Communications Department
External Information Services

[redacted]

15 June 2016
EIR Reference: E0002788

Dear [redacted]

I am writing in respect of your recent request of 19 May 2016, for the release of information held by the Civil Aviation Authority (CAA).

Having considered your request in line with the provisions of the Environmental Information Regulations 2004, we are able to provide the information below.

1. **Can you please explain the 1,000 foot rule relating to aircraft climb rates from Heathrow, in particular what does 'start of role' mean? And how is the departure track measured?**

   Aircraft are required to reach a height of 1,000ft at 6.5km from the start of their takeoff roll, i.e. measured from the position on the runway when the aircraft begins its take-off run. The distance of 6.5km is measured along the ground track flown by each departure, as measured from the position on the runway where the departure started (start of take-off roll).

2. **After take-off the aircraft shall not be at a height less than 1000 feet (above aerodrome level) at 6.5km from the start of roll as measured along the departure track of that aircraft.**

   - **When was this rule introduced?**

     A height requirement has been set by the Government for noise purposes since 1966. The current requirement, for aircraft to be at a height of 1,000ft at 6.5km from start of roll, was introduced following the Government's decision of 18 December 2000 on the noise limits and related noise monitoring arrangements to apply at the London airports. Prior to that decision, the requirement was that aircraft should be at a height of 1,000ft when passing the nearest noise monitor (some of which were not located close to 6.5km from start of roll).

   - **Who monitors and enforces the rule?**

     Although a height requirement has been set for noise purposes since 1966, it has never been enforced. In his December 2000 decision, the Secretary of State confirmed that he accepted that occasional and exceptional breaches of the height requirement would not be expected to lead to use of his power

under Section 78(2) of the Civil Aviation Act 1982 (to direct that the aircraft operator should be refused facilities for using the aerodrome). However, the airport operator monitors aircraft against this requirement and works with airlines with regards to their compliance.

- **What are the penalties for aircraft/ airlines that fail to comply with the rule?**

  See previous comments above.

- **Can you please provide me with data for the number of aircraft that failed to comply with the rule, by year, for 2016, 2015 and 2014 and 2013, broken down by airline, for Heathrow.**

  The CAA do not hold this information. Information on the numbers of aircraft that fail to comply with the requirement can be found in Heathrow Airport's quarterly Flight Performance Data Reports, which are available to download at http://www.heathrow.com/noise/facts,-stats-and-reports/reports

- **Can you please provide me with details of what fines or other penalties were applied to the airlines breaking this rule in these years.**

  See previous comments above.

- **Who is responsible for reviewing the rule, given changes to technology etc?**

  The rule is imposed by the Department for Transport. Any review, would be initiated by the Department for Transport.

- **Can you please provide me with a copy of the last review of this rule and any recommendations that followed.**

  Please find attached a copy of the Government's decision of 18 December 2000.

3. **Can you please provide me with information showing the possible climb rates (technically possible) of different types of modern aircraft, as typically used by Heathrow.**

   The CAA do not hold this information. Procedures are designed specifying *minimum* rates of climb. However, for your information we have attached departure profile graphs for a sample of common aircraft types at Heathrow.

4. **Can you please provide me with information about how the decibel level on the ground of typical aircraft changes with the height from take off or at least illustrate with one common plane currently in use e.g. every 500ft up to 7,000ft.**

   Please find attached a set of 'noise-power-distance' (NPD) curves which show the noise level received on the ground as a function of distance from the sound source and engine power setting, in this case for the Airbus A320 on departure (the A320 is the most common type in operation at Heathrow). NPD curves account for both noise emissions as well as atmospheric sound propagation effects. Care needs to be used when interpreting such data. The height that an aircraft can achieve at a given point after departure will be dependent on the performance capability of the aircraft, how heavily it is loaded and prevailing atmospheric conditions. Secondly, to

achieve a greater altitude may require an aircraft to use more engine power emitting more noise, and/or fly more slowly, increasing the duration of the noise event.

5. **Can you please provide information for a typical type of plane using Heathrow about how fuel usage varies according to the rate of climb.**

   It is not possible to provide such information, since there is no direction association between fuel usage and rate of climb, since many factors affect rate of climb that are independent of fuel usage.

6. **Can you please provide me with information about rules for rates of climb for comparable airports in other countries, where the CAA has this information.**

   We do not hold information regarding rules for rates of climb for airports outside the UK.

7. **What oversight does the CAA or any other body have for the commercial contracts between airlines and airline lease companies that dictate rates of climb?**

   The CAA has safety oversight for UK airline operators. Minimum rates of climb and minimum altitudes are specified at specific locations and for specific flight procedures in order to ensure safety with respect to obstacles on the ground. Beyond that, how an aircraft is operated is a matter for the airline concerned provided it is in accordance with the aircraft manufacturer's limitations.

If you are not satisfied with how we have dealt with your request in the first instance you should approach the CAA in writing at:-

Caroline Chalk
Head of External Information Services
Civil Aviation Authority
Aviation House
Gatwick Airport South
Gatwick
RH6 0YR

caroline.chalk@caa.co.uk

The CAA has a formal internal review process for dealing with appeals or complaints in connection with requests under the Environmental Information Regulations. The key steps in this process are set in the attachment.

Should you remain dissatisfied with the outcome you have a right to appeal against the decision by contacting the Information Commissioner at:-

Information Commissioner's Office
FOI/EIR Complaints Resolution
Wycliffe House
Water Lane
Wilmslow
SK9 5AF
https://ico.org.uk/concerns/

If you wish to request further information from the CAA, please use the form on the CAA website at http://publicapps.caa.co.uk/modalapplication.aspx?appid=24.

