



# Noise from Heathrow Airport

An Inquiry by the

All Party Parliamentary Group on

Heathrow and the Wider Economy

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## CONTENTS

All Party Parliamentary Group on Heathrow and the Wider Economy	2
Inquiry into Noise from Heathrow Airport	3
Foreword	4
Executive Summary	5
Actions	8
Inquiry procedure and methodology	10
Inquiry Topic 1: WHO guidelines on community noise	12
Inquiry Topic 2: Noise measurement indicators	17
Inquiry Topic 3: Scope for less noisy aircraft fleet	24
Inquiry Topic 4: Scope for less noisy operational procedures	32
Inquiry Topic 5: Flight paths for third runway	38
Inquiry Topic 6: Flight paths for existing two runways	42
Inquiry Topic 7: Daytime Respite from flight path noise	45
Inquiry Topic 8: Flight path noise at night	50
Inquiry Topic 9: Reaching capacity with three runways	53
Inquiry Topic 10: WHO guidelines with two and three runways	56
Appendix 1: Glossary and abbreviations	60
Appendix 2: Questions to consultees	64
Appendix 3: List of respondents to consultation	66
Appendix 4: References	67
Appendix 5: Supplementary noise measurement indicators	70
Appendix 6: Description of operational procedures	71
Appendix 7: Heathrow Indicative flight paths – Example 1	73
Appendix 8: Heathrow Indicative flight paths – Example 2	74
Appendix 9: Population around Heathrow	75

# ALL PARTY PARLIAMENTARY GROUP ON HEATHROW AND THE WIDER ECONOMY

The All Party Parliamentary Group on Heathrow and the Wider Economy was formed on 10 June 2014. Its terms of reference are to examine the implications of new runway capacity in London, in particular at Heathrow.

## **The members of the Group are as follows:**

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Baroness Jenny Tonge (**Treasurer**)

Sir Gerald Howarth MP

Lord True

Baroness Jenny Jones

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# **INQUIRY INTO NOISE FROM HEATHROW AIRPORT**

This report - *Noise from Heathrow Airport* - sets out the results from the Group's first inquiry in response to representations from members of the public to the effect that successive Governments, Parliament, the aviation industry and the media have underestimated and continue to under-estimate the impact of noise from Heathrow's flight paths. The inquiry considered the present and future noise impact of Heathrow's flight paths, with the existing two runways, and with the third runway as proposed by Heathrow Airports Limited to the Airports Commission. We did not examine the noise impact of the proposed extension of the existing northern runway at Heathrow, because less noise assessment data had been published for this proposal than for the third runway proposal at the time of the inquiry. In the time available we have not examined ground noise from the airport itself, including its road traffic which is a significant enough problem to merit an inquiry of its own.

The Group is grateful to the witnesses who took part in the Group's oral evidence sessions and to those who submitted written responses to the Group's consultation questions.

## **Publication/website**

*Noise from Heathrow Airport* can be found online at the Group's website [www.heathrowappg.com](http://www.heathrowappg.com), together with the written evidence and transcripts of evidence given in oral hearings.

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## FOREWORD

Heathrow Airport, by a colossal margin, is the largest noise polluter in Europe. It currently affects over 760,000 people from noise at levels that cause significant annoyance.

No other country in Europe allows this. The “next worst” airport in Europe affects less than one third of Heathrow’s total. Schipol - the airport much quoted as Heathrow’s hub competitor - affects sixteen times less. Heathrow is a huge problem: it is a very noisy neighbour.

But does noise disturbance really matter? Unequivocally yes, it does, say the World Health Organisation (WHO). Their research shows the deleterious effect that excessive noise has on the whole population, but particularly to the vulnerable - children, the elderly, those with underlying cardiovascular and mental health conditions. The WHO’s key guidance documents explain the effect that a noise environment above 55 decibels has on society: increasing aggressive behaviours; increasing stress hormones, increasing blood pressure levels, reducing helping behaviours and hindering child development. For a Government to fail to address this problem would demonstrate a Victorian disregard for the population of London.

At this moment, a debate is going on in the UK as to whether we need aviation expansion in the South East and the Davies Airports Commission have been tasked to choose whether this should mean an expansion of Heathrow or Gatwick.

Each member of the Group has his or her personal views for or against runway expansion at Heathrow, but there is a general concern about a lack of transparency in Heathrow’s proposal for an extra runway. Flight path information is not readily available to the public who do not know what is being examined behind closed doors. Given that whole swathes of London will be affected for the first time by flight path noise, and areas already affected risk losing respite periods, this is simply not democratic. This matters more following Heathrow Airport Limited’s admission that they will not stop expanding after a third runway.

We have created a list of actions that we feel are necessary to tackle the existing problem and that are central to the consideration of any third runway. In the view of the clear evidence of the negative effect on the colossal population of London it simply beggars belief that Heathrow is again under consideration.

# **EXECUTIVE SUMMARY**

## **World Health Organisation Guidelines & Noise Measurement Indicators**

WHO Guideline noise levels are not measured despite existence of the Guidelines for 15 years. There has been a serious failure of policy in not translating the Guidelines into active management of aircraft noise. There is no practical reason for not doing so.

Existing noise indicators show high impact of noise on local communities from Heathrow flights but the measurement inadequacies lead to poor recognition of the impact.

The gap between WHO Guideline noise levels and levels measured using existing indicators can only be guessed at but it is likely to be significantly adverse.

Reducing the noise gap is likely to take time but can only begin to occur when WHO Guideline measurements are introduced into policy and management of aircraft noise and this should occur without further delay.

Comparison of Heathrow noise with other UK and European airports further confirms the disproportionate impact of Heathrow.

Aircraft noise is exempt from a legal framework, such as applies for example to air pollution. The Group concludes that this is inequitable and leads to an unfair balance between the noise impact on local communities and the benefits of aviation in the wider economy.

A third runway under most assumptions increases the population exposed compared to continuing with two runways. Undoubtedly the flight path changes impact the estimates and since these have not been included in the published two runway case too much weight should not be placed on the comparison. What is clear is that the population exposed to Heathrow's aircraft noise remains high through to 2050, well above the WHO Guideline values and reduces only slowly over time.

In recent years, and with encouragement from the EU, supplementary noise indicators have been devised to measure the several effects that noise has on people - for example, the number and frequency of intermittent noise events of overhead aircraft. New indicators are welcome and the Group makes further recommendations including replacement of the existing LAEQ indicator. But these improvements should not overshadow the single main issue that noise levels from Heathrow aircraft are far too high, however measured. This comes back to the essential need to introduce the WHO Guidelines as the key standard against which to measure and manage noise reduction.

## Scope for Less Noisy Aircraft Fleet

Heathrow claim that the hundreds of thousands of additional flights from a potential third runway would be quieter than the situation today. However the dramatic increase in the number of flights into Heathrow in recent years means that although individual aircraft have become quieter – Concorde retiring for example - the environment is one of continual harmful noise energy.

Historically, technology significantly reduced the noise levels of aircraft but the rate of change is a fraction of what it once was. There is now a trade-off in aircraft design between the need to reduce noise and carbon dioxide emissions, leading to greater uncertainty about noise reduction.

The design and timing of the introduction of new less noisy aircraft in twenty or more years is uncertain. The Airports Commission seemingly shares our view that HAL has been over optimistic in its forecasts, and has reduced the replacement rate in its appraisal of HAL's forecasts.

Population growth is a major factor determining the number of people exposed to aircraft noise with estimates of London wide growth of 37% by 2050. HAL have produced estimates of population exposed with and without population growth. For example, by 2030 the difference could be 20%, other things being equal and excluding a third runway. The absence of definitive flight path detail only adds to the uncertain impact of population growth and its location.

## Scope for Less Noisy Operational Procedures

HAL plans on making some operational changes even if a third runway isn't built such as altering the angle of descent of planes on arrival, which can reduce noise levels. The Group welcomes this but there is insufficient information to determine the timing and overall net effect of these changes being proposed. Some procedures are localised, others produce adverse effects and some require investment in technical advances. It is unclear how the proposal integrates with the re-design of London's airspace currently underway by NATS. The Group is concerned there may be over optimism and asks for a robust consultation to be carried out on each proposal.

## Flight Paths for a Three Runway Scenario

Adding a new runway to Heathrow will lead to 50% more flights and therefore the general assumption is that more people will be affected by noise not only during the day, but also at night.

HAL have not released the definitive flight paths that would be used with a third runway and until they do, the numbers of people affected cannot be fully estimated. What is quite clear is that the population exposed to Heathrow's aircraft noise remains high through to 2050, well above the WHO Guideline values.

Regardless of whether or not a third runway is developed, it is likely that there will be a major re-direction of Heathrow's flight paths in the next decade or so, which would result in huge areas of London and the Thames Valley being overflown that have never previously been overflown on a regular basis.

## **Daytime Respite from Aircraft Noise**

The third and southern runways would operate on mixed mode in an alternating pattern resulting in use for approximately 12 hours a day and respite for approximately four hours a day. The existing northern runway would retain eight hours of respite. Mixed mode increases the overall runway capacity of the airport and in the past mixed mode has been strongly resisted by the communities affected as has any reduction in respite. People, depending on their location, often receive noise from more than one runway and some could even receive noise from three runways which would interrupt respite. The sheer number of planes makes this almost inevitable.

## **Night Flights**

It was disappointing to learn that Heathrow has no plans to end night flights, even with a third runway, and even though night flights account for less than two per cent of Heathrow's air traffic. Those of us with constituents who live under the flight paths are well aware that night flights are the primary noise concern.

## **Reaching Capacity with Three Runways**

Heathrow suffers from lack of resilience which is needed when operations do not go to plan for example due to adverse weather. Lack of resilience has noise implications because it tends to result in respite being interrupted and extra flights in the early morning shoulder period and pressure to reduce the restrictions on night flights. HAL maintains that it has built in sufficient resilience, but there remains concern that this may not be adequate and independent confirmation is needed.

## **Fourth Runway and Future Predictions**

HAL have confirmed that a business case is already underway for a fourth runway. All calculations and assessments relating to expansion by one runway must take into account the likelihood and practicalities of a fourth.

## **ACTIONS**

### **The Government Should:**

1. Provide the legal status of the WHO community noise guideline values.
2. Clarify the UK's strategy and timetable for reducing the levels of community noise for air traffic and from other major noise sources to below the WHO guideline values.
3. Provide the interim and long term targets over the next twenty-five years for reducing air traffic noise at Heathrow (and other UK airports) to below the WHO guideline values.

### **Airports Commission Should:**

1. Provide its noise assessments based on the LDEN noise indicator to include the lower WHO guideline values and the supplementary noise indicators that we have asked HAL to introduce.
2. Ensure its noise assessments identify more clearly all the flight paths that could be used for the proposed third runway at Heathrow and the areas that would be overflown that are not overflown regularly at present.
3. Ensure its noise assessments identify more clearly all possible changes to the flight paths for the existing runways as a consequence of the proposed third runway and the areas that would be overflown, including areas that are not overflown regularly at present.
4. Ensure its noise assessments factor in the possibility that Heathrow with a third runway would experience resilience difficulties as it nears 740 000 aircraft movements per year.
5. Recommend in its final report that air traffic in the night period should be phased out at Heathrow and across South East England; and that runway alternation should be retained at Heathrow throughout the day period.
6. Confirm that all residents under existing and all possible new flight paths will be consulted before the Commission gives its final recommendation.

### **Heathrow Airport Limited Should:**

1. Ensure its noise assessments based on the LDEN noise indicator include the lower WHO guideline values; that they use a number of additional supplementary noise indicators; and that they discontinue the use of the LEQ noise indicator.
2. Confirm the expected rate of aircraft noise reduction to 2025; and whether the incentives to hasten the introduction of less noisy aircraft can be strengthened.

3. Provide a comprehensive plan for the proposed noise-management operational procedures and the changes to Heathrow's airspace from the London Airspace Management Programme.
4. Identify measures that are needed to prevent new residential properties from being built under Heathrow's existing and future flight paths.
5. Ensure its noise assessments factor in the possibility that Heathrow with a third runway would experience increasing resilience difficulties as it nears 740 000 aircraft movements per year.

## INQUIRY PROCEDURE AND METHODOLOGY

1. The inquiry was conducted along the following lines: an initial session of oral evidence was held in order to help scope the parameters of the inquiry and to prepare a set of questions for public consultation; the questions were then sent to selected organisations in the aviation, local government and community sectors, with a general invitation to any other organisation or individual to submit their views; the responses and the reference literature were analysed and a preliminary report was prepared; finalisation of the report was then delayed pending the publication of the Airports Commission's recent consultation document and supporting documents, in order to take account of the Commission's views and to identify any additional material relevant to the inquiry.
2. The report itself has been structured around the ten topics that formed the basis of the consultation questions. The questions are listed in Appendix 2 to this report. It was recognised that many more questions might have been asked, given the scope of the subject matter and the long controversy surrounding it. But it was felt that too many questions would impose an unreasonable burden on consultees, given the short consultation period. It was therefore decided to concentrate the inquiry around what the Group considered to be the core strategic questions concerning aircraft noise from Heathrow's flight paths.
3. The first four questions concern the flight path noise between 2012 and 2025, the final six questions concern the flight path noise between 2025 and 2040. The significance of the break point is that 2025 is the earliest year by which the third runway, as proposed by HAL to the Airports Commission, would come into use. The questions after 2025 do not assume that a third runway would be built; they consider the flight path noise with two runways and with a possible third runway, as proposed by HAL.
4. Written responses were received from the seventeen organisations listed in Appendix 3 to this report. Copies of the responses are available on the Group's website at [www.heathrowappg.com](http://www.heathrowappg.com). The Group is grateful for the work that respondents put over such a short deadline.
5. Responses that specifically addressed the ten questions were sorted into question response templates (these are on the Group's website) and then the relevant issues for each question were analysed in question analysis templates.
6. Some respondents submitted or referred to published reports, so that there were over 1 000 pages of evidence submitted plus the evidence from the preliminary oral hearing. Respondents made reference to other published material and these and other references examined by the inquiry are listed in Appendix 4 to this report. The Airports Commission's recent consultation document and supporting documents have been

examined to ensure as far as possible that amendments and additional evidence prepared by HAL and the Commission have been reflected in the inquiry.

7. The inquiry noted that approximately two thirds of the submitted material specifically linked to the questions related to the first four questions (i.e. the flight path noise between 2012 and 2025 with two runways), with approximately one third of the material related to the final six questions (i.e. the flight path noise between 2025 and 2040 with two and possibly three runways), with the response from HAL accounting for much of that one third. This is perhaps explained by the fact that there is more data upon which to reach a view for the period up to 2025, whereas beyond 2025 is somewhat speculative, with HAL in 'pole position' to fill the data gap.
8. In order to give justice to the weight of evidence received by the inquiry, the report gives more space to the first four topics than to the final six. But neither the sequence in which the report addresses each topic nor the length of coverage given should be taken as a conscious or unconscious indication of the relative importance that the Group attached to each topic.
9. As indicated above, the individual responses received by the inquiry are available on the Group's website. In the report itself limited reference is made to named individual respondents, with anonymity the general rule for the first four topics. This rule is relaxed somewhat for the final six questions because, as stated above, the predominant respondent was HAL.

## INQUIRY TOPIC ONE:

### WHO GUIDELINES ON COMMUNITY NOISE

#### Question

**1.1.** Consultees were asked by what margin - in terms of the number of people affected - does the present noise from Heathrow's existing flight paths exceed the World Health Organisation (WHO) guideline values on community noise in the day/evening period (0700-2300) and in the night period (2300-0700). How does this compare with other airports within the UK and the EU?

#### Background

**1.2.** In 1980, WHO published Environmental Health Criteria 12 - Noise which recommended, on the basis of the most recent research, that for community noise:

- general daytime outdoor noise levels of less than 55 decibels (LAEQ) are desirable "to prevent any significant community annoyance"; and
- at night a lower level - in the order of 45 decibels (LAEQ), depending upon local housing conditions and other factors - is desirable "to meet sleep criteria".

**1.3.** In 1999, the WHO published Guidelines for Community Noise which took into account research since 1980 and listed values for the onset of the health effects of noise in fifteen specific environments (including schools and hospitals) that national governments are recommended to achieve in the long term. The day and night values recommended in 1980 were supplemented:

- 50 decibels (LAEQ) to avoid moderate annoyance in the daytime;
- 60 decibels (LAMAX) in the night.

**1.4.** In 2009, the WHO Regional Office for Europe published the Night Noise Guidelines for Europe, which took into account research since 1999 and recommended:

- 40 decibels (LAEQ) as the long term target at night (i.e. instead of 45 decibels (LAEQ) as recommended since 1980); and
- 55 decibels (LAEQ) as an interim target at night where 40 decibels cannot be achieved in the short term "for various reasons, and where policy-makers choose to adopt a stepwise approach."

