. If a flight needs to land in an emergency or because of delay at the point of departure, this is not Heathrow's fault and beyond its control. They also noted that if they were impacted by a late-night flight, diverting it to another airport would have the same impact to residents there.

The groups were also concerned that if Heathrow had to implement such a ban, airlines would look elsewhere and stop using Heathrow. Some spoke of the economic knock-on impacts to local businesses and the economy nationally if there wasn't a recovery period, or if the recovery period began much earlier in the evening. Participants voiced concerns over the potential financial costs being placed on passengers on late evening flights to protect airlines from potential penalties.

When discussing an alternative plan that would remove any recovery period and implement a ban after 23:00, most residents instantly adopted the mindset of passengers instead of residents. Faced with the trade-off of passenger impacts such as delays, diversion, or cancellations versus the impact to residents, participants felt that residents would face a lesser impact. Likewise, the financial trade-off between the impact to residents versus the potential cost to passengers meant that the groups were able to sympathise with passengers. Most had experienced delays, while others had travelled for business or leisure and noted that they would prefer to take the flight and impact residents, rather than face delays or cancellations.

The current structure of the regime means that the number of movements before 06:00 is limited and over the three decades of the regime's existence, Heathrow has not sought to increase operations before this time. In essence this position has been supportive of the existing structure. This has not typically been an industry-wide or stakeholder-wide position; the Airports Commission observed that there would be a strong economic case for more night flights at a constrained Heathrow. Community action groups would argue that fewer, if not zero, flights should operate before 06:00 – so the debate is clearly polarised. The evidence for restricting flights from 06:00, as opposed to 05:30 or 06:30, is at best limited and largely anecdotal.

Heathrow feels there are several aspects of the current structure that should be explored. For example, whether the use of both a movement and a QC limit is necessary, or a particular period should be protected. However, this needs to be considered with better evidence and **only once the noise abatement objective has been established**, to enable the most cost-effective measures for achieving the desired outcomes to be identified.

There are other aspects of night restrictions that should remain. For example, to protect the schedule in the 22:00 hour and enable operational resilience, provision for late-running operations should be retained. Heathrow has made significant progress in reducing the number of late running aircraft. All stakeholders from passengers to local communities wish to see this situation happen as seldom as possible, but the reality is that delays will occur. A 'hard stop' or complete ban creates a scheduling shadow that reduces capacity in the evening period leading up to a hard stop deadline.

Dispensations should continue to be a necessary part of any future regime since they are by their nature a response to significant and unpredictable events. Heathrow does acknowledge, however, that there are opportunities to improve the process which is discussed later in this response in Section 3.6.

In Heathrow's view, it is also important that night restrictions continue to reflect the eight-hour Night Period and it supports the use of QC as a management tool. In contrast, an aircraft movement limit would offer no incentive to invest in new technology and would seem at odds with the Government's stated policy aim of sharing the benefit of new technology between industry and community. It would also weaken Heathrow's ability to compete with the other major European hubs.

2.3.2 Effectiveness of the Existing Night Flying Restrictions Regime

It is difficult to determine whether the night flight regime has significantly affected, or more simply reflected, the improvements seen over the course of its application. This is because apart from one instance of a contour area target being set, establishing expected outcomes has not been a feature of the regime to date. On the basis that the Government's current policy objective is to:

> *"…limit or reduce the number of people significantly affected by aircraft noise at night, including through encouraging the use of quieter aircraft, while maintaining the existing benefits of night flights*[19] *"*

…it can be argued that there has been progress. However, without any expected outcomes being set, the extent to which progress has exceeded or fallen short is a moot point.

What can be evidenced is a significant reduction in the noise contours and other indicators since the start of the regime. Unfortunately, Heathrow does not have detailed data dating back to this time, but it has been able to assess the last twenty years. It should be noted that the aircraft noise contour (ANCON) model[20] used to calculate figures in 2001 has been updated several times since.

As Table 4 shows below, the 50dB 8-hour night noise contour area has reduced by 20% between 2001 and 2019. The number of people highly sleep disturbed has reduced by 26% without encroachment and by 9% including encroachment. Similarly, the 48dB 6.5-hour night noise contour area has reduced by 41%, and population contour by 35% without encroachment and 17% with encroachment since 2006. At the same time aircraft movements have remained static in the Night Quota Period and have increased by 25% over the longer Night Period.

Indicator	Metric	Earliest Data Available (Year)	2019	% Change
Health & Noise Exposure	Highly Sleep Disturbed Population	(2001) 25,441	23,130	-9%
	Highly Sleep disturbed Population ***without*** *encroachment**	(2001) 25,441	18,885	-26%
	Highly Annoyed Population	(2001) 81,526	63,755	-22%
	Highly Annoyed Population ***without*** *encroachment**	(2001) 81,526	53,744	-34%

[19] https://www.gov.uk/government/publications/aviation-policy-framework

[20] https://www.caa.co.uk/Consumers/Environment/Noise/Features-of-the-ANCON-noise-modelling-process/

Indicator	Metric	Earliest Data Available (Year)	2019	% Change
	8hr contour area *(L_{night} 50dB)*	(2001) 90.2	72.2	-20%
	6.5hr contour area *(L_{Aeq} 48dB)*	(2006) 56.4	33.4	-41%
	8hr contour population ***with** encroachment* *(L_{night} 50dB)*	(2001) 251,900	228,500	-9%
	8hr contour population ***without** encroachment* *(L_{night} 50dB)*	(2006) 207,200	188,200	-9%
	6.5hr contour population ***with** encroachment* *(L_{Aeq} 48dB)*	(2006) 137,400	114,000	-17%
	6.5hr contour population ***without** encroachment* *(L_{Aeq} 48dB)*	(2006) 137,400	89,500	-35%
	Yearly QC allowance *Winter + summer season combined*	(1998) 13,200	8,025	-39%
	Average QC per movement *Winter + summer season combined*	(1998) 1.62	0.81	-50%

Indicator	Metric	Earliest Data Available (Year)	2019	% Change
Operational & Economic	All Movements	(1991) 381,726	478,060	+25%
		(2001) 463,568	478,060	+3%
	All Passengers	(1991) 40,304,506	80,892,802	+101%
		(2001) 60,448,172	80,892,802	+34%
	All Cargo (kg)	(1991) 661,111,276	1,588,171,197	+140%
		(2001) 1,180,338,903	1,588,171,197	+ 35%
	Movements *23:00 - 23:30*	(2001) 2,481	2,932	+18%
	Movements *23:30 - 00:00*	(2001) 442	407	-8%
	Movements *00:00 - 04:30*	(2001) 613	270	-56%

Indicator	Metric	Earliest Data Available (Year)	2019	% Change
	Movements *04:30 - 06:00*	(2001) 4,589	5,217	+14%
	Movements *06:00 - 07:00*	(2001) 15,506	20,345	+31%
	Movements *Night Quota Period (23:30 – 06:00)*	(2001) 5,644	5,894	+4% *
	Movements *Night Period (23:00 – 07:00)*	(2001) 23,631	29,171	+23%
	Passengers *Night Quota Period (23:30 – 06:00)*	(2001) 1,382,507	1,615,398	+17%
	Passengers *Night Period (23:00 – 07:00)*	(2001) 4,581,431	6,519,264	+42%
	Cargo *Night Quota Period (23:30 – 06:00)*	(2001) 38,273,710	48,678,693	+27%
	Cargo *Night Period (23:00 – 07:00)*	(2001) 164,415,501	192,670,684	+17%
	Cargo *Half hour 23:00 - 23:30*	(2001) 11,657,099	20,866,938	+79%
	CDA *Night Quota Period (23:30 – 06:00)*	(2001) 83%	96%	+13%
	CDA *Night Period (23:00 – 07:00)*	(2001) 73%	93%	+20%
	CDA *06:00 hour*	(2007) 86%	92%	+6%

** Number is subject to dispensations and therefore fluctuates every year. e.g., a change of a– 4% would result if calculated between 2002 and 2019 as supposed to +4% when using 2001 as the reference year.*

Table 4: Long-Term Change in Health, Noise Exposure, Operational & Economic Indicators

It is important to recognise that night flying restrictions are just one aspect of a much wider approach to noise management. It is key to the principles of the ICAO Balanced Approach that in assessing the effectiveness of the strategic approach to reducing the impacts of noise, all aspects are considered. Heathrow has therefore considered the change in the aircraft fleet, operational procedures and management interventions, land use planning and mitigation, and the regime itself. These aspects are briefly discussed below.

Fleet Changes

The evolution of the commercial aircraft fleet is a gradual process. It is therefore difficult for any stakeholder to accurately reference the historic noise climate against the present day. At any point in time, there will be noisier and quieter aircraft relative to each other and inevitably the quieter, modern aircraft of today will become the noisier aircraft of the future.

To illustrate the scale of the change in fleet that has occurred at night, Heathrow commissioned the Environmental Research and Consultancy Department (ERCD) of the CAA to compare the impact of the Boeing 747-100 aircraft type, which regularly featured in the schedule of early morning arrivals in 2001, with today's equivalents.

Sound Exposure Level

Occasional loud noise is measured in the UK by Sound Exposure Level (SEL). Studies have found that SEL above 90dB(A) generally leads to sleep disturbance. SEL footprints can be used to work out the areas where departing aircraft create a SEL over 90dB(A) to inform decisions about whether a particular type of aircraft should be permitted to operate at night[21].

The arrival 80dB(A) and 90dB(A) SEL footprints for the Boeing 747-100 (ANCON type B741) operating at Heathrow in 2001 were compared to the Boeing 777-300ER (ANCON type B773G) and Airbus A350-900 (ANCON type EA359), both operating at Heathrow in 2019, for Runway 27L. The comparison showed at least a 58% and 74% improvement in the 80dB(A) and 90dB(A) SEL contours respectively. Appendix E provides full details of the change in area, population, and household estimates.

Quieter Operating Procedures

Although CAA did not have any suitable published examples of SEL footprints to illustrate the effects of changes in arrival procedures, its 2017 report 'CAP1554 Review of Arrival Noise Controls[22]' provides relevant information on the noise benefits arising from the use of:

- Continuous Descent Operations (CDO) – providing up to about 4dB noise benefit;
- Low Power/Low Drag (LP/LD) – providing up to about 3dB noise benefit; and
- Reduced landing flap – providing up to about 0.5dB noise benefit.

For ease of reference the relevant sections of this report are included in Appendix E. The noise benefits from the procedural changes above are portrayed by the report in an individual and cumulative manner for the Boeing 777-300ER along the extended runway centreline.

In addition, Figure 30 below shows a comparison between the 90dB(A) SEL footprint of an A380 and a B744R used to determine the boundary of the current Heathrow Night Noise Insulation Scheme (the latter is the same aircraft but operated differently in 2009). There are around 37,000 households within the scheme, whereas the revised 744R footprint impacts just over 14,000 and the A380 around 9,000. This illustrates how operating procedures and fleet changes have played a significant role in reducing noise impacts at night.

[21] https://www.caa.co.uk/Consumers/Environment/Noise/Measuring-and-modelling-noise/

[22] http://publicapps.caa.co.uk/docs/33/CAP1554ReviewofArrivalNoiseControls_July2017.pdf

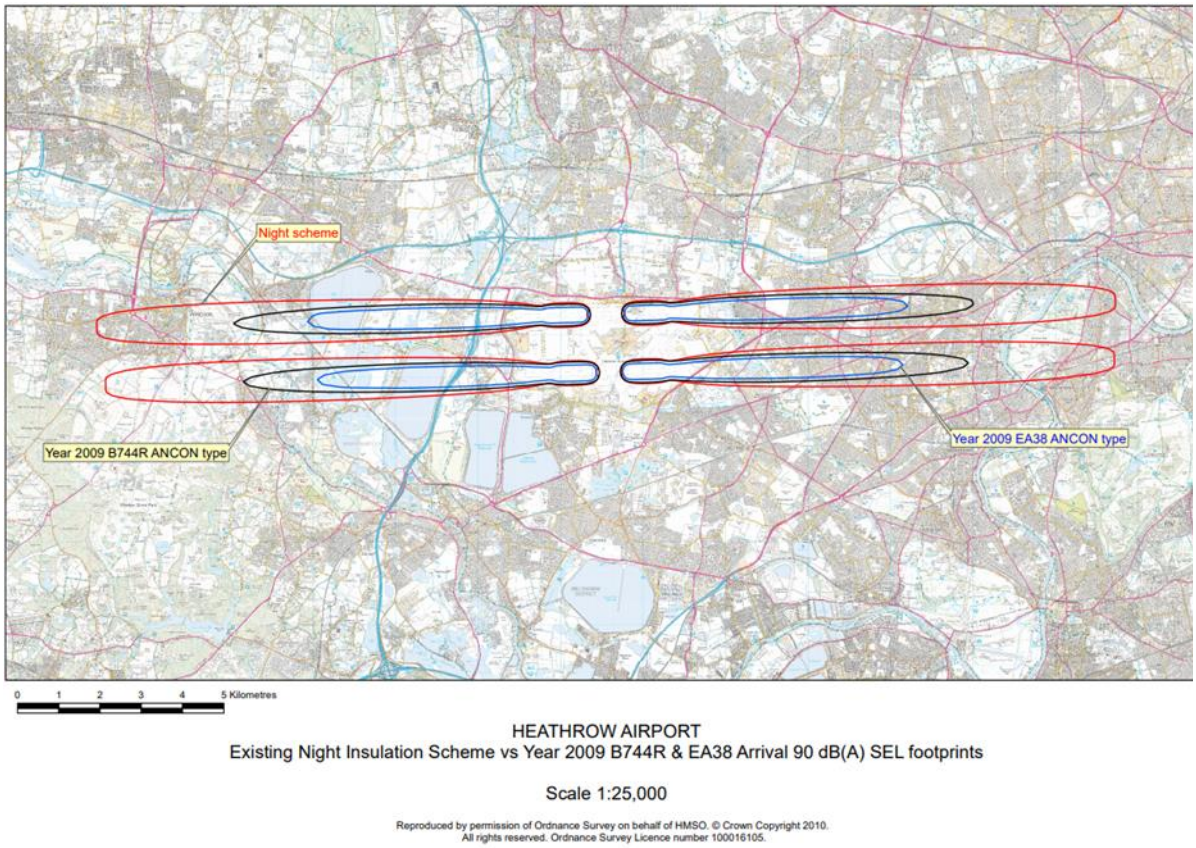


Figure 30: Map of Heathrow Night Insulation Scheme with 2009 90dB(A) Footprints

Over the past twenty-five years Heathrow has worked closely with airlines and NATS to improve arrival noise through operational procedures. This has focused primarily on Continuous Descent Approaches (CDA) and final approach joining point requirements, but over recent years has also included seeking innovative methods for the measurement of landing gear deployment and, in particular, how this could potentially be automatically monitored in the future, the trial and planned implementation of Slightly Steeper Approaches, as well as trials for Steeper Climb Departures. Table 4 above summarises the improvement in adherence to the Continuous Descent Procedures since 2001 of up to 20%.

Joining Point

The joining point requirements for aircraft arriving at Heathrow have been designed to minimise disturbance for those residents living closer into the airport and along the final approach path. The requirements are more stringent during night hours and are published in AD2.21 of the Heathrow UK Aeronautical Information Publication:

- For Runway 27L/R between 06:00-23:30, aircraft shall not descend on the glidepath below an altitude of 2,500 feet;
- For Runway 27L/R between 23:30-06:00, aircraft shall not descend on the glidepath below an altitude of 3,000 feet before being established on the localizer at not less than 10 nautical miles from touchdown; and
- For Runway 09L/R the heights are consistent with Runway 27L/R, but times are altered to 07:00-23:00 and 23:00-07:00.

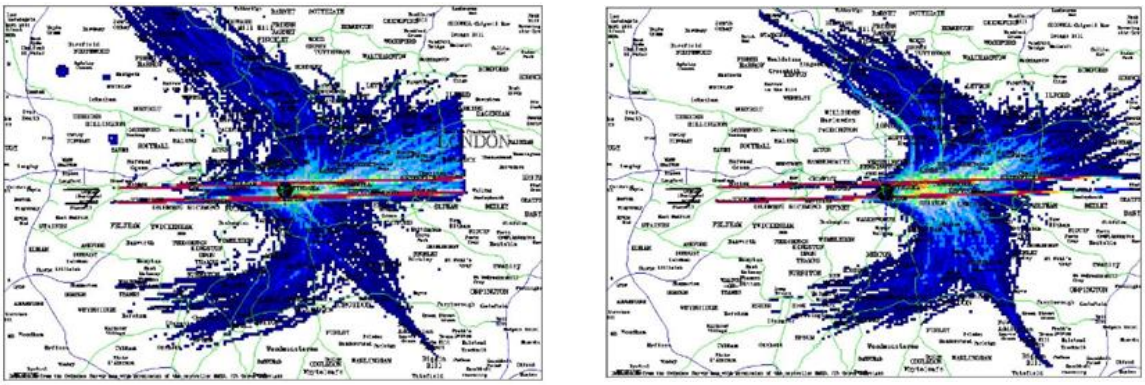


Figure 31: Track Density Map of Westerly Night-time Arrivals in 1996 & 2003

Figure 31 shows how the change to the minimum joining point (established on the final approach by 10 nautical miles from touchdown and shown in Figure 31 above as a black circle) shifted the night-time arrivals pattern eastwards. This had the effect of enhancing the benefit of runway rotation at night and reducing the number of people overflown below 3000 feet at night.

Land Use Planning and Mitigation

Heathrow commissioned the CAA to examine the population encroachment into areas around the airport between 2001 and 2019. Using the 2001 L_{den} contours, percentage changes in population and households for each 5dB band were calculated, with the population database changed from the 1999 CACI population database update (used for the original 2001 L_{den} contours) to the 2019 CACI update.

Appendix E provides tabular results of this analysis and shows that there are now over 29,000 more households and over 135,000 more people within the 55dB L_{den} noise contours. With the most significant percentage change occurring in the 65-70dB band and above, it is difficult to see the impact of any long-term land use planning policy being effective.

This data does not indicate the frequency with which houses are bought and sold, or tenants move into and out of the contour areas. This insight would help in understanding the risks of long-term exposure to aircraft noise at night.

New housing developments and population growth are significant factors affecting the extent to which the improvements in technology have been realised. This 'encroachment', as it is often referred to, has seen over 40,000 more people exposed to noise above 50dB(A) L_{night} since 2006 than would have been the case without it (see Figure 32).

When examining where this has occurred, as a proportion of the population exposed to aircraft noise within defined bands, the increase in both the highest and lowest bands has been the same. The most significant increase has been in the 55-60dB(A) band. This is shown in Figure 32 below.

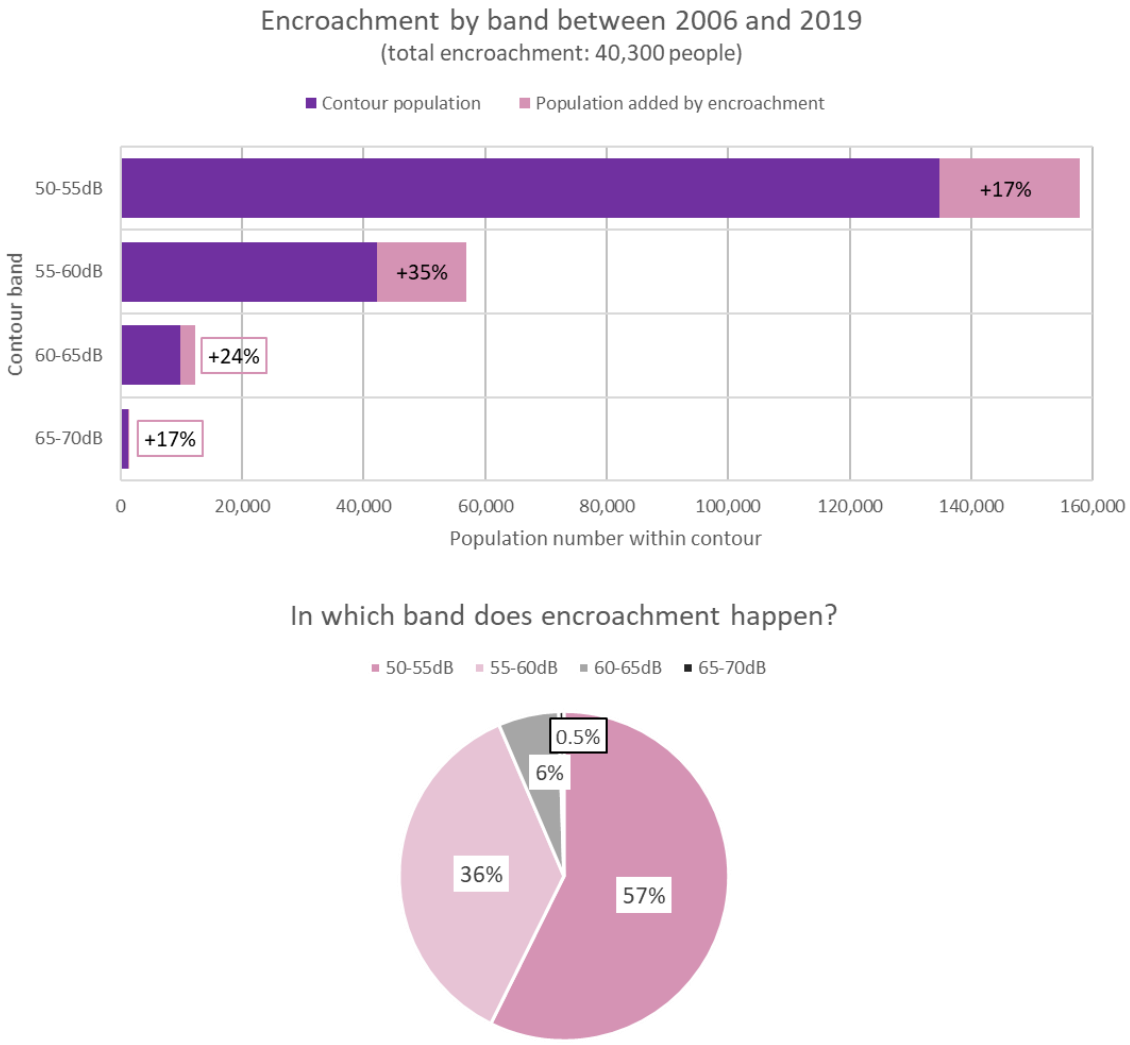


Figure 32: Encroachment Increase by Band between 2006 & 2019

Another view of the data is to consider how the additional circa 40,000 people are distributed across the bands. This shows that well over half the 'encroachment population' increase has occurred in the lowest noise band and almost 94% has been in areas below 60dB(A).

This may be for several reasons, including the much smaller area of the higher noise contours and limited opportunity for new development, tighter planning controls, and/or the conscious/unconscious consideration of other factors when determining where to develop or live. The reality is that the factors affecting the choice of where to live will be much broader than simply the exposure (or not) to a specific level of aircraft noise.

At the very least, clearer planning guidance and policy should focus on preventing encroachment within the 60dB(A) L_{night} contour.

Effective sound insulation maybe one reason why local planning authorities continue to enable developers to build within higher noise contours. Heathrow does not have details of how many of the additional households have installed acoustic insulation, but this information would help in understanding its effectiveness as an intervention.

Noise insulation schemes are commonplace around major airports and Heathrow has three schemes with over 40,000 eligible properties nearest the airport. This represents around 20% of households within the 55dB L_{den}. However, although take-up varies notably between the schemes, in total less than 11,000 households have taken up the offer. This represents around 5% of households within the 55dB L_{den}. In addition, around 4,000 homes in the most noise-affected areas are eligible for assistance with relocating away from those areas.

Heathrow recognises that more can be done in this area, not only to improve take-up, but also to better understand the effectiveness of acoustic insulation in reducing sleep disturbance. Therefore, it has committed to reviewing its noise insulation schemes over the course of 2021 and into 2022. Heathrow will continue to seek to work with its local authorities to improve the available data on new developments.

Operational Management Procedures to Minimise Impact

The night restrictions have evolved over time to reflect and effectively secure the improvements that have been seen over the past twenty-five years. Voluntary measures such as removing the 00:25 mail flight, re-timing early morning arrival flights to land after 04:30, scheduling QC4 and freighter aircraft outside of the Night Period, and reducing the number of aircraft operating beyond 23:30, have all contributed to the improvements seen at Heathrow. In addition, through close collaboration with airlines and air traffic control, including the establishment of the Airport Operations Centre (APOC) in 2014 Heathrow closely monitors operational performance throughout the operational day to identify risks of flights delayed into the Night Period as early as possible, and intervene to support and minimise the impact as far as practical. This monitoring is provided by dedicated roles within the APOC and supported by world leading innovative tools to predict aircraft movements in real time throughout the day using advanced statistics and predictive algorithms as well as real-time data feeds.

The Fly Quiet and Green and Quiet Night Charter programmes are further steps Heathrow has taken to work with airlines to reduce aircraft noise particularly at night, encouraging the use of quieter aircraft and flight procedures. Fly Quiet and Green includes the UK's first ever league table ranking airlines according to their noise performance. The league table can be found on the Fly Quiet and Green website[23]. The Quiet Night Charter has been developed to identify voluntary initiatives to improve the performance of Heathrow's operations and reduce the overall impact of unscheduled night movements on local communities. Heathrow, air traffic control, airlines and other key stakeholders work closely together to improve punctuality, and to provide a more predictable, quieter operation. More details can be found in the Quiet Night Charter document[24]. Temporarily paused through the pandemic, Heathrow is reviewing both programmes as part of its Noise Action Plan and plans to re-launch updated schema based on lessons learned and revised requirements as the industry recovers from COVID-19.