Yours sincerely

Rihanne Stephen
Information Rights Officer

CAA INTERNAL REVIEW & COMPLAINTS PROCEDURE

- The original case to which the appeal or complaint relates is identified and the case file is made available;
- The appeal or complaint is allocated to an Appeal Manager, the appeal is acknowledged and the details of the Appeal Manager are provided to the applicant;
- The Appeal Manager reviews the case to understand the nature of the appeal or complaint, reviews the actions and decisions taken in connection with the original case and takes account of any new information that may have been received. This will typically require contact with those persons involved in the original case and consultation with the CAA Legal Department;
- The Appeal Manager concludes the review and, after consultation with those involved with the case, and with the CAA Legal Department, agrees on the course of action to be taken;
- The Appeal Manager prepares the necessary response and collates any information to be provided to the applicant;
- The response and any necessary information is sent to the applicant, together with information about further rights of appeal to the Information Commissioners Office, including full contact details.

DR for info.

DETR
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News Release

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18 December 2000

CHRIS MULLIN ANNOUNCES NEW DEPARTURE NOISE LIMITS FOR THE LONDON AIRPORTS

Lower noise limits for aircraft departing from Heathrow, Gatwick and Stansted and more efficient noise monitoring arrangements were announced today by Chris Mullin, Parliamentary Under Secretary of State.

This should lead to small but worthwhile reductions in noise for many of those overflown by aircraft that have taken off from these airports, and to substantial improvements in monitoring efficiency compared with the arrangements that applied before 1997.

In response to a Parliamentary Question from Fiona Mactaggart MP (Slough), Chris Mullin said

"On 24 November 1997 the Department of the Environment, Transport and the Regions published a new consultation paper proposing lower noise limits and improved monitoring arrangements. This consultation followed the Court Order of 16 April 1997, made after challenges by the International Air Transport Association (IATA) to the 1996 decision on this subject. The Order, made with the consent of the parties, enabled interim arrangements to be put in place until the outcome of the new consultation.

The November 1997 paper was also challenged by IATA but the association withdrew its application for leave to apply for judicial review when the Department undertook to publish a supplementary consultation paper. That was done on 26 March 1999. All the proposals were unchanged. They were:

a) to relate the noise limits to a fixed reference distance, 6.5 km from start of roll;

b) to continue to monitor noise levels at the fixed monitors in L_{max} dBA and to apply the noise limits to all departing aircraft except Concorde and a number of specified exemptions (see h below);

c) to reduce the noise limits by 3 dBA (daytime) and 2 dBA (night-time), to 94 dBA and 87 dBA respectively;

d) to retain the five monitors at Gatwick and eight monitors at Stansted currently operating under the interim arrangement, but to resite a Stansted monitor to a better position. At Heathrow to keep the eight sites in the interim arrangements and to add two further monitors as previously proposed;

e) to calculate the positional adjustments on a revised basis;

f) to allow a reduction of not more than 2 dB of the noise recorded in specified tail wind conditions;

g) to require aircraft to be at a height of 1000ft aal at 6.5 km from start of roll;

h) to exempt from the new daytime noise limits certain aircraft given exemptions from the Chapter 2 phase out requirements in accordance with the provisions of the EC Directive;

i) to begin a further review of both monitoring efficiency and noise limits in 2000.

"Comments were invited on any aspect of the proposals and on the details covered in the supplementary paper. The closing date for responses was 4 June 1999. Taking account of the information and comments we received, we have decided to implement the proposals, with two modifications:

a) to reduce the night-time noise limit by 2 dB, to 87 dBA as proposed, but to apply it only during the night quota period (2330-0600), retaining the present night-time limit (89 dBA) for the rest of the night period, 2300-2330 and 0600-0700;

b) to implement the new daytime noise limit of 94 dBA from 25 February 2001 but to implement the new night-time noise limit from the start of the next summer night restrictions season (ie from 25 March 2001), rather than between 2 to 3 months from the date of the decision announcement, as was indicated in the consultation paper.

"Also, for technical reasons, for the purpose of the tailwind allowance I have decided to use wind data from an alternative source to that described in the consultation paper. I am satisfied that it is appropriate to use data from the on-airfield anemometers and wind vanes in the formula for the tailwind allowance proposed in the consultation paper (ie without making it necessary to adjust the formula).

"The reduction of 3 dB in the daytime limit represents a halving of noise energy but only a small reduction in loudness. This is a long accepted scientific fact; it is not disputed in the responses. The cumulative effect of even small improvements should be of benefit to many local residents, particularly those living under the departure routes from about 6.5 km from start of roll out to about 15 km. These small improvements will occur whenever an aircraft flies overhead that has changed its procedures (or adopted other measures) to meet the new noise limits.

"Some major airlines consider they will incur disproportionate costs to achieve these small benefits; conversely, many of the local authorities and other groups representing those living around the airports consider there should there should be greater noise reductions, to give greater benefits. I am satisfied that the requirements announced today are reasonable, having regard to what is operationally achievable (as explained in the consultation paper), to the costs that may be incurred by some airlines, the benefits that will accrue to many local residents, as I have already indicated, and the disbenefits that will be caused to others, particularly the far smaller number of people living very close to the end of a runway. Operators of heavily laden services bound for Asia-Pacific destinations that are scheduled to take off in the late evening, which would have particular difficulty in meeting the new night-time noise limit if delayed beyond 2300 hours, should be able to plan their operations with greater certainty in the light of our decision not to apply the toughest limit until 2330. I should emphasise that I do not want to encourage late departures. On the contrary, I trust operators of these services will continue to do their best to minimise delays: that will be of benefit both to their customers and to local people.

"The full decision, and the reasons for it, are set out in the document 'Noise limits for aircraft departing from Heathrow, Gatwick and Stansted airports: decision of December 2000' copies of which have been placed in the House Library.

"Copies of all the responses, excepting details for which the author has requested confidentiality, are available for inspection by prior appointment at the DETR Library and Information Centre, Ashdown House, 123 Victoria Street, London SW1E 6DE."