1.5. The WHO guideline values of application to the majority of the population - for the day and evening periods (0700-2300) and the night period (2300-0700) - are summarised in the table below.

Specific environment	Critical health effects	LAEQ (dB)	Hours	LAMAX (dB)
Outdoor living area	Serious annoyance	55	16	-
	Moderate annoyance	50	16	-
Outside bedrooms	Sleep disturbance (open window) short term	55	8	60
	Sleep disturbance (open window) long term	40	8	60

Source: WHO

## Responses - Heathrow and WHO

1.6. Responses to the first part of the question indicated that there is no systematic assessment of air traffic noise at Heathrow against the WHO guideline values. Because of this, responses indicated, it is therefore not possible to provide figures for the number of people who are exposed to noise levels at Heathrow above the WHO guideline values.

1.7. The noise measurements that are taken at Heathrow include the higher WHO guideline values - 55 decibels LAEQ for each of the day, evening and night periods - but their inclusion does not appear to be linked to monitoring against, or to movement to below, the WHO values. Moreover, there is no measurement of the lower WHO values - 50 decibels LAEQ for the day/evening period (0700-2300) and 40 decibels LAEQ and 60 decibels LAMAX for the night period (2300-0700). The table below gives the number of people (in thousands) who in 2012 were exposed to noise from Heathrow's flight paths at or above the higher WHO LAEQ guideline values.

Specific environment	Critical health effects	LAEQ (dB)	Hours	Population (000)
Outdoor living area	Serious annoyance	55	0700-1900	429.8
	Serious annoyance	55	1900-2300	382.2
	Moderate annoyance	50	0700-1900	?
	Moderate annoyance	50	1900-2300	?
Outside bedrooms	Sleep disturbance (open window) short term	55	2300-0700	59.8
	Sleep disturbance (open window) long term	40	2300-0700	?

Source: *ERCD Report 1305: Noise Action Plan Contours for Heathrow Airport in 2012* by Civil Aviation Authority (Environmental Research and Consultancy Department)

## Responses - Heathrow and Other Airports

**1.8.** In the absence of figures for the WHO guideline values, responses to the second part of the question referred to the figures for the “LDEN” noise indicator (which utilises weighted values for day/evening/night and is examined in Topic 2). The number of people exposed to the LDEN values in 2006 <sup>1</sup> is set out in the table below.

UK Airports				EU Airports	
<i>London</i>	<i>Population (000)</i>	<i>Other Regions</i>	<i>Population (000)</i>		<i>Population (000)</i>
Heathrow	725.5	Manchester	94.0	Heathrow	725.5
London City	12.2	Glasgow	63.6	Frankfurt	238.7
Gatwick	11.9	Birmingham	47.9	Brussels	173.3
Stansted	9.4	Aberdeen	16.3	Paris (C. de G.)	170.0
Luton	8.6	Edinburgh	15.0	Paris Orly	110.0
		Southampton	12.1	Amsterdam	43.7
				Madrid Barajas	43.3
				Rome Fiumicino	34.4

**1.9.** HAL argued that the number of people exposed to Heathrow air traffic was similar to that of major U.S. hubs. HAL’s report *A Quieter Heathrow* (May 2013) includes figures showing similar numbers of people exposed to 65 LDEN at Heathrow and at three U.S. airports<sup>2</sup>.

## Findings - Heathrow and WHO

**1.10.** The Group was surprised to learn from respondents that air traffic noise measurements for Heathrow do not include the full range of the WHO guideline values for community noise. The WHO first published guideline values in 1980 - thirty-four years ago - which were then updated in 1999 and again in 2009, in each case in line with the most recent research into the health effects of exposure to community noise (including the effects on vulnerable groups).

**1.11.** The Group considers that it is essential that the full range of WHO guideline values should be measured at Heathrow, as the starting point for assessing the extent to which aircraft noise is still a problem. Without the full WHO data, residents will have grounds for continuing to argue that the scale of the problem at Heathrow is being under-stated; and the Government and aviation industry may reach an unduly complacent conclusion that the problem is no more than a residual one.

<sup>1</sup> Member States were required to publish noise maps and supporting data for the years 2006 and 2011. The figures for 2011 have evidently not yet been collated and were not cited in any of the responses.

<sup>2</sup> HAL’s report *A Quieter Heathrow* (May 2013) includes figures showing similar numbers of people exposed to 65 LDEN at Heathrow and at three U.S. airports. The data does not go down to the noise levels in the comparative table above.

**1.12.** As regards Heathrow's performance against the WHO guideline values, the limited figures available to the Group indicate that 430 000 people between 0700-1900 and 382 000 people between 1900-2300 were exposed to air traffic noise at or above the 55 decibel 'serious annoyance' threshold in 2012, despite the WHO value having been in place since 1980. For the night period (2300-0700), 60 000 were exposed to air traffic noise at or above the 55 decibel 'interim' threshold for avoiding 'sleep disturbance', despite the WHO 'long term' value of 45 decibels having been in place since 1980 (and having been lowered to 40 decibels in 2009). The Group considers that these are significant numbers of people, despite the progressive withdrawal of the noisiest aircraft in the years before 2012.

**1.13.** In the absence of measured data, it is not possible to say with any confidence what number of people are exposed to the lower WHO values of 50 decibels between 0700-2300 and 40 decibels (and 60 Lmax) between 2300-0700. Respondents provided some estimates, but the Group is reluctant to endorse these without measured data. The Group nevertheless agrees with the basic assumption behind the estimates that the size of the population exposed for the lower WHO guideline values will - all things being equal - include and exceed the size of the population exposed to the higher WHO guideline values. An indication of the magnitude of the increase can be appreciated by comparing for 2012 the number of people exposed between 2300-0700 to air traffic noise at or above 55 decibels (60 000) with the more than three times the number exposed to 50 or more decibels (197 000).

**1.14.** Respondents contrasted the high priority that the Government has given to complying with air quality values that are based on WHO recommendations with the evidently lower priority that has been given to complying with the WHO community noise values. The comment was made that the air quality values have been made mandatory under EU legislation whereas the community noise values are not yet mandatory at either EU or UK level. The Group notes the different legal standings but considers that action on the community noise values should form the basis of noise assessment and long term noise reduction at Heathrow (and other UK airports) without having to wait for EU legislation to force the issue.

**1.15.** Respondents drew the Group's attention to the strategic noise mapping for London in 2011, which shows that the area around Heathrow and under its flight paths experience levels of noise from road traffic that are likely to exceed the WHO guideline values. The Group agrees that action is needed to bring down road traffic noise levels, and that action to reduce community noise in west London should not be focussed solely on air traffic at Heathrow.

**1.16.** Respondents pointed out the extent to which the number of people within Heathrow's 57 decibel contour has decreased since the 1970s. The Group acknowledges that long term air traffic noise trends must be taken into account, and this we do under Topic Three.

## Findings - Heathrow and Other Airports

**1.17.** The Group notes the views of respondents that the LDEN noise indicator provides the best substitute - in the absence of the complete WHO data - for comparing the number of people affected by air traffic noise at different airports.

**1.18.** The Group notes the large adverse gap between the number of people within the Heathrow LDEN 55 decibel contour compared with: (a) London's other main airports; (b) airports in other parts of the UK; and (c) airports in other EU countries. The figures underline the scale of the challenge that Heathrow faces in meeting the WHO guideline values compared with the other airports, particularly in comparison with the hubs with which Heathrow is said to be in direct competition for transfer passengers (Amsterdam, Frankfurt and Paris).

**1.19.** The Group notes that the number of people exposed to LDEN 65 decibels from flight paths at Heathrow is similar to that of three U. S. hubs - Chicago, Los Angeles and JFK New York. But no evidence was produced re: the 55LDEN comparisons between Heathrow and the American airports.

## Actions

**1.20.** The Group will ask HAL to expand its assessment of air traffic noise based on the LDEN noise indicator to include the WHO guideline values for community noise of 50 and 55 decibels LAEQ for the day/evening period (0700-2300) and for 40 and 55 decibels LAEQ and 60 decibels LAMAX for the night period (2300-0700).

**1.21.** The Group will ask the Government for clarification of (a) the legal status of the WHO guideline values; and (b) the UK's strategy and timetable for reducing the levels of community noise from aircraft and from other major noise sources to below the WHO guideline values. The Group will also ask the Government to set targets for reducing aircraft noise at Heathrow (and other UK airports) over the next ten years to 2025.

## **INQUIRY TOPIC TWO:**

### **NOISE MEASUREMENT INDICATORS**

#### **Question**

**2.1.** Consultees were asked whether the Environmental Noise Directive enables the UK to meet fully the criticisms that were made in the Report from the Heathrow Terminal Five Public Inquiry that the 57 decibel noise contour (LAEQ) was by itself an inadequate indicator for assessing the full impact of air traffic noise?

#### **Background**

**2.2.** *The European Union Environmental Noise Directive* was adopted in 2002 for the purpose of assessing and managing environmental noise from major noise sources, including air traffic. The Directive requires the noise indicators LDEN (noise averaged over twenty-four hours) and LNIGHT (noise averaged over eight-hour night) to be used for assessing the number of people and dwellings that are exposed to the following 5-decibel bands, starting at 55 decibels for LDEN and 50 decibels for LNIGHT:

- LDEN: 55-59, 60-64, 65-69, 70-74, >75
- LNIGHT: 50-54, 55-59, 60-64, 65-69, >70

**2.3.** The Directive recognises that LDEN and LNIGHT by themselves may be insufficient for assessing all noise impacts and provides for Member States to supplement LDEN and LNIGHT with other noise indicators. The United Kingdom has adopted one supplementary indicator, LAEQ (noise averaged over sixteen hours day and evening) for assessing the number of people that are exposed to the following 3-decibel bands at and above 57 decibels:

- LAEQ: 57-59, 60-62, 63-65, 66-68, 69-71, >72

**2.4.** The report in 2000 by Roy Vandermeer QC to the Secretary of State on the Heathrow Terminal Five Public Inquiry criticised the reliance that the Government placed on 57 decibels (LAEQ) as the sole indicator of the impact of air traffic noise at Heathrow. Specifically, it found that:

- people living in areas outside Heathrow's 57 decibels (LAEQ) were affected by noise;
- the research (dating from the early 1980s) did not support the claim that annoyance from air traffic noise is significant only at 57 decibels (LAEQ);

- LAEQ does not reflect the impact of the large increase that had taken place in the number aircraft movements at Heathrow;
- LAEQ does not measure the benefit of runway alternation at Heathrow in providing predictable periods of respite;
- LAEQ does not evaluate noise from movements in the night period (2300-0700).

## Responses - LAEQ as a Noise Indicator

**2.5.** Respondents generally were dissatisfied with LAEQ and were surprised by, and opposed to, the Government continuing its official status in the new *Aviation Policy Framework (2013)*. There was concern that its use in conjunction with the Framework's overall objective on aircraft noise - to limit and where possible reduce the number of people in the UK significantly affected by aircraft noise - rendered the objective as effectively meaningless, because it lacks quantitative targets and baseline reference points to protect health, prevent annoyance, and tackle existing noise problems; and it does not prevent an increase in noise.

**2.6.** Most respondents felt that the value of LAEQ in providing a continuum of historical data for trends and long-term comparison was overstated, with more relevant alternative data being available for the recent past. In the few cases where LAEQ does provide the basis for policies, for example on compensation, the policies are not based on a valid evidence base.

**2.7.** A number of criticisms were made of the principle of averaging measured noise energy over a period of time. These criticisms would apply to LDEN as well as to LAEQ:

- as a single indicator, averaging is unable to reflect the multiple characteristics of noise and their impact.
- averaging does not reflect changes in noise levels within the measurement period and the impact of these changes.
- averaging does not reflect the characteristics of single intermittent events such as the maximum noise level or the duration of events, both of which are characteristic of aircraft noise.
- averaging is insufficiently responsive to the number of noise events to which people are reported to be increasingly sensitive.
- averaging does not accurately reflect periods of respite from aircraft noise, such as occurs in response to wind direction and with runway alternation and departure dispersals.

**2.8.** There were other criticisms of LAEQ that would also apply to LDEN:

- A-weighted decibels do not fully recognise the impact of the lower frequencies within the spectrum of frequencies produced by aircraft.
- contours on the horizontal are not adequately representative of how people experience aircraft noise at specific locations.
- the indicator does not compare the air traffic noise levels with background noise levels and does not adequately take “quiet areas” into consideration.

**2.9.** A number of criticisms of the values measured by LEQ that would apply to a lesser degree to LDEN:

- the emphasis on 57 decibels is at the expense of consideration being given to the greater noise impact of people exposed to higher levels.
- 57 decibels is significantly above the WHO guideline values.
- people below 57 decibels are affected by Heathrow air traffic noise.
- 57 decibels as the onset of significant community annoyance was based on a social survey in 1982 but this threshold is now too high, as people are becoming less tolerant of noise.
- 57 decibels is not a limit value and does not create an incentive to reduce noise levels
- the 3-decibel bands between the LAEQ noise contours are difficult to compare with the 5-decibel bands between LDEN noise contours.

**2.10.** The measurement period for LAEQ was subject to a number of criticisms that would not apply to LDEN:

- LAEQ does not cover the night period.
- LAEQ amalgamates day and evening periods, with evening a more sensitive period.
- LAEQ is measured and averaged over 92 days in the summer and therefore is not representative of other times of the year.

## Responses - LDEN and WHO guideline values

**2.11.** LDEN was said to share many of the criticisms made against LAEQ (see above). The worst example given was the eight-hour night average (2300-0700). Heathrow's night traffic is scheduled in only three of the eight hours (2300-2330 and 0430-0700), so the inclusion of five hours of silence understates the noise impact during the three hours of movements.

**2.12.** LDEN was said to be an improvement on LAEQ in some respects: it covers 24 hours, with separate measurements for the day, evening and night periods and is measured over the whole year. The evening and night were weighted to reflect people's greater sensitivity to noise in these periods although there was comment that the weighting is arbitrary.

**2.13.** LDEN is an improvement in measuring the absolute and relative impact of air traffic noise, and provides improved comparison with other European airports. The LDEN 55 decibel day/evening threshold is approximately equivalent to the 53.4 LAEQ 16-hour noise level (based on 2011 END results for London designated airports - CAA response) thus reducing the gap between LAEQ and the higher WHO daytime guideline value.

## Responses - Other Supplementary Noise Indicators

**2.14.** Generally, there was support for supplementary indicators that better reflect the number of aircraft movements and their individual noise characteristics, flight path routing, and respite. The *National Aviation Policy Framework (2013)* encourages airports to devise supplementary indicators to suit their local situation. Heathrow's Noise Action Plans includes a 48 LAEQ 6.5-hour night supplementary indicator. The *Airports Commission's Appraisal Framework (2014)* includes a number of supplementary indicators: 54 LAEQ 16-hour for the day/evening and 48 LAEQ 8-hour for the night, together with an indicator for the number of noise events exceeding an outdoor maximum noise level in the day/evening (70 LAMAX) and at night (60 LAMAX) and a formula for combining the day/evening and night.

**2.15.** No obvious preferences were expressed in favour of any one supplementary indicator. Nor is it clear how and when even a suite of indicators would limit the noise impact of air traffic and bring it into line with the WHO guideline values. Several respondents referred to the report *Good practice guide on noise exposure and potential health effects* that was published in 2010 by the European Environment Agency, which aims to bring into practical effect the measurement of noise and its impact through sustainable noise action plans for airports and other major sources of environmental noise. But it was felt by some respondents that there was a policy vacuum within the UK and that a Government initiative is needed.

## Findings - LDEN and WHO Guideline Values

**2.16.** The lowest noise exposure values specified by the *Environmental Noise Directive* are 55 decibels for the day and the evening and 50 decibels at night. These values are higher than the WHO guideline values of 50 decibels for the day and evening and 40 decibels at night. But the Group could find nothing in the Directive that would prohibit noise assessment down to the WHO values, in addition to the values for LDEN that the Directive specifies. We therefore see no conflict between the Directive and our proposal in Topic One that all the WHO values should be measured at Heathrow.

## Findings - LEQ as a Noise Indicator

**2.17.** The Group finds that the legal position of LAEQ under the *Environmental Noise Directive* is as a supplementary noise indicator to LDEN. But it appears that LAEQ continues to be used as the decisive indicator in the development of noise policy at Heathrow, virtually to the exclusion of LDEN. The pre-eminence of LAEQ gives rise to concerns for residents.