Heathrow and air traffic control have, and continue to, significantly invest in world-leading operational procedures and toolsets to maximise operational resilience at the airport. Operational resilience enables reduced delays throughout the day and the ability to better manage peaks in demand (for example brought about by flights arriving earlier or later than scheduled for the day in question) therefore minimising risk of delays into the Night Period. Examples include Time Based Separation (TBS) and the subsequent update to enhanced Time Based Separation (eTBS) procedures and Intelligent Approach toolset on arrival (enabling resilience in arrival throughput particularly in strong wind conditions), and the Target Start Approval Time (TSAT) tools and procedures on departure (retaining efficient use of the departure runway while enabling

[23] https://www.heathrow.com/company/local-community/noise/making-heathrow-quieter/fly-quiet-and-green

[24] https://www.heathrow.com/content/dam/heathrow/web/common/documents/news/Heathrow_Quiet_Night_Charter_2018_Summary.pdf

delays to be identified and notified early, helping with predictions of traffic demand en-route, and enabling aircraft to take delays on stand rather than queue at the runway which reduces fuel burn and associated emissions).

The operational collaboration between Heathrow, airlines and air traffic control enabled by these investments has worked effectively within the regime to reduce the numbers of aircraft running late and departing into the Night Period, without which may have been up to 40% higher in 2019, and where night movements have not been possible to prevent, have brought them as early into the period as possible. Table 5 below shows the reductions over time for the numbers of nights without night flights operating between the core night hours of 0100 and 0430, and 23:30 to 0100.

Year	Recovery	Restricted Recovery		Exceptional Circumstances Only	Early Morning Scheduled Arrivals	Full Scheduled Operations
	23:00-23:30	23:30-00:00	00:00-01:00	01:00-04:30	04:30-06:00	06:00+
2001	3	148	65	214	0	0
2011	24	156	195	256	0	0
2012	12	121	191	276	0	0
2013	6	128	198	285	0	0
2014	7	154	210	305	0	0
2015	3	173	230	318	0	0
2016	5	158	209	326	0	0
2017	8	182	228	336	0	0
2018	3	169	231	342	0	0
2019	15	184	230	347	0	0

Source: ANOMS & Heathrow internal data

Table 5: Nights without Aircraft Movements 2001, 2011-2019[25]

[25] Data from 2001 has been taken from a different source (Heathrow internal data) to the ANOMS data from 2011-2020 as ANOMS was not in use at Heathrow in 2001.

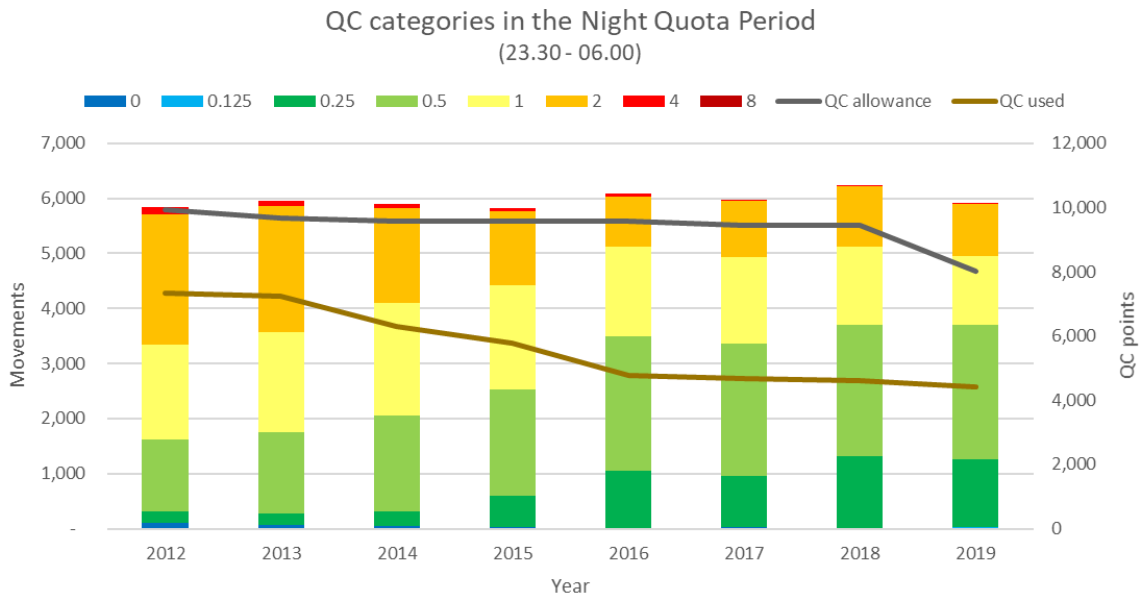


Figure 33: QC Categories in the Night Quota Period 2012-2019

Figure 33 shows how the fleet operating in the Night Quota Period has become increasingly quieter and how the QC limits have adjusted to reflect this. It is notable that the reduction in QC limits has lagged some way behind the reduction in QC use because of the fleet improvements. This may be a reason why external stakeholders, often focused on the limits, have been less supportive of the QC system. There is an opportunity for the Government to articulate the association more publicly between a reduction in QC points, the relevant noise contours, and harmful effects.

The Combined Effect of Existing Night Noise Management Measures

As part of Heathrow's response to this consultation, it commissioned the CAA to undertake an analysis of changes over the time that the night restriction regime has been in place.

The aim of the study was to adjust existing 2001 and 2019 L_{night} contour results to account for changes in the population database, total aircraft movement numbers and fleet mix between 2001 and 2019 (and vice versa), assuming all other variables remain constant. The methodology is provided in Appendix E.

Figure 33 above shows how these different factors influence the levels of exposure and degree of change. It should be noted that other factors such as procedural change or interventions such as noise insulation are not considered in this analysis.

The different methodologies for illustrating change over time do not perfectly align, for example, the total reduction on 2001 levels varies between 9% (Table 4) and 17% (Figure 2) and the sum of the population and movement changes do not equal the combined effect. However, there are several factors that could account for the gap, including:

- Noise database changes – the ANCON noise database is updated on an annual basis and over the years, noise measurements have improved and noise monitor coverage has increased;
- Runway usage – differences in west-east runway modal splits and north-south runway usage will affect contour shapes and therefore population counts;

- Flight procedures – there will be changes in mean flight tracks and dispersions for each route, and changes in airline procedures, passenger load factors and destinations will affect height, speed, and thrust profiles for each aircraft type;
- Noise model updates – the ANCON model has been updated several times between 2001 and 2019 to account for improvements in the noise modelling guidance document, ECAC Doc 29 Report on Standard Method of Computing Noise Contours around Civil Airports; and
- Fleet mix adjustment – the fleet mix adjustment used is simply a proxy based on 6.5-hour night data, so it may have been different if actual annual 8-hour night data were used.

Figure 34 shows how the distribution of flights across the Night Period has changed but remains dominated by operations in the post 06:00 period.

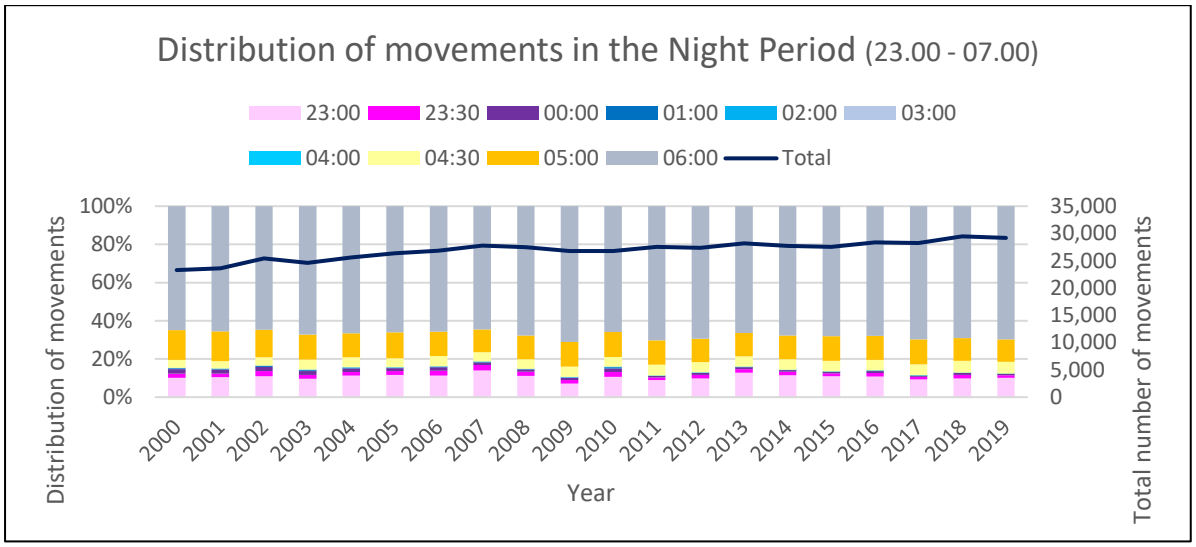


Figure 34: Distribution of Movements during the Night Quota Period

Figure 35 shows how the movements during the Night Quota Period have remained relatively constant since 2006 as the contour area and the number of people within it has reduced[26].

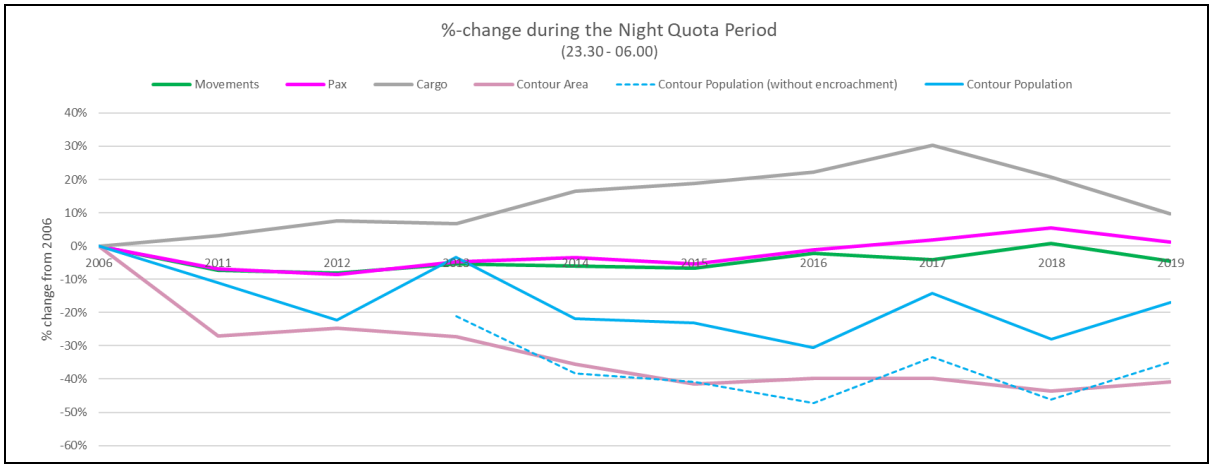


Figure 35: Percentage Change during the Night Quota Period

[26] The effect of a 2013 population database update can be clearly seen in figure 36.

This analysis (together with Figure 1 shown in the introduction to this document) suggests that, so far, the existing framework of restrictions and its evolution has struck a reasonable balance between maintaining the benefits of night flights within a sustainable transport network and the environmental and health impacts. Any significant growth in aircraft movements has been in the hour between 06:00 and 07:00 and there has been a reduction in the number of people highly sleep disturbed. However, without the clarity of knowing which environmental, social and economic indicators the existing regime was seeking to change and by how much, it is not possible to definitively state that the right balance has been achieved.

Nevertheless, Heathrow recognises and remains committed to continuous improvement in this area. More needs to be done, not least to better understand how measures such as noise insulation schemes, relocation schemes and land use planning policy impact on these trends. The pace at which further improvements can be achieved needs to continue to balance opportunities to grow sustainably and environmental protection.

It is also important to acknowledge that the UK and the aviation industry are now in a very different position than they were in 2019. With the uncertainty resulting from the pandemic and Brexit, Heathrow's view is that the UK's recovery in a global setting will need a robust transportation network that includes road, rail and air movements at night. Within this context, Heathrow's longstanding commitment to reducing negative and enhancing positive impacts of its operations remains, especially at night.

2.4 Policy Development, the Requirements of EU598 & the Environmental Noise Directive

2.4.1 ICAO Balanced Approach

In acknowledging the relationship between transportation noise and negative health effects, the key challenge facing policy makers and noise managers is how to reduce those impacts whilst enabling a sustainable and effective transport network. The International Civil Aviation Organisation document, ICAO Doc. 9829 – Guidance on the Balanced Approach to Aircraft Noise Management, sets out a clear and coherent approach.

This is established in UK law through Regulation (EU) No 598/2014 of the European Parliament and of the Council of 16 April 2014 (amended by the Aviation Noise (Amendment) (EU Exit) Regulations 2019) on the establishment of rules and procedures with regard to the introduction of noise-related operating restrictions at EU airports within a Balanced Approach and repealing Directive 2002/30/EC.

It is intrinsically linked to the airport noise assessments required under the Environmental Noise Directive 2002/49/EC (END) (Strategic Noise Mapping & Noise Action Planning). The END details three harmful effects, ischaemic heart disease (IHD), High Annoyance (HA) and High Sleep Disturbance (HSD) for the purposes of the noise assessment process, but neither the END nor EU598 provide guidance as to what, if any, level of risk or societal burden in relation to these harmful effects is considered acceptable.

In Heathrow's view there are clear steps to managing aviation noise that need to be followed sequentially. They are set out in Figure 36 below.

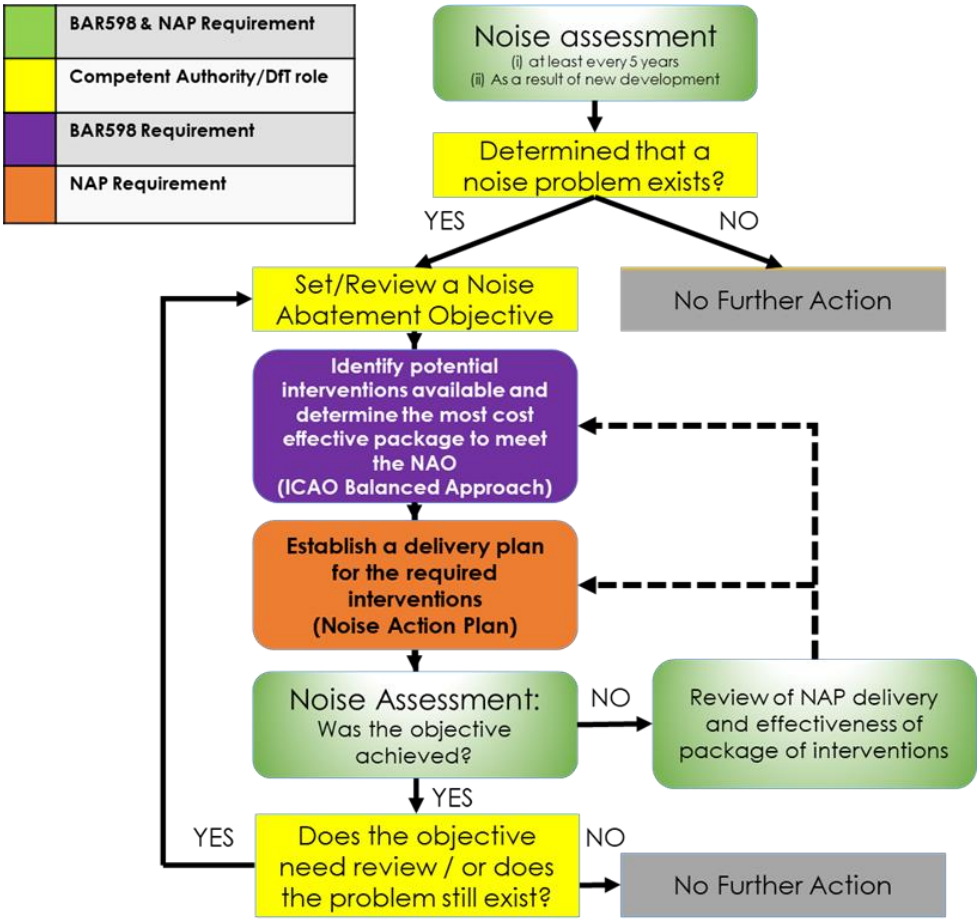


Figure 36: Balanced Approach Regulation 598 & END Noise Action Planning Requirements

Although both the END and EU598 require regular noise assessments, there is no guidance or standard methodology for determining whether an airport has a noise problem. To ensure consistency in the approach to determining a noise problem, it would be helpful for the Government to issue guidance that provides clarity to competent authorities and stakeholders. This does not mean that the Government needs to determine the scale of the noise problem, as this can often best be done locally within a common framework.

In setting the noise objective there are broadly two approaches depending on whether the objective is supported by a noise envelope concept. If this is the case, then it is reasonable for the objective to be visionary and long term. Without a noise envelope, the objective needs to be timebound and have clear measures of success or progress against the stated objective, like a noise envelope does.

The existing objective[27] for designated airports is neither of these. While it is clearly long term in its context and its measures might be considered reasonable, it does not provide stakeholders with any sense of progress against the objective over the length of the regime. It sets no expectation or opportunity for further growth or control based on performance, leading to frustration for all involved stakeholders.

[27] DfT objective: "Limit or reduce the number of people significantly affected by aircraft noise at night, including through encouraging the use of quieter aircraft, while maintaining the existing benefits of night flights." DfT intends to continue to measure achievement against this objective by the area of and number of people in the 48dB $L_{Aeq,\ 6.5\text{-hour}}$ night contour; sleep disturbance impacts associated with night flights, assessed using Transport Analysis Guidance (TAG) methodologies; and the average noise of an aircraft (as measured by the average noise quota count per aircraft movement over the course of a season).

Heathrow remains supportive of the noise envelope and environmentally managed growth (EMG) concepts, as they recognise the need to balance a sustainable functioning transport network with environmental protection over a stated timeframe. It provides the opportunity for businesses to be sustainable, and where possible to grow, by investing in technology and interventions that reduce harmful effects.

Heathrow would like to see an objective which acknowledges wider policy considerations and captures the needs of this balance, supported by clear, timebound, economically achievable expectations against indicators of progress. They should be developed through engagement with key stakeholders and relevant experts.

The last part of the process is to identify what steps can be undertaken towards achieving the stated objective, or specific regime outcomes. EU598 is very clear in requiring that competent authorities should ensure that, "…technical cooperation is established between airport operators, aircraft operators and air navigation service providers to examine measures" to achieve the objective. The END Noise Action Planning process supports this approach. If aligned with the regime review, or a mid-term review, it would be the obvious way of setting out the necessary measures to achieve the objective or its progress targets.

To illustrate the overall process, Figure 36 shows how the different steps might relate to Heathrow under the existing regime.

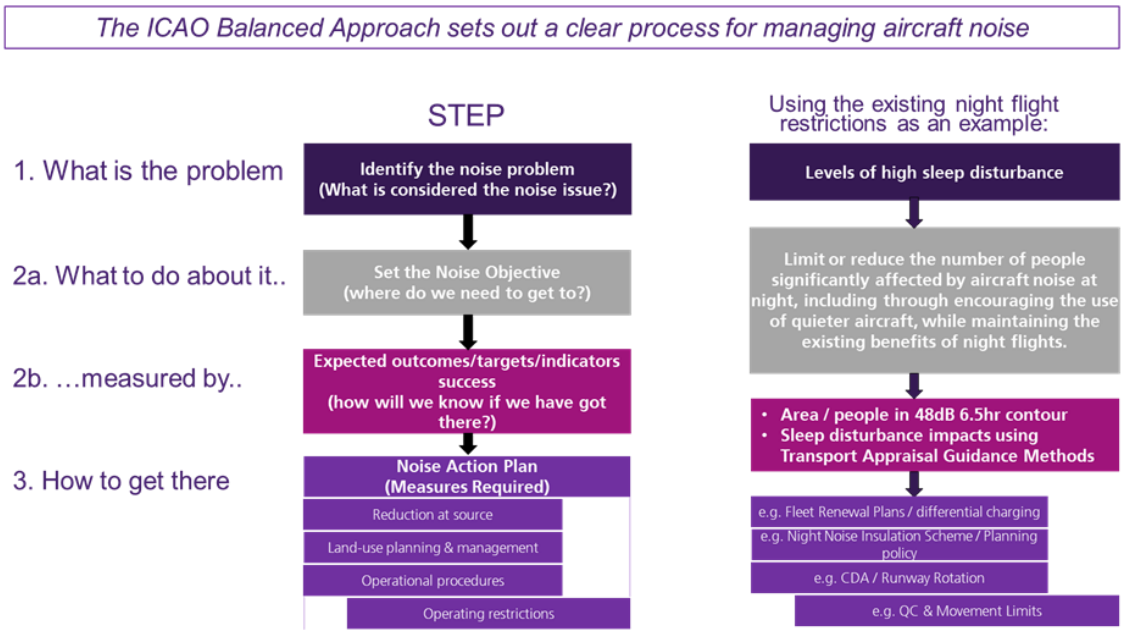


Figure 37: ICAO Balanced Approach to Managing Aircraft Noise

Heathrow is concerned that this process has become confusing for the stakeholders responding to this consultation. There is no guidance as to how a noise problem should be identified. More importantly, respondents are being asked to comment on the nature of the noise objective and the measures that should be in place at the same time. Without the certainty of knowing the objective that airports and their stakeholders are seeking to achieve, it seems premature to try and determine what measures should be taken, especially with no evidence of their effectiveness.

To originally propose that the package of measures required will be ready for consultation in 2022 without yet having consulted on and established national and/or local objectives, or the process by which they

should be developed locally, is at odds with the process set out in EU598. Heathrow therefore welcomes the July 2021 Part 1 Consultation decision to extend the timeline to 2025.

In Heathrow's view, there are five actions that are needed from Government to enable the established process to work most effectively. They are to:

1. Establish guidance, or a defined methodology, for determining if a noise problem exists;
2. Establish guidance, or if appropriate, set a noise abatement objective (e.g. for designated airports) that is cognisant of wider policy considerations;
3. Define or set evidence-based indicators of success and progress;
4. Improve the tools (particularly WebTAG) by which the cost effectiveness of intervention measures can be assessed (comments are set out below on this issue); and
5. Direct and support a research programme to better understand the effectiveness of the interventions being considered.

This action would not only assist the Government at designated airports, but also help support competent authorities and relationships at other airports.

2.4.2 Improving WebTAG

DfT provides a web-based set of Transport Analysis Guidance (WebTAG) for aviation appraisal, as part of a multi-criteria decision framework used to appraise transport projects and proposals in the UK. However, WebTAG does not provide methodologies and parameters to assess all aspects of the impacts of restrictions to night flights. Further work is required to develop a robust and comprehensive approach. This section highlights the identified gaps, with a further, fuller discussion included in Appendix D which addresses the economic and health impacts of night flying.

In terms of the economic impacts of night flying, the main area not covered by WebTAG is the impact on freight. The introduction of night flight operating restrictions may result in several outcomes for aircraft movements, passengers, freight and airlines. Key areas of consideration are laid out below:

- **Reduced Capacity –** The impact of the increased capacity constraint results in increases in shadow costs of the remaining flights. WebTAG sets out the methodology to calculate the consumer and producer surplus resulting from the reduced capacity for passengers. However, it is necessary to make assumptions on the existing shadow costs and the price elasticity of passenger demand, as there are no parameters provided by WebTAG. There is no method for assessing the impacts of reduced capacity on freight in WebTAG.
- **Flight Retimes –** WebTAG does not provide values of time for passengers or freight to assess the impact of flight retimes. The Airports Commission estimated the value of time for passengers, which were then updated by the DfT. However, no values of time for freight were estimated. Further work is also required to understand the applicability of these values of time to flight retimes. For example, there may be higher costs for business passengers who lose working hours at their destination or for time-critical freight, versus lower costs for leisure passengers, or business passengers who are able to work on the flight.
- **Creation of a Shadow Period in the Schedule –** If movement restrictions relate to late-running flights where there is only a short or no recovery period between the start of a schedule ban and the start of a runway ban, airlines may choose to conservatively schedule their flights to avoid the restriction. This would result in flight retimes or loss of flights and should be considered as part of the economic assessment.

- **Impact on Resilience –** Restrictions may impact resilience and increase average delays. WebTAG provides no guidance on how the impacts of flight delays should be assessed.
- **Impact on Flight Cancellations or Diversions –** Restrictions may result in an increase in flights being night-stopped, as they are unable to take-off or land. This would result in cancellations or diversions and the costs should be considered as part of the economic assessment.
- **Wider Economic Impacts –** Restrictions to night flights also have wider economic impacts that should be considered including trade, tourism, Foreign Direct Investment (FDI) and connectivity. Although WebTAG acknowledges these are aviation-specific impacts, there is no agreed methodology for assessment.
- **Other Environmental Impacts –** It may also be important to consider the wider environmental impacts of air quality and greenhouse gases when assessing night flight restrictions.

There are significant gaps in the research and guidance on how to assess the health impacts of aviation:

- **Noise measurements –** WebTAG assesses the impact of night noise using the L_{night} metric, which is the annual average equivalent noise level over the eight-hour period from 23:00 to 07:00. This means that implementing a range of interventions during the Night Period may still result in the same L_{night} value, despite having significantly different impacts on the local community. As a result, the benefits of those interventions are not fully assessed. In addition to the sensitivity of different hours within this period, there are a number of other factors that local communities would value but are not adequately measured by the L_{night} metric. For example, periods of predictable respite, frequency of flights and noise levels of individual flights. This is an issue initially requiring research to inform how WebTAG could then take it into account. Heathrow is pleased to note that the DfT recently indicated that this was to be undertaken for some aspects at least.
- **Health Impacts of Night Noise** – WebTAG provides links between L_{night} and the impact on sleep disturbance, annoyance and health impacts (AMI, stroke and dementia). It monetises these impacts using Disability-Adjusted Life Years (DALYs). However, there are potentially wider health impacts that are important to consider such as quality of life, productivity, mental health and wellbeing. Further research is needed to link appropriate metrics for night noise to a wider range of quality of life and health impacts.
- **Wider Health Impacts of Aviation –** Although the noise associated with flights has a negative impact on health, there are also positive impacts of aviation on health as a result of increased employment levels and accessibility to leisure travel. There is currently no guidance on how to include these impacts in an assessment.
- **Effectiveness of Mitigation –** In line with EU598, the introduction of scheduling restrictions should not be the first consideration when managing night noise. Other mitigation measures may comprise a far more cost-effective approach. However, there is currently no guidance on the mitigation measures that should be introduced or how to assess their effectiveness on reducing the health impacts of noise.