NOTES TO EDITORS

1. There are further details in Press Notices 282/97 and 303/99. After the November 1997 paper was issued the International Air Transport Association submitted an application for leave to apply for judicial review of the consultation paper, see Press Notice 100/98. The undertaking to issue a supplementary paper and for the consultation to remain open until eight weeks after its issue was announced in Press Notice 143/98.

2. Copies of the November 1997 consultation paper, and of the supplementary paper are available from DETR, Aviation Environmental Division, Zone 1/33, Great Minster House, 76 Marsham Street, London, SW1P 4DR, telephone 020 7944 5796.

3. Copies of all the responses, excepting details for which the author has requested confidentiality, are available for inspection by prior appointment at the DETR Library and Information Centre, Ashdown House, 123 Victoria Street, London SW1E 6DE. Appointments can be made by calling the Librarian on 020 7944 2002.

4. There are no noise limits for arriving aircraft similar to those for departing aircraft. The possibility of setting noise limits for arriving aircraft was considered recently by the Aircraft Noise Monitoring Advisory Committee but they concluded that it would be impractical. Their report, published on 10.2.00, set out a range of options to reduce noise and recommended there should be a new code of practice to promote the use of continuous descent approaches. The Minister for Aviation has invited the aviation industry to develop such a code. There are further details in Press Notice 92/00.

Press Enquiries: 020 7944 3108; out of hours: 020 7944 5925/5945
Public Enquiries Unit: 020 7944 3000; E-mail: press@detr.gov.uk
Press Notices available on the DETR website: http://www.detr.gov.uk

NOISE LIMITS FOR AIRCRAFT DEPARTING FROM HEATHROW, GATWICK AND STANSTED AIRPORTS: DECISION OF DECEMBER 2000

1. Chris Mullin MP, Parliamentary Under Secretary of State at the Department of the Environment, Transport and the Regions today announced the Secretary of State's decision on the noise limits and related noise monitoring arrangements to apply at London's three major airports. In his answer to a Parliamentary Question from Fiona Mactaggart MP, Chris Mullin referred to this document. His answer and this document together set out the decision.

Introduction

2. On 24 November 1997 the Department of the Environment, Transport and the Regions published a new consultation paper proposing lower noise limits and improved monitoring arrangements. This consultation followed the Court Order of 16 April 1997, made after challenges by the International Air Transport Association (IATA) to the 1996 decision on this subject. The Court Order, made with the consent of the parties, enabled interim arrangements to be put in place until the outcome of the new consultation. The November 1997 paper was also challenged by IATA but the association withdrew its application for leave to apply for judicial review when the Department undertook to publish a supplementary consultation paper. We published that supplementary paper on 26 March 1999. All the proposals were unchanged. They were:

a) to relate the noise limits to a fixed reference distance, 6.5 km from start of roll;

b) to continue to monitor noise levels at the fixed monitors in L_{max} dBA and to apply the noise limits to all departing aircraft except Concorde and a number of specified exemptions (see h below);

c) to reduce the noise limits by 3 dBA (daytime) and 2 dBA (night-time), to 94 dBA and 87 dBA respectively;

d) to retain the five monitors at Gatwick and eight monitors at Stansted currently operating under the interim arrangement, but to resite a Stansted monitor to a better position. At Heathrow to keep the eight sites in the interim arrangements and to add two further monitors as previously proposed;

e) to calculate the positional adjustments on a revised basis;

f) to allow a reduction of not more than 2 dB of the noise recorded in specified tail wind conditions;

g) to require aircraft to be at a height of 1000ft aal at 6.5 km from start of roll;

h) to exempt from the new daytime noise limits certain aircraft given exemptions from the Chapter 2 phase out requirements in accordance with the provisions of the EC Directive;

i) to begin a further review of both monitoring efficiency and noise limits in 2000.

3. Heathrow, Gatwick and Stansted airports are designated for the purposes of section 78 of the Civil Aviation Act 1982. This enables the Secretary of State to impose requirements on departing or landing aircraft for the purpose of limiting or of mitigating the effect of noise. These powers (and similar powers under earlier legislation) have been used to set noise limits for departing aircraft. The noise limits, the sites of the noise monitors and other related details, are set out in notices published in the United Kingdom Aeronautical Information Publication.

4. Noise limits were set for Heathrow in 1959 at 110 PNdB (day) and 102 PNdB (night). They were applied at Gatwick in 1968 and at Stansted in 1993. Noise monitors were installed specifically for recording noise against the limits. The noise limits have never been changed except that when the airports' new noise and track keeping system (NTK) was installed in 1992-93 the peak noise event levels were defined in L_{max} dBA, the equivalents of the old limits being 97 dBA (day) and 89 dBA (night). The number of noise monitors, and their locations, have varied over the years. The NTK system installed in 1992-93 comprised 7 fixed noise monitors at Heathrow, 2 at Gatwick and 3 at Stansted[1].

5. The noise monitors are operated by the airport companies, which levy financial penalties on operators of offending aircraft under their charging powers. These penalties were introduced for breaches of the night noise limit in spring 1993. Penalties for breaches of the day time limit were introduced in April 1994 for the first two and last two hours (7 am - 9am and 9pm -11pm) and they were subsequently extended to the whole of the day period at all three airports. The current penalties are £500 for exceeding the relevant limit (either day or night) by 3 dBA or less, £1000 for breaches of more than 3 dBA.

The Review

6. In the 1985 Airports Policy White Paper[2] the then Government undertook to review policy on noise limits and monitoring. They took account of the recommendation of Mr Graham Eyre QC, Inspector at the 1981-83 Airport Inquiries, that the noise limits and noise monitoring procedures should be reviewed with a view to introducing lower limits by 1 January 1986. The then Government noted that as quieter aircraft had come into operation the rate of compliance with the noise limits at Heathrow had improved significantly. However, they considered the suggestion that changes should be made to the noise limits to coincide with the 1 January 1986 ban on UK registered non noise-certificated subsonic jet aeroplanes was unrealistic "because of the need to consider all options fully and consult the relevant interests". The Government undertook to review its policy on noise limits and monitoring and to consider what improvements might be made. This led to the review which was initiated in 1993, as explained in paragraph 8 of the November 1997 consultation paper. The subsequent course of events was summarised at paragraphs 9 to 16 of that paper and paragraphs 1 and 2 of the supplementary paper.