- Firstly, it is not clear how LAEQ can be said to supplement LDEN, other than to report noise in 3-decibel bands rather than in 5-decibel bands. But the different band values are a source of confusion, because comparisons between the two are difficult.
- Secondly, the lowest LAEQ values - 57 decibels for the day and evening combined, and 48 decibels at night - are higher than the corresponding WHO guideline values. The continued predominance of LAEQ at Heathrow conveys the message that the WHO guideline values are excluded not only from the current noise assessment, but even from longer term noise management plans.
- Thirdly, the criticisms that were made of LAEQ in the report on the Heathrow Terminal Five Public Inquiry have not been resolved. The Government committed itself in 2001 to underpin policy on aircraft noise by substantial research that commands the widest possible confidence. But LAEQ continues unchanged, fuelling residents' suspicions that there is a reluctance within Government to acknowledge the extent of the noise impact of Heathrow.

**2.18.** The Group recognises that data from the LAEQ indicator extends back many years for daytime noise (although there is no corresponding long term data for the night). We considered over what length of period, since the opening of Heathrow, that exact comparisons are needed for monitoring noise trends. The noise history at Heathrow can be said to fall into four periods, the first three each of approximately twenty years:

- late 1940s to early 1960s: mainly propeller aircraft initially and an increasing but relatively limited number of movements, but none at night;

- early 1960s to early 1980s: jet aircraft replacing propeller, with a continued increase in the number of movements, including into the night;
- early 1980s to 2003: progressive withdrawal of the noisiest aircraft (culminating with Concorde), with a continued increase in the number of movements, including at night;
- 2003 to the present: relative stability in noise per aircraft and in the number of movements.

**2.19.** The Group considers that there is no real benefit in making exact comparisons back to the 1940s or even back to the early 1980s. The problem of the noise for our constituents are the present and future levels. We note that LDEN data for Heathrow was first prepared for 2001, with subsequent updates for 2003 and 2006, and for every year from 2009 to 2012. We therefore conclude that the long-term trend at Heathrow should be monitored by LDEN from 2001 (minus Concorde movements) and that LAEQ should be discontinued.

## **Findings - Other Supplementary Noise Indicators**

**2.20.** The Group notes that LAEQ is the only supplementary indicator that the UK has adopted, but that LAEQ is not included in the examples of supplementary indicators that are listed in Annex I (3) of the *Environmental Noise Directive*. We therefore assume that Member States are not restricted to only the supplementary indicators that are listed in Annex I (3).

**2.21.** The Group considers that greater use could and should be made of supplementary indicators, to supplement the LDEN information for a fuller assessment of the impact of noise from Heathrow's flight paths. We reach this view because LDEN (and LAEQ) report the theoretical constant noise level across the measured period (day/week/month/year), which implies that the noise source is constant over the same period. But that is not how noise from the Heathrow flight paths is experienced - different areas will experience different noise levels (and periods of no noise, including between movements over the same area) due to weather and operational factors which change over the year. The WHO guideline values recognise that average noise indicators do not fully capture the impact of intermittent noise.

**2.22.** One of the criticisms of LAEQ at the Heathrow Terminal Five Public Inquiry was that it failed to recognise the noise impact from the increase in the number of aircraft movements. The Group notes the introduction at Sydney Airport of an indicator for the number of times that aircraft noise exceeds maximum (i.e. not average) levels of 70 decibels over the day and 60 decibels over the night. But the results are converted into noise contours which again smooth out the peaks and troughs in noise levels and the number of individual noise events. The exclusion of some movements from this noise indicator further undermines its utility.

**2.23.** Another criticism of LAEQ at the Heathrow Terminal Five Public Inquiry was that it failed to recognise the benefits from runway alternation. The Group understands that the same criticism would apply to LDEN. So here again the Group finds there is a case for introducing a supplementary indicator.

**2.24.** The Group notes that Annex I (3) of the *Environmental Noise Directive* lists eleven examples of supplementary indicators (see Appendix 5 to this report). It is beyond the scope of this inquiry to make firm recommendations at this stage as to which of the eleven examples may be appropriate for Heathrow. But we would recommend a supplementary indicator that gives the number of days per year that each flight path is in use and the number of movements that occur per year on each of the flight paths, in both cases with separate numbers for the day and night periods. This information should be easy to compile and would readily show how many individual noise events are experienced over the year in each overflown area. The communities affected may find this information more useful and less mysterious than the average noise level aggregated for all flight paths under LDEN and LAEQ.

## **Actions**

**2.25.** The Group will ask HAL to discontinue the use of LAEQ as a supplementary indicator and to discuss with local communities and others the introduction of supplementary indicators for:

- 1. The number of aircraft movements per hour in the day/evening period (0700-2300) and the night period (2300-0700) per flight path.**
- 2. The benefits that existing respite measures provide (particularly runway alternation), including identification of the areas that benefit and the areas that do not.**
- 3. Such other supplementary indicators from the list of examples in the Environmental Noise Directive that would enhance the assessment of the noise impacts of flight paths.**

## **INQUIRY TOPIC THREE:**

### **SCOPE FOR LESS NOISY AIRCRAFT FLEET**

#### **Question**

**3.1.** Consultees were asked what the prospects are for significantly less noisy aircraft at Heathrow over the next ten years and are the prospects in any way dependent on the development of the proposed third runway; and the extent to which there is a conflict between the optimum reduction of aircraft noise and carbon emissions?

#### **Background**

**3.2.** The Government and the aviation industry both stated in evidence to the Heathrow Terminal Five Public Inquiry that there would be limited scope for reductions in noise per aircraft after the phase-out of Chapter 2 aircraft in 2002. Concerns have also been raised that it will not be possible to make future reductions.

#### **Responses**

**3.3.** Respondents commented at some length on the prospects for less noisy aircraft and the timescale for replacing the existing air fleet at Heathrow. Reference was also made to the size of the population that would continue to experience air traffic noise. But before addressing each of these issues, it is convenient to summarise the relatively few comments that were made about any conflict between the need to reduce simultaneously aircraft carbon and noise emissions.

#### **Trade-off Between Less Noisy Aircraft and Lower Carbon Emissions**

**3.4.** The *SA Noise Road-Map - A Blueprint for Managing Noise from Aviation Sources to 2050 by Sustainable Aviation (2013)* said more stringent noise regulations could mean aircraft designs lead to higher fuel burn and hence emissions on account of increased weight and/or drag. Conversely climate change and CO<sub>2</sub> restrictions could mean that aircraft designs have an adverse impact on noise. The *SA Noise Road-Map* baseline scenario, to which HAL's noise estimates are aligned, is considered by Sustainable Aviation as representative of the historical underlying balance of design priorities between noise and fuel burn without radical changes in engine or aircraft configurations. But it was evident from the responses that at the margin the tension between the two objectives is increasing.

#### **Less Noisy Aircraft**

**3.5.** Many responses acknowledged that aircraft had become less noisy since 1980. References were made to several published reports, including the *SA Noise Road-Map*. This

report was referred to or submitted as evidence by several respondents. The report says ‘Technology solutions were developed to reduce departure noise, only for this to make arrival noise much more noticeable. Similarly, reducing the source noise of aircraft engines created a new focus on airframe noise, as that source then became dominant.’ The report refers to two trends: an “evolutionary” trend delivering typically a 0.1 dB reduction in noise per year and periodic “revolutionary” changes, such that the overall reduction has been around 0.3 dB per year. The report goes on to say ‘A value of 0.1 dB reduction in noise per annum is chosen as our baseline forecast based on the underlying component of historical data (assuming no technology step-changes or major configurational changes)’. HAL use the 0.1 dB annual improvement in their estimates.

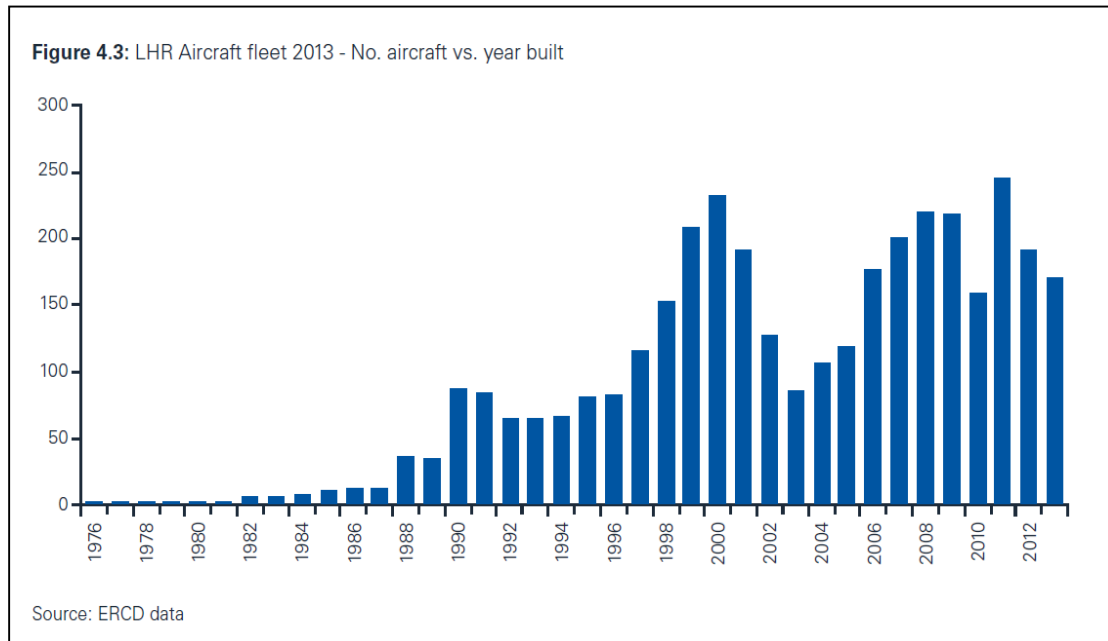
**3.6.** Respondents said that noise reduction achieved by new aircraft is not as great as sometimes implied and they provided the example of an older Boeing 747-400 that has an LAMAX (single event noise impact) when arriving at 1,000ft of 86dB whereas the newer Airbus A380 has an LAMAX arriving at 1 000 of 85 dB. It was said that a 1 dB difference in terms of a single event level would not be perceptible on the ground.

**3.7.** Future improvements in noise reduction on the landing are likely to be materially less than on take-off. The *HAL Report - Amec Environment & Infrastructure UK Limited, Heathrow Airport Limited: Heathrow’s North-West Runway - Air and Ground Assessment (18 June 2014)* refers to -1.0 dBA being applied to departures and -0.5 dBA being applied to arrivals.

### **Aircraft Fleet Replacement**

**3.8.** The aircraft fleet at Heathrow is made up of a variety of aircraft, each with different noise characteristics, which in aggregate and along with fleet usage determine the noise impact of the Heathrow fleet as a whole. The fleet is an allocation of aircraft from each airline’s international fleet and is not solely governed by Heathrow requirements.

The following chart shows the ageing of Heathrow’s current aircraft fleet and is taken from the *CAA Noise Report - Managing Aviation Noise (2014)*.



**3.9.** The *CAA Noise Report* cautions that the introduction of new aircraft types is a ‘slow and typically cyclical process that can be fraught with delays and issues’. Respondents noted that replacement depends on the age of the current fleet, availability of new types of aircraft, passenger and route demand, competition and cyclical airline profitability. It was also noted that aircraft are expensive to design, build and operate and need a long life to be economically viable, which may delay their replacement.

**3.10.** HAL assumes most of the current Heathrow fleet (around 3 500 aircraft according to the above chart) are phased out by 2030, which would appear to be a significant shortening of the fleet life to just over 15 years compared to the above chart where the life extends to around 25 years. The table below compares the fleet composition for Heathrow, as estimated in the *HAL Report* and in the *Airports Commission’s Noise Report – Technical Papers Noise-Local Assessment (2014)*. HAL’s phasing out of the current aircraft types at Heathrow, according to the table, is much faster than that estimated by the Airports Commission.

Aircraft Generation (See Appendix)	Two runway 2030		Three runway 2030		Two runway 2040		Three runway 2040	
	HAL	AC	HAL	AC	HAL	AC	HAL	AC
Current	6%	35%	7%	32%		15%		13%
Imminent	94%	65%	93%	67%	78%	73%	80%	76%
Future	0	0	0	0	22%	12%	20%	10%
Total	100%	100%	100%	100%	100%	100%	100%	100%

Source: *Heathrow fleet HAL Report Table C1, 2014; Airports Commission (AC) Aviation Noise Local Assessment Appendix A Table A2, 2014*

**3.11.** HAL commented on its provision of incentives through variable landing charges, restrictions and penalties to encourage a less noisy fleet and says Heathrow attracts quieter aircraft; the Airports Commission says it believes this assumption provides an explanation for HAL's estimate of rapid fleet replacement at Heathrow. The *CAA Report - Managing Aviation Noise (2014)* says 'despite the existing incentives to improve fleet noise performance, even at Heathrow, there has been no evidence that airlines have changed their normal fleet replacement cycles (for instance, in early 2014, British Airways' long-haul fleet consisted of four Airbus A380s, 55 Boeing 747-400s, 21 Boeing 767-300s and 55 Boeing 777s covering an age range of 0 to 25 years)'

**3.12.** HAL says the requirement to phase out certain classes of aircraft defined by ICAO could reduce the fleet's noise, and Heathrow's night time regime has potential to control noise through a noise quota system. But other respondents commented that these standards tend to follow rather than bear down on noise. Some commented, without specific conclusion, on potential interventions including noise tax and noise envelopes that impact the fleet composition and hence its noise.

**3.13.** Generally, respondents expressed concern that assumptions used to estimate the future rate of noise reduction from less noisy aircraft, and hence population exposure, are too optimistic. CAA in its report *Managing Aviation Noise (2014)* says 'With noise from Heathrow alone affecting significantly more people than any other airport in Europe, the CAA believes that the status quo is not acceptable, particularly if airport expansion is to occur. As such, the CAA believes that while Sustainable Aviation is an effective forum to coordinate efforts to manage and mitigate noise, industry's ambition must be to actively improve noise performance before, during and after expansion so as to ensure that in future, fewer people are significantly affected by aircraft noise than today'.

#### **Dependence of Noise Reduction on Development of a Third Runway**

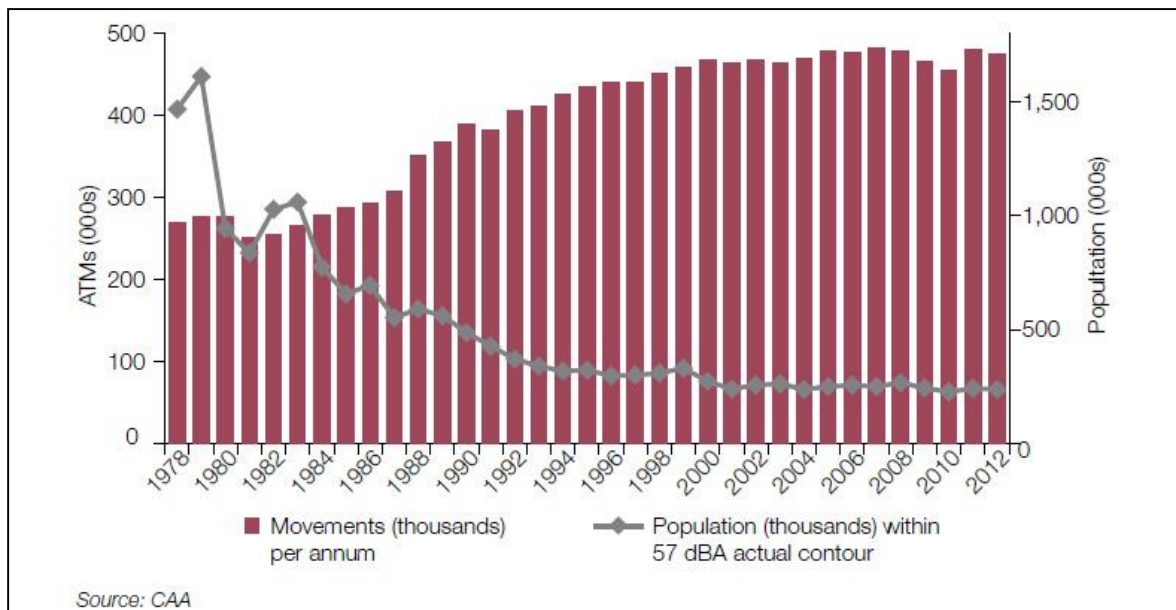
**3.14.** The previous table shows in both 2030 and 2040 there is little difference in the fleet mix for the two and three runway cases although HAL says 'a third runway offers opportunities to further incentivise less noisy aircraft, for example, through "green slots" where only the quietest category of aircraft are allocated new slots'.