As discussed above, there are large gaps in the current guidance and evidence base for assessing the impacts of night flight restrictions. Any assessment is subject to a high number of assumptions and requires full sensitivity testing. As it stands, WebTAG is not considered fully fit for assessing the impacts of night flight restrictions and has been criticised by stakeholders. Significant additional work is needed to develop a robust and comprehensive assessment framework. Heathrow strongly recommends that DfT takes the time to improve WebTAG based on input from relevant experts and engagement with interested stakeholders.

3. Synopsis of Heathrow's View on the Points Raised by the Night Flights Consultation

3.1 Plans for Rollover between 2022-2024

The DfT asked in Part 1 of the consultation if the existing night noise objective and night flight restrictions should be rolled over for a further period to the end of 2024. This part of the consultation ran from 2 December 2020 until 3 March 2021.

Heathrow responded to Part 1 in a separate letter to the DfT, providing direct answers to the relevant questions. A copy of this letter is provided in Appendix A.

On 19 July 2021, DfT announced that the existing scheme will continue for a further three years from October 2022 to October 2025, including a ban on QC4 rated aircraft movements at the designated airports during the Night Quota Period[28].

In summary, Heathrow supported the originally proposed rollover and is pleased to see that this has been applied with additional time now given for consideration of the policy options for the future night flight policy beyond 2025, at designated airports and nationally.

The tables throughout the remainder of this chapter detailing Heathrow's response to specific consultation questions feature the numbering system contained in the DfT's online survey response form, hosted by www.smartsurvey.co.uk.

The survey questions set out on the gov.uk website are not numbered, however the online survey form used a numbering system to separate some questions from requests for evidence. For example, "Should disruption caused by ATC industrial action qualify for dispensations? Please provide evidence to support your view."

Questions such as this required separate, numbered responses in the survey form, so they are treated as two separate rows in the following tables, where applicable, using the same online response form numbering as displayed when the response was submitted. Some tables feature blank rows where a question was answered but further provision of evidence was not required or was not applicable.

3.2 National Policy

As a designated airport Heathrow is already subject to noise policy established by Government. Heathrow sees no reason for that to change, as the Government is best placed to consider and determine the right balance between economic opportunity, a sustainable functioning transport network and environmental protection. The EU598 and END legislation aims to ensure that the process is consistent and aligned with the requirements of the ICAO Balanced Approach.

[28] DfT night flight restrictions at Heathrow, Gatwick and Stansted: decision document

In Heathrow's view, the Government has an opportunity to ensure wider consistency in the approach to managing aviation noise. That is not to say that one size fits all; local situations will warrant different approaches, but the process should remain constant and compliant with the ICAO Balanced Approach.

There are two fundamental gaps at a national level. As Figure 36 above illustrates, EU598 and END clearly set out the process for identifying the most cost-effective measures and subsequently establish a management plan. The gaps are in the determination of a noise problem and the development of a noise abatement objective. Taking the learning from locations where there are good local relationships between stakeholders, Heathrow would like to see the DfT offer guidance on both aspects and set out in one place how it expects noise management strategies to be developed. Heathrow would like to see:

1. Guidance on determining a noise problem;
2. Guidance on setting an objective;
3. Guidance on evidence-based progress metrics and indicators;
4. A better cost-effectiveness assessment tool (e.g. a WebTAG 'PLUS' enhancement); and
5. A research roadmap to ensure existing gaps are filled, or at least our collective understanding improved.

Examples of research areas include identifying/protecting sensitive time periods, respite, noise insulation, land use planning, and aviation's contribution to wellbeing and quality of life – so their effectiveness can be properly assessed and accounted for in the cost-effectiveness model. At present Heathrow can only robustly measure the effectiveness of aircraft fleet changes and maybe some procedural changes.

This would still enable local solutions and existing stakeholder relationships to remain strong, or where needed, develop within a commonly understood process.

Heathrow knows of examples in other jurisdictions that could help formulate the Government's approach. It is understood that the Aircraft Noise Competent Authority (ANCA) in Ireland has been working on these areas in relation to Dublin Airport and the application of the EU598 and END processes. In another example, Hong Kong International Airport has developed a 'growth pool' concept which rewards airlines that adopt new, quieter aircraft earlier at the same time as securing noise improvement.

As the national policy develops, it is crucial that expectations of change are managed and reflect the technological and economic ability to deliver them.

3.2.1 National Policy Questions Response

No.	QUESTION	RESPONSE
64	How fair a balance between health and economic objectives do you think our current night flight approach is?	The answer to this question is far from straightforward. It is possible to make a case to say that the approach has been reasonably fair, that it has favoured communities or industry depending on the differing stakeholder perspectives. Over the last 25 years or so of the night regime at Heathrow, the airport has seen a reduction in operations between 00:00 and 04:30, fewer late running flights after 23:30 and more flights between 06:00 and 07:00. It has also seen significant reductions in noise contour areas, lower average QC of operations, population encroachment and fewer people potentially highly sleep

No.	QUESTION	RESPONSE
		disturbed. This has occurred as passenger numbers and tonnes of cargo carried have increased. There have been numerous studies detailing the economic benefit of night operations and similarly many describing the association between night noise and harmful health and wellbeing impacts. There has been far fewer detailing the economic costs or the health and wellbeing benefits from night flights. However, the quantum of change by which to judge success or fairness of the regime has, except for a single requirement to meet a 6.5-hour contour area a decade or so ago, been left to the 'judgement' of the respective stakeholders and policymakers. Without this clarity of expectation at the start of a regime period, determining the fairness of the resulting outcomes will remain very subjective. At present, a number of indicators are used to determine the progress of the night restrictions regime but no sense or expectation as to what level of change would be considered positive or negative. The lack of economic or commercial metrics does not invite an expectation of a balanced outcome. This makes assessing the success of the policy more of a reactive review process than a proactive management one. Consequently, Heathrow believes that while the outcome over time has been largely fair, it would be better for a future regime to establish a range of health, economic and quality of life indicators and economically achievable outcomes that provide a clearer indication of the level of success for all stakeholders.
65	What are your views on the health impacts of aviation noise at night, including potential impacts on different groups in society?	In responding to this question, it is important to recognise that the noise and health research on which much of Heathrow's understanding of these effects is based, relates to exposure from road, rail and air transport sources. Heathrow notes that many community group stakeholders do not acknowledge that WHO issues guidelines on all transportation sources. In fact, WHO recognises that the scale of impact from road transport noise exposure is many times higher than from rail and air transport and understandably this has been where much of the academic research has been focused. The research has also been primarily focused on exploring and debating 'dose-response' relationships between different health outcomes and noise metrics. There has been much less attention given to the non-acoustic factors influencing how individuals respond to different sound levels and sources. Yet these are increasingly cited as being as, if not more, influential in shaping their response as noise level. Of even more significance to policymakers and airport (or wider transportation) noise managers is the dearth of research into the effectiveness of potential management interventions. Equally there is little research into the overall impacts of aviation on quality of life and wellbeing. It is Heathrow's view that a more holistic assessment of the impacts of aviation is needed. This is a view shared with other airports, academics and experts which resulted in a paper for the Inter-Noise 2018 convention in Chicago, Illinois, 26-29 Aug 2018, which set out collective thoughts on a 'Research Roadmap for Airport Noise'. Figure 27 above provides a summary of the paper. The body of research that has been conducted over several decades leaves little doubt that there are health effects associated with transportation noise exposure. Heathrow's understanding of where that debate has currently reached is summarised earlier in this response (see Table 3).

<table>
<tr><th>No.</th><th>QUESTION</th><th>RESPONSE</th></tr>
<tr><td></td><td></td><td>In Heathrow's view there are two fundamental areas that require better understanding. Firstly, for a given population exposed to a noise level, what are the non-acoustic factors that determine whether they are more likely to become annoyed (and in so doing potentially begin a pathway towards more serious conditions) and whether these could be modified? Secondly, how effective are the potential interventions at reducing the numbers at risk of any health impact?</td></tr>
<tr><td>66</td><td>What are your views on the economic value of night flights, including the potential value on different businesses and aviation sectors?</td><td>
There are two approaches to quantifying the economic value of night flights:

Assessing the gross value added (GVA), which measures the contribution of night flights to the economy and the employment benefits associated with night flying; and
Carrying out a cost-benefit or cost-effectiveness analysis. A cost-benefit analysis attempts to capture both the economic and social impacts of night flying in monetary terms. A cost-effectiveness analysis assesses which of the different options available to achieve a given objective is the most cost-effective.

GVA Analysis
In 2016, CEPA carried out an assessment for the financial year 2013/14 of the GVA and employment impacts of night flights at Heathrow in the Night Quota Period, 23:30 to 06:00. The results are shown in the table below:
<table>
<tr><th rowspan="2">Type</th><th colspan="3">Night Quota Period (23:30 – 06:00)</th></tr>
<tr><th>Direct</th><th>Indirect</th><th>Induced</th></tr>
<tr><td>Annual GVA (2013 prices)</td><td>£155m</td><td>£110m</td><td>£99m</td></tr>
<tr><td>Employment Impacts (jobs)</td><td>620 - 851</td><td>461 - 638</td><td>492 - 593</td></tr>
</table>
Source: CEPA
Table 6: Economic Impact of Aviation Activity during the Night at Heathrow in 2013/14

Most recently, and building on the approach used by CEPA, York Aviation has carried out a study to assess the economic impact of night flying at Heathrow and in the UK in 2019, as shown in the table below:
<table>
<tr><th colspan="2" rowspan="2">Type</th><th colspan="2">Night Quota Period (23:30 – 06:00)</th><th colspan="2">Total Night Period (23:00 – 07:00)</th></tr>
<tr><th>Direct</th><th>Indirect & Induced</th><th>Direct</th><th>Indirect & Induced</th></tr>
<tr><td rowspan="2">Heathrow</td><td>Annual GVA (2019 prices)</td><td>£100m</td><td>£125m</td><td>£325m</td><td>£425m</td></tr>
<tr><td>Employment Impacts (jobs)</td><td>1,800</td><td>2,800</td><td>6,300</td><td>10,000</td></tr>
<tr><td rowspan="2">UK</td><td>Annual GVA (2019 prices)</td><td>£0.6bn</td><td>£0.8bn</td><td>£1.4bn</td><td>£1.9bn</td></tr>
<tr><td>Employment Impacts (jobs)</td><td>10,100</td><td>16,200</td><td>23,400</td><td>37,400</td></tr>
</table>
Source: York Aviation
Table 7: Economic Impact of Aviation during the Night at Heathrow & UK Airports 2019
</td></tr>
</table>

No.	QUESTION	RESPONSE
		Cost-benefit & Cost-effectiveness Analysis EU598 requires an assessment of the most cost-effective measure or combination of measures when action is being taken to deliver a noise objective. An advantage of cost-effectiveness analysis is that there is no requirement to monetise the objective; the results of a cost-benefit analysis can alternatively be presented in cost-effectiveness terms. Heathrow notes that whilst the EU598 process only requires a cost-effectiveness assessment, it does not preclude the use of cost-benefit analysis. In 2016, CEPA carried out a cost-benefit analysis of banning night flights at Heathrow between 23:30 and 06:00, following the WebTAG approach: • Net Benefit –£1.3bn (2010 prices, Net Present Value (NPV) 2016 to 2025, discounted to 2016. Total costs –£1.4bn) • Average net benefit per night flight per year –£15k (2010 prices, gross benefit per aircraft movement per year –£16k) In 2019, CEPA built on the methodology of its earlier work and carried out a cost-benefit analysis for nine different options for introducing night-time operating restrictions at Heathrow with expansion (for the purposes of the ANPS para 5.62). This was in relation to the 6.5-hour Night Period only, including a combination of: • Varying lengths of recovery periods (current period is two hours); • Varying start times for early morning arrivals; • Varying Quota Count (QC) limits before 06:00, affecting the type of aircraft that can land during the Night Period (or up until 06:00); and • Varying levels of respite, where complete flight bans are in place at one or all of the runways. CEPA estimated the costs and benefits of each option compared to the baseline of current operations. The results are expressed as the Net Present Value (NPV) of the benefits and costs for each year between 2027 and 2050, discounted back to 2019. The NPVs of central cases were less than the baseline for all options. Those with runway opening times of later than 05:30 were shown clearly not to be cost effective (all 2019 prices): • Options with runway opening times of 04:30, 05:00, 04:45 and 05:15 were largely similar in impact with an estimated central case NPV of around –£20m, and the maximum of the range of outcomes having a positive NPV; • The option with a runway opening time of 05:30 was slightly worse than these cases with an estimated central NPV case of around –£30m, but with none of the range showing a positive NPV; • Options with runway opening times of 05:15 and 05:30 were progressively worse than these cases, with estimated NPVs of –£40m and –£60m; and • Options with runway opening times of 05:45 and 06:00 were significantly less cost beneficial than the other cases, with estimated central NPVs of –£0.4bn and –£1.3bn.

No.	QUESTION	RESPONSE
		Wider Economic Benefits Night flights also have wider economic benefits, including trade, tourism, Foreign Direct Investment and connectivity. In CEPA's 2016 work, connectivity analysis showed a night flight contributes more than twice as much to Heathrow's connectivity as the average flight. The work of InterVISTAS[29] is frequently used to relate changes in connectivity to GDP. It estimates that for every 1% change in connectivity there is a 0.007% change in labour productivity. CEPA found that the cost of lost connectivity of banning night flights at Heathrow between 23:30 and 06:00 was £164 million (in 2010 prices, NPV 2016 to 2025 discounted to 2016). More recently, York Aviation has developed a relationship between connectivity at UK airports and national productivity. It defined connectivity as the number of business passengers plus air cargo tonnage multiplied by 10, relative to UK GDP. It found that a 10% increase in UK connectivity would result in a 0.5% increase in productivity. Using this relationship, it determined that in 2019 Heathrow night flying connectivity contributed £3.6bn to the national economy and across all airports in the UK night flying connectivity contributed £13.1bn. York Aviation notes that while similar relationships exist for passenger connectivity, its approach is the first to capture cargo wider economic impacts.
67	What are your views on changes to aircraft noise at night as result of the COVID-19 pandemic (provide evidence to support your view)?	There are two elements to consider: (i) the number of movements and (ii) aircraft type. In terms of movements, during 2020 the number of night flights operating during the pandemic (April to December) reduced in proportion to the full day's schedule. That is, the average number of monthly night flights was 21% of 2019 (for the same period) and the average number of monthly flights at other times of day was also 21% of 2019 showing the importance of the night flights even when there are fewer total flights. These figures are based on a comparison of the period 23:00 to 07:00 versus the rest of the day and is based on actual data for passenger and cargo movements only. The type of flights has changed however, with a larger proportion of the night flights being cargo movements – but these are flights that have been temporarily converted to cargo-only flights whilst passenger demand is reduced. As demand returns it is more than likely that these flights will operate as they did in 2019 and in previous years. Although Heathrow does not yet have noise contour calculations for the 8-hour Night Period, it expects that they will show significant reductions given that only 21% of the usual number operated. By way of comparison, the total number of QC points used in summer 2019 was 29,310 and in 2020 this fell to 8,568 – representing a 71% reduction. In terms of aircraft type, over the last decade airlines have tended to choose the largest models for most popular aircraft types, namely the Airbus A320 and Boeing 777. Heathrow also saw growth in the number of flights by Airbus A380s from 900 per year in 2008 to just under 16,000 movements in 2019.

[29] InterVISTAS, Measuring the Economic Rate of Return on Investment in Aviation, December 2006

No.	QUESTION	RESPONSE
		Even prior to the pandemic, a levelling out or even a reversal in seat per movement growth was observed. More efficient twin jets such as Boeing 787s and Airbus A350s led to airlines switching older, larger aircraft for these modern replacements. Heathrow was already anticipating that the next few years would see remaining 747s replaced with these aircraft and a continuation in the replacements of A380s for increasingly more efficient aircraft. These expected changes have been exaggerated and accelerated by COVID-19 as airlines now seek to downsize their fleets to compete in a restricted marketplace. The past year has already seen the early retirement of British Airways' entire Boeing 747-400 fleet, totalling 31 aircraft and accounting for 31% of its long-haul seat capacity at Heathrow. British Airways had been the world's largest operator of passenger 747s. Other airlines have signalled their intention to adjust supply to align with future levels of demand, such as several airlines choosing to ground their A380s either whilst demand remains low or in some cases, indefinitely. Airlines have been reducing fleets sizes and/or deferring deliveries of new aircraft where possible. Singapore Airlines announced in February 2021 that it had reached an agreement for aircraft to be delivered over a longer period than initially contracted. This allows airlines to defer capital expenditure and manage the rate at which capacity is added to align with international air travel recovery. In terms of direct links to aircraft noise at night at Heathrow, the changes that have taken place were expected regardless of the pandemic. However, the rate of change is quicker than anticipated. This is likely to result in a reduced noise exposure contour area, but the uncertainty around the timing and nature of the recovery in aviation makes forecasting future levels very difficult. It should be noted that at any airport there will always be a mix of older and newer aircraft types and that typically this might span 20-25 years, although the unique circumstances of the post-pandemic period may reduce that gap for a short period at least.
68	In your opinion what are the advantages or disadvantages that the emergence of new technology will have in relation to night noise from aircraft within the next 10 years?	As part of Heathrow's work towards expansion, it commissioned a study into the trends in new technology and uptake at the airport, but in light of the pandemic and the current state of the recovery it is not appropriate to cite its findings in this response. Heathrow believes that DfT should seek updated information owing to the pandemic, recognising that earlier predictions are likely to be uncertain.

Table 8: National Policy Questions Response

3.3 Designation

Heathrow is cautious about the de-designation of the airport for two principal reasons.

Firstly, as an airport of national importance, the appropriate competent authority with accountability for noise should be the Government and removing this oversight could create an accountability vacuum.

Secondly, it would undermine trust with communities and stakeholders, fuelling uncertainty about where the responsibility and independence would lie. Previous consultation responses have demonstrated general support for existing arrangements to remain.

There are other models where separate independent bodies have been created with the remit to oversee the ICAO Balanced Approach and noise action planning process, but this may well add yet another body to an already complex regulatory space.

It would be helpful for the Government to consider what additional value designation or non-designation would add, given the processes already in place for determining noise action plans. If minded to develop the idea further, Heathrow suggests that the Government initially develops potential criteria based on its long-term national and regional policy aims and objectives. Having established draft criteria, these could be tested with focus groups representing different perspectives – for example, competent authorities, the aviation industry, local business interests, community action groups, residents focus groups and if deemed necessary, wider public consultation.

3.3.1 Response to Designation Questions

No.	QUESTION	RESPONSE
71	Should the government set criteria for airport designation?	It would be helpful for the Government to first consider what value is added by designation, particularly in the context of the existing process for establishing noise action plans. Heathrow's response to questions 71 to 76 should be considered within this context. If Government is minded to add or remove airports from designation status, then Heathrow supports the need to set criteria. This would help clarify some of the uncertainty around airport noise regulation and improve transparency for stakeholders.
72	What do you think are the: advantages to the government setting criteria for airport designation? disadvantages to the government setting criteria for airport designation?	Advantage: a common and consistent approach for those airports meeting the designation criteria. Disadvantage: it potentially removes local accountability for noise management and may be perceived as adding an unnecessary layer of complexity or bureaucracy.
73	What factors, if any, do you think we should consider when setting criteria for designation?	The existing and forecasted noise situation at the airport; the economic significance of the airport in the local, regional, and national economies; the nature and scale of potential health impacts; and performance and progress against existing noise action plans.
74	How should any criteria for designation be agreed?	If deemed necessary, it would be helpful for the Government to initially develop potential criteria based on its long-term national and regional policy aims and objectives. Having established draft criteria, these could be tested with focus groups representing different perspectives – for example, competent authorities, the aviation industry, local business interests, community action groups, residents focus groups and if appropriate, wider public consultation.
75	What impact, if any, do you think the designation of an airport have on: communities?	Designation has no particular impact on any individual group other than to clarify or change the chain of accountability in managing noise impacts at a particular airport. One concern might be that strong positive local relationships between key stakeholder groups could be

No.	QUESTION	RESPONSE
	airports? airport users? airlines? business in and around airports?	undermined, or equally where those relationships are less positive, raise an expectation of change. Ultimately, noise objectives and subsequent action plans will determine the impacts on these groups.
76	What impact, if any, do you think the de-designation of an already designated airport (Heathrow, Gatwick, Stansted) will have on: communities? airports? airport users? airlines? business in and around airports?	Heathrow is cautious about the de-designation of the airport for two principal reasons. Firstly, as an airport of national importance, the appropriate competent authority with accountability for noise should be the Government and removing this oversight could create an accountability vacuum. Secondly, it would undermine trust with communities and stakeholders, fuelling uncertainty about where the responsibility and independence would lie. Previous consultation responses have demonstrated general support for existing arrangements to remain. One possible advantage is that the pace of change may be accelerated, but this is far from certain.

Table 9: Response to Designation Questions

3.4 Setting Objectives

The process of developing a noise action plan which includes consideration of operating restrictions is a relatively straightforward process. The requirements of EU Regulation No. 598/2014 (EU598) and the Environmental Noise Directive (END) are clear – both rely on the fact that a noise problem has been identified and a noise abatement objective (NAO) has been set. In essence, EU598 sets out the process for determining what should go in the plan and the END sets out the process for delivery. This is illustrated in Figure 35 above. It is therefore fundamental that the objective provides the necessary elements to enable the application of legislated processes.

This section describes what Heathrow thinks the purpose of the NAO is and how it could be developed to provide the clarity stakeholders require, as well as to set realistic expectations.

An NAO's purpose is to set the level of ambition for a noise management regime, that secures both environmental improvement and a sustainable functioning transport network. It should be set in the context of wider economic, planning and environmental policies. It is the enabling statement that provides the focus for the EU598 Balanced Approach and the END Noise Action Planning processes. It should aim to unite multiple stakeholder interests around a common purpose, to engender trust in the competent authorities.

There are core expectations for an NAO that are typically cited by different interest groups and these should be considered as key points to successfully gain broad stakeholder support. In high-level terms these are:

- use of clear, accessible language;
- to provide a level of certainty by setting realistic outcomes and/or expectations of change/stability;
- to ensure the desired outcomes are measurable, and the metrics used are evidence-based and credible with different stakeholders;
- to provide opportunities for sustainable growth and protect the health of local residents;
- to contain consequences and incentives for under- or over-performance;

- to reduce negative and enhance positive impacts of the activity, for example, quality of life, wellbeing and economic impacts can be both positive and negative from the same activity; and
- to achieve a balance between the needs of different stakeholder groups.

To meet the expectations of multiple and often conflicting stakeholder needs, the body responsible for setting the objective should ensure that the NAO:

- is developed within the context of, and aligns with, wider regional and national noise, sustainability, and economic policy;
- allows for flexibility in how the desired outcomes are to be achieved and does not seek to prescribe the approach, for example, by including the need to provide noise insulation or night flight bans. This is consistent with the requirements of the Balanced Approach and set out in EU598;
- includes measurable and achievable outcomes against which progress can be assessed, which clarifies expectations and opportunities for all stakeholders;
- becomes a benchmark against which stakeholders can hold to account competent authorities, airports and/or local authorities;
- incentivises the development and uptake of new technology at the airport in an economically viable way, enabling benefits to be shared between stakeholders;
- allows for consistency in undertaking the requirements of EU598 and END Noise Action Plan processes, particularly where there are multiple agencies involved;
- allows for additional or supplementary metrics to be used to assess progress, as these may be important or more accessible to some stakeholder groups and/or currently lack the necessary evidence base. For example, the number of movements by the noisiest aircraft category, or delivery of a respite schedule; and
- is subject to regular review.

In addition, airports may have some specific expectations as to what the NAO needs to do. For example:

- it must enable them to sustainably meet and deliver their existing business plans;
- reduce the health impact of their operations;
- provide long-term certainty to enable them to develop long-term operating and business plans;
- provide the flexibility and resilience required to recover from both macro-economic events such as the current pandemic, and from micro daily or seasonal operational challenges;
- provide a positive incentive to attract new technology;
- have wide stakeholder support;
- be transparent in how the objective is developed and monitored;
- enable cost-effective economically viable interventions over a reasonable timeframe;
- enable both outcome-based and management input metrics to be used to effectively monitor delivery against an objective to avoid retrospective shocks of under- or over-utilisation of runways; and

- recognise the role of other agencies in delivering the objective, such as local authorities in relation to new noise-sensitive developments.

Having set out the out the purpose and what the NAO should aim to do, Heathrow has also considered how an NAO statement might be constructed and framed. There are two primary types of objective statements:

- **Visionary** – in this case, the statement would set out a long-term ambition or aspiration and does not need to change over time. For example, "the objective is to remove the risk of sleep disturbance." Although this cannot be achieved in the foreseeable future, it sets an expectation of continuous improvement. This type of objective must be supported by short-term targets or goals, or some sort of noise envelope approach to meet stakeholder needs and to establish reasonable expectations of progress.
- **Focused** – in this case, the statement is timebound and frames the desired outcome within a specific context. For example, "the objective is to reduce the number of people highly sleep-disturbed by between x% and y% by 2030 compared with 2013." This type of objective needs to be reviewed and renewed regularly.