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[1] Under the interim arrangements, set out in the Court Order, there are 8 monitors at Heathrow, 5 at Gatwick and 8 at Stansted.

[2] Cmnd. 9542.

Policy and Objectives

7. The policy on the control, abatement and mitigation of aircraft noise set out in the 1985 Airports Policy White Paper continued the broad strategy followed by successive Governments since the 1960s. In 1997 the present Government indicated its intention to continue that broad strategy. Among the objectives which the Government is setting for UK airports policy, within a framework for the sustainable development of an integrated transport infrastructure, is the need to minimise the impact of airports on the environment while ensuring that land use planning and conservation policies take account of the economic benefits of development from maintaining a strong and competitive British airline industry and providing sufficient airport capacity where it is economically and environmentally justified. This necessarily involves striking a balance between the needs of an efficient aviation industry, providing jobs and serving the local, regional and national economy, and the need to minimise the impact on the environment and the communities around airports.

8. The Department's general aim in noise monitoring is to help reduce the impact of aircraft noise around airports. As noted in the November 1997 consultation paper, specific objectives and measures include :

- encouraging the use of quieter aircraft and best operating practice;
- deterring excessively noisy movements by detecting and penalising them;
- measuring the effectiveness of noise abatement measures by analysing infringement rates.

An important objective in the early days of noise monitoring was "protecting" built up areas - usually the first such area under a departure route - and the fixed monitors were positioned accordingly. Another monitoring strategy was to locate monitors as "gateway pairs" either side of a departure route on the assumption that aircraft would fly between them. Nowadays, neither of these approaches is necessarily consistent with the specific objectives detailed above, nor would they ensure uniformity of protection at the three airports or between the various departure routes at each airport. Locating noise monitors to "protect" individual communities is, at first sight, an attractive proposition but has been found not to work well in practice.

Responses to the consultation

9. The noise limits consultation attracted 97 responses before the supplementary paper was issued, 60 further responses before the 4 June 1999 deadline and 8 responses after that. In total, 128 individuals, local authorities, environmental and residents' groups, consumer and business user interests, airports, airlines and related aviation interests. There were very few responses from individuals and few from individual airlines but there was a good level of response from representative organisations - local authorities and environmental groups, the airport consultative committees, and airline organisations. The responses were polarised, as is often the case on aircraft noise issues, and several were strongly worded. In general, local authorities and environmental groups thought the proposed reductions to the noise limits were too little and long overdue, whereas the airlines considered the proposals too stringent. Concerns on some international aspects and on emissions feature more prominently in some of the responses than in the consultation paper.

10. The reduction in both limits is supported by 63 local authorities and environmental groups and others although many expressed reservations about what were felt to be very modest reductions. Some linked the limits to the night restrictions and called for a complete ban of flights at night. (These responses predated the night restrictions decision announcement of 10 June 1999.) The airline industry consider the daytime noise limit is not achievable by older 747s (some, such as 747-200s certificated to Chapter 2 standards, cannot operate after 31.3.2002 but others, such as 747-200s certificated to Chapter 3 standards, can continue in service) and that the Department has greatly underestimated the weight reductions needed to enable aircraft to meet the new limit, and the economic impact this would have on the airlines. They say the problem is greater for the night-time noise limit, which could also affect the B747-400s (the current model) and A340s (the largest Airbuses), with a major impact on their operations. Probably for this reason, in most of the industry responses, neither the arguments nor the economic and financial information are neatly broken down into "day" and "night": in practice, the night-time limit poses the greatest difficulty for flights that are scheduled to take off in the late evening (about 9.30-10 pm, when the day time limit applies) but are susceptible to delays into the night period.

11. Although the supplementary consultation paper was chiefly focused on far out noise displacement, the whole subject of noise displacement (including the increased noise around the airport boundary that is a consequence of higher power take-offs by heavy aircraft) was of very little concern to respondents. However, airlines supported their arguments for moving the monitors further out by saying this would avoid creating far out noise displacement. Local authorities and environmental groups inclined to the Government's view as expressed in paragraph 22 of the supplementary paper.

Decisions taken after consideration of all the responses

12. Under the terms of the Court Order[3] the Government is required to take account of the following (but not only the following) relevant considerations :

"(a) The extent to which the requirements are operationally achievable;
(b) The effects of the requirements upon :
  (i) the capacity and use of aircraft and the aerodromes for the transport of passengers and/or cargo;
  (ii) the economic operation of aircraft and the aerodromes;
  (iii) the international competitiveness of the aerodromes;
(c) The compatibility of the requirements with the government policies concerning ;
  (i) the phase-out regime for Chapter 2 aircraft and
  (ii) the Night Restrictions operating at the aerodromes as contained in the London Heathrow, London Gatwick and London Stansted Airports Noise Restrictions (No 1) Notice 1997;
(d) Any displacement effect of noise or vibration to the detriment of any residential community."

[3] There is a copy of the Court Order at Annex 1 of the November 1997 consultation paper.

13. Other matters that we considered relevant when drawing up the consultation paper and the supplementary paper were:

(e) Government policy on the control abatement and mitigation of aircraft noise;
(f) the sustainable development of integrated transport infrastructure;
(g) the objectives of noise monitoring;
(h) the noise improvements;
(i) the balance between environmental concerns and those of industry.

14. The Court Order recognised that "the weight to be attached to any consideration is, subject to the relevant principles of public law, a matter for the Secretary of State to determine in the exercise of his discretion.".