#### **Trends in Population Affected by Aircraft Noise (0700-2300)**

**3.15.** Concerning historic trends and their relevance to the future, it can be seen from the following chart, which was referred to by several respondents that the population exposed to air traffic noise has decreased over time but at a decreasing rate. The trends are said to be the result of less noisy aircraft and operational procedures offset by population growth in areas under the flight paths and especially in earlier years the increased number of flights.

**3.16.** The 35 year historic trend is quoted by some respondents but others quoted more recent trends since the phasing out of Chapter Two aircraft and Concorde. Thus, whereas

the contour area contracted by about 6.25% per year between 1980 and 2003, it contracted by only around 1.5% per year between 2004 and 2012.



**3.17.** Respondents cited the *HAL Report* on future estimates of population exposure. HAL’s estimate of reduction in contour area 2012 - 2030 is 2.4% (2.1 km<sup>2</sup>) per year, resulting in a contour of 69.5 km<sup>2</sup> by 2030, as can be seen from the table below.

**Heathrow - Projected Noise Exposure – 2 runway case:**

	Population	Source	2012	2030	2040
<b>Contour 57 LAEQ 16-hour:</b>					
Contour area (km <sup>2</sup> )		HAL	106.7	69.5	66.1
Population exposed	No growth	HAL	237 350	169 500	152 800
Population exposed	Growth	HAL		203 900	195 800
Population exposed	Growth	AC		221 200	219 400
<b>55 LDEN 24-hour:</b>					
Population exposed	No growth	HAL	725 000	446 350	375 050
Population exposed	Growth	HAL		522 500	468 450
Population exposed	Growth	AC		580 500	588 900

**Source:** HAL Report (Tables E21, E23, E24, E52 & E55); Airports Commission Noise Baseline Report (Tables 4.3 & 4.7)

**3.18.** The Airports Commission in its *Noise Report* says ‘in almost all cases, the exposure metrics in [HAL] the promoter’s submission are substantially lower than the corresponding Airports Commission figure’. In terms of population exposed (as opposed to contour area) using the LDEN indicator and assuming population growth, HAL projects a reduction in the

exposed population from 2012 to 2030 of 1.8% per annum and the Commission projects 1.2% per annum. The rate of reduction still leaves 580 500 people exposed to aircraft noise in 2030 based on the LDEN indicator according to the Airports Commission. The projected rate of reduction is still slower in the next ten years to 2040 and the Commission even project the LDEN exposure increasing slightly.

### **Population Growth**

**3.19.** The population growth in London, estimated in the *Mayor's Infrastructure Plan 2050* (July 2014) is 37% between 2011 and 2050, when population is estimated to be 11 million. There is uncertainty as to where this growth might arise but HAL has made some estimates for the two runway case assuming existing flight paths with the results shown in the above table. The HAL estimates are based on CACI data that updated the 2001 census in 2013. HAL estimate around 20% more people will be exposed to aircraft noise in 2030 comparing exposure with and without population growth (based on the 57 LAeq contour).

### **Findings - Trade-off Between Noise and Carbon Reduction**

**3.20.** The Group notes that respondents did not consider that the rate of replacing the noisiest aircraft at Heathrow over the next ten years will be affected by the need to reduce aircraft carbon emissions. The situation for new aircraft types after 2025 is less clear.

### **Findings - Less Noisy Aircraft and Fleet Replacement**

**3.21.** As regards the size of the overflowed areas and number of people exposed to aircraft noise, no forecast has been produced for 2025 - the earliest forecast is for 2030.

**3.22.** Heathrow is currently operating at just under the existing planning limit of 480 000 air transport movements per year (day and night). Assuming no third runway and a continuation of the planning limit to 2025 and beyond, the overflowed areas should not experience an increase in the number of individual noise events (i.e. the number of movements). The Group notes that the number of people exposed to aircraft noise over this period is therefore essentially dependent on less noisy aircraft, fleet replacement and the resultant contour area as offset by population growth.

**3.23.** Based on the LAEQ noise indicator, the size of the 57 decibel contour in 2030 would be 69.5 km<sup>2</sup> compared to 117.4 km<sup>2</sup> in 2004 according to HAL's forecast. The Group notes that the annual rate of decrease in area between 2004 and 2030 - approximately 2 % per year according to HAL's forecast will be much lower than the annual rate of decrease of around 6.25 % per year over a similar length of time between 1980 and 2003.

**3.24.** Examination of the recent trend in contour area shows that based on the LAEQ noise indicator, the size of the 57 decibel contour contracted on a trend of around 1.4 km<sup>2</sup> (1.5%)

per year over the 9 years 2004 to 2012 and were this trend to continue the contour would be around 82 Km<sup>2</sup> in 2030. This compares with estimates by HAL of 69.5 Km<sup>2</sup> in 2030, which is equivalent to a rate of 2.1 km<sup>2</sup> (2.4%) per year between 2012 and 2030 and thus much faster than the recent historic trend. On this basis HAL's estimate of contour area is around 15% less than the recent trend projected to 2030.

**3.25.** The Group notes that evolutionary developments in aircraft design are said to have produced around 0.1 dB reduction in noise per year and that this is the rate incorporated into HAL's forecasts but at the same time recognising different sound level reductions of about 1.0 dBA on departures and 0.5 dBA on arrivals. This disproportionate improvement has significance given that the predominance of Heathrow arrivals are westerly operations over the relatively high population density in London. Appendix 9 illustrates the current population density around Heathrow. Some respondents questioned the noise reduction of individual aircraft when checked against actual improvements on the ground.

**3.26.** The Group notes there appears to be disparity in the assumptions on the rate of fleet replacement. For example, HAL assumes the current aircraft fleet will be replaced with less noisy aircraft by 2030 but the Airports Commission in their appraisal estimates the rate to be slower with 35% of the current fleet remaining at that date.

**3.27.** Regarding population growth and its dispersion the Group notes from respondents that the planning system is said to form part of the noise management framework for Heathrow. But over the years there has been an increase in the number of new residential properties built within the LEQ noise indicator, with a consequent increase in the number of exposed people, despite a contraction in the size of the affected areas. HAL estimates show that population growth will expose 20% more people to aircraft noise in 2030 compared to no population growth. Given the pressures for more homes to be built in the London area, it seems inevitable that more residences will be built in areas affected by the noise from Heathrow's flight paths. The Group considers that allowance should be made in the noise forecasts for an increase in the exposed population on account of new residences over the next ten years, if it is not possible to prevent their construction.

**3.28.** The mass of an aircraft and its payload affects the noise generated. HAL projects growth in passenger numbers from a current 72 million a year to 90 million without any increase in aircraft movements but involving larger aircraft and higher load factors. The noise impact is not identified in the responses but could be material.

**3.29.** Examination of the number of people exposed assuming less noisy aircraft and population growth suggests over-optimism in HAL's forecasts. In the two runway case HAL estimates the number of people exposed at 57 LAEQ in 2030 to be 203 900 compared to the Commission's estimate of 221 200. HAL estimate of the number of people exposed at 55 LDEN to be 522 500 people compared to the Commission's estimate of 580 500 people.

**3.30.** The Group considers that the number of exposures to the LAEQ and LDEN noise indicators in 2030 is still significant. The number of exposures above the WHO guideline values would be larger than the LAEQ indicator, for the reasons set out in Topic One, although the Group is not able to estimate a figure. In addition, the sensitivity issues which are not measured by noise averaging, as discussed in Topic Two, would continue to apply in 2030.

**3.31.** The Group notes that these estimates do not appear to be dependent on whether a third runway is built.

**3.32.** The Group notes the views of respondents that the success of incentives and restrictions at Heathrow to hasten the introduction of less noisy aircraft has been marginal at best. The Group tends to the view that in the absence of international agreement to phase out the noisiest aircraft within short timescales, it is probably unrealistic to expect Heathrow to phase out aircraft that are still accepted in most other airports, with consequent implications for Heathrow's ability to comply with the WHO guideline values.

## **Action**

### **3.33. The Group will ask HAL:**

- 1. To confirm their estimate of the rate of noise reduction to 2025 in the light of comments we received and our own observations indicating the rate may be over-optimistic.**
- 2. What measures are needed to prevent the building of new residential properties under Heathrow's flight paths.**
- 3. Whether it is possible to strengthen the incentives to hasten the introduction of less noisy aircraft.**

## **INQUIRY TOPIC FOUR:**

### **LESS NOISY OPERATIONAL PROCEDURES**

#### **Question**

**4.1.** Consultees were asked if there are additional operational procedures for noise reduction and respite at Heathrow that could be introduced within the next ten years; or are any such noise improvements being held back for the development of a third runway?

#### **Background**

**4.2.** HAL's revised proposal for a third runway includes a number of options for reducing air traffic noise by changes to existing operational procedures to mitigate noise impacts. The aviation industry has long focused on reducing departure noise, given that the noise at source is greater than on arrivals. But this has exposed the problem of dispersion of noise from arrivals over a wide area, which is increasingly the topic of attention. Broadly, the noise impact of operating procedures is a function of noise at source (e.g. landing gear deployment), height of an aircraft (e.g. angle of descent), lateral dispersion of flight paths and respite. Arriving aircraft can join their final flight paths 5 nautical miles ahead of touchdown but in reality the majority will be on their final approach at least 10 nautical miles from touchdown, with some joining as far as 20 nautical miles from touchdown. Departing aircraft gain height and speed quickly using noise preferential routes. Appendix 6 briefly describes the operational procedures.

#### **Responses**

**4.3.** The main arrival procedures where the noise impact depends on noise at source and aircraft height are shown in the following table. This information is not Heathrow specific and was provided by the *CAA Report - Managing Aviation Noise (2014)* and the *Sustainable Aviation Report – SA Noise Road-Map*. The table indicates where and over what distance the procedures can have an impact on arrivals and the potential noise reduction. But the evidence from respondents was somewhat patchy and inconsistent in respect of the benefits. While the procedures were generally welcomed by respondents there were reservations.

<b>Arrival Procedures:</b>	<b>Nautical miles from runway threshold</b>	<b>Potential noise improvements decibel (SEL)</b>	<b>Nautical miles from runway threshold</b>	<b>Potential noise improvements decibel (SEL)</b>
	SA	SA	CAA	CAA
Continuous descent operation CDO	10-25	1-5	10-20	2.5-5
Low power/drag (e.g. deferred landing gear)		1-3	5-10	3-5
Reduced landing flap		1	0-5	0.5-1.5
Steeper approaches e.g. 3.2deg cf current 3.0deg	0-20	Up to 1	0-20	Up to 1
Displaced threshold	0-20			

**4.4.** It was said that some procedures can be combined but often individually they impact only a segment of the flight path, as illustrated in the above table, and where the procedures do overlap there can be conflicts so that the full potential of individual measures is not always realised. Taking each procedure in turn the following comments were made - on both noise reduction and deliverability including timescale, where such information was provided:

- Continuous descent: It was said that CDO is already applied at Heathrow and there may be only limited scope for further improvement in the noise climate. Evidence was said to show that CDO concentrates aircraft along corridors which causes a significant increase in complaints well beyond the 57 LAEQ contour, e.g. Greenwich and Reading.
- Landing gear: There was support for more aircraft deferring landing gear deployment with the enhanced procedures being implemented in the near term, which could lead to reduced noise over a segment of a few miles on arrivals.
- Reduced landing flap setting: Details were not provided but it was indicated that procedures are already in place and the opportunity for future improvement to the overall noise climate is relatively small.
- Steeper approaches: It was generally thought steeper approaches could pay dividends in the longer term. But the *CAA Report - Managing Aviation Noise (2014)* says 'There are potential difficulties in low visibility conditions and it is likely that even 3.2 degrees could interfere with the ability to use low power/low drag and reduced landing flap techniques'. It was said that the interference could increase noise over parts of the approach. The Airports Commission in its *Noise Discussion Paper (2013)* says 'with more

aerodynamic aircraft of the future, designed to save fuel, steeper angles of descent become more difficult to fly.’ NATS in its response pointed out that ICAO recommend 3 degrees and ‘in excess of 3 degrees should not be used except where alternative means of satisfying obstruction clearance requirements are impractical. Any deviation would require the CAA to file a difference with ICAO and strong arguments would need to exist for them to be persuaded to do so.’

- But HAL’s proposals to the Airports Commission assume 3.2 degrees can be achieved by 2030 in the two and three runway cases and 3.5 degrees by 2040 in the three runway case. HAL says ‘increasing the glideslope to 3.2 degrees is already planned for Heathrow’ and ‘trials are planned for September 2015’. It was said that increasing the slope from 3 degrees to 3.2 degrees may offer scope for noise reduction of up to 1dBA SEL from about 22 nautical miles to touchdown. The CAA says ‘It is clear that the additional benefits of 3.2 degree approaches are relatively small’.
- Displaced thresholds were said to require significant re-organisation of runway exits and this is apparently not justified without a third runway and therefore will not happen before 2025. NATS in its response says ‘All recent safety analysis of global accidents shows that the vast majority of aviation fatalities result from runway excursions and overruns. A very careful consideration would need to be given to reducing the amount of landing run available’. Details of the noise impact of displaced thresholds were not provided by respondents.

**4.5.** Departure procedures, it was said, are concerned with the aircraft’s speed and rate of climb. It was commented that continuous climb is generally sought but that the noise impact is of small benefit compared to the impact on CO2 and nitrogen dioxide pollution.

**4.6.** Respondents commented on arrival and departure flight paths and the dispersion of noise. In particular, reference was made to concentration of aircraft over several flight paths with rotation of the flight paths so as to provide respite. On arrivals this involves curved flight paths joining the final straight line approach to each runway. For departures it could involve early vectoring - again with alternation of the routes so as to provide respite. But without definitive flight path proposals respondents were not able to comment on the specific noise impact of these considerations. Nevertheless, relevant issues regarding flight paths were raised as follows:

- NATS in its response says ‘At Heathrow there are stacks North and South, in order to maintain a high landing rate, controllers need flexibility to vector aircraft and consequently the ‘swathe’ of aircraft tracks into Heathrow is much greater. To develop a track that could be altered for noise respite at Heathrow would give controllers far less flexibility and be severely detrimental to throughput.’ However, it was said that

consideration is being given to ‘tromboning’ whereby aircraft use several routes to a specific point on the arrivals path.

- Respondents made the point that operational procedures often depend on technical advances and in particular Performance Based Navigation (PBN) that is now being introduced. PBN enables accurate concentration of flights along planned flight paths, thus potentially avoiding the more populated areas.
- Respondents referred to a number of projects underway, such as the London Airspace Management Programme (LAMP), which aim to improve the capacity, efficiency and safety of London’s crowded airspace; these have potential to change the noise impact of Heathrow arrivals and departures. It was noted that LAMP is scheduled for completion by 2020. NATS in its response said ‘Air Traffic Management will change significantly over the next 10 years, with constraints that limit the effectiveness of today’s operation largely overcome by advances in ground-based and airborne technology’. It was recognised that proposals for Heathrow’s flight paths will need to be integrated and optimised with the re-design of the airspace over London and indeed that over the UK and Europe which is also underway.
- It was pointed out that the high population density east of Heathrow means it is difficult to re-direct flights to avoid populated areas and often the noise impact is moved from one populated area to another without much, if any, net benefit. It was said that concentrating noise might expose fewer people but with more noise. The evidence was not clear how people would respond to airspace changes (e.g. dispersion versus concentration), although HAL referred to past consultations on specific issues and the need for trials and further consultations.
- Respondents referred to westerly preference, mixed mode and the Cranford Agreement. Mixed mode (arrivals and departures on the same runway) generally was not supported. Westerly preference could be withdrawn and HAL’s proposal assumes the Cranfield Agreement is terminated but comment on the merits or otherwise of these issues was not sufficiently developed to comment on here.

**4.7.** Respite from overhead aircraft was considered important by respondents. In its proposals to the Airports Commission, HAL described the changes to respite that might arise with a third runway as discussed under Topic 7. But there is no suggestion that any of these changes would take place before 2025 or indeed thereafter were there to be no third runway.

**4.8.** Some changes to operational procedures are being considered primarily with the aim of not reducing noise but improving performance, for example - resilience and reduced congestion. Respondents mentioned queue management and time based separation and

that indirectly these changes can affect the noise impact; for example less congestion should reduce de-alternation of runway use during periods of respite but increasing the flow rate could increase the noise impact. The noise impact of these measures was not quantified in any detail.