Table 10 sets out how an NAO statement could be framed within a structure providing stakeholders with greater clarity in terms of desired outcomes, which could be related to health, operational, and/or economic outcomes.

Element	Description
Objective Statement	Having identified a noise problem this statement should detail the ambition against a stated baseline. If "visionary" it will require an interim timebound 'priority or target statement' to provide the necessary focus for the noise action planning process.
What this means	Explanatory text which should clarify that overall impacts will be within the envelope set in relation to the stated baseline but not necessarily for individuals. It should identify the impacts being considered, e.g. sleep disturbance, cardiovascular disease, annoyance. It should clarify the general expectation and timeframe that effects will be limited, reduced, removed or improved.
How will progress be measured	This should set out the mechanism and assumptions used to calculate outcomes of interest. For example, the specific noise contours used to determine particular health impacts or whether population databases and wind direction splits will be standardised.
What are the expected outcomes	This should detail the specific outcomes of interest and the expected change over the lifetime of the objective (or if visionary, the interim target or goal).
How will progress be audited and reported	This should set out how data will be independently verified and reported to interested stakeholders.
How often will the objective be reviewed	This should detail the frequency with which the objective will be reviewed. For example, it could be every 5 or 10 years in line with the Noise Action Plan cycles.

Table 10: Elements of a Noise Abatement Objective Statement

In creating an objective statement there are seven component parts that should be present to provide meaning to as many stakeholders as possible. These are described below:

1. **The balancing or framing context** – example: "*enabling the long-term sustainability of aviation*, supporting the growth of Heathrow airport, consistent with planning policy, compliant with

aviation policy and regulation, consistent with the ICAO Balanced Approach and EU598, within the conditions of any planning permission, enabling growth to X movements per year, Y passengers per year."

2. **The change we are looking for** – example: "*limit*, reduce, improve, grow" etc.
3. **The outcome we are seeking to change** – which can be specific or general, example: "*adverse health effects*, number of people highly sleep-disturbed, specific quality of life indicators" etc.
4. **The source activity impacting the outcome** – example: "*long-term aircraft noise exposure*, night flight operations, respite time" etc.
5. **The scale of change** – example: "*to 2019 levels*, by X%, continuously improve from baseline of Y."
6. **The timeframe of the change** – example: "in the *next 10 years*, to 20xx, in/from 20xx, by 20xx" etc.
7. **The measurement method** – example: *"using WHO guidelines*, based on current evidence [which may be local], the average noise quota count, X noise contour" etc.

By using example phrases such as these for each component, it is possible to build multiple, if not infinite, examples of candidate NAO policy statements – a composite approach. Using the italicised examples above for instance, a draft objective statement might be:

> *" Whilst enabling the long-term sustainability of aviation, to limit the adverse health effects of long-term aircraft noise exposure to 2019 levels over the next decade, calculated using existing WHO guidelines."*

The establishment of the NAO must come prior to any consideration of the most cost-effective measures to achieve it. The fact that this consultation is asking about both the objective **AND** seeking views on the interventions that should be deployed, makes it seem at odds with the requirements of both EU598 and END legislation.

Aviation will take some years to recover to pre-pandemic levels and the pace of that recovery is uncertain. Effective measures are already in place to manage night flights and there is under-utilisation of the schemes compared to 2019 levels, so there is an opportunity for the Government to split out the development of an NAO – or at least establish the process by which the delegated competent authorities set them. Once this has been established, then consideration of any potential measures to achieve the objective should be undertaken in line with the process set out in EU598.

3.4.1 Responses to Objective Questions

No.	QUESTION	RESPONSE
69	Should we include a reference to night noise when we publish a revised aviation noise objective?	Heathrow expects that a revised noise objective would include references to both the costs and benefits of night flights, although this need not be within the objective statement itself. It is reasonable to establish an overarching noise objective that is supported by a range of indicators and measures of success. There are two principal options in relation to the establishment of a noise objective. On one hand it could be a long-term aspirational (Visionary) statement (much as exists today) supported by a noise envelope concept, establishing timebound expectations in terms of both economic and environmental outcomes. On the other, it could be short-term (Focused), perhaps a five- or ten-year objective that is subject to more regular review, but equally requiring clear economic and environmental expectations of success to be established.
70	What factors relating to night noise should we include if we do introduce a noise reference in our revised aviation noise objective?	The starting point for a competent authority should be Regulation 598 (the Aviation Noise (Amendment) (EU Exit) regulations 2019), in which Annex 1 and Annex 2 set out considerations in respect of assessing the noise situation and the cost effectiveness of any proposed operating restrictions. This provides a framework within which to consider social, economic, environmental and health factors. It is important to note that these factors are not exclusively positive or negative in relation to aviation. For example, while there are well established links between aviation noise and negative health impacts, there are also positive health impacts arising from stable employment and social connectivity.

Table 11: Responses to Objective Questions

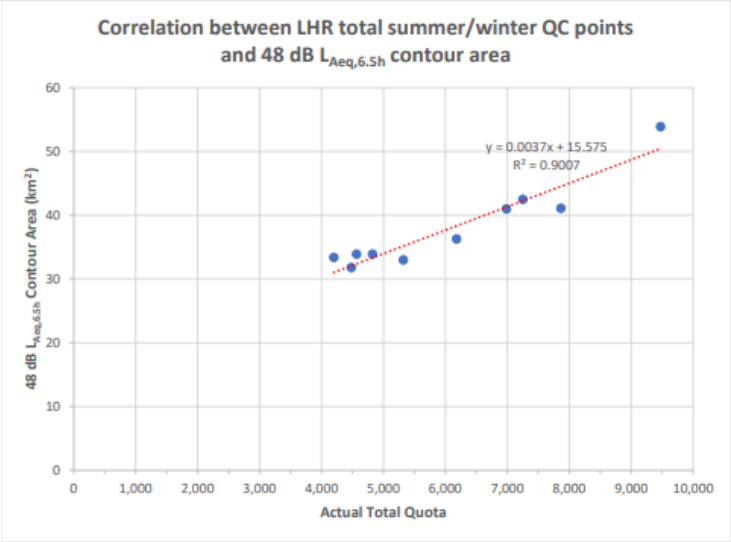
3.5 Future Regime Structure

Without the clarity of a stated objective, measures of success or targets, it is difficult to comment on the exact nature of what a future regime should include. As a general principle Heathrow supports the Balanced Approach, in that operating restrictions should only be as restrictive as is necessary to achieve the objective.

It is possible to comment further on the length of the regime. Aircraft fleet replacement will be an integral part of any package of measures to improve noise-related health outcomes. This is not a short-term process and Heathrow's understanding is that airlines are typically looking seven to ten years ahead in terms of fleet planning. It is likely therefore that aircraft manufacturer order books are already reserved.

Setting a longer period would enable airlines to consider the regime's objectives in their fleet planning activity as well as providing some stability to it. On the basis that action planning cycles are set at five years, Heathrow suggests a ten-year regime cycle. This would enable a mid-term review through the noise assessment required for the noise action planning process.

3.5.1 Future Regime Question Responses

No.	QUESTION	RESPONSE
31	What length should the night flight regime beyond 2024 be?	Heathrow supports a longer regime because it provides greater certainty for all stakeholders, and it would potentially provide an adequate lead time for airline fleet replacement planning or other improvements in technology. A ten-year regime with a progress review against the objective or desired regime outcomes after five years (aligned to the Noise Action Planning process) would be favourable. Any period longer than this would make forecasting potential changes more uncertain.
32	How do you think the length of regime will affect you?	As the industry recovers from the pandemic and the UK adjusts to leaving the EU, Heathrow welcomes the stability that a longer regime could provide. As the airport looks to attract and maintain business, the potential risk of a frequently changing night flight regime would be unhelpful. Additionally, any changes to the regime could result in additional expenditure to update monitoring or management systems, at a time when financial resources are much more limited.
33	Do you think that QC is the best system for limiting noise at the designated airports?	Heathrow agrees that it is probably the best system for managing a noise budget and enabling day-to-day decisions. Other metrics such as contours are post-event and thus limited in their usefulness in proactively managing noise. The fact that the system has been copied by other regulators around the world suggests that it has widely recognised merits. The relationship between contour area and total QC points shows a strong correlation as Figure 38 below illustrates.  Figure 38: Correlation between QC Points & Noise Contour Area Heathrow is not aware of another system, based on movements or noise budget, operational noise level, or chapter, that would offer any significant benefit over the QC system.
34	What do you think are the:	There are no obvious advantages of changing to a new system. If the purpose of the system is to assist in the proactive management of

No.	QUESTION	RESPONSE
	advantages of changing to a new system? disadvantages of changing to a new system?	night flights, any replacement would simply be another variant of a noise budget system. For example, a system based on actual noise could only be considered retrospectively and would lead to uncertainty for planners and scheduling coordinators, with a retrospective culture of night noise management. There are several immediately identifiable disadvantages. These include the costs of establishing a new system, the time to set it up and to validate it, and for stakeholders (including foreign carriers) to understand it.
35	Do you have evidence of other noise management regimes being used elsewhere and how they compare with the current system?	Heathrow does not have a detailed understanding of other regimes, so undertaking a comparison is not feasible. Heathrow understands that Hong Kong International Airport, for example, has a growth pool which incentivises the adoption of quieter aircraft and is based around the UK QC system. In Heathrow's view there are essentially five broad types of management regime that could be deployed (note that they are not mutually exclusive): • **Movement-based** – which offers no incentive to operate the quietest aircraft; • **Total noise budget-based** – like the QC system today that enables pre-planning and effective day-to-day management; • **Noise chapter-based** – which potentially removes the noisiest aircraft types from the operation at sensitive times, but does not quantify the total noise exposure or movements; • **Operational noise level-based** – a retrospective system which does not enable pre-planning or effective day-to-day management. It is also extremely complex given the number of variables in play, unless a generic operational performance measure is used – which is effectively what the QC system is based on (the certification process); and • **Noise contour-based** – another retrospective measure which cannot be managed day-to-day and would likely mean underuse or overuse in any given period, a lack of stability in scheduling services, or uncertainty of outcome for community stakeholders.
36	Should we introduce an additional QC category for quieter aircraft in the longer term?	There is merit in recognising technology improvements, but this should be considered within the context of a wider re-baselining of the QC system (see Question 39 below).
37	Should the government reintroduce an exempt category?	For the sake of transparency, the exempt category should only apply if it can be demonstrated that with effective insulation the aircraft would not result in internal sound levels above those deemed reasonable, otherwise not counting certain aircraft will always be a cause for contention.

No.	QUESTION	RESPONSE
38	Provide evidence to support your view.	N/A
39	Do you think we should re-baseline the night quota system in the longer-term?	It makes sense to do this to enable wider accessibility to the system, but any new limits need to take account of the new baseline. It will need careful communication to avoid misuse of the re-baselined values to make political points. Where possible whole integers would be preferable for communicating to community stakeholders. On the other hand, the views of international airlines are important as they will need to understand any changes amongst the multiple regimes they operate in. It may be more effective if the Government worked toward an internationally-agreed method of categorising aircraft noise levels.
40	What factors should we consider when anticipating how to best future proof a re-baselined QC system?	Consideration of future technology advances; the need to provide a database for all aircraft operating in the UK (regardless of time of day); and consideration of how this is received by international airlines attempting to navigate multiple interpretations of noise certificates.
41	What costs, if any, would you anticipate in re-baselining the QC system?	The noise track-keeping systems that are used to monitor and manage the night regime would need to be re-configured to take account of any new rules or QC values. This will generate cost to airports to install or upgrade equipment, both in financial terms and in time.
42	Would you be impacted if the NQP was extended to 23:00 to 07:00?	Depending on the rules imposed, there is a risk to both recovery and longer-term growth if the limits are set too low. Heathrow would want to see any limits set only if all other potential measures to achieve objectives have been exhausted.
43		
44	Do you think night flights in certain hours of the NQP have a greater impact on local communities than other times of the NQP?	Intuitively this would seem to be a reasonable presumption, however Heathrow believes this is an important area requiring research. Heathrow's work exploring the value of respite has illustrated that people value times of the day and of the week differently. The airport's work to date with various focus groups suggests that flights at different times of the night are considered differently. Other objective sleep disturbance studies indicate that people react differently depending on what phase of sleep they are in.
45		
46	Would a mechanism that disincentivises aircraft movements in periods of the night that are more sensitive for communities impact you?	This would depend on the period. Heathrow already has voluntary measures in place to protect the 'middle of the night' (e.g., minimising operations between 0100 and 0430) and is working on reducing operations after 23:30 and before 04:30. This is another area requiring research to establish an evidence base and the value of such an intervention.
47		
48	What would be the impact on you if QC4	At present there would not be much impact for Heathrow, but this assumes that the post-pandemic recovery mirrors the past. With

No.	QUESTION	RESPONSE
	rated aircraft movements were banned between 23:00 and 07:00 after October 2024?	recovery still likely to be in progress in 2024, Heathrow would be concerned about the shadow impacts in the 22:00 hour of not permitting the operation of QC4 aircraft and particularly the impact for cargo carriers. The airport does not yet fully understand the nature of the recovery, but it would support a trial in the rollover period to test demand, monitor fleet changes and inform any decision. It is also cautious of jumping straight to a 'ban' option before assessing (consistent with EU598) whether it is firstly required, and secondly is the most cost-effective measure.
49	What would be the impact on you if a scheduling ban was placed on QC2 rated aircraft movements between 23:30 and 06:00 after October 2024?	This would have a significant negative impact based on 2019 operations, but without knowing the nature of the recovery and profile of future markets, Heathrow cannot be certain at this time. This option was looked at during recent airport expansion work (prior to the pandemic) and determined that it would not be feasible or required until at least the mid-2030s. Heathrow would also stress the importance of only considering such steps if other interventions fail to achieve the objective.
50	What would be the impact on you or your business if a scheduling ban was placed on QC2 rated aircraft movements between 23:00 and 07:00 after October 2024	As above.
51	If bans are introduced should the implementation be staged?	Heathrow is mindful of jumping straight to bans with no discussion or assessment of other interventions, or evidence of how this best serves the objective.
52		
53	In a future regime how should we manage the number of aircraft movements (detailing the airport or airports relevant to your view)?	Heathrow acknowledges that movement limits of some form during the NQP will be considered necessary at the airport for some time yet but would like to highlight that the EU598 process is focused on the most cost-effective measures to achieve the objective – within the context of a sustainable functioning transport network. The airport is against movement limits generally, as they are a blunt instrument and offer no incentive to accelerate the introduction of new technology; nor do they align with the Government's stated policy of sharing the benefits of new technology (particularly in the context of capacity constraints). However, restrictions in the most sensitive times may be needed and Heathrow recognises this; it would want it to be kept under regular review. There is a need for evidence to inform this debate.
54	In a future regime how should we manage an airport's	Noise budgets should be managed in a way that balances the benefits of new technology between industry and community stakeholders.

No.	QUESTION	RESPONSE
	noise allowances (detailing the airport or airports relevant to your view)?	Heathrow calculated the difference between 2001 and 2019 in movements and residents within the 50dB 8-hour L_{night} contour and found that for every flight added, 11.5 residents were taken out of the contour (based on no encroachment)[30]. For the Night Quota Period, the number of flights had marginally reduced and nearly 48,000 residents were taken out of the 48dB 6.5-hour contour (based on no encroachment) when comparing 2006 and 2019. The airport notes that local communities do benefit more broadly from a vibrant, growing aviation industry.
55	Should we remove the movement limit and manage night flights through a QC limit only?	Heathrow would support this but recognises the challenges this would pose and how there could be a perception of a lack of control. Heathrow suggests that the Government provides evidence to support how a QC limit would have had the same impact as limiting movements and may even have accelerated the adoption of newer aircraft into the fleet. To be credible the regular review and reduction in QC limits over time is an important aspect of a QC only scheme. The model of a growth pool at Hong Kong International Airport is worth further exploration.
56		
57	Should we introduce a ring-fencing mechanism to ensure night slots are available for: commercial passengers dedicated freight business general aviation	In Heathrow's view this is not appropriate, as each airport should have the ability to determine the right mix for its operation and business model.
58		
59	Should an airline be able to use unused allowances later in the season?	The context of this question is not clear. If the airline has an allocation and has yet to use it, then yes, it should be able to use the allocation. If, on the other hand, this is about using up the 'pool' or spare capacity beyond its allocation, then potentially not. This will depend on the circumstance surrounding the request to use the unused allowances. Another way of interpreting the question is to assume that an airline only has an allowance for a specific flight and if not used, then it returns to an airport pool. This may help to maximise efficient use of allowances. Alternatively, it reduces the flexibility of operators and the airport and may lead to more delay during the day. The challenge is mitigating a 'use it or lose it' philosophy, which is another reason to support a long-term regime and outcome-focused approach.

[30] See Appendix B

No.	QUESTION	RESPONSE
60	If the government decided that unused allowances should be returned to the airport's pool, what would be the impacts on: communities? airports? airport users? airlines? business in and around airports?	If the budget has been set in line with meeting a stated objective and desired outcome, then the impact should be minimal (assuming the usage for the season/year is the same). But without further detail as to how the pool could be used, it is impossible to accurately account for the potential impacts.
61	Do you agree or disagree that the current carry-over process benefits you?	It briefly benefits Heathrow because clock changes between Greenwich Mean Time (GMT) and British Summer Time (BST) are not perfectly aligned with similar time zone changes in the rest of the world, meaning that there is a period of a week or so where the seasonal schedules are out of step. Moving to an annual scheme would also support the same benefit while making the process simpler for some stakeholders to understand. However, this may also reveal schedule challenges.
62		
63	What changes, if any, would you like to see to the carry-over process and how would this impact you?	There are no immediate changes Heathrow would seek at this point.

Table 12: Future Regime Question Responses

3.6 Dispensations

3.6.1 Why Dispensations are Necessary

Heathrow requires flexibility at each end of the day to support a resilient and viable airport and airline operations. The need for a dispensation scheme will remain alongside any quota or noise budget system to minimise the impact of night operations. By their nature, events leading to flight delays can be unpredictable. Some trends may be predicted over time such as seasonal weather patterns or planned for (industrial action or maintenance of infrastructure), but there will be inevitable exceptions in all cases, and some years or seasons will be more impacted than others particularly when rare adverse events combine into the same period. Heathrow also notes that the annual contours and subsequent calculations of effects of night flights will still include any dispensations that occurred.

Without dispensations, a commercial disadvantage exists for some flights which would be disproportionately impacted by events over which they have little or no control. There is a particular risk for flights near the end of the operating schedule, leading to further inequality and barriers to market entry as well as potential inconvenience for passengers if the alternative is to cancel the flight.

Case Study – Dispensation Request Scenario

Significant delays have built up during the late afternoon period at Heathrow due to widespread, coordinated strikes by air traffic controllers across several European countries. These delays cause a surge in demand later in the day and delays knock-on into the evening. One airline has a single flight scheduled that day, that was due to depart at 20:30. It is now delayed to 23:15 because of the departure queue at the runway caused by the earlier delays.

The airline cannot influence this wider delay at the airport. It is unable to schedule its inbound flight earlier so that it can depart ahead of the Night Period. If the flight cannot be dispensed because of the widespread delay, then the airline unfairly loses some of its night quota allocation. It may even be forced to cancel the flight.

While there is a case for quota counts being increased for flights scheduled later in the day, on other rare occasions even morning or afternoon flights can be delayed into the Night Period. This is more likely to be driven by exceptional circumstances causing deep and widespread disruption, including those at other airports or restrictions in the en-route airspace such as airspace restrictions or closure in commonly used airspace in Europe, snow, ice or prolonged thunderstorms.

At the same time, it would not be reasonable to allow unlimited night flights, so a scheme which sets a quota with the ability to dispense flights outside of normal limits manages both requirements well. It is important that limits are set proportionately to cover reasonable numbers of unplanned events based on reasonable delays in the context of a global network and considering extended time periods (since some years see peaks when rare adverse events combine or are prolonged). Such a scheme works effectively to incentivise the airport and its airlines to work together towards punctual operations on a day-to-day basis, while enabling exceptional cases to ensure equity and to cover unusual circumstances that cannot be overcome with advances in technology or collaborative procedures.

Categorising Qualifying Events For all Events and Airports Is Challenging

As aircraft are often used on multiple journeys in a single day between different airports, disruption in one region can easily have knock-on impacts to others. This is especially the case for adverse weather, which can impact large geographic areas and move between regions. Therefore, understanding the potential impact of an event in one region on a single airport or airline's operation can be very challenging.

In addition, the same event – for example, snow – can have varying impacts on the schedule depending upon the time of day it occurs, the duration of snowfall, the amount and type of snow that falls, and its propensity to settle and accumulate. It is extremely challenging to categorise a range of disruptive phenomena with complex variables, then to define the circumstances in which they should be dispensed; especially in a way that captures all events and their impacts while also fairly and equitably balancing the needs of airlines, airports, the travelling public, and local communities.

A Summary of Heathrow's Response to the Dispensation Questions

It is important that the ability to dispense flights remains. The associated processes should be transparent and governed to ensure any revised guidance is applied in a fair and equitable way. It is also important that airlines and airports are encouraged within the regime to minimise the number of night flights wherever practical.

Flight cancellation is not always the outcome in the best interest of all stakeholders (balancing the needs of passengers, airlines, the airport, the environment, and the local community), and therefore processes to enable progression of flight(s) into the Night Period, but without commercial disadvantage for individually impacted airlines, are required.

Heathrow therefore proposes guidance for revised dispensation arrangements that focuses on the need to demonstrate the **impact** to flights and their schedules, and that appropriate steps have been taken to **mitigate** the impact where practical. Whilst no stakeholders wish to see delay or disruption this cannot be completely ruled out, dispensations will be required, so it is key to minimise the impact on all parties. Local schemes could be formed to govern execution at each airport based upon agreed principles and managed through a collaborative process with the relevant stakeholders (such as airlines, regulators, air navigation service providers, ground handlers, the airport, and local community representatives).

Taking this into account, Heathrow's recommendation is for a set of **standard guiding principles** for unilateral application across the UK which focus on:

- The requirements to demonstrate that the impact of an event on a flight leads to the requirement of a night flight
- The evidence to demonstrate that the airline has taken any and all reasonable steps to mitigate the impact ahead of time (recommended to be set on the day before the operation takes place at the latest).

Heathrow recommends this approach rather than focusing on the type or location of events for inclusion in any dispensation scheme, as different events can have wide-ranging outcomes depending on many complex variables.

More detailed guidance and procedures for each airport could be generated based on a set of national principles, taking further account of local circumstances including population, routes, airlines, schedule profile and delays. These could be agreed and governed by a collaborative process. Individual events would be classified at the time, following the principles set in the local guidance, then reviewed post-event by regular collective working group sessions. A review and feedback mechanism would update and refine guidance for future events as required (but not change historic dispensation decisions).

This would enable a more transparent system featuring a consistent high level process across airports, able to respond flexibly to a variety of disruptive events; as well as managing a range of complex operational variables which may differ between airports, while working to effectively minimise the requirements for night flights.

Responding to the DfT's Dispensation Review

Heathrow agrees that it is important that the dispensation process, its requirements and decisions for dispensations are transparent and driven from a consistent rule set. The airport strives to achieve this within the current guidance wherever possible.

The review correctly identifies that most dispensations at Heathrow pertain to adverse weather conditions. The discussion in the report highlights the difficulty in identifying the occasions on which weather conditions should qualify for dispensation. The review concludes that significantly adverse weather at the airport, and potentially also near the airport (e.g., oceanic hurricanes), may qualify for dispensation, but that significant events further afield may not – even though the predictability of the event, and the impact on the timing of the flight, can potentially be the same for the airline and its passengers. As stated above, it will be extremely challenging, if not impossible, to categorise all eventualities for dispensation in a way that balances the needs of all the affected stakeholders. That is why Heathrow instead recommend UK guidance which concentrates on the evidence required to demonstrate the need for the night flight and local governance groups and principles that are able to respond to higher level guidance from the new regime. In this way, the cross-industry group can respond more readily to local population densities and concerns, as well as airport specific schedules, different airline business models, and the particular circumstances on the operational day in question.

In 2018 and 2019 there were increasing airspace capacity constraints impacting European airspace. These restrictions manifested as delays to planned flight times from Heathrow that airlines were required to adhere to (as the flights were issued with a revised calculated take-off time slot by the EUROCONTROL Network Manager). Heathrow has worked closely with airlines, air traffic control, and the Network Manager to invest in new toolsets, operating procedures and working practices via the airport's Airport Operations Centre (APOC) – which works to minimise these delays and where possible, bring revised departure slot times forward ahead of the Night Period. However, even with these investments, it is not always possible to mitigate delays completely. While Heathrow acknowledges that the review finds these types of delays fall outside the current dispensation guidance, the original cause of the delay is outside the influence of both the airport and the airline. Once any delay is mitigated as much as possible with existing procedures, the only alternative available to the airline is to cancel the flight. For these reasons, Heathrow believes such delays should qualify for dispensation where evidence can be provided that delays have been mitigated as far as practical under the circumstances (including consideration of different flight routes where practical).

3.6.2 Response to Dispensation Questions

No.	QUESTION	RESPONSE
13	What are your views on the: findings of the night flight dispensation review? proposals for the night flight dispensation review?	Heathrow's response to these questions are set out in the sections above, 'Why Dispensations are Necessary', 'A Summary of Heathrow's Response to the Dispensation Questions' and 'Responding to the DfTs Dispensation Review'
14	Should disruption due to local weather qualify for dispensations?	Yes, for weather events that have a greater-than-forecast impact on the day prior to the flight's operation, and/or for which airlines could not reasonably be expected to take action to mitigate. However, as detailed above, a definition of 'local' in these circumstances is difficult to identify, as weather disruption across the UK and beyond can impact Heathrow's flights as they make their journeys to and from around the globe.