15. The consultation paper set out the reasoning supporting each of the proposals and further information was provided in the supplementary paper. We have decided to implement all the proposals as set out in paragraph 2 (a) to (i) above, but with two modifications:

a) to reduce the night-time noise limit by 2 dB, to 87 dBA as proposed, but to apply it only during the night quota period (2330-0600), retaining the present night-time limit (89 dBA) for the rest of the night period, 2300-2330 and 0600-0700;

b) to implement the new daytime noise limit of 94 dBA from 25 February 2001 but to implement the new night-time noise limit from the start of the next summer night restrictions season (ie from 25 March 2001) rather than between 2 to 3 months from the date of the decision announcement, as was indicated in the consultation paper.

16. Our reasons for these modifications are, in summary, that applying the new 87 dBA limit from 2330-0600, with the present night-time limit of 89 dB being retained for the balance of the night period, will ensure greater consistency with the night restrictions regime. They will also reduce the problem (and potential costs) that would otherwise arise for operators of the heavily laden services bound for Asia-Pacific destinations that are scheduled to take off in the late evening, which would have particular difficulty in meeting the proposed new night-time noise limit if they are delayed beyond 2300. Giving an extra half hour leeway before the new limit applies should provide considerable assurance to these operators in planning their operations and reduce the costs that they might otherwise incur. The night restrictions apply on a seasonal basis and airlines take this into account when planning their operations, including daytime operations susceptible to being delayed into the night period. It might cause additional scheduling problems and disproportionate costs for these airlines if we implemented the new night-time limit part way through a season.

17. For the purpose of the tailwind allowance, for technical reasons relating to the NTK system, we have decided to use wind data from an alternative source, the on-airfield anemometers and wind vanes, to that described in the consultation paper. We are satisfied that it is appropriate to use this data in the formula for the tailwind allowance proposed in the consultation paper (without any adjustments or modifications to the formula).

The overall effect of the decisions

18. The overall effect of these decisions is to put in place new noise limits and noise monitoring arrangements at Heathrow, Gatwick and Stansted that will apply to all aircraft other than Concorde (and with exemption from the new daytime noise limit for certain specified aircraft until 31.3.2002). This will contribute to the achievement of the Government's objectives set out in the consultation paper and confirmed at paragraphs 7 and 8 above.

19. In reaching our decisions we took account of all the matters set out in paragraphs 12 and 13 above and all the responses that we received to the consultation. The extent to which we have decided to modify the proposals that we put to consultation reflects the weight that we have attached to the economic and financial information provided by airlines and their representative organisations in their responses.

20. We believe that our decisions, in total, strike an appropriate balance between the needs of the aviation industry and the need to minimise the effects on the environment and the communities around the three airports. We recognise that both the costs and the benefits of our decisions will not be shared evenly between, on the one hand, all the airlines operating from those airports and, on the other hand, between all communities around the airports. Nevertheless, we believe that the overall effects of our decision will be far more equitable than the earlier non-standardised arrangements. Aircraft operators will be subject to consistent requirements at the three airports, and on all the departure routes at those airports, and local people living under the usual tracks of aircraft departing from the three airports will have comparable protection from individual aircraft noise events. In terms of aircraft making less noise than they otherwise might, the benefits will accrue chiefly to those living at distances from 6.5 km to about 15 km from start of roll, but diminishing with distance. Closer in towards the airports there are far fewer people, while communities substantially further out already experience lower noise levels and should continue to do so.

21. Our decisions on the individual proposals are considered further below. However, our nine proposals were closely interrelated. The interrelationship between the noise limits, "stringency", and the effectiveness of the monitoring positions, "efficiency", was explained in paragraphs 23, 28 and 31 of the November 1997 paper and paragraph 23 of the supplementary paper. Many points made in the responses are similarly interrelated, as are our decisions on the nine proposals. To avoid undue repetition, points are generally covered only under the heading to which they most obviously relate but this does not mean they were not taken into account in our decisions on the other proposals.

To relate the noise limits to a fixed reference distance, 6.5 km from start of roll

22. The proposal that the noise limits should be related to a fixed reference distance in relation to the runway and aircraft departure tracks, and that this distance should be 6.5 km from start of roll, was explained in paragraphs 19 to 22 of the November 1997 consultation paper. Further information was provided at paragraphs 5 to 24 of the supplementary paper.

23. A substantial proportion of local authorities and environmental groups expressed positive support for this proposal and many others supported it implicitly. A few wanted more account to be taken of specific community locations.

24. None of the airlines or airline organisations that commented was against a standard reference distance, although several were strongly against the 6.5 km distance proposed. IATA suggested a standard distance of 7.5 km (and the possibility of a lower daytime limit at that point) to enable large four-engined aircraft which could not reach 1000 ft at 6.5 km, to cut-back [without altering other aspects of their operations] and to allow some other aircraft to cut-back at 1500 ft, rather than 1000 ft, resulting in a noise benefit for residents who live further out from the airport. However, this would reduce, if not entirely eliminate, the benefits that the Government's proposals were intended to bring to people living closer to the airports, who already suffer higher noise levels than those further out.

25. There are two points, acknowledged in the consultation paper, on which airlines have raised very specific questions. These are:

(i) that in the UK, for safety reasons, aircraft cannot cutback power until they reach a height of 1000 ft above the ground (paragraph 22 of the November 1997 paper refers);

(ii) that, largely for safety reasons, airlines usually use the same operating procedures for all departure routes from a particular airport and that some aim to use the same operating procedures at every airport from which they operate (see paragraph 18 of the November 1997 paper).

26. Nothing relating to the proposals that we put to consultation is unsafe. In respect of (i), the Secretary of State expects airlines to take this into account when considering what operating procedures and other measures (see para 48 of the 1997 paper) they will adopt in order to meet the proposed new noise limits. This was explained in paragraph 48 of the November 1997 paper and paragraphs 39 to 42 of the supplementary paper. He accepts this will impose some costs and scheduling difficulties on some airlines and has taken this into account.