**4.9.** Respondents generally supported the assessment of the operational changes and the opportunities they offered. Proponents of expansion tended to give a more confident appraisal of the benefits and their deliverability than did other respondents. Where reservations were expressed it was not clear to what extent the uncertainties might be overcome. Generally, respondents expressed the view that changes to operational procedures were likely to deliver only marginal noise reduction benefits, if they were indeed feasible at all.

## **Findings**

**4.10.** The Group notes that some of the noise-management operational procedures have already been introduced, at least in part, and that the introduction of the other procedures under consideration are not dependent on HAL's proposed third runway, other than displaced thresholds.

**4.11.** It has not been possible to determine from the evidence supplied what might be the combined noise impact on the population of the various operational changes identified, notwithstanding indicative benefits suggested. Respondents did not translate single event noise reduction of aircraft into noise contours or population affected.

**4.12.** It appears to the Group that the effect of the procedures individually and collectively in reducing in absolute terms the present air traffic noise levels will be somewhat marginal. The main effect appears to be a redistribution of noise from one area to another, including possibly to areas that hitherto previously were not overflowed regularly. It could be argued that equity demands a more even distribution of noise.

**4.13.** The Group considers that future trials for testing changes to operational procedures need to be independently undertaken and with greater transparency in terms of information to the communities affected and evaluation of the noise effects.

## **Actions**

**4.14. The Group will ask HAL to prepare a comprehensive plan that sets out for the proposed noise-management operational procedures and for LAMP and associated changes to London's airspace:**

- 1. The expected effect of each procedure in reducing the size of the air traffic noise contours (day and night) and whether supplementary noise indicators would be needed in order to understand the noise effects fully.**
- 2. The flight paths and the overflowed areas that the noise effect of each procedure would be: (a) beneficial; (b) detrimental; (c) neither beneficial nor detrimental.**
- 3. The timescales by which each procedure could be (a) introduced (if has not already been introduced) and (b) operational fully in terms of the noise effects.**
- 4. The arrangements for consulting communities in all the areas affected by procedure trials and for evaluating the noise effects of trials.**

## **INQUIRY TOPIC FIVE:**

### **FLIGHT PATHS FOR THIRD RUNWAY**

#### **Question**

**5.1.** Consultees were asked - Over what areas will the arrival and departure flight paths for the proposed third runway be routed, and which of those areas are not currently overflowed by Heathrow air traffic, either at all or only occasionally?

#### **Background**

**5.2.** HAL proposes to develop a third runway at Heathrow on a latitude that is approximately half a mile to the north of the existing northern runway and between longitudes that are approximately one mile further to the west than the existing northern runway. The third runway would require its own set of arrival and departure flight paths (i.e. in addition to flight paths for the existing two runways). HAL has assessed three options for flight paths that would be shared between the third runway and the two existing runways against the following policy criteria:

- Option T: flight paths for all three runways that would minimise the total number of people overflowed.
- Option N: flight paths for all three runways that would minimise the number of new people overflowed.
- Option R: flight paths for all three runways that would maximise the opportunities for noise respite (i.e. intervals during the day and night in which areas under the flight paths would not be overflowed).

**5.3.** Flight path diagrams for the three options are set out in *Appendix H starting on page 264 of the HAL Report*, which can be accessed on the Group's website.

**5.4.** Appendix H of the *HAL Report* contains sixteen diagrams for Option R and eight diagrams each for Option T and Option N. For illustrative purposes only, two of the diagrams for Option R in westerly operation (arrivals from the east/departures to the west) are reproduced in Appendices 7 and 8 to this report. The grey lines show the distribution of landing and departure flights with the existing two runway operation. The green lines show arrivals and the blue lines show departures with three runway operations. The flight paths shown on the diagrams are said by HAL to represent approximately 500 metres either side of a centre line.

5.5. Again for illustration only, the table below shows the four modal patterns for Options T and N applied to westerly operations (arrivals from the east/departures to the west) and to easterly operations (arrivals from the west/departures to the east). ‘M’ stands for mixed mode (arrivals and departures operating on the same runway), ‘D’ stands for departures and L for landings (arrivals). HAL’s intention is to switch between the modal patterns. For example, if switching took place between 0700-2300 then each of the four modal patterns would run for four hours. If 0600-0700 from the night period were included, then each modal pattern would be slightly longer.

Options T&N modal patterns	MDL	MLD	LDM	DLM
New Third runway	Arrival & Departure	Arrival & Departure	Arrival	Departure
Northern runway	Departure	Arrival	Departure	Arrival
Southern runway	Arrival	Departure	Arrival & Departure	Arrival & Departure

5.6. HAL suggests that Option R arrivals would rotate between two different flight paths during each of the four runway modal patterns thus resulting in eight arrival periods, as shown in the table below; over 16 hours each period would last for two hours. Switching involves additional traffic control work and switching modal patterns over four days may be more practical than switching over 16 or 17 hours each day.

Option R modal patterns	MDL-1	MDL-2	MLD-1	MLD-2	LDM-1	LDM-2	DLM-1	DLM-2
	Period 1	Period 2	Period 1	Period 2	Period 1	Period 2	Period 1	Period 2
New Third runway	Arrival & Departure		Arrival & Departure		Arrival		Departure	
Northern runway	Departure		Arrival		Departure		Arrival	
Southern runway	Arrival		Departure		Arrival & Departure		Arrival & Departure	

5.7. In summary, HAL’s indicative flight paths for arrivals from the east, for example, are as follows:

- [Option T](#): one arrival flight path serves the new third runway and curves in from the north over new territory not previously overflowed by arrivals.
- [Option N](#): two flight paths serve the new third runway and their use alternates depending on runway modal pattern; one of the flight paths is in line with the existing

northern flight path until the last 5 nautical miles when it lines up with the new third runway and over territory not previously overflowed by arrivals. The other flight path curves in from the north and is over new territory not previously overflowed by arrivals. The paths merge before the final 5 nautical miles to touchdown.

- [Option R](#): two flight paths serve the new third runway and their use alternates depending on modal pattern and route alternation; both curve in from the north over new territory not previously overflowed by arrivals.

## Responses

**5.8.** HAL said that the flight paths in their report were indicative only. It is too early to say with any certainty where the third runway flight paths would be routed. The final decision on their routing would be the subject of further work and consultation, if and when the third runway was selected. HAL's consultations to date show that the majority of those who responded felt that providing periods of relief from flight path noise was more important than minimising the number of overflowed communities.

**5.9.** Other respondents said that the flight paths in HAL's proposal were not in sufficient detail to identify with any precision the areas that would be within audible distance of the third runway flight paths. Moreover, the flight paths were indicative only and could be subject to change, so the lack of detail was compounded by additional uncertainty as to which areas would ultimately be overflowed.

**5.10.** These criticisms were directed at the arrival paths more than five miles from touch down and the departure paths. It was acknowledged that arrivals in the five miles before touch down would have to align with the third runway, so the areas overflowed over this distance could be identified accurately and would not, it was argued, change.

**5.11.** Some respondents attempted to identify in broad terms the areas likely to be overflowed by the third runway arrival paths more than five nautical miles from touchdown and departure paths. There was wide consensus that the third runway flight paths would mostly overfly areas and populations that hitherto were not exposed to flight path noise, at least on a regular basis.

**5.12.** Respondents argued that the impact of the existing flight paths on areas away from the immediate vicinity of Heathrow are disregarded in the noise assessments, particularly in respect of arrivals at heights above 5 000 feet. More aircraft movements with a third runway would probably result in more areas beyond 20 km from Heathrow being overflowed regularly by air traffic at high altitude but nevertheless clearly audible and often against low background noise which accentuates the perceived annoyance from aircraft noise.

**5.13.** Generally respondents expressed concern about the lack of detail and certainty for the third runway flight paths, and argued that detail and certainty had to be provided before

the Airports Commission could make a recommendation and before any Government decision. It was further argued that NATS should be involved on safety and related issues because airspace is becoming increasingly crowded as the number of movements increase.

## Findings

**5.14.** The Group concludes from HAL's proposal and the responses from consultees that the third runway flight paths are likely to be routed at least partially and possibly almost entirely over areas and populations that have not previously been exposed to flight path noise, at least on a regular basis. No greater precision or certainty is available at this juncture, because HAL's proposals lack some precision and are in any case merely indicative and not final.

**5.15.** The Group does not have much sympathy with the argument that people who do not like aircraft noise should be careful about where they chose to live. But the argument loses all force when applied to the development of a new runway and/or the introduction of new flight paths. The Group was therefore disappointed that HAL has not been able to advise people whether their areas will or will not be overflown by the third runway flight paths.

**5.16.** The Group notes that HAL appears to expect that the routing of the third runway flight paths will only be agreed when the Government signals its backing for a third runway. The attitude appears to be that the impact of flight path noise on areas that have not previously been overflown regularly is not to be regarded as sufficiently important to influence the decision on whether the Government should back a third runway, merely a detail to be sorted out when the key decision has been made. Such an attitude can take comfort from the fact that there is a statutory bar on seeking redress in the courts in respect of aircraft noise; and that aircraft noise is outside the scope of local authority noise abatement orders.

## Action

**5.17.** The Group will ask the Airports Commission to undertake research into all the possible flight paths for the proposed third runway and the areas that would be overflown regularly that are not overflown regularly at present; and to publish the results of this research before the Airports Commission makes its final report.

## INQUIRY TOPIC SIX:

### FLIGHT PATHS FOR EXISTING TWO RUNWAYS

#### Question

**6.1.** Consultees were asked - Would the flight paths for the third runway cause any alteration to the present routing of the flight paths for the existing runways; and if so, to what extent?

#### Background

**6.2.** The background to Topic 5 is pertinent to Topic 6 except that the flight paths considered in Topic 6 are those that would serve the existing two runways if the third runway came into operation. As in Topic 5, flight path diagrams for the three options are set out in *Appendix H starting on page 264 of the HAL Report*, which can be accessed on the Group's website.

**6.3.** For illustrative purposes only, two of the diagrams for Option R in westerly operation (arrivals from the east/departures to the west) are re-produced in Appendices 7 and 8 to this report. The grey lines show the distribution of landing and departure flights with the existing two runway operation. The green lines show arrivals and the blue lines show departures with three runway operations. The flight paths shown on the diagrams are said by HAL to represent approximately 500 metres either side of a centre line. The HAL diagrams are indicative only so the brief description here is for illustration of the principals. In summary, HAL's indicative flight paths for arrivals from the east, for example, are as follows:

- Option T: two arrival flight paths serve the existing northern runway; they curve in from the north and the south and merge onto a straight line ahead of the final 5 nautical miles. They alternate with change in modal pattern. People east of the merge points would no longer be exposed to arrival noise. One arrival flight path serves the southern runway and curves in from the south. In this example of Option T, it would appear that very approximately two thirds of the distances for the flight paths serving the existing northern and southern runways would be over new territory and population not previously exposed to noise from arrivals. This increases to approximately three quarters of the distance if the new third runway were to be included.
- Option N: one arrival flight path serves the existing northern runway and one serves the southern runway; both for the most part are over existing flight paths serving the two

runways. The flight paths curve in to meet a straight line approach some ten nautical miles from touch down and in comparison with Option T it would appear that there is a smaller distance over new territory and population not previously exposed. It would appear that very approximately one third of the distance for the flight paths serving the existing northern and southern runways would be over new territory not previously exposed to noise from arrivals. This increases to approximately half of the distance if the new third runway were to be included.

- [Option R](#): four arrival flight paths serve the existing northern runway and are used alternately. Two of these flight paths curve in from the south, one from the north and one is along the existing flight path. Two arrival flight paths serve the southern runway and curve in from the south. It would appear that very approximately half of the distances for the flight paths serving the existing northern and southern runways would be over new territory and population not previously exposed to noise from arrivals. This increases to approximately two thirds of the distance if the new third runway were to be included.

## Responses

**6.4.** HAL confirmed that a third runway would require the existing flight paths at Heathrow to be modified; but regardless of the third runway decision, some modification is likely over the next decade, due to the London Airspace Management Programme (LAMP) for upgrading London's airspace use (i.e. the LAMP modifications would apply across London and not just at Heathrow). It was too early to say with any certainty what modifications would be made to the existing runway flight paths or the areas that would be affected by the modifications. But the final decision on their routing would be the subject of further work and consultation.

**6.5.** Many respondents cited the lack of detail and the provisional nature of HAL's 'indicative' new flight paths for the existing runways as reasons for not being able to provide a definitive response to the question. There was a general expression of concern that any changes to the existing flight paths would have noise implications for areas that had not previously been over-flown on a regular basis. Respondents argued that HAL and NATS should be required to provide clarity and certainty about any changes to the existing flight paths.

**6.6.** The Mayor of London argued that the continued use of Heathrow as the UK's main airport, located amidst sizeable concentrations of population, meant that neither of the noise options for flight path modifications would produce palatable results (concentrating movements on a small number of flight paths would expose a relatively small number of homes, schools and medical facilities to significantly more noise disturbance; but dispersing

movements across many flight paths would expose many more homes, schools and medical facilities to noise disturbance, albeit less frequently).

**6.7.** Other respondents argued that proposals for flight path changes should be dovetailed with other initiatives under the future Air Airspace Strategy; and that flight path changes would be needed not just to accommodate third runway arrivals and departures, but also for the overall increase in the number of movements.

**6.8.** It was argued that HAL's proposal must indicate that NATS is confident that Heathrow with three runways would not adversely affect any other London airports. But Hillingdon Council drew attention to the close proximity of Heathrow to RAF Northolt and requested that the Group should ask NATS about the potential impact of Heathrow on RAF Northolt.

**6.9.** It was argued by some that a subsequent fourth runway at Heathrow would effectively prevent Gatwick and London City from continuing to operate.

## Findings

**6.10.** The Group notes that the third runway would necessitate some changes to the routing of the flight paths on the existing runways; but that some changes are in any case likely, due to LAMP and regardless of whether or not a third runway is developed.

**6.11.** The Group can appreciate that LAMP is outside HAL's control and that LAMP to some extent cuts across the flight path changes that would happen with a third runway. But HAL cannot hide behind LAMP: the areas and populations that would be affected by the flight path changes consequent on a third runway need more complete and definite information about the changes, sooner rather than later.

**6.12.** In other respects, the Group's findings on this Topic are as stated in our findings on Topic 5.

## Action

**6.13. The Group will ask the Airports Commission to undertake research into all the possible flight paths for the existing runways and the areas that would be overflowed; and to publish the results of this research before the Airports Commission makes its final report.**

## **INQUIRY TOPIC SEVEN:**

### **DAYTIME RESPITE FROM FLIGHT PATH NOISE**

#### **Question**

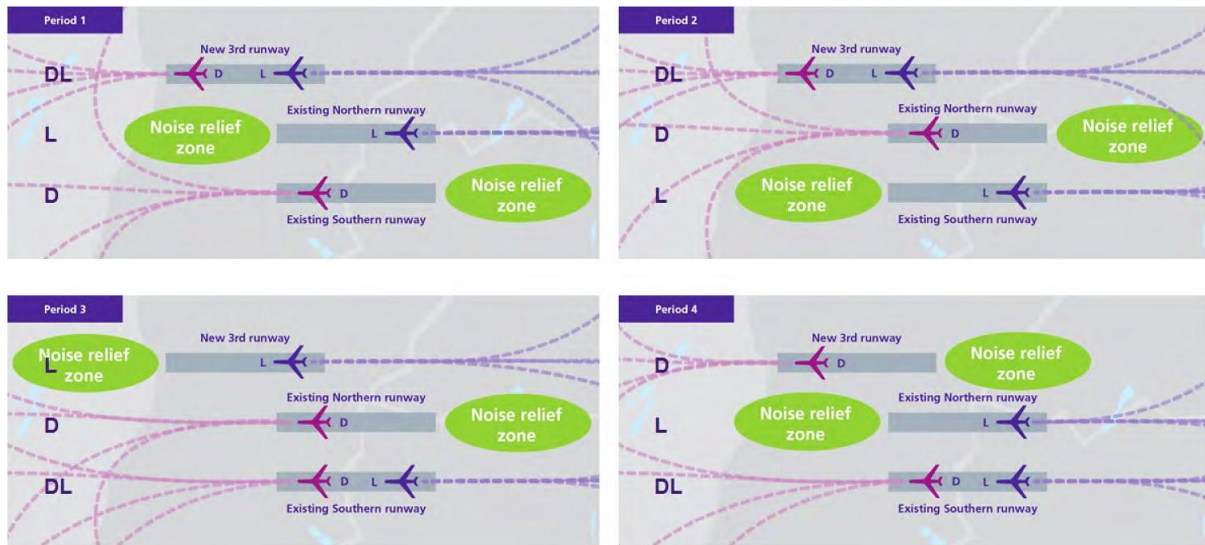
**7.1.** Consultees were asked - How would the proposed segregated mode respite periods operate with three runways, compared with the existing runway alternation arrangements (between 0700-2300 and between 2300-0700)?