No.	QUESTION	RESPONSE
		For example, thunderstorms along a departure route, but many miles from the airport can still restrict departures along that route, causing considerable ground congestion impacting all departures on all routes and with a knock-on impact to later arrivals and departures.
15	Should disruption due to en-route weather qualify for dispensations?	Heathrow believes the principles set out above in Section 3.6.1 should apply. Therefore, for significant adverse weather resulting in widespread network disruption that can't be controlled or overcome by other reasonable means, and where other mitigations have been exhausted, then dispensations should qualify. It should be a requirement to demonstrate a direct relationship between the impact to a flight and the subsequent need for a night movement, for example, receipt of a European slot regulation with timing that predicates a night movement.
16	Should disruption due to foreign airport weather qualify for dispensations?	For the same rationale given in Question 15 above, yes they should qualify.
17	Should disruption caused by ATC industrial action qualify for dispensations?	Adhering to the principles set out above in Section 3.6.1, where ATC industrial action is planned in advance, dispensations should only apply when evidence suggests that pro-active management took place but there remained an impact to the operation and airlines could not reasonably be expected to mitigate the resulting disruption.
18	Should disruption caused by industrial action by airport staff qualify for dispensations?	For the same rationale given in Question 17 above, yes they should qualify.
19	Should disruption caused by industrial action by airline staff qualify for dispensations?	Industrial action by airline personnel could be argued as more directly under the airline's influence compared to external events such as industrial events by other parties, weather, or airspace closures. Heathrow would therefore recommend that sufficient evidence is provided that all reasonable steps were taken by the airline to mitigate the requirement for a night flight in planning for the strike action before dispensation would qualify.
20	Should network capacity delays qualify for dispensations?	Under the same principles set out in Section 3.6.1, where the direct impact of capacity constraints can be demonstrated to lead to the requirement of a night movement and reasonable mitigating actions exhausted, then Heathrow would support dispensation. Greater definition and a process for identifying the evidence and the steps to be followed is recommended within the UK guidance to ensure appropriate decisions are taken locally. For example, under what circumstances is it practical to expect aircraft to re-route or make alternative arrangements? Last-minute restrictions in national airspace due to unforeseen ATC delays may qualify if re-routing was not practical or would lead to equal delays. However, if an area of a national airspace remained closed for a prolonged period, dispensation may qualify for an initial period of closure until alternative longer term arrangements can be made.

No.	QUESTION	RESPONSE
21	Should delays caused by serious criminal or terrorist activity that affect multiple flights qualify for dispensations?	As this would fall into the category of an unforeseen event out of an airline's control; and if it can be demonstrated that the activity impacted the flight in a way that led to a night movement then yes, Heathrow supports dispensation.
22	Should cumulative delays qualify for dispensations?	Routine delays that impact an aircraft flying several route sectors in a day should be accounted for in regular operational planning and scheduling processes. However, for larger events that are unforeseen and out of the airline's control, or where a night movement can be evidenced to minimise further night movements, then Heathrow supports dispensation. Governance through a Collaborative Decision Making (CDM) process is recommended.
23	Should dispensations be permitted for flights delayed to the NQP due to a medical emergency that has passed?	As this would fall under the category of an unplanned event that is outside of the airline's control, Heathrow supports dispensation if evidence can be provided. For example, data records showing the times and nature of calls to emergency services.
24	Should dispensations be permitted for flights delayed to the NQP due to a police emergency (for example a disruptive passenger) that has passed?	For the same rationale given in Question 23 above, yes, they should be permitted.
25	Should dispensations be permitted for the repositioning of emergency service (including medical transplant) aircraft?	If the repositioning is required at that time for the service to remain operational, Heathrow supports dispensation in these circumstances.
26	Should dispensations on the basis of reducing carbon emissions be permitted?	Heathrow recognises the importance of carbon reductions required to support the UKs ambitions to reach net zero emissions by 2050 and respond to the climate crisis. Our collective challenge is to protect the benefits of aviation in a world without carbon. In line with our other answers, Heathrow supports dispensation for night movements that are required for reasons outside the airlines reasonable control or mitigation. Reasonable mitigation includes taking account of the operational viability of alternative options, including the carbon and operational impact of diverts and re-positioning of flights and any resulting ground taxi or arrival holding times that may occur which may mean that operating the flight but delayed into the Night Period is the only reasonable mitigation.
27	Should pre-emptive dispensations be permitted?	If there is an anticipated event that is not within the airline's control and other measures to minimise the need for a night movement have been exhausted or are not appropriate, then yes, Heathrow supports dispensation. Examples might include airfield works or air traffic software updates leading to prolonged periods of reduced capacity and resulting in delays. In addition, there may be circumstances known in advance whereby a night movement is in the national interest (see response below).

No.	QUESTION	RESPONSE
28	Should dispensations be granted for information technology failures?	If the failure could not have been anticipated and is out of the airline's control then yes, Heathrow supports dispensation. It would be suitable in these circumstances to review timings and details to ensure each request can be associated with the failure. It may on occasion be suitable to exclude failures where it can be demonstrated that an airline had the ability to control, anticipate, or otherwise prevent the impact.
29	Supply any further views or evidence on the guidance allowing airport operators to grant dispensations you may have?	Please see 'A Summary of Heathrow's Response to the Dispensation Questions' for an overview of our response.
30	What are your views on government dispensations overall?	DfT dispensations are provided for flights for heads of state, royal families, senior ministers, relief flights, aircraft affected by hostilities, and military flights required on compassionate grounds. Heathrow recognise that these dispensations are provided as the timely operation of the flight is considered to be in the national interests.

Table 13: Response to Dispensation Questions

4. Conclusion

Night flights play an important role at airports around the world. Flights that operate in the Night Period are some of the most valuable for national economies, passengers and trade and the landing slots for them are therefore the most sought-after across the globe. However, it is acknowledged that these flights are also some of the most disruptive, which is why many governments seek to balance their usage.

For the UK, night flights at Heathrow contribute £4.3 billion to the economy and around 57,400 jobs[31]. Flights during the Night Period allow the UK to be a country that is open for business, that attracts international investment, that promotes UK exports abroad and that brings the benefit of travel and tourism to the whole nation. Consequently, these operations are crucial for the Government's ambitions to deliver a Global Britain.

Although there is no formal night flight ban, Heathrow has some of the most stringent night flight restrictions in the world (between 23:30 and 06:00) and has pioneered many of the systems that are now in place at other international airports. Heathrow has provided industry leadership, working alongside local communities, creating several voluntary initiatives to help reduce the impact of noise on the local community.

Whilst some stakeholders argue for a rigid 8-hour night flight ban, Heathrow does not believe that within current operating restrictions this would provide an effective solution for local communities, the airport or the UK economy. Instead, Heathrow's view is that the Government must establish a clear objective and expected outcomes for night flights which reflect the balance outlined in relevant legislation for 'a sustainable transport network and protection of the environment'. Mindful of this legal requirement, the Government needs to balance the benefits for the UK economy that night flights bring with disturbance they cause to the local community. Once an objective has been set, with desired outcomes, the Government should engage with both industry and communities to establish the required interventions, controls and monitoring. It will be crucial that the benefits of such an approach are clearly communicated to all stakeholders.

The Role of Night Flights

Aviation is a globally interconnected network which must work within zonal time differences. In order to have international connections there must be some flights late at night and early in the morning. As well as logistical scheduling, the UK economy relies on night flights for a number of reasons including transporting cargo which is crucial to delivering 'just-in-time' products and services; enabling onward connections for same-day appointments and meetings that can bring inward investment; and to facilitate unavoidable delays which would otherwise leave passengers stranded.

As the UK's only hub airport, Heathrow has a unique role to play in connecting the UK to global growth. Hub airports play a different role to point-to-point airports as they pool demand for global connections with transfer passengers on inbound flights, allowing the hub to maintain a broader range and frequency of direct destinations which cannot be fulfilled by domestic passengers alone. A domestic hub brings competition and choice for consumers as well as direct access to markets for the UK.

[31] York Aviation, The Economic Impact of Night Flying in the UK, July 2021

International connectivity: Airports rely on complex economics and operations to be viable entities, which makes simplistic solutions for night flights unworkable. Night flights are essential for the UK's connectivity contributing a significant economic benefit of £13.1 billion to the UK economy[32]. Many long-haul routes would not be viable without early morning arrivals. An example of this is Heathrow's non-stop route to Australia, the only one in Europe, which provides a strong basis for the Government's ambitions for a Free Trade Agreement with Australia. Without night operations this route would likely be cancelled for safety reasons (outlined in Section 2.1.4) – not only jeopardising the strength of the UK's route network but also taking away one of the UK's economic advantages over Europe.

Long-haul routes, like the Australia link, rely on a thriving short-haul market to complement them. This balance of routes is critical to hub dynamics, with connections from the short-haul network making long-haul routes with less direct demand commercially viable. However, in order to make many short-haul routes commercially viable they are reliant on a high number of rotations per day – these are facilitated by early morning and late evening flights. As well as feeding long-haul routes a competitive short-haul market drives benefits for UK consumers with lower fares and a greater route choice.

Domestic connectivity and levelling up: Early morning arrivals are particularly important for regional connectivity to Heathrow. Heathrow's first wave of departures includes six routes to UK regional airports which go on to arrive back at Heathrow before 09:00. Typically, around 42% of these passengers are transfer passengers. Without early morning arrivals into Heathrow, it would not be possible for connecting passengers to be on these flights, seriously inhibiting the Government's levelling up agenda and reducing the ability of the UK's regions to benefit from the global trade, tourism and inward investment brought in by Heathrow.

Value to local economy: Night flights are some of the most economically valuable flights at Heathrow. Typical yields on flights arriving before 06:00 are £50 higher per passenger and £2,100 higher per tonne of freight than those arriving in the 06:00-07:00 hour. This demonstrates the higher value and demand that both passengers and freight customers have for early morning arrivals. Late evening flights also have a higher yield in terms of both passengers and freight. It is not just airlines and airports who benefits from this demand – a thriving ecosystem has developed around Heathrow with numerous companies, such as freight forwarders, based around the airport to take advantage of the high value passengers and cargo that come in on these flights. A significant number of international headquarters are based around the airport, relying on night flights to do business. This ecosystem makes a huge contribution to the UK economy and employs tens of thousands of people in Heathrow's local communities – night flights should not be divorced from the positive impacts they also have within the local community.

Operational resilience: There will always be events in aviation that cannot be planned for and therefore some flexibility for flights within the Night Period will be required. Some instances may be foreseen by hours or days in advance, such as weather conditions and strike action, others, such as equipment failure, terrorist threats and last-minute changes in weather, cannot. While some flights can be cancelled or redirected, most stakeholders, including passengers and local communities (as outlined in 2.3.1), would agree that flexibility for some events should be allowed. A hard stop or complete ban creates a scheduling shadow that reduces capacity in the evening period leading up to the hard stop deadline, severely limiting demand and having further knock-on effects for connectivity and trade.

Impact of COVID-19: The global pandemic has had a devastating impact on the whole aviation industry. More than a year on from its onset, Heathrow's passenger numbers for the first half of 2021 remain 90%

[32] York Aviation, The Economic Impact of Night Flying in the UK, July 2021

down on 2019 levels. Uncertainty remains as to when passenger traffic will return as well as how and where it will recover. The type of passenger demand is likely to change depending on the rate of recovery within each country. These changes could result in the traffic mix changing, for example, if Europe recovers more quickly than other continents then it would drive a short-haul, high frequency schedule at Heathrow. It is important that airports can provide flexibility in their schedules, including hours of operation, to accommodate changes in growth in the market. Any new restrictions that impact Heathrow's already limited flexibility could hinder the rate of recovery. This would not only disadvantage the UK compared to its European competitors but also limit the ability for the Government to achieve its own ambitions for post-Brexit trade. As seen throughout the pandemic, European airports have worked closely with their governments to be on the front-foot and have consequently benefitted from a faster recovery than Heathrow. Cargo volume at Heathrow, Britain's biggest port, remain 18% down on pre-pandemic levels, while Frankfurt and Schiphol are up by 9%. If further restrictions are put in place, just as the world starts to open up again, Heathrow – and the UK – are very likely to lose out on the return of long-haul markets to these European competitors.

Balancing the Impact of Night Flights

Heathrow recognises the impact of night flights, particularly of those between 23:30 and 06:00, on the local communities and remains committed to reducing them. Despite no formal ban on night flights, working alongside airlines, Heathrow has:

- prevented scheduled arrivals landing before 04:30;
- declined to add new slots prior to 06:00;
- scheduled cargo operations and QC4 aircraft outside the Night Quota Period;
- reduced late running departures after 23:30;
- developed a 'Quiet Night Charter' with industry partners; and
- sought to extend the period for which no flight operations take place at night. This can be seen in the number of nights without flights after 0100 and before 04:30 - in 2001, this was 214 nights; whereas in 2019, it was 347.

Heathrow, and partners at the airport, have invested a significant amount into operational resilience and quieter night operations. The airport has incentivised the use of quieter and greener aircraft with airlines spending billions to upgrade their fleet type. The airport applies tougher noise charges to flights arriving during the Night Quota Period with unscheduled flights operating during this period required to pay five times more than daytime charges. The fleet mix that airlines use to fly into Heathrow are some of the quietest in operation. Heathrow is also continually improving its operational resilience to delays to minimise night flights as well as its operating procedures and, following trials, will implement slightly steeper approaches which sees aircraft flying into the airport staying higher for longer.

Although noise at the airport is steadily reducing over the long term, it cannot be completely eliminated whilst maintaining operations. Heathrow and its partners are continually investing to reduce noise levels but also the impact on health of noise. An example of these mitigations includes a noise insulation scheme offered to those most impacted. Heathrow has three insulation schemes with over 40,000 properties nearest to the airport eligible for insulation – this represents around 20% of households within the 55dB L_{den}. In addition, around 4,000 homes in the most noise-affected areas are eligible for assistance with relocating away from those areas. Heathrow is currently reviewing its noise insulation schemes to better

understand how it can improve take up and the effectiveness of acoustic insulation in reducing sleep disturbance.

There is very little research into the overall impacts of aviation on quality of life and wellbeing and Heathrow believes that a more holistic assessment of the impacts of aviation is required. The World Health Organisation has outlined that the scale of the impact from road noise exposure is many times higher than from air (or rail) transport which is why the academic research has focused on road noise effects. Whilst the health effects associated with transportation noise exposure are known there is a significant lack of research into the effectiveness of the interventions used to combat them. Therefore, Heathrow would like to see a structured research programme into what non-acoustic factors determine whether a population exposed to a noise level is likely to encounter deteriorating health effects (Figure 24) and the effectiveness of interventions in reducing the numbers at risk of health impacts established and supported by the Government. This would allow airports to direct funding to the most effective measures and would provide significant benefits for local communities.

Heathrow engages extensively with stakeholders on night flights including both the communities around the airport that are impacted by them and the businesses at the airport who rely on them. The airport recognises that there is general support for an aircraft movement limit from community noise groups. Since the regime began in October 1993, there has been no increase in scheduled movements between 23:30 and 06:00, despite significant changes to flight timings and reduction in noise exposure levels – this means that all the benefits of new technologies have been accrued to local communities. There has been an increase in movements in the 06:00 to 07:00 hour of the Night Period which is the busiest hour for arrivals at Heathrow. Even with the increase in movements from 06:00 to 07:00 the L_{night} 8-hour noise contour has reduced as a result of the investment in quieter aircraft fleet.

Heathrow is supportive of noise envelopes and environmentally managed growth, both of which recognise the need for balance in servicing community and commercial stakeholders. These concepts provide greater certainty in relation to the expected outcomes over a stated time period for all stakeholders. Heathrow would like to see an objective from the Government which captures this need for balance and is supported by clear, timebound, achievable expectations against indicators of progress.

Retiming night flights to the day period is not straightforward as is often suggested by making comparisons with other hubs. It has significant commercial and economic impacts and is often not operationally viable. CEPA assessed potential night flight restriction scenarios with expansion and the associated impact of flight retimes. As an example of the potential economic impact, a scenario retiming just three flights had retime costs of £18m (NPV 2027-2050, 2019 prices)[33]. Heathrow is already constrained, not only by night-time restrictions, but also runway capacity, restrictions in runway use and annual movement limits that mean retimings would have impact on the UK's connectivity. Airlines would likely need to consolidate their route network, replacing lower yielding thinner routes (which are often important domestic connections) with services to core destinations, thus severing regional links to core global markets at a time the Government is seeking to Level Up the nation.

The Current System

The existing UK noise management regime has generally balanced the economic and environmental impacts of night flights as well as reducing the noise impacts over time. The regime has demonstrated success by reducing night noise whilst enabling the required flexibility for commercial entities and Heathrow encourages the Government to continue to seek to maintain this balance.

[33] CEPA, Cost Effectiveness of Noise Related Operating Restrictions – Initial Assessment, July 2019

As stated, Heathrow has gone beyond Government requirements for the Night Period and has extended the period in which no flights take place. The benefit of more nights without any flights from the 00:00 to 04:30 hour is not accounted for within night noise contours, but it is valued by local communities.

The current structure of this regime means that the number of movements before 06:00 is limited. Over the three decades that this regime has existed, and despite overall growth at the airport, Heathrow has not sought to increase operations before 06:00 in recognition of the impact on local communities. It should be noted that this is not a position supported by all in the industry. The Airports Commission observed that there would be a strong economic case for more night flights without expansion at Heathrow.

Whilst scheduled movements have not increased between 23:30 and 06:00 there will always been a need for dispensations during the Night Period for unexpected events. Heathrow recommends that there is a set of national standard guiding principles for dispensations. Rather than focusing on type or location of events for inclusion in the dispensation scheme the guidelines should focus on the impact of an event and the evidence that an airline has taken any reasonable steps to mitigate the impact. More detailed guidance and procedures should then be created locally for each airport taking into account local circumstances. For Heathrow, these could be agreed on and governed through a collaborative process.

Heathrow has seen a significant reduction in the noise contours and other indicators since the start of this regime. Unfortunately, Heathrow does not have detailed data dating back to the beginning of the regime but can show and assess the last twenty years. The 50dB 8-hour night noise contour area has reduced by 20% between 2001 and 2019. The number of people highly sleep disturbed has reduced by 26% without encroachment and by 9% including encroachment. Whilst noise contours during the regime have shrunk, new housing developments and population growth are significant factors affecting the extent to which the improvements in technology have been realised. This 'encroachment' has seen over 40,000 more people exposed to noise above 50dB(A) L_{night} than would have been the case without it. Similarly, the 48dB L_{night} 6.5-hour night noise contour area has reduced by 41%, and population contour by 35% without encroachment and 17% with encroachment. At the same time aircraft movements have remained static in the Night Quota Period and have increased by 25% over the longer Night Period.

The Government, and local authorities, clearly have a role to play to ensure the right controls are in place and any new developments are on an informed basis when the industry is already investing billions of pounds to reduce the impact of noise. Clearer planning guidance and policy should focus on preventing encroachment within the 60dB(A) L_{night} contour and limiting population encroachment must be considered before operational restrictions.

The Quota Count (QC) System

The QC system is internationally recognised as an effective noise management tool. It has the advantage of enabling both proactive day-to-day management of operational performance and seasonal schedule planning within a noise budget.

Night restrictions should continue to reflect the eight-hour Night Period and Heathrow supports the use of a QC as a management tool for this. An aircraft movement limit would offer no incentive to invest in new technology and would be at odds with the Government's policy aim of sharing the benefit of new technology between industry and community. It would also weaken Heathrow's ability to compete with other major European hubs.

Evidence has shown the effectiveness of the package of noise management measures, including the QC system and investment in quieter planes, has had in reducing night noise at Heathrow. This is reflected in a reduction in the geographic noise impact of the airport. The change in aircraft type has meant that the total QC used has declined over the same period whereas the QC allowance has only minimally reduced.

One of the challenges with the current Quota Count budgets, that the Government can help to solve, is the connection between QC as a management tool and the reduction in the noise contour area and consequently the number of people who are sleep disturbed. Links such as this are rarely made meaning that community groups often have little faith in the QC system. When communities do look at the QC system, they often focus on the total QC allowed, which has stayed relatively static, rather than the QC used, which has declined dramatically. The Government should look to review how much the QC limits continue to be reduced in order to demonstrate to communities that the benefits of noise reduction are being shared.

Wider Noise Management Tools

It is important to note that night flight restrictions are just one aspect of a much wider approach to noise management. It is key to the principles of the ICAO Balanced Approach that in addressing the effectiveness of any approach to reducing noise impacts all aspects should be considered. This is why a range of measures have been considered at Heathrow to reduce the impacts of noise including incentivising a change in aircraft fleet, new operational procedures, revised land use planning and improved mitigation as well as the regime itself.

This approach is further highlighted in The Aviation Noise (Amendment) (EU Exit) Regulations 2019 No. 643, which sets out in its first paragraph that the key objective of transport policy is sustainable development and states that, "this requires… the effective functioning of both… transport systems and protection of the environment." A balance between the benefits and effects of night flights clearly needs to be struck.

There is currently no guidance or standard methodology for determining whether an airport has a noise problem. To ensure consistency it would be helpful for the Government to issue guidance that provides clarity to competent authorities and stakeholders. This does not require Ministers to determine the scale of a problem, rather it allows a common framework that can be assessed locally.

When setting a noise objective there are two approaches depending on whether the objective is supported by a noise envelope. With a noise envelope it is reasonable for an objective to be visionary and long term. However, without the noise envelope, the objective needs to be timebound to have clear measures of success or for progress to be measured against the stated objective. At present the existing noise objective for designated airports does neither of these which limits progress and leads to frustration for all stakeholders involved. Heathrow is concerned that the process for determining a noise problem has become confusing for stakeholders responding to this consultation. Without the certainty of knowing the objective that airports and their stakeholders are seeking to achieve, it seems premature to try and determine what measures should be taken, particularly with no evidence of their effectiveness. Heathrow was supportive of the decision to extend the rollover period for the current night flights regime as well as the indication by the DfT that further research work would now be undertaken. This work, along with other suggested improvements to WebTAG (see Appendix D) would greatly improve the assessment of potential night flight interventions.

Night flights, and noise measurement at Heathrow more generally, are a complex landscape. The benefits of flights during the Night Period are enormous, not only commercially for the aviation industry but also locally for thousands that are employed as a result and for the UK economy which is connected to growing markets. However, they are not without impact and Heathrow understands the effect on many residents surrounding the airport. It is therefore vital that the Government strikes the right balance in determining restrictions on the Night Period. Heathrow believes the current approach of using a range of interventions aligned with the Balanced Approach, including a Night Flying Restrictions regime, strikes this balance for designated airports – but would urge the Government to make the link between all of these measures for reducing noise clearer for communities and to set a more measurable objective.

Appendix A: Consultation Part 1 Response

Night Flights Consultation Team

Department for Transport

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3 March 2021

Dear Night Flights team,

RE: Night Flight Restrictions Consultation Part 1.

Heathrow has a longstanding commitment to reducing the impact of our operations generally and particularly at night. Since the introduction of the night flying restrictions at the designated airports in the mid-1990s there has been notable improvements in the management of night flights. When the restrictions were first in place it was not unusual for aircraft to depart after 0100 and arrive well before 0430, which meant there was no period of predictable respite for residents. Over time Heathrow has led much of the change in night noise management with several voluntary initiatives helping to reduce the impacts. These include scheduling arrivals to not land before 0430, not adding new slots prior to 0600, scheduling cargo operations or QC4 aircraft outside of the Night Quota Period, reducing late running departures after 2330 and most recently developing a Quiet Night Charter with industry partners.

These steps along with the ongoing introduction of quieter aircraft mean that the impact of our night operation has significantly reduced. For example, an indicative calculation of the number of people highly sleep disturbed by our night flights (8-hour Night Period) shows a fall of around 27% between 2001 and 2017 assuming no population encroachment, and by over 10% even taking account of new development and population change. This has been at the same time as passenger numbers, freight and movements have increased by over 20% and movements by less than 15%. Indeed, the movement growth seen in that period has been in the 0600-0700 hour. On this basis, it might be reasonably argued that the existing framework of restrictions and their evolution over time has struck a fair balance between maintaining the benefits of night flights within a sustainable transport network and the environmental and health impacts.

We welcome the opportunity to participate in a thorough review of both the existing night restrictions at the designated airports and more broadly, national night flight policy. Given the very challenging and uncertain conditions the industry is operating in at present we would also like to record our support for the decision by the Department for Transport (DfT) to extend the second part of the Night Flights

consultation to 31 May 2021. With significantly reduced resources and many colleagues on furlough this will ensure that industry, as well as all other stakeholders, have additional time to provide a more considered and comprehensive response.

As the consultation paper sets out, there is a more pressing need to determine the nature of the night flying restrictions at the designated airports as the existing regime will end in 2024. We support the Government's rationale for a rollover of the existing regime from 2022 and believe that it is the only pragmatic solution, in the context of simultaneously undertaking a more far-reaching review of aviation night noise management.

We have detailed below our response to the specific questions set out in part 1 of the consultation and look forward to responding more fully on these matters in our response to part 2 in May 2021.

Noise abatement objective

6. Do you agree with our October 2022 to 2024 night noise objective for the designated airports?

We would firstly like to record our support for a review of the existing objectives and metrics which we intend to comment on more fully in part 2 of this consultation. We also believe there is insufficient time to meaningfully consult on an alternative noise or specific night noise objective and subsequently comply with "Balanced Approach" legal assessment, consultation and notification requirements resulting from any regime change. Consequently, we would agree that the existing objective should remain during any proposed rollover period.