27. In respect of (ii), BA have commented that "aircraft operators have very little scope to alter departure procedures, as they are mandated to apply the requirements of JAR-OPS[4] 1.235, which states:

"(a) An operator shall establish operating procedures for noise abatement during instrument flight operations in compliance with ICAO PANS OPS Volume 1 (Doc 8168-OPS/611).

(b) Take-off climb procedures for noise abatement specified by an operator for any one aeroplane type should be the same for all aerodromes."

28. The Secretary of State is satisfied that there is nothing in the proposals that we have decided to confirm that could conflict with the requirements of PANS OPS.

[4] Joint Aviation Requirement – Commercial Air Transportation

aircraft. The effect of the 1992 change was not analysed in any way comparable with our 1997 proposals. It is not relevant in the context of the November 1997 proposals as the starting point was DORA's analysis of actual noise performance of aircraft operating in normal day to day conditions in 1994, published in CS Report 9539.

35. There were no objections to the continued use of L_{max} for the purposes of the noise limits. The local authorities and environmental groups that commented on this proposal all expressed support or agreement. The Secretary of State has decided to implement the proposal.

To reduce the noise limits by 3 dBA daytime, to 94 dBA; to reduce the night-time noise limit by 2 dB, to 87 dBA as proposed, but to apply it only during the night quota period (2330-0600), retaining the present night-time limit (89 dBA) for the rest of the night period, 2300-2330 and 0600-0700

36. Our proposals to reduce the day and night-time noise limits by 3dBA and 2dBA respectively are explained at paragraphs 25 to 27 of the November 1997 paper, with supporting information at paragraphs 48 to 58, and at 35 to 38 and 47 to 48 of the supplementary paper.

37. 86 organisations and individuals responded on the proposed new limits. 19 airlines and industry organisations opposed the proposed limits as too stringent, 63 (all local/environmental) accepted them although some would have preferred the limits to be considerably more stringent; a few local and environmental respondents opposed the proposals outright as insufficiently stringent[6]. These views are clearly irreconcilable.

38. The London Boroughs of Ealing, Hounslow and Hillingdon suggested that differential noise limits would be more appropriate. Ealing and Hillingdon proposed that newer, quieter aircraft should be required to be 3 dBA quieter than the limits set for Chapter 2 aircraft whereas Hounslow wanted the noise limits to be based on the QC ratings of aircraft. These points are matters for the next review, as the Government has already indicated.

39. Industry responses contest our view as to the extent to which the UK's international obligations impinge on our proposals.

40. In paragraph 59 of the November 1997 paper we confirmed that, in formulating our proposals we had "taken account of the aircraft which are most likely to have difficulties in meeting the new requirements. In particular, ... the large long haul aircraft certificated to Chapter 2 standards." We stated that "Having regard to international commitments, the Government does not wish to impose requirements which those aircraft could not comply with however they were operated, on whatever route and however maintained. But this does not mean that the Government considers that limits should be set so as to permit every such aircraft to fly on any route however heavily loaded. It is therefore recognized that operators may have to reschedule aircraft within their existing fleets or deploy quieter aircraft".

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[6] All the respondents except one were consistent in their opinions on both the proposed day and night-time limits although some differed in emphasis. One airline agreed with the proposed night-time noise limit but not the daytime limit although they indicated their aircraft would not be affected by it.

41. The Supplementary paper addressed the related questions of operational achievability and international obligations in the following terms: "IATA has called attention to what it considers to be previously announced policies that noise restriction measures should be (a) operationally achievable and (b) compatible with the internationally negotiated phase-out regime for Chapter 2 aircraft by 2002. Statements to this effect in the October 1995 consultation paper were not intended as policy statements, but the present Government accepts, as did the previous Government, that a daytime noise limit which most of the large long haul aircraft certificated to ICAO Chapter 2 standards could not meet in any circumstances would not be compatible with the UK's international obligations. As explained in paragraph 59 of the November 1997 consultation paper, this does not mean that the Government considers that limits should be set so as to permit every such aircraft to fly on any route however heavily loaded."

42. Measures to reduce aircraft noise in the vicinity of airports have been applied at major airports since the late 1950s, their introduction roughly coinciding with commercial jet aircraft coming into general use. Major work in the 1960s, under the auspices of ICAO, led to the establishment of an international noise certification scheme, to the development of criteria to assist States in establishing operating procedures for effective noise abatement without compromise to safety and to the publication, for guidance purposes, of local material on land use planning around aerodromes. These measures, recommended at the ICAO special meeting on aircraft noise in the vicinity of aerodromes, held at Montreal November-December 1969 and approved by the ICAO Council in 1970, were and remain major components of a range of measures to ameliorate noise around airports. They were, and updated remain, complementary measures, not incompatible or mutually exclusive.

43. The ICAO special meeting of 1969 discussed the principles that should be followed in the development of an international scheme for noise certification of aircraft and the status that should be given to its specification. It was agreed that the noise certification scheme should be in the form of ICAO Standards. "It was also stressed that the ICAO Standards on noise certification would, as in the case of other Standards, be considered as the minimum international standards and that States could apply more stringent requirements to the aircraft on their national registers, if they so desired....Foreign aircraft complying with the ICAO noise certification Standards, would, noisewise, be allowed to operate subject only to such additional noise restrictions that might be specified by the responsible authority (ies) in relation to an aerodrome (s) due to local considerations applied on a non-discriminatory basis as between foreign and domestic aircraft."[7]

44. Successive UK Governments have upheld these principles. We believe that there is no inconsistency between our international commitments in respect of aircraft certificated to ICAO Chapter 2 standards and the proposals published for consultation in November 1997, as explained in paragraph 48 of that paper.