#### **Background**

**7.2.** Heathrow has operated a runway alternation procedure since the early 1970s, whereby all arrivals over London are routed to one runway between 0700-1500 and are switched to the other runway between 1500-2300. Runway alternation currently provides a half-day of relief from aircraft noise for many (but not all) of the residents overflowed by the two flight paths over London. It has been the intention of HAL to extend the benefit of alternation to air traffic arriving over Windsor. HAL's revised proposal for a third runway gives a commitment to operating periods of relief from aircraft noise even with three runways in operation.

**7.3.** The following is a brief description of respite summarised from the HAL Report. The three runways would operate with two arrival and two departure streams at any particular time during the day, with one runway operating in segregated mode for arrivals, one runway operating in segregated mode for departures, and one runway operating in mixed mode for arrivals and departures. This plan of operation results in four combinations or modal patterns which would be rotated between the three runways. The runway modes are shown for westerly operations (arrivals from the east/departures to the west) in the following diagrams.

Illustration of effect on noise relief of rotating the four operating modes (shown for westerly operations)



Source: HAL Report page 18

7.4. The above diagrams show that the new third runway and existing southern runway would each be used for arrivals in three of the four hour periods, i.e. for twelve hours thus leaving four hours for respite. Eight of the twelve hours in use would be in mixed mode and four hours in segregated mode. Similar arrangements apply to easterly operations and to departures. The following table illustrates the use of all three runways assuming the modes are rotated over sixteen hours but it could be over four days or another period.

**Daily Runway and Flight path use and respite (arrivals-westerly operations) 0700-2300:**

Runway modes	Mixed mode hours	Segregated mode hours	Respite hours
New Third runway	8	4	4
Northern runway	0	8	8
Southern runway	8	4	4

Source: Group Secretariat analysis of the HAL Report

7.5. The HAL Report explains that generally speaking, in mixed mode each arrival follows a departure. The flow rate is not halved compared to segregated mode because the vortex constraint (keeping the planes apart because of turbulence) can be relaxed to some extent. Depending on operational considerations the average mixed mode flow rate is of the order of two thirds the segregated rate.

7.6. The HAL report also explains that the use and respite experience outlined above would be modified where on arrivals more than one flight path serves the runway before the flight paths merge and on departures after each flight path divides. So near the airport respite shown in the above table would be experienced but further away it could be increased. The

respite for each flight path where there are multiple flight paths depends on the number of flight paths and the number of modal patterns in which they are used. The number of flight paths is indicative only at this stage so the following example is for illustration only. Option R arrivals between 0700-2300 and during westerly operations might have four flight paths serving the existing northern runway which could result in each having 14 hours of respite. The new third runway and existing southern runway might each be served by two flight paths each with ten hours of respite.

## Responses

**7.7.** HAL re-iterated that the periods of respite from flight path noise in their third runway proposal are just one way that operations might be planned. There would be further consultation before a final decision is taken on the respite measures.

**7.8.** Other respondents stressed that runway alternation is important for the heavily populated areas of west London over which the two arrival flight paths are routed, because neither flight path has to take arrivals for more than eight hours per day in the sixteen hour period between 0700-2300, thereby giving the overflowed areas an eight hour rest from flight path noise. Concern was expressed that a third runway would result in some areas being overflowed for twelve hours per day, with the break from flight path noise reduced to four hours per day.

**7.9.** Concern was expressed that mixed mode would be used on the existing southern runway and the third runway, despite previous statements from HAL that mixed mode would add little to Heathrow's operational capacity.

**7.10.** It was pointed out that the heavily populated areas between flight paths do not benefit from respite to the full extent because they are within audible distance of both the existing arrivals paths, and that this unsatisfactory situation would be replicated in areas between the existing northern runway and the new northern runway.

**7.11.** It was pointed out that at present some areas are exposed to both arrivals and departures when the operations switch between easterlies and westerly operations. This unsatisfactory situation would be replicated with a third runway.

**7.12.** It was argued that the loss of respite did not conform to the Aviation Policy Framework objective to limit and where possible reduce the number of people in the UK significantly affected by aircraft noise.

**7.13.** It was argued that there was lack of detail and certainty about the respite proposals. The view was expressed that without this detail it could not be seen how the Airports Commission could properly inform itself as to the required mitigation strategy and hence overall cost of a third runway.

## Findings

**7.14.** The Group notes that noise respite measures do not involve any reduction in the overall quantity of noise generated by the flight paths, but are ‘merely’ the distribution of the noise, with two runways or with three runways. Thus, while we support a strategy for noise distribution because the flight path noise levels are so high, distribution should not be seen as substitute for a strategy for overall noise reduction, with two runways or three runways. We address noise reduction more fully under Topic 10.

**7.15.** The Group notes that flight path noise can be either concentrated over a small number of areas or dispersed over a larger number of areas. Similarly, the noise over one area can be concentrated into short periods or spread over longer periods. As regards the areas affected, the effect of concentration is to create ‘noise ghettos’. Equity therefore points towards a more even distribution over as many areas as possible, but inevitably this would mean that some areas would be overflowed that have not previously been overflowed, at least on a regular basis. This would happen with two runways, but even more so with three runways.

**7.16.** The Group finds that - as with HAL’s indicative flight paths for the third runway (Topic 5) and for the existing runways (Topic 6) - there is insufficient detail or certainty about the respite possibilities. It is therefore difficult to identify the areas that would be overflowed for longer or shorter periods than at present, or the areas that would be newly overflowed. These are serious gaps in information for residents that need to be filled before the Airports Commission makes its final report.

**7.17.** The Group considers that the reduction in flight path noise respite from eight hours to four hours per day in some areas would be a serious imposition on many people. Similarly, the area between the existing northern runway and the new northern runway are likely to lose entirely the respite from flight path noise that they currently obtain from alternation of the existing runways.

**7.18.** The Group notes that an increase in the existing number of flight paths could enhance the scope for more respite from flight path noise. With two runways in operation, this may be an absolute gain compared with the present situation. But with a third runway, there is the risk that any gains from more flight paths could be offset by the increase in the number of aircraft movements (1 315 per day with two runways to 2 027 per day with three runways).

## **Actions**

**7.19. The Group will ask the Airports Commission to recommend in its final report (if it were to recommend Heathrow) that 8-hour runway alternation should be retained at Heathrow in all scenarios.**

**7.20. The Group will ask the Airports Commission to identify all the flight path noise respite options and permutations, with two and proposed three runways, together with an assessment of the most equitable package, having regard to the gains and losses for each overflowed area.**

## **INQUIRY TOPIC EIGHT:**

### **NIGHT FLIGHTS**

#### **Question**

**8.1.** Consultees were asked whether a third runway would enable Heathrow to operate without flights in the night period (2300-0700)

#### **Background**

**8.2.** The current system of restrictions on night flights at Heathrow between 2330-0600 (the 'night noise quota period') have operated since 1993, with limits on the number of scheduled aircraft movements and the noise level (as measured by noise quota points), below which the permitted number of movements must operate:

- The permitted number of movements across the winter and summer seasons has been 5 800 since 1993/94. The actual number of movements has increased from 5 257 in 1993/94 to 5 434 in 2011/12.
- The permitted number of noise quota points has decreased from 12 000 in 1993/94 to 9 180 since 2011/12. The actual number points used has decreased from 9 493 in 1993/4 to 7 321 in 2011/12.

**8.3.** There is no limit on the number of movements or noise quota points between 2300-2330 or 0600-0700, despite a recommendation from the Heathrow Terminal Five Public Inquiry that there should be a limit between 0600-0700. The number of movements in this hour has increased steadily since the early 1990s.

#### **Responses**

**8.4.** It was acknowledged that noise from Heathrow's flight paths at night is a major concern for residents and some respondents thought it the most important noise issue. There were broadly two opposing views as to the need for night flights. But it was generally thought that Heathrow would operate with night flights with or without a third runway.

**8.5.** Some argued that night flights are crucial in order to satisfy passenger preference, particularly business, and freight and to support UK connectivity; and that the demand would switch to other hub airports in Europe if night capacity were reduced or withdrawn altogether. Night flights were said to be essential to the operation of a hub airport, whereby arriving long-haul passengers are positioned to transfer to connecting flights at the start of

the day. It was pointed out that business demand for night flights made night flights most profitable for the airlines. It was stated that a third runway would not reduce the need.

**8.6.** The contrasting views were that the need was not time sensitive and could still be met in the daytime if daytime capacity were made available by more efficient use of the runways. Some respondents said that there was already sufficient daytime capacity to shift all the night flights currently scheduled between 2300 and 0700 into the day, but that with a third runway capacity constraint could no longer be an excuse for not banning all night flights, or at least those before 0600. Some of those who accepted that there might be a need for night flights still argued that the environmental cost is too high.

**8.7.** One respondent claimed that BA had claimed at the Terminal Five Public Inquiry that it could eliminate all but one of its flights in the night quota period due to larger terminal and aircraft capacity but this promise has not been delivered. Another respondent commented that future demand for more daytime movements should prompt a proportionate increase in demand for more movements at night.

**8.8.** It was claimed that other EU airports, such as Frankfurt, have banned night flights without the airline threats that they would move their business becoming a reality. It was also said that it would be a lost opportunity if HAL did not promise that a third runway would result in the total elimination of night noise or a dramatic reduction by 2030 or even 2040. Others thought that it was only a matter of time before a case would be made to increase night flights claiming economic need and a reduction of noise.

**8.9.** HAL suggested that with three runways the night time arrivals could be rotated between at least three approaches from the east or west and weather permitting between six approaches from both directions compared to the rotation between up to four approaches currently. HAL argued that this rotation and less noisy aircraft and operational improvements would reduce night flight noise and the need to reduce night flights but it has not sought in its proposals to offset this redistribution noise with an increase in the number of night flights.

**8.10.** Improved noise impact based on rotation between six arrival approaches was questioned because night flights on the third runway flight paths would expose people who are not currently exposed to aircraft noise at night, although those who are currently exposed to aircraft noise at night would benefit from less frequent noise. Some commented that notwithstanding retention of the night time quota regime between 2330 and 0600, there is likely to be a significant increase in the number of flights between 0600-0700 with a third runway and that this would offset any respite from rotation. It was pointed out that HAL's projected noise contours for 2030 and 2040 showed over the ten years some reduction in noise in the full night period (2300-0700) for the two runway case but an increase for the three runway case.

## Findings

**8.11.** The Group has little doubt that air traffic in the night period (2300-0700 hours) is the worst of Heathrow's aircraft noise impacts for many of our constituents. We were disappointed to find that HAL would not use the additional capacity from a third runway to phase out the very small number of movements at Heathrow in the night quota period (accounting for less than two per cent of all Heathrow's movements).

**8.12.** The Group notes that night flights are an important part of the function of a hub airport; and that the number of movements per year would increase from 480 000 to 740 000 with a third runway (an increase of fifty-four per cent); but that HAL would not seek to increase the number of movements between 2330-0600. We find it difficult to accept that the airlines (either those already at Heathrow or those who would be entitled to slots on the third runway) would not demand additional movements between 2330-0600; or that a future HAL management would not argue that the limits on the number of movements in the night quota period were preventing Heathrow from fulfilling its full hub role.

**8.13.** The Group notes also that HAL's proposal that the third runway could be used to provide some respite for areas currently overflowed by the night flights would mean that areas not currently overflowed by the night flights would be affected. This again points to the need to identify where the third runway flight paths would be routed.

**8.14.** The Group notes finally that HAL argues that improved operational procedures and less noisy aircraft should reduce noise overall, but that the rate of improvement in the night period according to HAL's forecasts is markedly slower than in the daytime, presumably due to further increases in the number of movements between 2330-2300 and 0600-0700. We comment on this more fully in Topic 10.

## Action

**8.15.** The Group will ask the Airports Commission to assess the likely future demand for night flights at Heathrow and their impact on flight path noise levels at night; and to consider the options for phasing out aircraft movements in the night period at Heathrow and across South East England more generally if additional runway capacity were to be provided in South East England.

## **INQUIRY TOPIC NINE:**

### **REACHING CAPACITY WITH THREE RUNWAYS**

#### **Question**

**9.1.** Consultees were asked how quickly Heathrow with the proposed third runway would reach its stated capacity of 740 000 aircraft movements (ATMs) per year; and how much resilience would there be with 740 000 ATMs.

#### **Background**

**9.2.** The Heathrow Terminal Five Public Inquiry established that Heathrow with a fifth terminal and two runways would have an annual capacity of 90 - 95 million passengers and 480 000 aircraft movements. These figures were arrived at on the basis that: (a) it would be feasible to carry 90-95 million passengers in 480 000 movements; and (b) 480 000 movements would permit unbroken runway alternation between 0700-2300 without the need for more movements in the night quota period (2330-0600), both key measures for mitigating the noise impact of Heathrow's flight paths with five terminals in full use.

**9.3.** Heathrow handled 72 million passengers in 470 000 movements in 2013, with spare capacity per year of 18-23 million passengers and 10 000 movements. But despite still operating below its passenger and movement capacities, Heathrow is said to have reached a resilience crisis due to insufficient runway capacity. The lack of resilience has resulted in the periodic suspension of runway alternation between 0700-2300; and has prompted the Airports Commission to recommend that the number of movements should be increased before 0600 in order to manage the regular congestion post 0600.

#### **Responses**

**9.4.** HAL envisages that, with the third runway open in 2025, Heathrow would handle about 570 000 movements per year by 2030 and would reach about 740 000 movements per year by 2040. HAL has worked with NATS in determining 740 000 movements as the practical limit for operating the three runways with the proposed alternation system, while providing also the necessary resilience. Improvements and efficiencies in air and ground traffic management are expected to reduce the scale of the resilience problems compared with today.

**9.5.** Other respondents (including the Mayor of London and the 2M Group) commented that lack of resilience would re-emerge as Heathrow approaches capacity with three runways.

Insufficient resilience would have a knock-on effect on alternation and other noise respite measures, with the possibility of more movements at night - all of which would have adverse noise implications for the overflowed areas. The guidance from IATA is that no more than 70 per cent of runway capacity should be utilised.

**9.6.** Some respondents thought that full use of a third runway would build up more quickly than predicted by HAL, with resilience and noise issues arising earlier than 2040. It was likely that suppressed demand would build up by 2025; Heathrow, as a dominant hub airport, would seek to increase its market share once the third runway opened; HAL would want to recover its substantial development costs as quickly as possible; airlines would rush to get the new slots, in some measure to avoid subsequently paying the substantial slot premium in the secondary market. The Airports Commission's *Technical Papers - Strategic Fit Forecasts*, in support of the Commission's current consultation, estimates the number of movements per year by 2030 as ranging between 625 000 and 740 000.

**9.7.** Some respondents expressed concern at the lack of substantive evidence and information about resilience. It was suggested that local communities would bear the risks of insufficient resilience and that the number of movements should be capped to preserve sufficient spare capacity for full resilience .

## Findings

**9.8.** The Group notes HAL's assurance that Heathrow with three runways would not face the resilience difficulties that have been experienced in recent years with two runways. But the Group notes also that BAA - HAL's predecessor - gave assurances to the Terminal Five Public Inquiry that resilience would be provided for with 480 000 movements, by reserving periods of the day when relatively few movements would be scheduled in order to handle any build-up of delays in the preceding peak hours.

**9.10.** In the light of the present resilience problems and with the benefit of hindsight, it can be seen that the resilience needs of Heathrow with 480 000 movements were underestimated at the Terminal Five Public Inquiry. As a consequence, two of the noise respite measures that were promised to local communities - unbroken runway alternation in the daytime and no increase in the number of movements before 0600 - are now in jeopardy, with some loss already of alternation before Heathrow has reached 480 000 movements, and the threat of more flights before 0600. The Group is therefore not entirely comfortable with HAL's assurance that 740 000 movements per year would leave adequate resilience.

**9.11.** For example, there are resilience difficulties at present with just under 480 000 movements (i.e. approximately 240 000 movements per runway). With 740 000 movements, there would be approximately 247 000 movements per runway. That is to say, Heathrow would be making even more intensive use of the three runways and airspace in

future than it is with two runways at present. That would appear to leave even less spare capacity than there is at present for handling delays.

**9.12.** The increase in the overall number of movements from 480 000 to 740 000 (i.e. an increase of more than fifty per cent) would presumably bring with it - when the three runways are all operating at capacity - the risk of a proportionate increase in the number of delays (i.e. for every ten delays at present there could be fifteen delays in 2040). Efficiency improvements may well be able to handle some of the surge in delays, but would there be any significant reduction in the number of delays in absolute terms?