7. Do you agree with how our October 2022 to 2024 draft noise objective for the designated airports will be measured?

We support the proposal to continue to monitor achievement against the current objective using the metrics proposed. We also feel that there is an opportunity, at least during any rollover period, to work together towards establishing a revised objective(s) ahead of identifying a range of metrics and indicators of progress. This could include using the "rollover period" to trial proposed metrics and indicators. We would like to see the use of both environmental and economic indicators to better understand the extent to which the balance between the two is being achieved. One general comment we would make in relation to the way the existing metrics are used is that stakeholders are unaware whether the level of change is above or below the expectations for that regime period. This would help provide clarity for all stakeholders both in terms of expectation and assessment of performance. The Government has previously discussed noise envelopes/targets together with objectives and measures in the context of needing to share the benefits of new technology between community and industry stakeholders. We would welcome clarity on how these concepts fit within future night regime proposals. We intend to comment more on this in our response to part 2 of the consultation.

Specifics of the regime

8. Do you agree that we should maintain the existing restrictions for two years from October 2022 to October 2024?

Given that there is insufficient time to meaningfully consult on an alternative noise objective or subsequently consider how that objective could be met in order to comply with "Balanced Approach", legal consultation and notification requirements, we would agree that the existing restrictions should remain for at least two years. However, we think that only rolling over for two years is ambitious.

We believe it would be sensible for Government to consider extending the rollover period for two main reasons. Firstly, we are concerned that, given the scale of the review of the existing restrictions, the time and resources required to meet the legal obligations is not sufficient to undertake the necessary steps adequately. Secondly, aviation will take some years to recover from the COVID-19 pandemic, as well as respond to the UK's post-Brexit economy, with current forecasts from a variety of sources consistently putting recovery to pre-2020 levels beyond 2023. Therefore, we think it is premature to assume that there will be sufficient understanding of the recovery in 2022 when the proposals for a new regime would be due for consultation.

Consequently, we would encourage the Government to at least provision for a further rollover of up to two years to ensure compliance with the legal process and give adequate time for the consideration and assessment of future night noise management options. We would support using this period to develop and advance our understanding of night flight management interventions to develop a robust approach to a post-recovery night flight policy and local regimes.

Maintaining the existing regime

9. What would be the impacts to you should the government maintain the existing restrictions for two years, from October 2022 to October 2024?

Although there is uncertainty about the nature and timing of the recovery from the impacts of the pandemic, we do not anticipate a discernible impact on Heathrow operations because of the government maintaining the existing restrictions. We would remain committed to working with all our stakeholders to identify priorities and opportunities to reduce the impacts of our night operations through voluntary initiatives.

10.What would be the impacts to you should the government allow the night fight restriction in place at the designated airports to lapse?

We remain committed to reducing the impacts of our night operations and whilst this would not change if the restrictions lapsed, it would clearly limit our legal ability to manage and refuse operations in the Night Quota Period. With this in mind, we do not think it is in the best interests of our community stakeholders to allow the existing arrangements to lapse.

Ban on QC4

11.Do you agree we should ban QC4 rated aircraft movements from operating at the designated airports between 23:30 and 06:00 from October 2022?

We recognise that the widespread removal from scheduled services of QC4 aircraft is an opportunity for the Government to establish an operational ban. Whilst we support the operational ban, we would also point out the requirement of EU598 to provide evidence as to how this operating restriction contributes

in a cost-effective way to the achievement of the noise objective. As we understand it the data provided to date simply indicates that over the past couple of years (prior to the pandemic) at Heathrow for example, there were between 10 and 15 flights per annum without the additional data as to how this reduces the noise contour or number of people highly sleep disturbed. We would not want this decision to be considered as a precedent for the operational ban of the noisiest category of aircraft without undertaking the process required by EU598. With the need for data in mind, we believe there is an opportunity to explore the effectiveness of an extension of the operational ban to the 0600-0700 period and would support a trial of this during the rollover period.

Please do not hesitate to contact me should you have any questions in relation to our responses above or if there is any further information you require.

Yours sincerely

Rick Norman

Head of Noise
Heathrow Airport
Heathrow

Appendix B: Heathrow Summary Data

Heathrow uses multiple data sources to gather information pertaining to cargo numbers, aircraft movements, passenger numbers and more. Aircraft movement data is predominately taken from Heathrow's main Noise and Track Keeping (NTK) system, ANOMS. Where aircraft movement data has been referenced that pre-dates the installation of ANOMS in 2007, alternative Heathrow internal data is provided. An example of this can be found in Table 4 shown in Section 2.3.2, which compares 2001 aircraft movements to 2019 data. For consistency, the internal database has been used to populate this table. In the few instances where multiple sources have been used to reference aircraft movement data, there may be very minor differences in numbers during certain time periods. This can be explained by the way each database processes times and rounds up figures.

Movements, Passengers & Cargo – Full Operational Day

Year	Movements	Passengers	Cargo (kg)
1991	381,726	40,304,506	661,111,276
1992	406,433	45,019,430	757,934,971
1993	411,172	47,645,056	846,647,135
1994	334,677	40,256,242	756,028,163
1995	217,252	27,108,055	518,341,096
1996	220,156	27,899,191	526,634,374
1997	228,924	30,176,419	606,802,038
1998	225,676	30,158,168	588,761,850
1999	229,105	30,953,195	616,340,398
2000	233,406	32,121,752	644,268,272
2001	463,568	60,448,172	1,180,338,903
2002	466,554	63,029,462	1,235,035,176
2003	423,158	57,175,057	1,124,875,488
2004	475,999	67,128,853	1,325,183,057
2005	477,891	67,701,876	1,306,049,433
2006	477,040	67,356,307	1,264,426,704
2007	481,480	67,870,158	1,313,644,411
2008	478,715	66,926,842	1,400,569,469
2009	466,393	65,927,092	1,278,309,112
2010	454,883	65,763,848	1,473,105,074
2011	480,931	69,407,874	1,484,490,428
2012	475,180	70,000,043	1,464,628,093
2013	471,938	72,342,730	1,423,028,642
2014	472,817	73,383,081	1,499,081,445
2015	474,103	74,968,158	1,496,750,269
2016	474,983	75,684,088	1,542,103,553
2017	475,915	77,996,266	1,699,118,979
2018	477,775	80,111,313	1,700,517,401
2019	478,060	80,892,802	1,588,171,197

Source: Heathrow internal data

Table 14: Movements, Passengers & Cargo – Full Operational Day 1991-2019

Movements, Passengers & Cargo – Operational Night

Movements														Number of Dispensations	Nights without Night Flights				CDA Compliance			Passengers		Cargo		
	Night Period (2300-0700)	Night Quota Period (2330-0600)		2300-2330	2330-0000	0000-0100	0100-0200	0200-0300	0300-0400	0400-0430	0430-0500	0500-0600	0600-0700	Night Quota Period (2330-0600)	2300-2330	2330-0000	0000-0100	0100-0430	Night Quota Period (2330-0600)	Night Period (2300-0700)	0600-0700	Night Period (2300-0700)	Night Quota Period (2330-0600)	Night Period (2300-0700)	Night Quota Period (2330-0600)	2300-2330
Year	Count	Count	Change vs. 2019*	Count										Count	Count				% Compliance			Count		kg		
2001	23,631	5,644	+4%	2,481	442	481	79	25	11	17	914	3,675	15,506		3	148	65	214	83	73		4,581,431	1,382,507	164,415,501	38,273,710	11,657,099
2002	25,415	6,154	-4%	2,803	657	576	109	34	8	14	1,109	3,647	16,458									5,185,043	1,523,701	185,455,322	46,390,627	15,913,740
2003	24,607	5,700	+3%	2,376	470	524	97	31	35	33	1,297	3,213	16,531									5,070,025	1,450,852	178,893,893	43,462,987	13,105,189
2004	25,636	5,686	+4%	2,879	508	472	111	26	8	18	1,311	3,232	17,071									5,411,234	1,475,608	186,305,894	44,260,280	15,114,599
2005	26,358	5,859	+1%	3,067	546	373	84	20	9	27	1,242	3,558	17,432									5,612,993	1,572,847	192,581,514	47,769,778	16,539,933
2006	26,859	6,180	-5%	3,047	659	478	114	36	6	20	1,410	3,457	17,632									5,564,361	1,597,658	184,737,340	44,378,006	14,766,798
2007	27,791	5,961	-1%	3,901	767	375	83	24	7	22	1,358	3,325	17,929						92	88	86	5,716,462	1,525,223	193,336,491	43,640,335	21,595,568
2008	27,495	5,814	+1%	3,065	598	318	67	26	7	11	1,350	3,437	18,616									5,536,882	1,475,322	185,524,174	43,837,766	16,417,365
2009	26,779	5,816	+1%	1,905	498	289	83	38	6	7	1,455	3,440	19,058	206					94	89	88	5,463,987	1,506,955	174,137,317	43,300,386	12,624,753
2010	26,757	6,253	-6%	2,850	654	506	182	53	19	9	1,373	3,457	17,654	666					94	91	90	5,482,763	1,552,053	208,615,358	48,440,080	18,442,697
2011	27,523	5,733	+3%	2,457	374	222	56	10	6	6	1,552	3,507	19,333	198	24	156	195	256	94	92	91	5,579,536	1,486,053	198,334,337	45,752,084	17,329,684
2012	27,363	5,676	+4%	2,671	504	299	49	23	10	10	1,454	3,327	19,016	292	12	121	191	276	95	92	91	5,553,138	1,461,309	192,376,712	47,687,849	17,632,441
2013	28,196	5,848	+1%	3,628	510	270	78	29	9	8	1,470	3,474	18,720	314	6	128	198	285	95	93	93	5,880,513	1,521,140	181,929,934	47,323,995	22,464,356
2014	27,741	5,806	+2%	3,166	509	250	42	4	4	2	1,544	3,451	18,769	482	7	154	210	305	96	93	92	5,734,070	1,540,793	188,914,178	51,671,567	20,605,370
2015	27,551	5,770	+2%	3,037	411	203	38	3	1	3	1,531	3,580	18,744	299	3	173	230	318	96	93	92	5,785,045	1,512,632	191,935,795	52,741,715	20,044,727
2016	28,386	6,039	-2%	3,088	492	318	52	6	0	5	1,570	3,596	19,259	477	5	158	209	326	96	92	92	5,936,595	1,577,810	190,401,942	54,198,962	21,345,189
2017	28,265	5,924	-1%	2,632	361	199	25	2	0	2	1,617	3,718	19,709	368	8	182	228	336	97	93	91	6,075,625	1,626,162	204,543,302	57,813,066	20,648,236
2018	29,470	6,224	-5%	2,897	513	304	48	1	0	1	1,836	3,521	20,349	700	3	169	231	342	96	93	92	6,500,641	1,683,107	210,345,403	53,593,366	22,716,998
2019	29,171	5,894	0%	2,932	407	231	27	5	1	6	1,779	3,438	20,345	419	15	184	230	347	96	93	92	6,519,264	1,615,398	192,670,684	48,678,693	20,866,938

Source: ANOMS (noise track keeping system), Heathrow internal data

Table 15: Movements, Passengers & Cargo – Operational Night 2001-2019

* + indicates an increase towards 2019, – indicates a decrease towards 2019

Noise Exposure – Population

Highly annoyed population							Highly annoyed population (without encroachment)						Highly sleep-disturbed population						Highly sleep-disturbed population (without encroachment)					
Metric	Population count based on L_{den}												Population count based on L_{night}											
SPL	55-60dB	60-65dB	65-70dB	70-75dB	> 75dB	Total	55-60dB	60-65dB	65-70dB	70-75dB	> 75dB	Total	55-60dB	60-65dB	65-70dB	70-75dB	> 75dB	Total	55-60dB	60-65dB	65-70dB	70-75dB	>75 dB	Total
2001	36,743	26,250	12,980	4,736	817	81,526	36,743	26,250	12,980	4,736	817	81,526	15,998	6,185	2,850	381	26	25,441	15,998	6,185	2,850	381	26	25,441
2002																								
2003																								
2004																								
2005																								
2006	39,305	19,642	9,834	2,848	301	71,930	39,305	19,642	9,834	2,848	301	71,930	12,784	5,564	2,378	359	0	21,086	12,784	5,564	2,378	359	0	21,086
2007																								
2008																								
2009																								
2010																								
2011																								
2012	38,199	18,914	8,514	1,728	43	67,398							12,080	5,783	1,743	338	0	19,944						
2013	38,563	20,538	10,846	1,888	43	71,878	35,189	17,038	8,734	1,632	43	62,636	12,925	7,184	1,955	275	0	22,338	11,314	5,589	1,678	233	0	18,813
2014	35,336	21,294	9,284	1,600	86	67,600	32,214	17,486	7,480	1,184	43	58,407	13,533	6,051	1,792	233	0	21,608	11,560	4,797	1,498	190	0	18,046
2015	34,489	21,700	9,328	1,664	43	67,224	31,318	17,766	7,128	1,376	43	57,631	13,718	6,697	1,841	275	0	22,530	11,613	5,065	1,547	233	0	18,458
2016	34,566	21,154	8,734	1,504	43	66,001	31,185	16,828	6,688	1,152	43	55,896	13,982	6,270	1,596	233	0	22,081	11,719	4,688	1,336	169	0	17,911
2017	35,700	19,600	9,746	1,664	43	66,753	31,759	15,694	7,348	1,184	43	56,028	13,409	7,038	2,150	275	0	22,872	11,376	5,175	1,694	233	0	18,477
2018	30,044	19,530	8,470	1,280	43	59,367	27,293	14,994	6,380	960	43	49,670	14,202	5,893	1,694	169	0	21,958	11,710	4,347	1,287	148	0	17,492
2019	33,439	19,628	9,152	1,536	0	63,755	29,876	15,708	7,040	1,120	0	53,744	13,903	6,928	2,003	296	0	23,130	11,869	5,150	1,612	254	0	18,885

Source: Noise Action Plan contour reports, referring to the Night Period (23:00 to 07:00)

Table 16: Noise Exposure – Population 2001-2019

Noise Exposure – Contours

	L_{eq} 6.5-hour contour area	L_{eq} 6.5-hour contour population	L_{eq} 6.5-hour contour population (without encroachment)	L_{night} 8-hour contour area		L_{night} 8-hour contour population		L_{night} 8-hour contour population (without encroachment)		Encroachment per band			
Period	Night Quota Period (2330-0600)			Night Period (2300-0700)						Night Period (2300-0700)			
Metric	km^2	Population count based on L_{eq} 6.5-hour		km^2		Population count based on L_{night}							
SPL	> 48dB	> 48dB	> 48dB	> 50dB	> 60dB	> 50dB	> 60dB	> 50dB	> 60dB	50-55dB	55-60dB	60-65dB	65-70dB
2001				90.2		251,900							
2002													
2003													
2004													
2005													
2006	56.4	137,400	137,400	84.4	11.9	207,200	16,300	207,200	16,300				
2007													
2008													
2009													
2010													
2011	41.1	122,400											
2012	42.5	106,900		73.7	12.3	197,000	12,300						
2013	41.0	133,300	108,300	76.5	13.3	219,100	13,300	185,800	11,400	18,300	13,100	1,700	200
2014	36.3	107,500	84,700	74.8	12.1	215,500	12,100	180,800	10,100	22,400	10,300	1,800	200
2015	33.0	105,500	81,200	74.1	12.6	223,400	12,600	184,100	10,600	23,900	13,400	1,800	200
2016	33.9	95,400	72,600	74	10.9	221,200	10,900	180,600	9,000	25,700	13,000	1,600	300
2017	33.9	118,000	91,400	69.9	8.1	224,600	14,500	183,200	11,500	23,100	15,300	2,800	200
2018	31.8	99,000	74,100	72.7		220,900		177,300		28,300	12,700	2,500	100
2019	33.4	114,000	89,500	72.2		228,500		188,200		23,100	14,600	2,400	200

Source: Noise Action Plan contour reports

Table 17: Noise Exposure – Contours 2001-2019

Noise Exposure – Quota Count

	Night Quota Period (2330-0600)										Night Period (2300-0700)								
	QC Allowance	QC Usage	6.5-hr Average QC	QC Categories							8-hr Average QC	QC Categories							
				0	0.125	0.25	0.5	1	2	4		0	0.125	0.25	0.5	1	2	4	8
Metric	QC Points		-	Movement Counts							-	Movement Counts							
2001	10,052	8,812	1.59																
2002	10,311	9,309	1.66																
2003	10,030	9,473	1.72																
2004	10,025	9,643	1.70																
2005	10,138	9,586	1.73																
2006	10,030	9,587	1.67																
2007	10,030	9,501	1.66																
2008	9,974	8,734	1.55																
2009	10,396	8,377	1.51																
2010	9,887	8,368	1.46																
2011	9,902	8,226	1.49																
2012	9,939	7,323	1.35	112		204	1,295	1,724	2,374	124	1.04	231		1,543	11,131	7,545	6,885	349	3
2013	9,690	7,228	1.31	70		201	1,485	1,822	2,280	107	1.07	92		1,910	10,295	8,134	7,524	414	
2014	9,588	6,313	1.16	48		261	1,743	2,039	1,727	78	1.00	54		2,461	10,571	8,283	6,260	317	1
2015	9,588	5,787	1.06	26		565	1,940	1,883	1,351	49	0.96	38		3,005	10,860	7,776	5,622	360	
2016	9,588	4,780	0.85	18		1,033	2,451	1,630	902	58	0.92	22		3,875	11,598	7,112	5,665	241	
2017	9,435	4,667	0.84	20		929	2,417	1,570	1,023	23	0.87	131		4,554	11,124	7,377	5,132	99	
2018	9,435	4,598	0.83	9	2	1,312	2,377	1,418	1,099	28	0.85	192	61	5,669	10,828	7,675	5,263	87	
2019	8,025	4,420	0.81	5	27	1,225	2,449	1,240	956	13	0.79	5	922	4,692	12,443	6,876	4,304	68	

Source: ANOMS (noise track keeping system), Heathrow historic data

Table 18: Noise Exposure – Quota Count 2001-2019

Yearly values for QC allowance, QC usage and Average QC do not represent a calendar year, but the winter season of the previous year combined with the summer season of the stated year

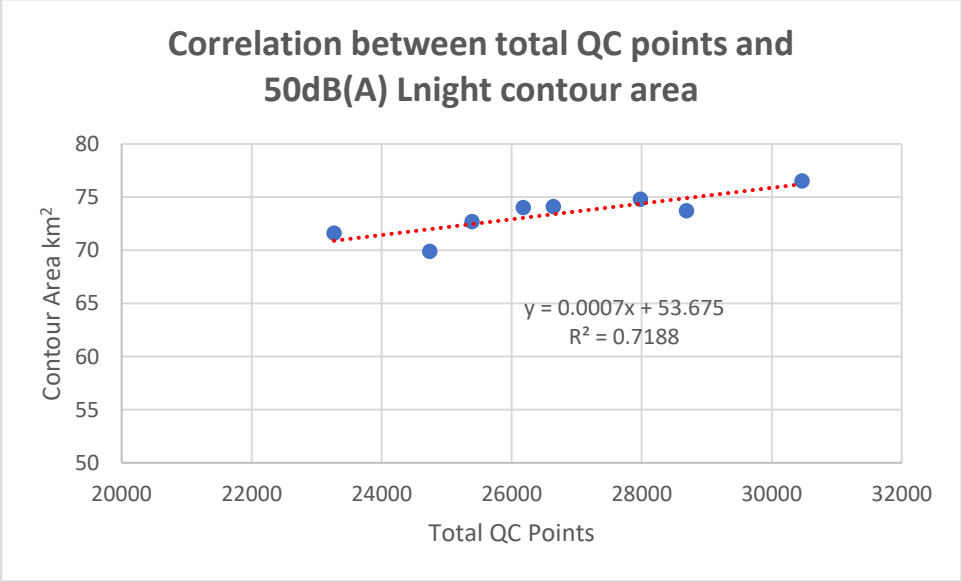
Impact on Cargo Night Flights due to COVID-19

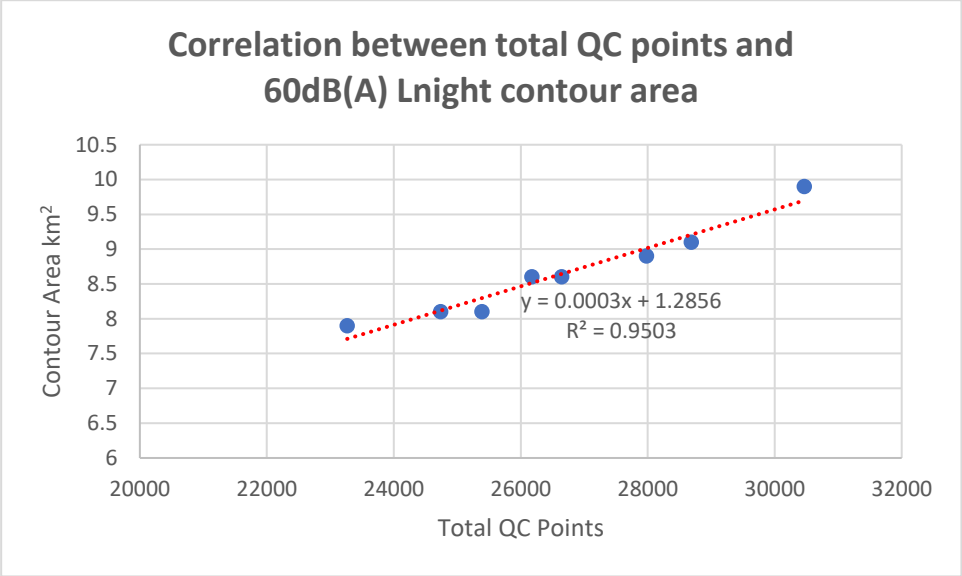
2019 Night Flights				
	Cargo (kg)	% Cargo	Movements	% Movements
Total	1,588,171,197	100%	478,060	100%
Night Flights	170,707,243	11%	26,508	5.54%
2020 Night Flights				
	Cargo (kg)	% Cargo	Movements	% Movements
Total	1,150,815,781	100%	204,732	100%
Night Flights	102,784,920	8.9%	10,151	4.96%

Source: Heathrow internal data

Table 19: Impact on Cargo Night Flights due to COVID-19 2019-2020

Correlation between QC Points & Noise Contour Area





Year	Total QC	50dB(A) Area	60dB(A) Area
2012	28686.25	73.7	9.1
2013	30463	76.5	9.9
2014	27979.75	74.8	8.9
2015	26641.25	74.1	8.6
2016	26173.75	74	8.6
2017	24737.5	69.9	8.1
2018	25387.875	72.7	8.1
2019	23265.75	71.6	7.9

Source: Heathrow internal data

Figure 39: Correlation between QC Points & 50/60 dB(A) Noise Contour Areas 2012-2019

Total QC points are the combined value of the winter season followed by the summer season. Data covers the years from 2012 to 2019.