45. There has been no change of Government policy on this subject. Noise limits were set at both Heathrow and Gatwick before noise certification standards were introduced. After noise certification standards became effective in August 1971, UK

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[7] *Report of the Special Meeting on Aircraft Noise in the Vicinity of Aerodromes,* (para 3:1.3) , ICAO Doc 8857. NOISE (1969).

registered non noise certificated jet aircraft were permitted to continue in operation until 1 January 1986 (subject to a non addition rule) and foreign registered ones until December 1988. These non noise certificated aircraft continued to be subject to our local departure noise limits, even though they could not comply with those limits in all circumstances. Requiring Chapter 2 aircraft to comply with the new local noise limits for Heathrow, Gatwick and Stansted is no different in terms of policy or principle.

46. In both the November 1997 consultation paper and the March 1999 supplement we invited any airline which considered its economic or financial position might be adversely affected by the proposals to supply information. Some individual airlines and the Scheduling Committees have provided data, some of which they said was commercially sensitive. No airline has submitted all the information we suggested in paragraph 62 of the November 1997 paper.

47. As already noted, our nine proposals are closely interrelated: so too are the effects on the airlines. Because of this, the economic and financial information provided by the airlines does not generally distinguish between the cost of complying with the proposed new noise limits and and the cost of complying with the proposed monitoring arrangements. What they do attempt to separate is the effects of meeting the proposed new day and night noise limits.

48. The industry say that the daytime noise limit is not achievable by older 747s and that the Department has greatly underestimated the weight reductions needed to enable aircraft to meet the new limit and the economic impact this would have on the airlines. They say the problem is greater for the night-time noise limit, which could also affect the B747-400s (the current model) and A340s (the largest Airbuses), with a major impact on their operations.

49. The Secretary of State has taken into account all the information provided. He has noted that some of the assumptions underlying some of the calculations, such as the take-off weight at which the aircraft would have been likely to operate, if it were not for the proposed noise limits, may have tended to overstate the costs to particular airlines although he accepts they have provided the information in good faith. He accepts that the greatest difficulty is posed for flights that are scheduled to take off in the late evening (from 2200 hours, as identified by the Scheduling Committees, when the daytime limit applies) but are susceptible to delays into the night period. These flights use mostly 747-400s and similar types bound for Asia-Pacific destinations and comprise some of the most heavily laden and most profitable services. The industry also drew attention to the fact that the night restrictions regime recognises the need for departures after 2300; noisier heavier types are allowed to take off between 2300 and 2330 (primarily to allow for delays) than in the night quota period, 2330-0600.

50. The proposed night-time noise limit is intended to be broadly compatible with the night restrictions regime (although, as explained in paragraph 27 of the November 1997 paper and paragraph 35 of the supplement, no exact equivalence is possible between the night restrictions and the night noise limit). When we stated this in the November 1997 consultation paper, the night restrictions were those that applied until October 1998 (subsequently extended to October 1999). Under those restrictions, the noisiest types of aircraft permitted to operate in normal circumstances during the night

quota period, 2330-0600, are those classified as QC/4; under the new regime (October 1999-2004), this remains so until summer 2002, although BAA is in process of extending a voluntary ban on scheduling QC/4s. Airlines questioned the ability of QC/4 aircraft (including some 747-400s) to meet the proposed night-time limit. We have already acknowledged that some QC/4s could have difficulty meeting the limit at the very highest operating weight. In practice, these aircraft are the heavy late evening departures.

51. The Secretary of State remains of the view that a reduction of 3dB in the daytime noise limit is the most that it seems reasonable to require airlines to achieve while Chapter 2 aircraft are still legally entitled to operate in the UK. He has therefore decided that the new daytime limit shall be 94 dBA. This should help fulfil the objectives of encouraging the use of quieter aircraft and best operating practice, and of detecting and deterring excessively noisy movements. It will bring small but worthwhile noise improvements to communities living immediately beyond the 6.5 km reference distance.

52. The proposed reduction of 2dB in the night-time noise limit was intended to ensure that the night noise limit would be broadly compatible with the night restrictions regime, which also applies at Heathrow, Gatwick and Stansted, and to reflect what is operationally achievable in that context. Having regard to all the responses, the Secretary of State has decided that the proposed new 87 dB night-time limit should apply only from 2330 to 0600, with the present night-time limit of 89 dB being retained for the balance of the night period (ie 2300-2330 and 0600-0700). This will ensure greater consistency with the night restrictions regime; it will also reduce the problem (and potential costs) that would otherwise arise for operators of the heavily laden services bound for Asia-Pacific destinations that are scheduled to take off in the late evening, which would have particular difficulty in meeting the proposed new night-time noise limit if they are delayed beyond 2300.

53. Commencing the new lower night-time limit later will be of most benefit to the airlines; few are likely to be delayed long enough to benefit from the concession in the early morning. Introducing the same distinction between the most protected night quota period (2330-0600) and the "shoulder periods" (2300-2330 and 0600-0700) as applies in the night restrictions regime is important in terms of consistency.

54. Some of the industry responses pointed out that we had not carried out a Regulatory Impact Assessment or any form of cost benefit analysis. However, although we published the noise limits proposals in November 1997, before the present RIA requirements came into force (10.8.98), most of the relevant material was provided in the consultation paper and supplement and we explained the difficulties of assessing benefits and disbenefits in the context of noise displacement.

55. Having invited and received some information from the airlines on the costs to them of our proposals we have considered how it might be used in a cost benefit assessment. However, the difficulties already explained in the context of noise displacement, also apply when considering the proposals as a whole. Any form of cost-benefit calculation can be used, if at all, only with very substantial qualification.

56. However, the Government's requirements for Regulatory Impact Assessment now catch long running proposals when they reach a significant stage of development or decision. We have therefore completed a full RIA, summarising the relevant information under all the requisite headings. It is published at Appendix 1 to this decision document.