**9.13.** The Group considers that there is a real risk that Heathrow with three runways could reach capacity sooner than HAL is anticipating, and that resilience difficulties could re-emerge that are at least as bad as at present. For communities under the flight paths there could be a return to suspended runway alternation for at least part of the daytime, and an increase in the number of movements before 0600.

**9.14.** The Group's inquiry into resilience has focussed on its noise implications. But a number of respondents commented on the wider implications of Heathrow reaching capacity even with three runways. The Group will consider these wider implications in our separate inquiry into Heathrow and the Economy.

## **Action**

**9.15. The Group will ask the Airports Commission to factor into their aircraft noise assessments the possibility that Heathrow with a third runway would experience resilience difficulties as it nears handling 740 000 aircraft movements per year.**

## **INQUIRY TOPIC TEN:**

### **WHO GUIDELINES WITH TWO AND THREE RUNWAYS**

#### **Question**

**10.1.** Consultees were asked - Would the proposed third runway hasten or delay the date by which the air traffic noise levels at Heathrow would not exceed the World Health Organization's guideline values on community noise?

#### **Background**

**10.2.** The table below set out estimates by HAL and the Airports Commission (AC) of the number of people who would in 2040 be exposed to noise from Heathrow's flight paths (assuming population growth):

- With two runways and 480 000 movements per year.
- With three runways and 740 000 movements per year for the three flight path options (Options T, N and R) referred to in Topics 5-7 above, and for a fourth option (Option T-C) introduced by the Airports Commission. Options T, N and R are based on a carbon capped scenario and Option T-C is based on a carbon traded scenario which is less restrictive.

**10.3.** HAL's estimates were published in support of their revised third runway proposal in May 2015 and were available to the consultees who submitted evidence in response to the Group's questions. The Airport Commission's estimates were published in November 2014 and have been included in the table below for completeness, although the consultees in this inquiry were clearly not in a position to comment on the Airports Commission's estimates in their responses to Group's questions.

**10.4.** In addition to the figures in the table below, HAL and the Airports Commission have published a number of additional estimates of noise exposure, at 57 LAEQ (0700-2300) and Numbers Above Averages (0700-2300 and 2300-0700). These additional estimates have not been included in the table below because 54 LAEQ is closer than 57 LAEQ to the higher WHO guideline value of 55 LAEQ for day; and Numbers Above are difficult to compare with the WHO guideline values.

	55 LDEN (24 hours)		54 LAEQ (0700-2300)		48 LAEQ (2300-0700)	
	HAL	AC	HAL	AC	HAL	AC
2 runway	468 450	588 900	405 600	460 600	254 700	337 000
3 runway - Option T	408 450	618 100	439 250	488 600	265 500	308 500
3 runway - Option N	653 000	702 500	568 950	593 900	307 150	385 300
3 runway - Option R	507 450	515 200	463 800	455 700	263 650	308 900
3 runway - Option T-C	-	667 200	-	522 800	-	309 700

**Source:** HAL Report E52, E55 & E58; Airports Commission Consultation Nov 2014 - Technical papers, noise - local assessment 4.7, 4.29, 4.48 & 4.70 and noise baseline 4.7.

## Responses

**10.5.** HAL said that there is no date by which the WHO guideline values are required to be met; and that the guidelines were not aviation-specific and had to be seen in a wider context than Heathrow. In particular, the levels of community noise in much of west London and the Thames Valley exceed the guideline values due to noise sources other than air traffic. HAL said additionally that its funding of home noise insulation should be taken into account in reaching the guideline values; and that the employment provided by Heathrow has a corresponding benefit on health that should be balanced against the impact of air traffic noise.

**10.6.** Transport for London referred to the assessment that it had commissioned of the noise from Heathrow's flight path with three runways. The assessment was based on relatively conservative modelling assumptions and found that in comparison with 2012, an additional 372 100 people would be exposed to noise above 55 LDEN with a third runway in 2050 (725 100 exposures in 2012 and 1 097 200 exposures in 2050, assuming no growth in population in the overflown areas).

**10.7.** One respondent argued that no Government that is committed to meeting the WHO guideline values would be able to approve a third runway. Another respondent argued that a third runway would conflict with the objective of the Aviation Policy Framework and National Policy Statement for Noise to avoid significant adverse impacts on health and quality of life.

**10.8.** A number of other respondents argued that a third runway would delay reaching meet the WHO guideline values by a much wider margin than would be the case with two runways; and that a third runway would affect areas that currently do not exceed the WHO guideline values, at least as regards noise from air traffic.

## Findings

**10.9.** The Group notes that the Airports Commission's estimates all show a larger number of exposures than do HAL's original estimates. But we consider that the margin of difference is not so small as to invalidate the comments submitted by consultees. Of more concern to the Group is the much larger margin of difference between the number of LDEN exposures with three runways in 2050 according to Transport for London (1 097 200) and the largest number of LDEN exposures with three runways in 2040 in the options considered by HAL (653 000) and the Airports Commission (702 500). The Group recognises that forecasting over such a long period involves an element of guesswork. Our concern is that the guesswork may err on under-estimating the number of exposures. We have not been able to call on expert forecasting advice, but we consider it a matter of great importance that all the assumptions that have been fed into the noise forecasts should be tested by independent experts; including consideration of whether additional assumptions need to be fed in.

**10.10.** For example, we note that Heathrow with three runways would handle 740 000 movements per year, which is 260 000 more per year than 480 000 movement with two runways, an increase of approximately 54 per cent. But the increase in the number of exposures from 740 000 movements compared with 480 000 movements is much lower - approximately 39 per cent and 19 per cent respectively for HAL's and the Airports Commission's third runway LDEN options with the largest exposure numbers compared with their two-runway figures. The significance of the number movements as individual noise events - and the consequent adverse impact from an increase in the number of movements - was a major factor in the report from the Heathrow Terminal Five Public Inquiry (see Topic 2 above) that HAL and the Airports Commission appear to have both ignored.

**10.11.** Setting aside the concerns the Group has about the forecasting assumptions, we consider that the figures prepared by HAL and the Airports Commission, even taken at face value, show that far too many people would still be exposed to flight path noise in the day and night in 2040 with two runways, and even more so with three runways. We say this against the background that Heathrow in 2040 would be approaching nearly one hundred years of operations. While we note HAL's comment that there are no deadlines for meeting the WHO guideline values, we consider that a faster pace of noise reduction is necessary over the next twenty five years, regardless of whether Heathrow is then operating with two or three runways.

**10.12.** The Group reaches this view because neither HAL's nor the Airports Commission's estimates measure the number of exposures down to the lowest WHO guideline values for the day or the night. As we discussed in Topic 1 above, there is no measured data for Heathrow against the lower WHO guideline values. But we are advised as crude estimates that the number of people exposed to the lower WHO guideline value of 50 LAEQ for day is

likely to be approximately twice the numbers given for 54 LAEQ by HAL and the Airports Commission; and that the numbers given by HAL and the Airports Commission for 48 LAEQ would need to be doubled and re-doubled for an approximation of the number of people exposed to the long term WHO guideline value of 40 LAEQ for night.

**10.13.** The Group considered the argument that the number of exposures in 2040 is likely to be lower than at present, regardless of the precise figures. But this provides cold comfort for the overflowed communities: any reduction would be in the areas furthest away from Heathrow which currently experience the lowest noise exposure, whereas the communities closer to the airport that currently experience higher noise exposure would still be affected, both in the daytime and at night. Moreover, the third runway would bring in communities that are not currently overflowed on a regular basis in either the day or the night.

**10.14.** The Group recognises that the community noise levels in much of west London and the Thames Valley may exceed the WHO guideline values due to noise sources other than air traffic, as argued by HAL, but we consider that each noise source must make its own reduction, rather than despair at the magnitude of the overall task.

**10.15.** The Group recognises the health and other benefits of employment at Heathrow, as argued by HAL, but we do not consider that they would be put in jeopardy if Heathrow moved at a faster pace towards the WHO guideline values.

**10.16.** The Group recognises the need for - and the importance of - generous provision for home noise insulation, as argued by HAL, but we consider that noise insulation is an intermediate measure until ambient noise levels reach the WHO guideline values, and should not be seen as an alternative to reaching WHO guideline values.

## **Actions**

**10.17.** The Group will ask the Airports Commission to extend its LDEN assessment of future air traffic noise at Heathrow to include the WHO lower guideline values for community noise (50 decibels LAEQ for 0700-2300 and 40 decibels LAEQ and 60 decibels LMAX for 2300-0700), together with the supplementary noise indicators that we recommended to HAL in response to Topic 2.

**10.18.** The Group will ask the Airports Commission to initiate a peer review of its noise forecasting assumptions and methodology.

**10.19.** The Group will ask the Government to set targets for reducing the levels of aircraft noise at Heathrow (and other UK airports) to below the WHO guideline values by 2040.

## APPENDIX 1: GLOSSARY AND ABBREVIATIONS

AC	Airports Commission.
ANASE	Attitudes to Noise from Aviation Sources in England Study.
ANCON	ANCON is the CAA's UK civil aviation aircraft noise contour model. It is developed to international standards and incorporates noise measurements and radar track information obtained from the London airports including Heathrow. (see also INM).
Aircraft Generations	'Imminent aircraft' types incorporate Generation 1 technology with significant fuel burn and noise benefits. These have recently entered, or are currently offered for sale to the market, and include all-new aircraft as well as re-engined aircraft. 'Future' aircraft types incorporate Generation 2 technology, which aim to achieve the noise goals set out in Flightpath 2050. These types are envisaged to eventually replace Imminent Generation 1 aircraft.
ATM	Air Traffic Movement-the landing or departure of an aircraft.
CAA	Civil Aviation Authority.
CACI	CACI are a company that prepare demographic datasets.
CDO	Continuous Descent Operations.
CCO	Continuous Climb Operations.
CO2	Carbon Dioxide.
Cranford Agreement	A 1952 Ministerial verbal statement of best endeavours that the northern runway would not be used for take-offs to the east.
dB	Decibel-this is a unit for measuring the relative magnitude of noise on a logarithmic scale. An increase or decrease of 3dB(A) represents a doubling or halving of noise energy.
dBA	'A' weighted decibel. This is a system of adjustment applied to sound of different frequencies to take account of the way the sensitivity of the human ear varies with sound frequency.
DEFRA	Department of Food, Environment and Rural Affairs.
DfT	Department for Transport.
DM	Do-Minimum case.
Easterly operations	When aircraft make their final approach to land from the west (over the

(easterlies)	Windsor area) and take-off towards the east (over London).
END	European Union Environmental Noise Directive, 2002
ERCD	The CAA's Environmental Research and Consultancy Department.
FAS	Future Airspace Strategy.
GAL	Gatwick Airport Limited.
HAL	Heathrow Airport Limited.
ICAO	International Civil Aviation Organisation.
INM	Integrated Noise Model – this is an aircraft noise modelling tool that is used internationally to assess noise from airports. (see also ANCON).
LAMP	London Airspace Management Programme.
LAEQ, 16-hour	Equivalent continuous sound level of aircraft noise in dB during an average summer day. For conventional historical contours this is based on the daily average movements that take place in the 16 hour period (0700-2300 hours local time) during the 92 day period between the 16 June and 15 September inclusive.
LAEQ, 8-hour night LNIGHT	Equivalent continuous sound level of aircraft noise in dB during an average summer night. The indicator uses average movements that take place during an 8- hour night-time period (2300-0700 hours local time) during the 92 day period between the 16 June and 15 September inclusive.
LAMAX	Maximum sound pressure level. The simplest measure of a noise event such as the over-flight of an aircraft is the maximum sound level that occurred during the event, measured in dB(A). As the name implies, it is the highest sound level that occurred during the over-flight. The greater the value, the greater the risk of disturbance or intrusion.
LDAY	Covers the period 0700 – 1900 hours in any 24 hour period.
LDEN	The day, evening, night level, LDEN is a composite of a 12-hour annual average daytime noise level (LDAY), a 4-hour annual average evening noise level (LEVENING) with a penalty of 5 dB added, and an 8-hour annual average night-time noise level (LNIGHT) with a penalty of 10 dB added.
LEQ	A measure of long term average noise exposure and is shorthand for 'equivalent continuous noise level'. For aircraft it is the level of a steady sound which, if heard continuously over the same period of time, would contain the same total sound energy as all the aircraft noise events.

LEVENING	Covers the period 1900 – 2300 hours in any 24 hour period.
Mixed mode	A method of operating two runways allowing for a mix of both take-offs and landings on each. (see also segregated mode).
N60 (night-time)	Number of times a threshold level (in this case 60 dB) is exceeded within the 8-hour night period 2300-0700.
N70 (daytime)	Number of times a threshold level (in this case 70 dB) is exceeded within the 16-hour period 0700-2300.
NATS	National Air Traffic Service.
Nautical mile (nm)	Equals 1.1508 statute miles, 6 076 feet and 1 852 metres.
Night Quota period	6 ½ hour period between 2330-0600. The number of aircraft movements are restricted are there are noise quotas set for each summer and winter season.
NNI	Noise and Number Index.
NPR	Noise Preferential Route-departure routings which are designed to avoid, as far as possible, major built-up areas.
PBN	Performance Based Navigation.
P-RNAV	Precision Area Navigation.
SA	Sustainable Aviation – an alliance of the UK’s airlines, airports, aerospace manufacturers and air navigation service providers.
Segregated mode	A method of operating a pair of runways where one runway is used for departing aircraft and the other for arriving aircraft. (see also mixed mode).
SEL	Sound Exposure Level – a measure of noise from a single event which accounts for both its duration and intensity. It is the level which, if maintained for one second, would have the same acoustic energy as the noise event.
SID	Standard Instrument Departure. A designated departure route linking the aerodrome with a specified point at which the en-route phase of a flight commences. It gives a set of instructions that should allow the aircraft to fly along an NPR.
T5	Terminal 5.
TEAM	Tactically Enhanced Arrival Measures – used to reduce delays in holding stacks by temporarily suspending runway alternation by allowing the

	departure to be used for arrivals.
TfL	Transport for London.
Tromboning	A concept whereby aircraft can route to a specific point on the arrivals path.
Westerly operations (westerlies)	When aircraft make their final approach to land from the east (over London) and take-off towards the west (over the Windsor area).
Westerly preference	Maintaining operations in a westerly direction when there is a light easterly tail-wind up to five knots.
WHO	World Health Organisation.

## APPENDIX 2: QUESTIONS TO CONSULTEES

- Question 1: By what margin - in terms of the number of people affected - does the present noise from Heathrow's existing flight paths exceed the World Health Organisation (WHO) guideline values on community noise in the day/evening period (0700-2300) and in the night period (2300-0700)? How does this compare with other airports within the UK and the EU?
- Question 2: Does the Environmental Noise Directive enable the UK to meet fully the criticisms that were made in the Report from the Heathrow Terminal Five Public Inquiry that the 57 decibel noise contour was by itself an inadequate measure for assessing the full impact of air traffic noise?
- Question 3: What are the prospects for significantly less noisy aircraft at Heathrow over the next ten years and are the prospects in any way dependent on the development of the proposed third runway? To what extent is there a conflict between the optimum reduction of aircraft noise and carbon emissions?
- Question 4: Are there additional operational procedures for noise reduction and respite at Heathrow that could be introduced within the next ten years; or are any such noise improvements being held back for the development of a third runway?
- Question 5: Over what areas will the arrival and departure flight paths for the proposed third runway be routed, and which of those areas are not currently overflown by Heathrow air traffic, either at all or only occasionally?
- Question 6: Would the flight paths for the third runway cause any alteration to the present routing of the flight paths for the existing runways; and if so, to what extent?
- Question 7: How would the proposed segregated mode respite periods operate with three runways, compared with the existing runway alternation arrangements (between 0700-2300 and 2300-0700)?
- Question 8: Would the third runway enable Heathrow to operate without flights in the night period (2300-0700)?
- Question 9: How quickly would Heathrow with the proposed third runway reach its stated capacity of 740 000 aircraft movements (ATMs) per year; and how much resilience would there be with 740 000 ATMs?

Question 10: Would the proposed third runway hasten or delay the date by which the air traffic noise levels at Heathrow would not exceed the World Health Organization's guideline values on community noise?