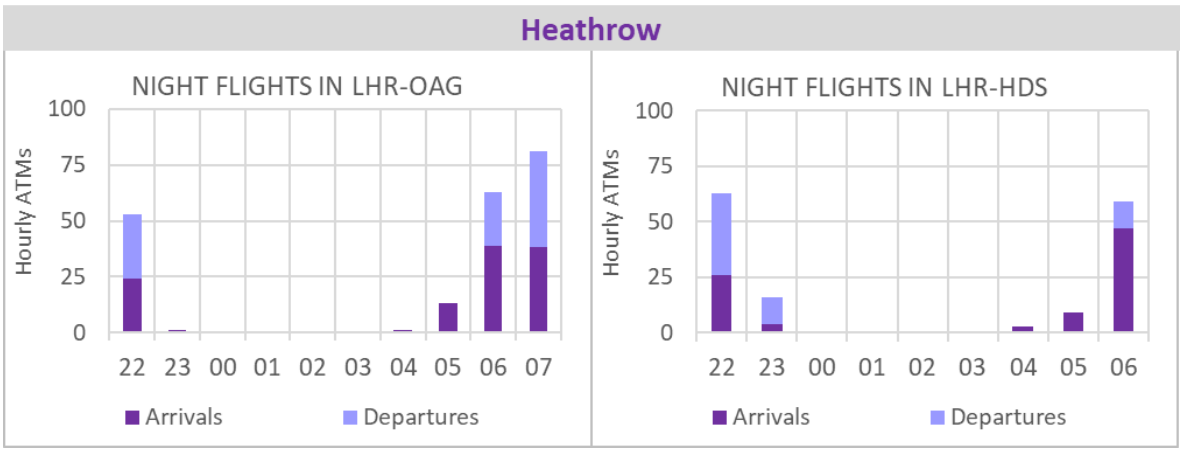
Night Noise Management Benefit Calculator

For the 8-hour night:		(2001 - 2019)
Per	**1**	flight added
	354	passengers added
	1.2	fewer residents highly sleep disturbed *(without encroachment)*
	0.4	fewer residents highly sleep disturbed *(with encroachment)*
	11.5	residents taken out of the contour *(without encroachment)*
	4.2	residents taken out of the contour *(with encroachment)*
For the 6.5-hour night:		(2006 - 2019)
Per	**0**	flights added = flights constant
	17,740	passengers added
	47,900	residents taken out of the contour *(without encroachment)*
	23,400	residents taken out of the contour *(with encroachment)*

Source: Heathrow internal data

Figure 40: Benefit of Noise Budget Management

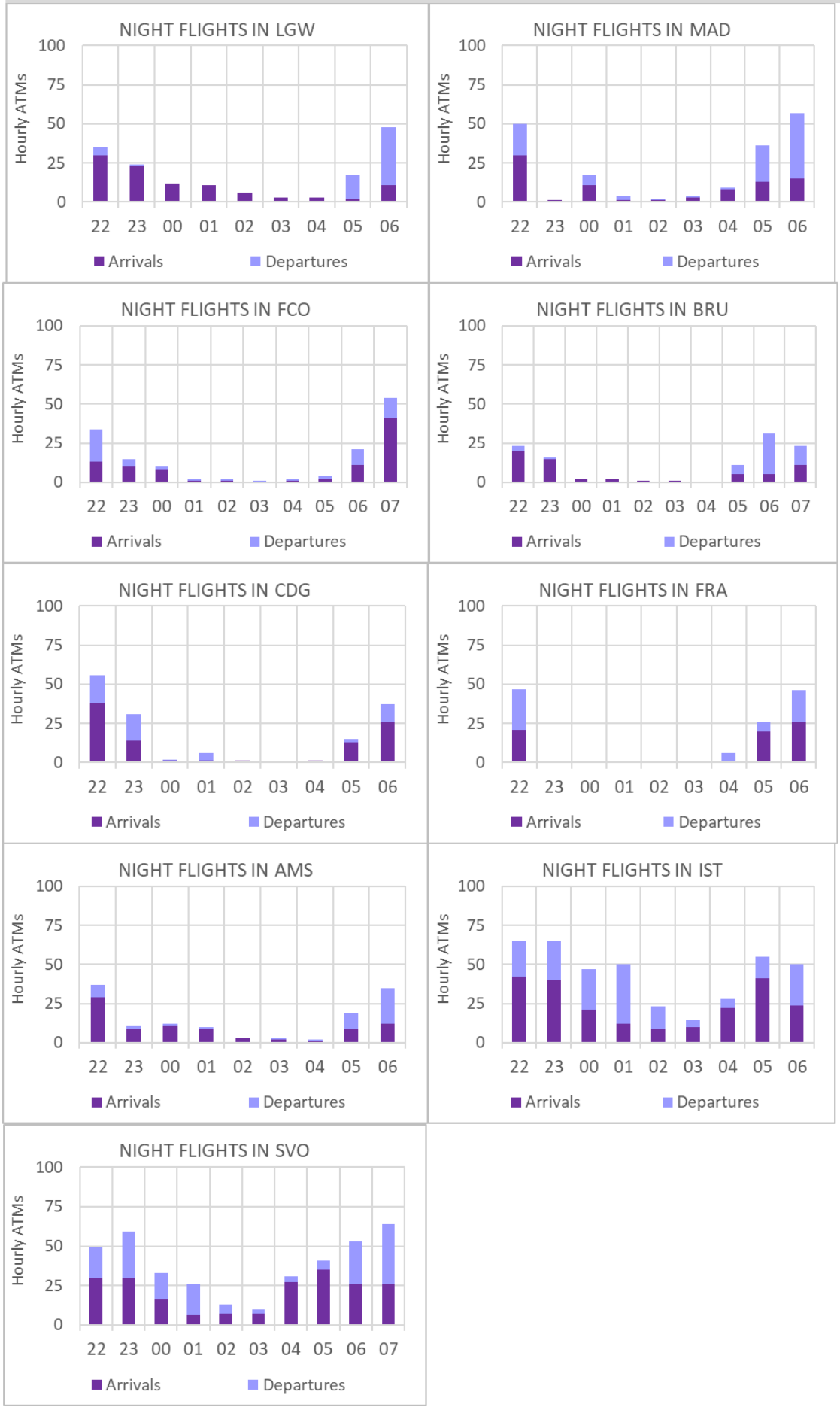
International Comparisons



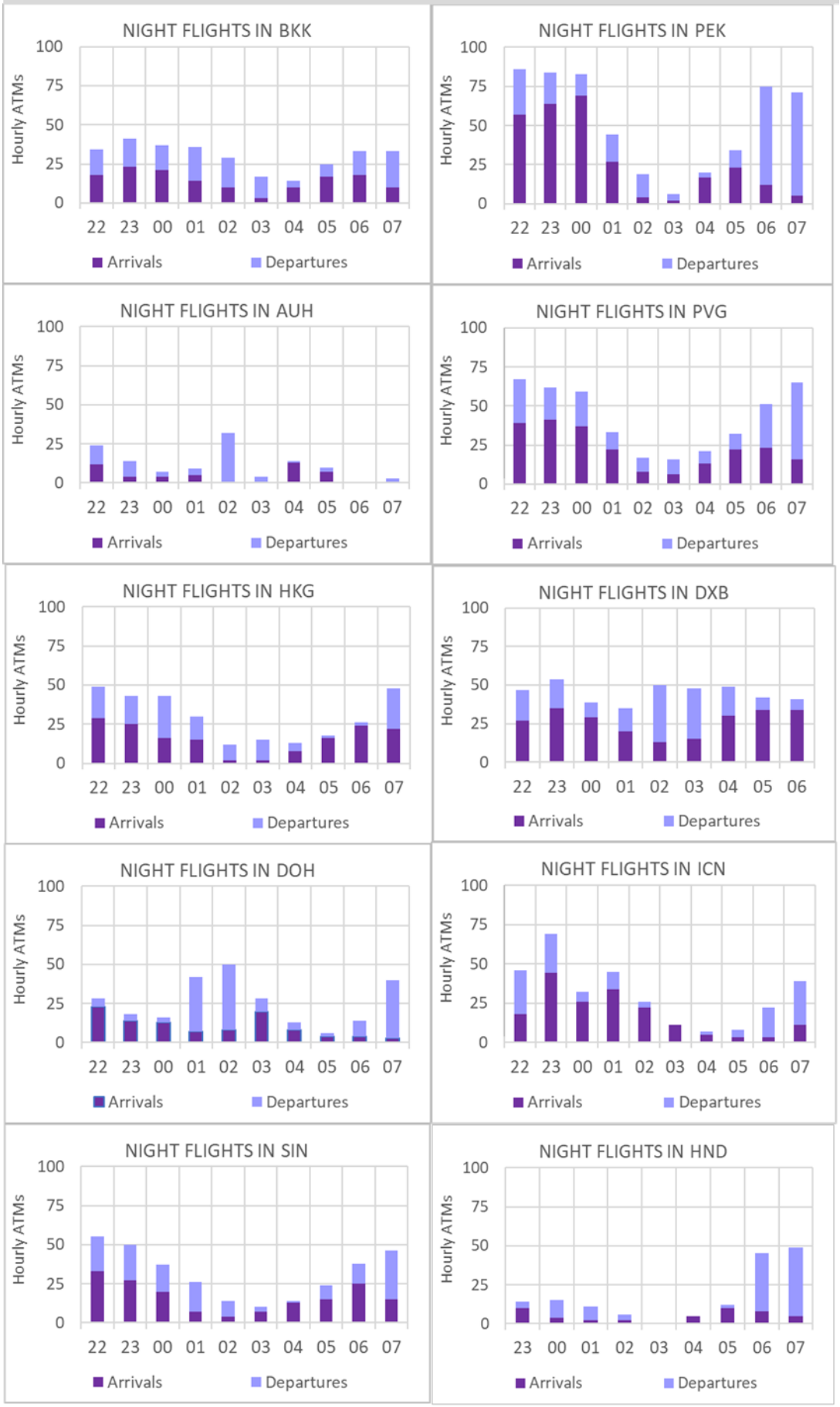
Source: OAG, and HDS refers to Heathrow internal data. OAG data relates to planned scheduled operations and Heathrow internal data refers to the actual operations in a stated hour.

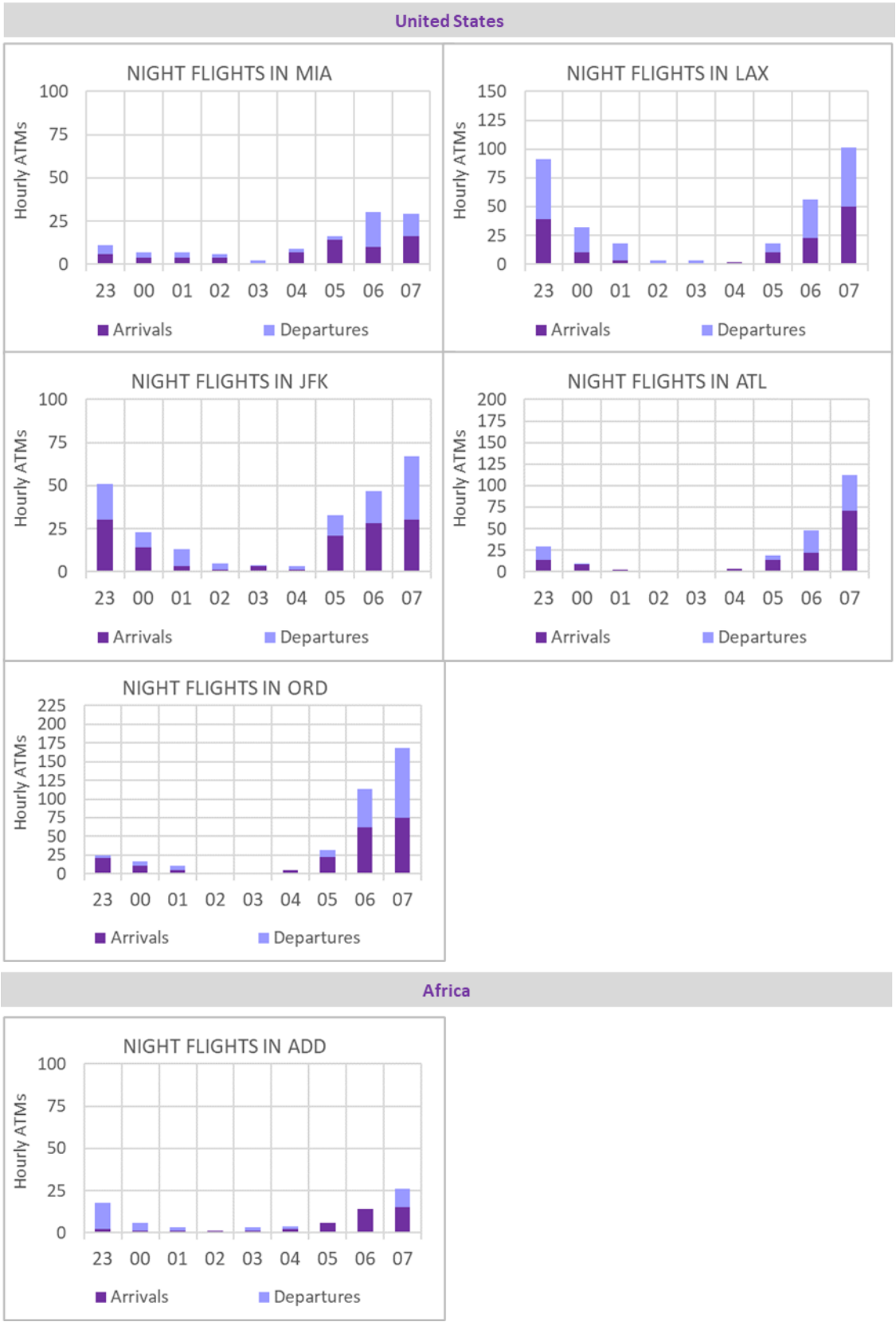
Figure 41: Heathrow Benchmark Night Flight Data vs. OAG

Europe


NIGHT FLIGHTS IN LGW
NIGHT FLIGHTS IN MAD
NIGHT FLIGHTS IN FCO
NIGHT FLIGHTS IN BRU
NIGHT FLIGHTS IN CDG
NIGHT FLIGHTS IN FRA
NIGHT FLIGHTS IN AMS
NIGHT FLIGHTS IN IST
NIGHT FLIGHTS IN SVO
Hourly ATMs
Arrivals
Departures

Middle East & Asia





Source: OAG

Figure 42: International Airport Benchmark Night Flight Data

Appendix C: York Aviation Study – Heathrow Results

Airlines UK, working with a number of industry partners, commissioned York Aviation to undertake an assessment of the economic impact of night flying in the UK. Results for the UK as a whole are published in the main report.[34] The economic impacts generated by night flying at Heathrow are presented below.

Heathrow Airport		
NQP	**GVA (£m)**	**Jobs**
Direct	£100	1,800
Indirect & Induced	£125	2,800
Wider	£1,000	11,500
Total	**£1,225**	**16,100**
Other Night	**GVA (£m)**	**Jobs**
Direct	£225	4,500
Indirect & Induced	£300	7,200
Wider	£2,575	29,600
Total	**£3,100**	**41,300**
Total Night	**GVA (£m)**	**Jobs**
Direct	£325	6,300
Indirect & Induced	£425	10,000
Wider	£3,575	41,100
Total	**£4,325**	**57,400**

Source: York Aviation

Table 20: Baseline Impact of Night Flying at Heathrow 2019

York Aviation also evaluated the impact of four scenarios that would further constrain the levels of night flying at UK airports:

- Night Ban – a total ban on all aircraft movements between 23:00 to 06:59;
- NQP Ban – a total ban on all aircraft movements during the NQP (23:30 to 05:59);

[34] York Aviation, The Economic Impact of Night Flying in the UK, July 2021

- NQP Ban, 50% Night Reduction – a total ban on all aircraft movements during the NQP (23:30 to 05:59), and a 50% reduction in aircraft movements between 23:00 to 23:29 and 06:00 to 06:59;
- 50% Night Reduction – a 50% reduction of aircraft movements between 23:00 and 06:59.

Full details of the scenarios, methodology and results for all UK airports are included in the main report. The economic impacts of each scenario at Heathrow are presented in Table 21 below:

Heathrow	Direct		Indirect & Induced		Wider		Total	
Scenario/Impacts	GVA (£m)	Jobs	GVA (£m)	Jobs	GVA (£m)	Jobs	GVA (£m)	Jobs
Scenario 1: Night Ban	-£125	-2,400	-£175	-3,900	-£2,100	-24,000	-£2,400	-30,300
Scenario 2: NQP Ban, 50% Reduction in Other Night	-£100	-2,200	-£150	-3,500	-£1,675	-19,300	-£1,925	-25,000
Scenario 3: NQP Ban	-£50	-1,100	-£75	-1,700	-£800	-9,300	-£925	-12,100
Scenario 4: 50% Reduction	-£75	-1,600	-£100	-2,500	-£1,250	-14,200	-£1,425	-18,300

Source: York Aviation

Table 21: Economic Impact of Night Flying at Heathrow

Appendix D: Improving WebTAG

This Appendix provides a more detailed discussion on the identified gaps in WebTAG, to address the economic and health impacts of night flying.

D.1 Assessing Economic Impacts

In terms of the economic impacts of night flying, the main area not covered in WebTAG is the impact on freight. Cambridge Economic Policy Associates (CEPA) began to develop additional methodologies to address these gaps on Heathrow's behalf as part of its preparation for the third runway Development Consent Order (DCO) application[35]. The introduction of night flight operating restrictions may result in several outcomes for aircraft movements, passengers, freight and airlines. Key areas of consideration are laid out below with available guidance to assess the impacts and suggested approaches from the work by CEPA.

Reduced Capacity

If future restrictions involve banning or reducing movements during the Night Period, flights will need to be rescheduled to an alternative time. However, if capacity constraints do not allow for this, or if the flight is no longer operationally viable (because it is no longer possible to reschedule a flight later in the day as it would violate restrictions at the other end of the journey, or short-haul aircraft turn-rounds could no longer be accommodated within a day), the flight will be lost and overall capacity is reduced at the airport. In the case of short-haul airlines whose business models are dependent on aircraft utilisation, all rotations associated with the aircraft used for the lost night flight may also be lost throughout the day.

Alternatively, an airline may choose to replace one of its existing slots with the retimed night flight, generally resulting in the loss of a less lucrative short-haul flight. For restrictions that involve limiting certain types of aircraft, airlines may need to downgrade in size to alternative aircraft with reduced passenger or cargo capacity, again reducing overall capacity at the airport. Passengers and freight previously travelling on night flights may still travel on retimed or alternative flights, or be lost entirely – particularly transfer passengers and cargo whose connections are no longer viable, or time-sensitive business passengers and express freight.

The impact of the increased capacity constraint results in increases in shadow costs of the remaining flights. WebTAG sets out the methodology to calculate the consumer and producer surplus resulting from the reduced capacity for passengers. However, it is necessary to make assumptions on the existing shadow costs and the price elasticity of passenger demand, as there are no parameters provided by WebTAG. Frontier Economics[36] estimated that in 2018, the shadow cost of a single short-haul flight at Heathrow was £17 and a single long-haul flight was £109. DfT used an estimate of –0.6 for the price elasticity of passenger demand in its 2017 Aviation Forecasts.

As there is no set method for assessing the impacts of restrictions on freight in WebTAG, CEPA developed a methodology to estimate the shadow cost and price elasticity of freight demand. It reviewed the academic evidence on the elasticity of freight, which showed a range of –1.6 to –0.2 and adopted –0.9 as a central estimate. CEPA analysed changes in the number of all-cargo movements at Heathrow and in the

[35] CEPA, Cost-effectiveness of Night Flight Restrictions: Methodology Report, February 2020

[36] Frontier Economics, Estimating the Congestion Premium at Heathrow, May 2019

UK to estimate there is zero to ten percent of unmet demand for all-cargo flights at Heathrow. Assuming a central case of 5% and price elasticity of –0.9, CEPA used IATA estimates of cargo prices to estimate a freight shadow cost of £73 per tonne.

Flight Retimes

If there is available capacity within the schedule, night flights may be retimed. The difference between the original flight time and the new flight time is referred to as the displacement time. CEPA proposed two different methods to quantify the impacts of retimes.

The first approach assumes that in terms of lost time, the average cost per passenger or freight is equal to the displacement time and is measured by the value of time for passengers or freight. WebTAG does not provide values of time for passengers or freight. However, the Airports Commission estimated the value of time for leisure at £6.03 per hour; UK and foreign business passengers at £54.98 and £51.71 per hour respectively. DfT updated those estimates for leisure and UK business passengers to £4.59 and £43.84 per hour respectively (all figures in 2008 prices). CEPA reviewed the available literature to determine an appropriate range and central estimate for the value of time for freight with a range of £115 to £213 per tonne per hour, with a central estimate £127 (in 2018 prices).

Further work is required to understand the applicability of these values of time to displacement time. For example, there may be higher costs for business passengers who lose working hours at their destination or for time-critical freight, versus lower costs for leisure passengers or business passengers who are able to work on the flight.

CEPA also proposed an alternative approach based on the impacts on yields of retimes. It used data provided by airlines on the typical passenger and freight yields that flights at certain times of the day attract. For example, retiming a pre-06:00 arrival to the 06:00-07:00 hour would result in a reduction in yield of £50 per passenger and £2,100 per tonne of freight.

CEPA highlights that although the first approach assumes that the cost is incurred by the passenger or freight customer and in the second approach the cost is incurred by the airline, in reality it is ambiguous who incurs the cost.

Creation of a Shadow Period in the Schedule

If movement restrictions relate to late-running flights where there is only a short or no recovery period between the start of the schedule ban and the start of the runway ban, airlines may choose to conservatively schedule their flights to avoid the restriction. CEPA collected evidence from airlines to show that they would only schedule a long-haul flight arrival at 60-90 minutes before a runway ban and at 75-135 minutes for a departure; a short-haul flight arrival at 50-70 minutes or departure at 80 minutes before. The creation of a shadow period would result in flight retimes, or if there was insufficient capacity, a loss of flights with an impact to economic value for airlines, airports and the UK from business travel connections, trade, and cargo.

Impact on Resilience

Restrictions may impact resilience due to the shortened hours of operation and an increase in the concentration of flights during the day, resulting in an increase in average delays. WebTAG provides no guidance on how the impacts of flight delays should be assessed. However, it does recommend using a

delay multiplier of 2.4 to passenger values of time for average delays to public transport journeys. No estimates of delay multipliers are provided for freight. CEPA reviewed the available literature and found no studies relating to air freight, however, reviewing studies for rail and road suggests a central estimate of 4.6. There are also costs to airlines of increased delays that should be accounted for. CEPA highlighted the study by the University of Westminster[37] which quantified four types of costs: fuel, maintenance, crew overtime and passenger compensation costs.

Impact on Flight Cancellations or Diversions

Restrictions may result in an increase in flights being night-stopped, as they are unable to take-off or land. CEPA gathered feedback from airlines and found that foreign carriers are unlikely to divert flights in the event of being night-stopped and would instead cancel their flights. Home-based carriers may be more likely to divert short-haul flights to alternative UK airports and return passengers to Heathrow by coach but would cancel long-haul flights.

For cargo flights, feedback suggests that airlines would divert flights if possible, rather than cancel. CEPA assumed that the costs of cancellation are equivalent to a long delay and would include crew and passenger compensation costs to airlines, inconvenience to passengers and freight, and there will be a loss of passengers who choose not to fly following a cancellation. The costs of a diversion would be equivalent to a delay of the length of time of travel back to Heathrow, for example around two hours from Gatwick.

It should also be noted that restrictions resulting in flight diversions move the night noise exposure to a different population.

Wider Economic Impacts

Restrictions to night flights also have wider economic impacts that should be considered including trade, tourism, Foreign Direct Investment (FDI) and connectivity. Although WebTAG acknowledges these are aviation-specific impacts, there is no agreed methodology for assessment. CEPA proposed using the work of InterVISTAS[38] to relate changes in connectivity to GDP, using its elasticity estimate of a 1% change in connectivity resulting in a 0.007% change in labour productivity. More recently, York Aviation[39] used a statistical relationship developed by Oxford Economics, where connectivity is defined as the number of business passengers using UK airports plus air cargo tonnage multiplied by 10, relative to UK GDP. This analysis identified that a 10% increase in the UK's connectivity would result in a 0.5% increase in productivity. York Aviation highlights that this relationship is particularly appropriate for assessing the benefits of night flights in the UK because it is the only relationship identified that includes air cargo, is based on analysis focusing on the UK that has been refined over time through a number of studies, and is in line with similar work undertaken in this area.

[37] University of Westminster, Cook, A.J., and Tanner, G. (2015) European airline delay cost reference values. EUROCONTROL Performance Review Unit. Available at: https://www.eurocontrol.int/sites/default/files/publication/files/european-airline-delay-cost-reference-values-final-report-4-1.pdf

[38] InterVISTAS, Measuring the Economic Rate of Return on Investment in Aviation, Dec 2006

[39] York Aviation, The Economic Impact of Night Flying in the UK, Jul 2021

D.2 Health Impacts Associated with Noise Exposure

There are significant gaps in the research and guidance on how to assess the health impacts of aviation.

WebTAG assesses the impact of night noise using the L_{night} metric, which is the annual average equivalent noise level over the eight-hour period from 23:00 to 07:00. This means that implementing a range of interventions during the Night Period may still result in the same L_{night} value, despite having significantly different impacts on the local community. As a result, the benefits of those interventions are not fully assessed.

For example, moving flights from the pre-06:00 period to the 06:00-07:00 hour would have no impact on the L_{night} metric, but community feedback would suggest this would be a valued change. In addition to the sensitivity of different hours within this period, there are a number of other factors that local communities would value but are not adequately measured by the L_{night} metric. For example, periods of predictable respite, frequency of flights and noise levels of individual flights. This is an issue initially requiring research to inform how WebTAG could then take it into account. Heathrow is pleased to note that the DfT recently indicated that this work is going to be undertaken.

WebTAG does suggest that supplementary noise metrics such as N70 should be considered. The 70 decibel (N70) measure is a commonly used frequency-based aircraft noise measure in many countries because a 70dB outside noise will generally be experienced as a 60dB event inside a residence when windows are open. Where there is evidence supporting an association between a recognised aircraft noise metric and a particular health impact, Heathrow advocates the use of the most scientifically robust option.

Health Impacts of Night Noise

WebTAG provides links between L_{night} and the impact on sleep disturbance, annoyance and health impacts (AMI, stroke and dementia). It monetises these impacts using Disability-Adjusted Life Years (DALYs). However, there are potentially wider health impacts that are important to consider such as quality of life, productivity, mental health and wellbeing.

Further research is needed to link appropriate metrics for night noise to a wider range of quality of life and health impacts. It should be noted that for the purposes of a cost-effectiveness assessment, the impacts do not need to be monetised. For example, an assessment could be on the basis of the most cost-effective method of providing an additional hour of respite, provided there were clear links to the health benefits of respite.

Wider Health Impacts of Aviation

Although the noise associated with flights has a negative impact on health, there are also positive impacts of aviation on health as a result of increased employment levels and accessibility to leisure travel. There is currently no guidance on how to include these impacts in an assessment.

The report by consultancy firm Jacobs entitled "Quality of Life, Health and Equalities Assessment Review" (May 2015) commissioned by the Airports Commission, highlights that increased levels of employment and income can improve health and wellbeing. The PwC report "Quality of Life: leisure impacts" (June 2015) also commissioned by the Airports Commission found that taking holidays and flights are associated with improvements to health and wellbeing, and that flights to the rest of the world have a larger effect than those to Europe.

Effectiveness of Mitigation

In line with EU598, the introduction of scheduling restrictions should not be the first consideration when managing night noise. Other mitigation measures may comprise a far more cost-effective approach. However, there is currently no guidance on the mitigation measures that should be introduced or how to assess their effectiveness on reducing the health impacts of noise.

For example, the installation of noise insulation or predictable respite through runway rotation schedules will not change the external sound levels or long-term noise exposure metrics used to calculate sleep disturbance – so they would appear ineffective and costly under the existing approach.

Appendix E: CAA Noise Data

Heathrow commissioned the CAA to further analyse data on noise contours, population and procedural changes between 2001 and 2019.

1. Adjustments to 2001 and 2019 L_{night} contours to account for changes in population database, movement numbers and fleet mix

Objective

Making adjustments to existing L_{night} contour results to account for changes in the population database, total movement numbers and fleet mix between 2001 and 2019 and vice versa, assuming that all other variables remain constant.

Method

To undertake a full like for like assessment would be both complex and time consuming given that the model used for 2001 differs to the version used for 2019. However, a simplified approach was agreed including the following adjustments:

- For the **population adjustment**, a different population database is used to determine its effect on the same set of contours, e.g. 2001 contours with the 2019 population database. In this study:
  (a) the 2001 contours were analysed with the 2019 CACI database
  (b) the 2019 contours were analysed with the 1999 CACI database
  (note: this database was used for the original 2001 L_{night} contour work)

- For the **movement adjustment**, the existing contour dataset was scaled to account for a growth in total movements by adding a dB factor. In this study:
  - 2001 annual average 8-hour night movements = 66.39
  - 2019 annual average 8-hour night movements = 80.53
  - Adjustment factor:
    $10*\log_{10}(80.53/66.39)$ = **+**0.84dB applied to the 2001 contours
    $10*\log_{10}(66.39/80.53)$ = **-**0.84dB applied to the 2019 contours

- For the **fleet mix adjustment**, the average QC value per movement was used as a proxy for fleet mix noise and knowing the changes of this value between 2001 to 2019, a dB adjustment can be made to account for fleet mix changes. For 2001, this can only be easily determined for the summer/winter 6.5h night, so the QC values for summer/winter 6.5h are used as a proxy for L_{night} fleet changes between 2001 and 2019.
  - For the 2001-2 summer/winter season:
    Actual QC points = 8,951
    Actual movements used = 5,623
    Average QC per movement = 1.592

- For the 2019-2020 summer/winter season:
  Actual QC points = 4,199
  Actual movements used = 5,290
  Average QC per movement = 0.794
- Adjustment factor:
  $10*\log_{10}(0.794/1.592)$ = **-**3.02dB applied to the 2001 contours
  $10*\log_{10}(1.592/0.794)$ = **+**3.02dB applied to the 2019 contours

The adjustments above were applied in various combinations as follows:

Scenarios analysed for 2001 L_{night}		Scenarios analysed for 2019 L_{night}	
A1.	LHR 2001 L_{night} + 1999 CACI database (**original case**)	B1.	LHR 2019 L_{night} + 2019 CACI database (**original case**)
A2.	LHR 2001 L_{night} + 2019 CACI database	B2.	LHR 2019 L_{night} + 1999 CACI database
A3.	LHR 2001 L_{night} + 1999 CACI database + 2019 adjusted movements	B3.	LHR 2019 L_{night} + 2019 CACI database + 2001 adjusted movements
A4.	LHR 2001 L_{night} + 2019 CACI database + 2019 adjusted movements	B4.	LHR 2019 L_{night} + 1999 CACI database + 2001 adjusted movements
A5.	LHR 2001 L_{night} + 1999 CACI database + 2019 adjusted fleet mix	B5.	LHR 2019 L_{night} + 2019 CACI database + 2001 adjusted fleet mix
A6.	LHR 2001 L_{night} + 2019 CACI database + 2019 adjusted fleet mix	B6.	LHR 2019 L_{night} + 1999 CACI database + 2001 adjusted fleet mix
A7.	LHR 2001 L_{night} + 1999 CACI database + 2019 adjusted movements + 2019 adjusted fleet mix	B7.	LHR 2019 L_{night} + 2019 CACI database + 2001 adjusted movements + 2001 adjusted fleet mix
A8.	LHR 2001 L_{night} + 2019 CACI database + 2019 adjusted movements + 2019 adjusted fleet mix	B8.	LHR 2019 L_{night} + 1999 CACI database + 2001 adjusted movements + 2019 adjusted fleet mix

Source: CAA

Table 22: L_{night} Contour Adjustments for Changes in Population, Movements & Fleet 2001-2019

2. Population encroachment analysis

Objective

To examine the population encroachment into areas around Heathrow between 2001 and 2019.

Method

Using the 2001 L_{den} contours, percentage changes in population and households for each 5dB band were calculated with the population database changed from the 1999 CACI population database update (used for the original 2001 L_{den} contours) to the 2019 CACI update.

Results

The percentage changes in population and households are summarised below. The counts have been rounded to the nearest 100 for this analysis.

Population Changes				
L_{den} band (dB)	Area (km^2)	1999 CACI database	2019 CACI database	Change
55-60	142.8	479,700	566,900	+18%
60-65	54.2	149,000	179,100	+20%
65-70	24.8	47,900	63,500	+33%
70-75	10.0	10,800	14,600	+35%
> 75	5.0	700	1,100	+57%
Household Changes				
L_{den} band (dB)	Area (km^2)	1999 CACI database	2019 CACI database	Change
55-60	142.8	214,900	234,700	+9%
60-65	54.2	63,800	69,800	+9%
65-70	24.8	19,000	21,800	+15%
70-75	10.0	4,200	4,700	+12%
> 75	5.0	300	300	0%

Source: CAA

Table 23: Heathrow Population Encroachment 2001-2019

3. Procedural changes and changes to quieter aircraft

3.1 Procedural Changes

The CAA considered some of its previous work to identify suitable examples of SEL footprints that illustrate the effects of change in procedures, for example, aircraft flap settings.

Whilst suitable examples could not be found, the 2017 CAA report CAP1554 Review of Arrival Noise Controls provides relevant information on the noise benefits arising from the use of:

- Continuous Descent Operations (CDO) – providing up to about 4dB noise benefit.
- Low Power/Low Drag (LP/LD) – providing up to about 3dB noise benefit.
- Reduced landing flap – providing up to about 0.5dB noise benefit.

In this report the noise benefits from the above procedural changes are portrayed in an individual manner for the Boeing 777-300ER aircraft type along the extended runway centreline as follows:

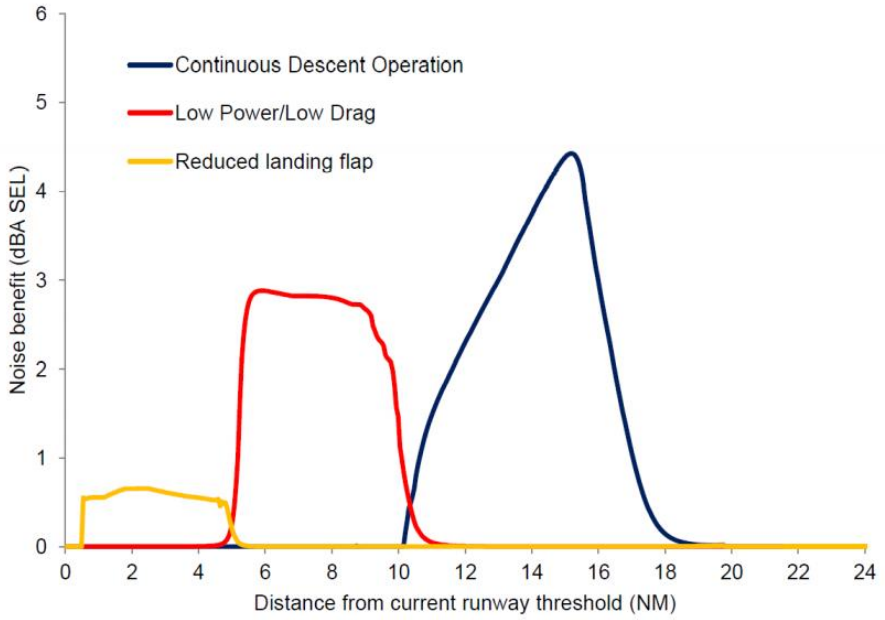


Figure 43: Benefit Comparison of Individual Arrival Noise Measures for Boeing 777

3.2 Changes to Quieter Aircraft Types

Objective

To examine the noise benefits of changing from an older, noisier aircraft type to a more modern, quieter aircraft type on arrival at Heathrow.

Method

Arrival 80 and 90dB SEL footprints for the Boeing 747-100 (ANCON type B741), which was operating at Heathrow in 2001, were compared against the Boeing 777-300ER (ANCON type B773G) and Airbus A350-900 (ANCON type EA359), which were both operating at Heathrow in 2019, for Runway 27L. Area, population and household estimates were made using the 2019 CACI population database.

Results

The area, population and household estimates within the 80 and 90dB SEL footprints are summarised in Table 24 below, along with the percentage changes relative to the B741.

80dB SEL area, population and household estimates						
ANCON type	Area (km^2)	Population	Households	Area change relative to B741	Population change relative to B741	Households change relative to B741
B741	52.2	324,400	132,800	-	-	-
B773G	21.8	121,400	47,000	-58%	-63%	-65%
EA359	18.6	105,000	40,400	-64%	-68%	-70%
90dB SEL area, population and household estimates						
ANCON type	Area (km^2)	Population	Households	Area change relative to B741	Population change relative to B741	Households change relative to B741
B741	10.1	41,400	14,400	-	-	-
B773G	2.6	10,900	3,600	-74%	-74%	-75%
EA359	1.6	3,300	1,000	-84%	-92%	-93%

Source: CAA

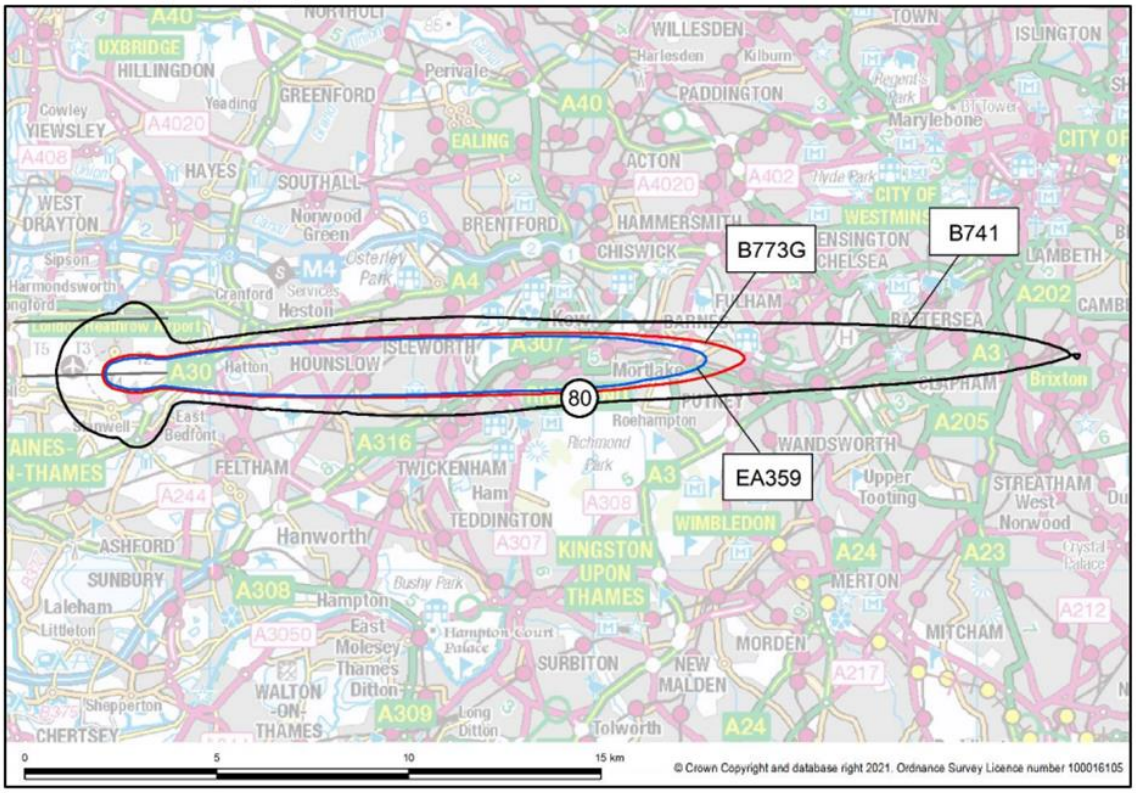
Table 24: Area, Population & Household Estimates 80 & 90dB SEL Footprints by ANCON Type

The area reductions relative to the B741 are in the range of 58-74% for the B773G and 64-84% for the EA359.

The population count reductions relative to the B741 are in the range of 63-74% for the B773G and 68-92% for the EA359.

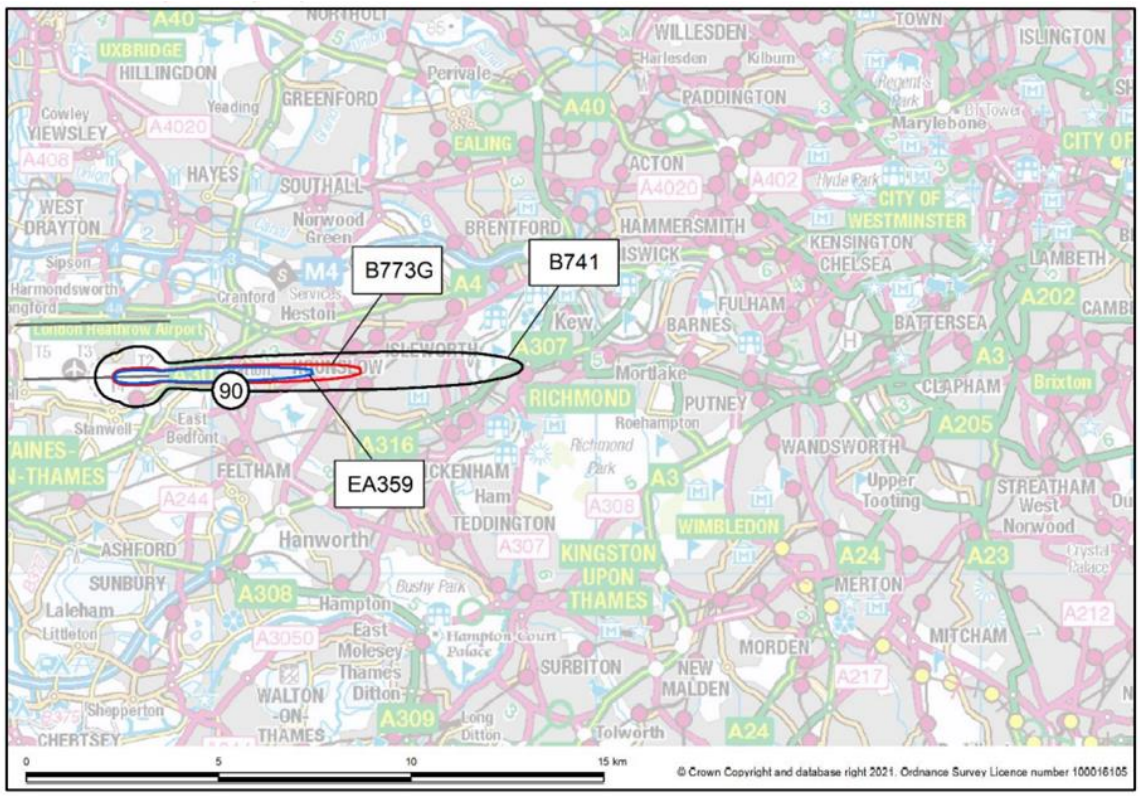
The household count reductions relative to the B741 are in the range of 65-75% for the B773G and 70-93% for the EA359.

Note that the population and household counts are rounded to the nearest 100. SEL footprint comparison diagrams for each ANCON type are shown on the following page for the 80 and 90dB SEL levels separately.



Source: CAA

Figure 44: 80dB SEL Comparison Plot for Runway 27L Arrivals



Source: CAA

Figure 45: 90dB SEL Comparison Plot for Runway 27L Arrivals

4. Correlation between QC points and contour area

Objective

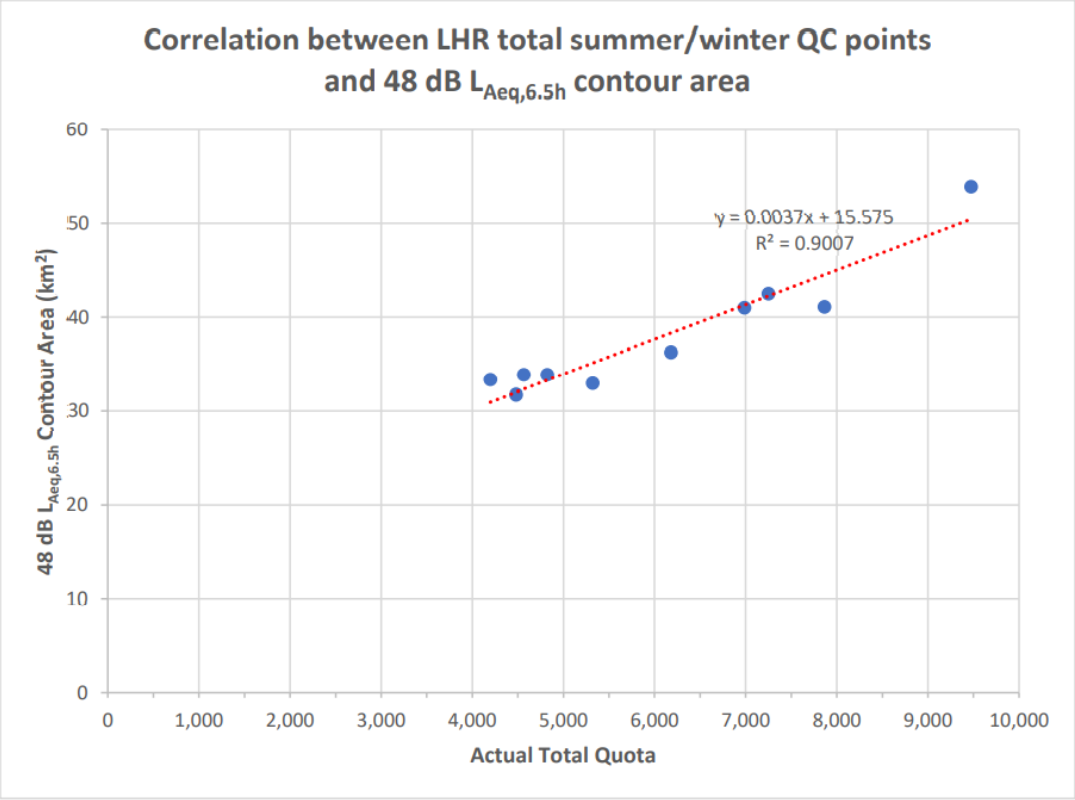
To examine the relationship between actual QC points used and contour area at Heathrow.

Method

The 48dB $L_{Aeq,\ 6.5\text{-}hour}$ contour areas and actual QC point totals were collated for the summer/winter 6.5-hour Night Period between 2001 and 2019. Data was available for:

- 2002-3 (winter 2002-3 and summer 2003 seasons combined); and
- 2011-12 through to 2019-20 (summer/winter seasons combined).

The contour areas and QC points data are plotted below and a linear regression trendline has been fitted to the data:



Source: CAA

Figure 46: Correlation between Total Summer/Winter QC points & 48dB $L_{Aeq,\ 6.5\text{-}hour}$ Contour Area

List of Abbreviations

Acronym	Meaning
ADD	Addis Ababa Bole International Airport (IATA Airport Code)
AMI	Acute Myocardial Infarction
AMS	Amsterdam Airport Schiphol (IATA Airport Code)
ANCA	Aircraft Noise Competent Authority
ANCON	Aircraft Noise Contour
ANOMS	Airport Noise and Operations Monitoring System
ANPS	see CEPA 2019 study ref page 60 para 5.62
APOC	Heathrow Airport Operations Centre
ATC	Air Traffic Control
ATL	Hartsfield-Jackson Atlanta International Airport (IATA Airport Code)
ATM	Air Transport Movement
AUH	Abu Dhabi International Airport (IATA Airport Code)
BA	British Airways
BCN	Josep Tarradellas Barcelona-El Prat Airport (IATA Airport Code)
BKK	Suvarnabhumi Airport (IATA Airport Code)
BRU	Brussels Airport (IATA Airport Code)
BST	British Summer Time
CAA	United Kingdom Civil Aviation Authority
CACI	CACI Limited, provider of population & demographic data
CAP	CAA Civil Aviation Publication
CDA	Continuous Descent Approaches
CDG	Paris Charles de Gaulle Airport (IATA Airport Code)
CDM	Collaborative Decision Making
CDO	Continuous Descent Operations
CEO	Chief Executive Officer
CEPA	Cambridge Economic Policy Associates, a UK-based economics consultancy
COVID-19	Coronavirus Disease 2019
DALYs	Disability-Adjusted Life Years
DCO	Development Consent Order
DHL	Global Logistics Company
DOH	Hamad International Airport (IATA Airport Code)
DUB	Dublin Airport (IATA Airport Code)
DXB	Dubai International Airport (IATA Airport Code)
ECAC	European Civil Aviation Conference
EEA	European Environmental Agency
EEG	Electroencephalogram
EMG	Environmentally Managed Growth
END	Environmental Noise Directive
ERCD	CAA Environmental Research and Consultancy Department
EU	European Union
EUROCONTROL	European Organisation for the Safety of Air Navigation

FCO	Leonardo da Vinci International Airport (IATA Airport Code)
FDI	Foreign Direct Investment
FRA	Frankfurt Airport (IATA Airport Code)
GDP	Gross Domestic Product
GMT	Greenwich Mean Time
GVA	Gross Value Added
GVA	Geneva Airport (IATA Airport Code)
HA	High Annoyance
HKG	Hong Kong International Airport (IATA Airport Code)
HND	Tokyo Haneda International Airport (IATA Airport Code)
HSD	Highly Sleep Disturbed
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
ICCAN	Independent Commission on Civil Aviation Noise
ICN	Incheon International Airport (IATA Airport Code)
IFR	Instrument Flight Rules
IHD	Ischaemic Heart Disease
IST	Istanbul Airport (IATA Airport Code)
JFK	John F. Kennedy International Airport (IATA Airport Code)
JNB	O.R. Tambo International Airport (IATA Airport Code)
KUL	Kuala Lumpur International Airport (IATA Airport Code)
LAX	Los Angeles International Airport (IATA Airport Code)
LGW	London Gatwick Airport (IATA Airport Code)
LHR	London Heathrow Airport (IATA Airport Code)
LOS	Murtala Muhammed International Airport (IATA Airport Code)
LP/LD	Low Power/Low Drag
LYS	Lyon-Saint Exupéry Airport (IATA Airport Code)
MAD	Madrid-Barajas Adolfo Suárez Airport (IATA Airport Code)
MAN	Manchester Airport (IATA Airport Code)
MIA	Miami International Airport (IATA Airport Code)
NAO	Noise Abatement Objective
NATS	NATS Limited
NPV	Net Present Value
NQP	Night Quota Period
OAG	Aviation industry flight database provider
OE	Oxford Economics
ORD	O'Hare International Airport (IATA Airport Code)
PATM	Passenger Air Transport Movement
PEK	Beijing Capital International Airport (IATA Airport Code)
PVG	Shanghai Pudong International Airport (IATA Airport Code)
PwC	PricewaterhouseCoopers
QC	Quota Count
SARS	Severe Acute Respiratory Syndrome
SEL	Sound Exposure Level
SFO	San Francisco International Airport (IATA Airport Code)

SIN	Singapore Changi Airport (IATA Airport Code)
SYD	Sydney Kingsford Smith Airport (IATA Airport Code)
SVO	Sheremetyevo A.S. Pushkin International Airport (IATA Airport Code)
TAG	Transport Analysis Guidance
TBS	Time-Based Separation
TEAM	Tactical Enhanced Arrivals Mode
TSAT	Target Start-Up Approval Time
UK	United Kingdom
UPS	United Parcel Service
VAT	Value-Added Tax
WHO	World Health Organisation
ZRH	Zurich Airport (IATA Airport Code)

Glossary

Term	Definition
Environmentally Managed Growth	Environmentally Managed Growth (or EMG) is a new concept for UK airports, although there are precedents abroad. It means that throughout Heathrow's planned growth and into the future, the airport will always operate within clear, defined environmental limits.
L_{Aeq} etc.	Exposure metrics are intended to quantify noise exposure over a given period of time. There are a wide range of exposure metrics which are used to describe aircraft noise. The most common is the **A**-weighted **eq**uivalent continuous sound pressure **L**evel measured over a certain **T**ime period (L_{Aeq},T). This metric gives an indication of the continuous steady sound level that would contain the same sound energy as the actual fluctuating noise level of a time period, and studies[40] have shown that a large proportion of measured variation in annoyance can be accounted for by the L_{Aeq} metric. A-weighted means that the sound pressure level is evaluated using the A-weighted filter network. It is applied to instrument-measured sound levels to account for the relative loudness perceived by the human ear, as the ear is less sensitive to low audio frequencies. A table of values is used to mathematically adjust measured sound levels (in decibels) to provide a single A-weighted value describing the sound, expressed as dB(A). There are two competing conventions regarding the position of this identifier, either immediately after the 'L' as shown in the example above, or alternatively in brackets following the decibel (dB) units. L_{night} is the A-weighted equivalent continuous noise level, assessed over an annual average Night Period (23:00 to 07:00).
Night Period	23:00 – 07:00
Night Quota Period	23:30 – 06:00
Noise Abatement Objective	A Noise Abatement Objective (NAO) is a component of the requirements of EU Regulation No. 598/2014 (EU598) and the Environmental Noise Directive (END), which both rely on the fact that a noise problem has been identified and a noise abatement objective (NAO) has been set. An NAO's purpose is to set the level of ambition for a noise management regime, that secures both environmental improvement and a sustainable functioning transport

[40] ANASE – Attitudes to Noise from Aviation Sources in England

	network. It is the enabling statement that provides the focus for the EU598 Balanced Approach and the END Noise Action Planning processes.
Noise Envelope	CAA defines a noise envelope in CAP1129 as a method to limit noise with three possible approaches: restricting inputs, restricting noise exposure, or restricting noise impact. The Government has set out that it "wishes to pursue the concept of noise envelopes as a means of giving certainty to local communities about the levels of noise which can be expected in the future and to give developers certainty on how they can use their airports."

– DOCUMENT END –