## **APPENDIX 3: RESPONDENTS SUBMITTING WRITTEN EVIDENCE TO THE CONSULTATION**

### **All-Party Parliamentary Group on Heathrow and the Wider Economy First Inquiry: Noise from Heathrow's Flight paths.**

2M Group of Local Authorities\*

Aviation Environment Federation (AEF)

Civil Aviation Authority (CAA)

Ealing Aircraft Noise Action Group (EANAG)

Gatwick Airport Limited (GAL)

Hammersmith & Fulham (London Borough of)

Heathrow Airports Limited (HAL)\*

Heathrow Association for the Control of Aircraft Noise (HACAN) \*

Hillingdon (London Borough of)

Local Authorities Aircraft Noise Council (LAANC)\*

NATS

Richmond Heathrow Campaign\*

Richmond upon Thames (London Borough of)

The Royal Borough of Windsor and Maidenhead

Transport for London (Mayoral Submission) (TfL)

Virgin Atlantic

Wandsworth (London Borough of)

. \* Attended Oral Hearing on Tuesday 15 July 2014

## APPENDIX 4: REFERENCES

ANASE: Attitudes to Noise from Aviation Sources in England. Final Report prepared for Department for Transport by MVA Consultancy, October 2007.

ANASE: Technical Appendices, October 2007

ANASE: Executive Summary, October 2007

ANASE: Non SP Peer Review, DfT, CAA, ERCD, Bureau Veritas, October 2007

ANASE: Comments on MVA Report ANASE by Professor Ian J. Bateman, October 2007

ANASE: Chief Economist Statement on ANASE, October 2007

ANASE: Second Review of ANASE Stated Preference results, October 2007

ANASE: Comments on SP study for ANASE Brett Day, October 2007

ANASE: Update by Ian Flindell & Associates & MVA Consultancy, September 2013

AC: Interim Report, December 2013

AC: Appraisal Framework, April 2014

AC: Long-term Options-Approach and Assumptions, December 2013

AC: Noise Discussion Paper 05, July 2013 (*Noise Discussion Paper, 2013*)

AC: List of Respondents to Noise Discussion Paper 05, July 2013

AC: Leigh Fisher Jacobs Ref 62 Heathrow Airport – Northwest Runway Sift 3 Final, 2013

AC: Technical Papers – noise - local assessment, Nov 2014 (*Airports Commission Noise Report*)

AC: Technical Papers – Noise baseline, Nov 2014

AC: Technical Papers – National assessment, Nov 2014

AC: Technical papers – Strategic fit forecasts, Nov 2014

AC: Heathrow Airport North West Runway: Business Case and Sustainability Assessment, Nov 2014

AC: Consultation Document, Nov 2014

BMJ: Aircraft noise and cardiovascular disease near Heathrow airport in London: small area study, Oct 2013

CAA: ERCD Report 1201 Noise Contours 2011

CAA: ERCD Report 1204 Strategic Noise Maps for Heathrow Airport 2011, June 2013

CAA: ERCD Report 1208 Aircraft Noise, Sleep Disturbance and Health Effects, A Review Jan 2013

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CAA: ERCD Report 1301 Noise Contours 2012

CAA: ERCD Report 1304 Noise Action Plan Contours for Heathrow Airport 2011, August 2013

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CAA: Aircraft Noise and Health CAP 1164, 2014

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DfT: Aviation Policy Framework, March 2013

EU: European Noise Directive END 2002/49/EC, June 2002

EU: Report Tech 11 2010 Good practice guide on noise, Oct 2010

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HAL: A Quieter Heathrow, May 2013

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ICAO: Aviation Outlook, Environmental Report, 2010

Mayor of London: Mayor's London Infrastructure Plan 2050. July 2014

NATS: Support to the Airports Commission – short term measures, Nov 2013

NATS: Support to the Airports Commission – long term measures, Nov 2013

Roy Vandermeer QC, Report to the Secretary of State for the Environment, Transport and the Regions on the Heathrow Terminal Five and Associated Public Inquiries, 21 November 2000.

SA: Interdependencies between emissions of CO<sub>2</sub>, NO<sub>x</sub> & Noise from Aviation, Sept 2010

SA: A Blueprint for managing noise from aviation sources to 2050, 2013. (*SA Noise Road-Map*)

TfL: Aviation Noise Modelling: Heathrow Options (CAA-ERCD) Commissioned by Atkins on behalf of TfL, 16 May 2014

WHO: Environmental Health Criteria 12 – Noise, 1980

WHO: Guidelines for Community Noise, 1999

WHO: Night Noise Guidelines for Europe, 2009

WHO: Methodological guidance for estimating the burden of disease from environmental noise, 2012

VA: Virgin Atlantic Noise management strategy, Autumn 2013

## APPENDIX 5: SUPPLEMENTARY NOISE MEASUREMENT INDICATORS

Annex I (3) of the Environmental Noise Directive (Directive 2002/49/EC of 25 June 2002) states:

### 3. Supplementary noise indicators

In some cases, in addition to LDEN and LNIGHT, and where appropriate LDAY and LEVENING, it may be advantageous to use special noise indicators and related limit values. Some examples are given below:

- the noise source under consideration operates only for a small proportion of the time (for example, less than 20 % of the time over the total day periods in a year; the total of the evening periods in a year, the total of the night periods in a year).
- the average number of noise events in one or more of the periods is very low (for example, less than one event per hour; a noise event could be defined as a noise that lasts less than five minutes; examples are the noise from a passing train or a passing aircraft).
- the low-frequency content of the noise is strong.
- LMAX or SEL (sound exposure level) for night period protection in the case of noise peaks.
- extra protection at the weekend or a specific part of the year.
- extra protection of the day period.
- extra protection of the evening period.
- a combination of noises from different sources.
- quiet areas in open country.
- the noise contains strong tonal components.
- the noise has an impulsive character.

## **APPENDIX 6: DESCRIPTION OF OPERATIONAL PROCEDURES**

The following descriptions of procedures have been prepared from the responses and references.

### **Continuous Descent Operation (CDO)**

CDO provides the optimal trajectory giving minimum noise and minimum fuel burn. HAL assumes that by 2030 CDO will be applied across all aircraft from 6,000ft. CDO tends to concentrate aircraft along corridors some 19nm from Heathrow.

### **Low power/drag**

Over the intermediate approach on arrivals phase, flaps and landing gear are deployed to maintain lift and prepare for landing. Selecting more flap than is needed can increase noise by about 1 dBA SEL. Landing gear deployment increases noise by 3-5 dBA SEL. Deployment needs to occur no less than 5 nm from touchdown but early deployment sometimes occurs. Deploying landing gear increases drag and airframe noise and increases engine power and therefore engine noise.

### **Reduced landing flap**

Most aircraft are certified with two landing flap angle settings – maximum and reduced. Reduced landing flap typically results in noise reductions of 0.5 dBA SEL over the segment of about 5nm to touchdown.

### **Steeper Approaches**

Increasing an aircraft's glide path reduces noise by increasing the aircraft's height and distance over which sound travels before it reaches a population. Secondly, it increases an aircraft's rate of descent, reducing the amount of engine power required, and thus reducing the amount of noise emitted.

### **Displaced runway thresholds**

The threshold is where aircraft cross a point on the runway at 50 feet. Displacement allows aircraft to fly at higher altitudes over communities located near the airport. Current displacements at Heathrow are around 310 metres. HAL's proposals increase these to 1162 metres on the northern and 862 metres on the southern runway. The proposed third runway is offset to the west by around 1,900 metres and the threshold displacement is 700 metres. These displacements add about 150 feet aircraft height. The third runway offset increases the height by about 300 feet. The proportional increase in height diminishes with distance from the airport. At Heston the height is currently around 950 feet and at Brentford 1,600 feet.

### **Continuous Climb Operations (CCO)**

Following take-off there is a balance between gaining altitude and speed and the power difference this means. More power produces more noise but if the power is used to gain height the greater height more quickly dissipates the noise at ground level. Stepped climbs may be needed for safe operations to avoid other aircraft but generally they are more noisy. HAL is promoting CCO.

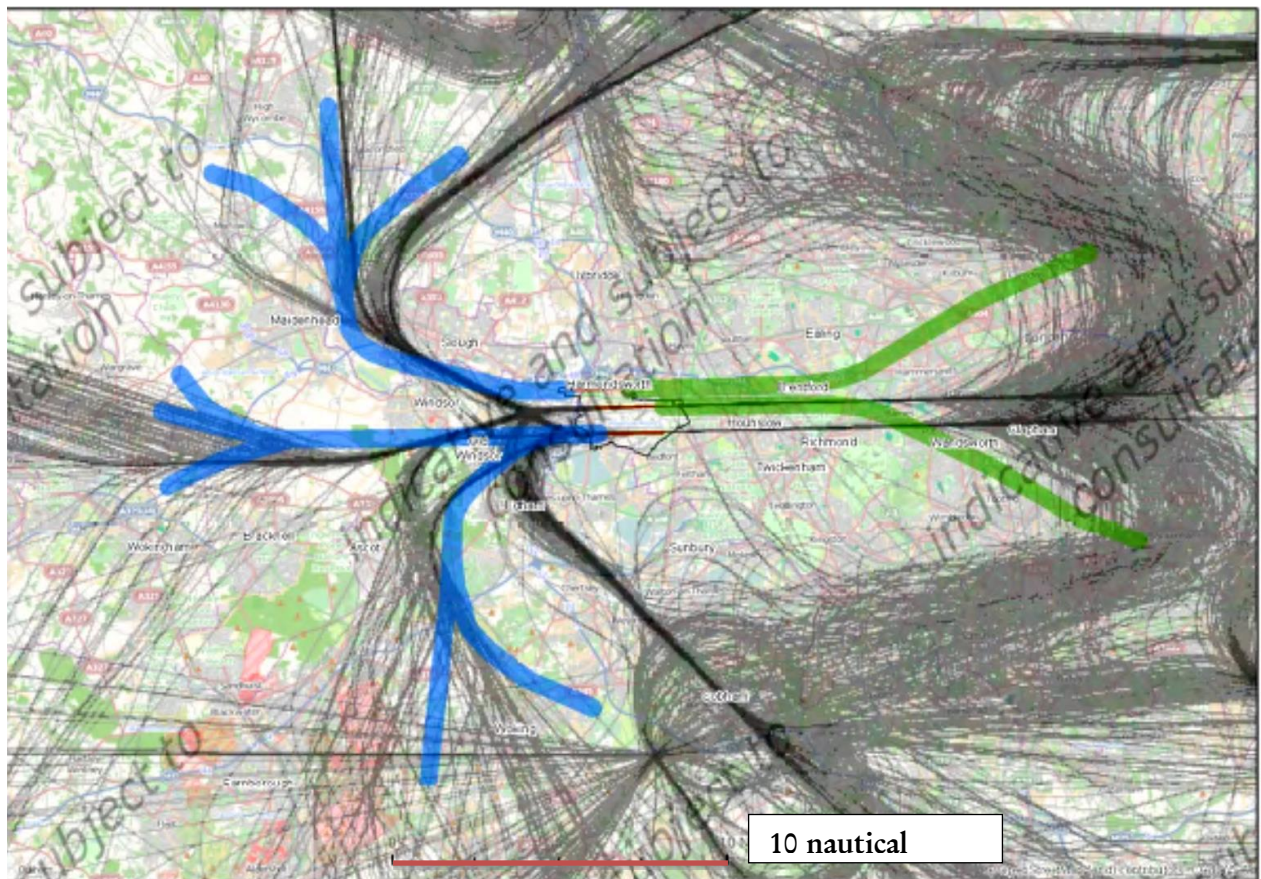
### **Dispersion of flight paths**

NATS says 'LAMP sees a complete redesign of the arrival routes and departure routes for traffic operating in to and out of the five London airports.' LAMP is scheduled for completion by 2020. Government's current policy is one of concentration and flight path changes are its responsibility and subject to the CAA's Airspace Change Process, with the environmental impact being subject to public consultation. Departing aircraft use Noise Preferential Routes (NPRs) to avoid noise-sensitive areas. NPRs rise to 4,000 feet and form the first part of the Standard Instrument Departure routes (SIDs). NPRs have a swathe measuring 1.5 km either side of a centre line. Using Performance Based Navigation (PBN) to concentrate tracks on either side of the centre line and alternate between them to provide respite is being considered. Above 4,000 feet pilots can vector away from the NPR. Changing departure SID's and early vectoring are under review. Arriving aircraft: HAL's proposals for a third runway include corridors 500m either side of a PBN-based centre line to a distance of approximately 15 nautical miles from the airport. The proposals apply multiple curved route corridors to arrivals with route alternation. It brings dispersal on arrival much nearer to the airport, i.e. about 5 nautical miles.

## APPENDIX 7: HEATHROW INDICATIVE FLIGHT PATHS – EXAMPLE 1

Three Runway Option R – Westerly Operations - Maximise Respite MLD-1

Source: Heathrow's North-West Runway – Air and Ground Noise Assessment Appendix H – Figure H 19, June 2014



Departures



Arrival



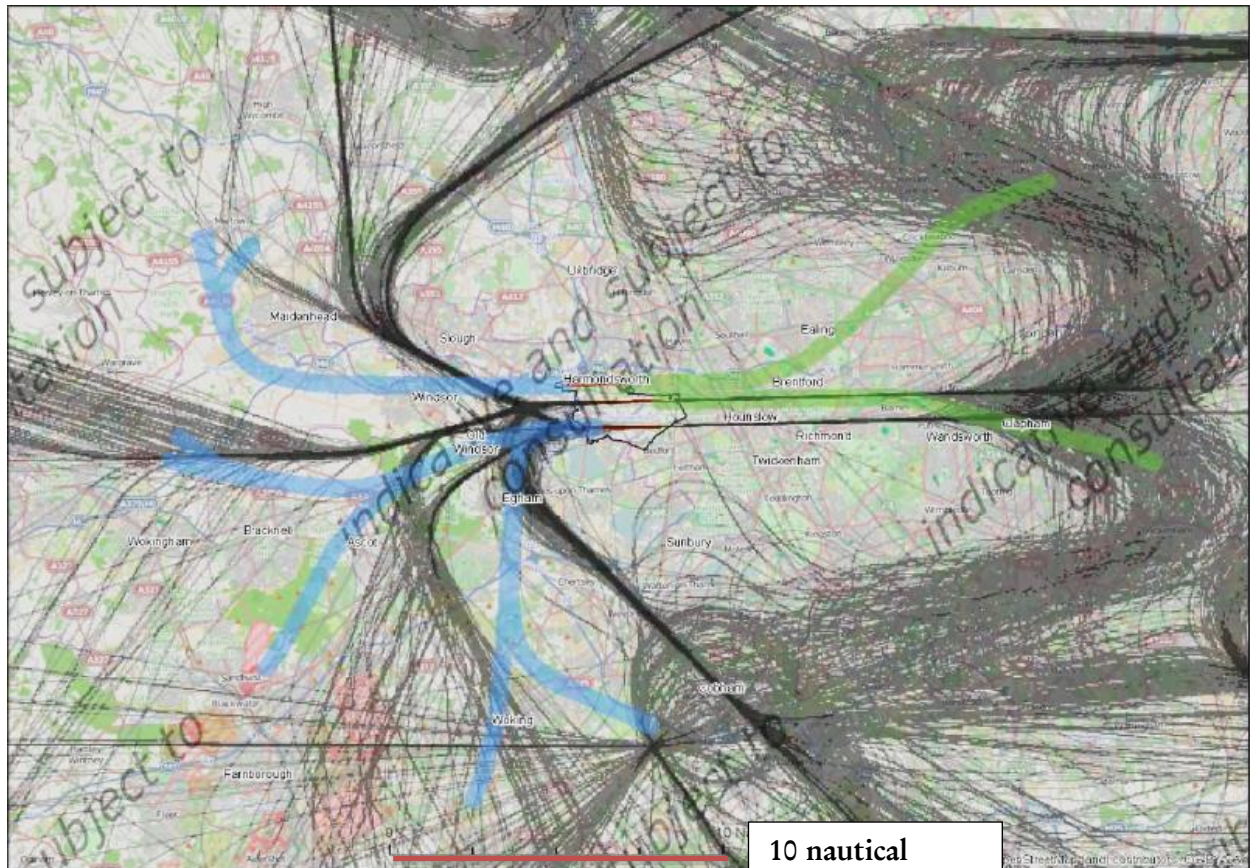
The grey lines are existing departure and arrival tracks

The width of the flight path does not represent the noise footprint on the ground

## APPENDIX 8: HEATHROW INDICATIVE FLIGHT PATHS – EXAMPLE 2

Three Runway Option R – Westerly Operations - Maximise Respite MLD-2

Source: Heathrow's North-West Runway – Air and Ground Noise Assessment Appendix H – Figure H 19, June 2014



Departures



Arrival



The grey lines are existing departure and arrival tracks

The width of the flight path does not represent the noise footprint on the ground

# APPENDIX 9: POPULATION AROUND HEATHROW

Source: CAA- ERCD Report 1301, Noise Contours 2012