57. In the RIA, some of the information provided by individual airlines is not shown as they indicated it is commercially sensitive. The figure put forward by the Scheduling Committees as a broad indication of the costs of the proposed new night-time noise limit on B747-400 aircraft relates to the costs of all the airlines involved in that scenario and has been used in the cost benefit comparison in the RIA (paragraphs 8.7-8.8). These particular costs (and the associated benefits) will be reduced by our decision to apply the new nighttime limit only to the night quota period (2330-0600) but the total costs and benefits of our decision will be higher, because of other night flights that may be affected and because of the reduction in the daytime noise limts.

58. As already indicated (paragraph 49), we have taken account of all the information provided. Airlines generally attempted to cost the proposals on the basis of assuming a reduction in take-off weight to enable the most vulnerable aircraft to meet the proposed limits. In terms of economic analysis, this is not an unreasonable approach although operators would not necessarily react this way in practice. As indicated in paragraph 47 of our November 1997 consultation paper, there are a range of operational measures that airlines could apply, either singly or in combination. Obviously the scope for employing each or all of these measures will vary from airline to airline, and from flight to flight, as some of the responses confirmed. Similarly some of the data provided implied aircraft would be operating at maximum capacity were it not for the noise limits. This is not necessarily so: average load factors of about 70% are not uncommon in the industry, although we accept they are usually much higher on the long haul late evening departures.

59. In paragraph 8.6 of the RIA we indicate several airlines refer to having consulted Boeing and using their 90% probability of compliance and that this could lead to payload reductions and costs being overestimated. The genesis of this is in IATA's earlier (and continued) complaints on operational achievability and on the information on achievability that we have provided (see paragraph 8.2 (i)-(iii) of the RIA). Our technical evidence on achievability is explained in paragraphs 49-58 of the November 1997 consultation paper. We provided further explanation of the data, and of the underlying statistical concepts, in paragraphs 25-33 and Appendix 4 of the Supplementary consultation paper. That shows the general achievability of our proposals. However, we advised aircraft operators to make their own calculations of the possibility of their own operations (and of any changes in operating procedures or in take-off weight that they might be considering) exceeding the proposed new noise limits. We indicated these factors were likely to be of greater relevance to individual operators when considering the Government's proposals than the "average" performance achieved in actual operations and analysed by DORA, or the statistical spread associated with those averages (para 26 of the Supplementary paper refers).

60. We also explained why we had not published information that would enable individual operators to determine whether or not their particular aircraft would be likely to comply with the proposed new noise limits – because we did not have all the

requisite data – and we stated Dr Ollerhead was available to advise on his method of calculation, if required. We also published advice on that methodology in Appendix 3 of the supplementary consultation paper.

61. That advice on how to do such calculations included a suggested way of calculating the different statistical probabilities of exceeding a given noise level at a particular take off weight. The worked example published there at Figure 1 shows that a Chapter 3 B747-200, operated in a particular way and in specific atmospheric conditions, would have a 50% probability of meeting the proposed new daytime noise limit at 98.5% of MTOW. This is the "average" noise critical TOW for the same aircraft in the same conditions shown in paragraph 21 of the supplementary paper. It also shows that there would be a 90% probability of meeting the proposed new noise limit at about 93% of MTOW. This probability has been calculated by different means (as described in Appendix 3 of the supplementary paper). It also explains there why individual aircraft operators are best placed to do such calculations.

62 In normal operations flight-to-flight variations will occur in departure noise levels, which means some departures will exceed a noise critical weight (derived from on calculations using the Integrated Noise Model)[8] and some above will not. No information or advice on the variability is provided with INM. It produces only "average" data. It is for the operators, with advice from aircraft manufacturers, to carry out calculations for specific aircraft models.

63 The more specific the operators are as to the operational procedures and other conditions, the more confident they can be that the actual noise levels will be close to their predictions (because the variability will be less)[9].

64. We accept that individual operators doing detailed calculations relating to their own very specific operations may wish to use a 90% probability criterion. Indeed, observance of the noise limits at the London airports is a statutory requirement and we expect a high standard of compliance. However, we do not believe that the 90% probability should be estimated on a basis which allows for uncertainty in each and all operating conditions such as the weather - wind speed and direction, air temperature and pressure - and the aircraft operating procedure. If none of these conditions were known, that would be appropriate and would require the assumption of a large standard deviation about the mean noise level. It would also result in a low estimated TOW. In practice, operators should have enough reliable information on many of the conditions to assume a rather lower standard deviation and thus determine a more reliable, and higher, permissible TOW.

65. Whilst recognizing that individual operators will need to account for this variability when performing detailed calculations to estimate noise compliant TOWs

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[8] The US Federal Administration's official noise model. The noise and performance indata in its data base depicts representative long-term average operations. (See also Supplementary consultation paper, note 16.)

[9] The standard deviation assumed in the calculations for figure1 of Appendix 3 of the supplementary paper was 1.64dB. This was considered appropriate for any single TOW. This is smaller than the standard deviation of 2.2 dB shown for the same aircraft type in Appendix 4 because the latter covers a wide range of TOWs and other operating conditions. As noted in Appendix 3, a standard deviation even smaller than 1.64 dB could have been assumed there as those calculations also relate to a specific operating procedure.

in specific circumstances, we continue to believe that "average" figures derived from data obtained from aircraft (of types most likely to breach the noise limits) operating in normal circumstances at the London airports are an appropriate basis for indicating the general achievability or practicability of our proposals.

To retain the five monitors at Gatwick and eight monitors at Stansted currently operating under the interim arrangement, but to resite a Stansted monitor to a better position. At Heathrow to keep the eight sites in the interim arrangements and to add two further monitors.

66. The proposal was designed to improve daytime monitoring efficiency (compared to what applied before the interim arrangements) to at least 50%. The efficiency of the monitoring system depends of the number of monitors and where they are positioned in relation to the departure routes and the actual tracks flown, and on the noise limits themselves. This is explained in paragraphs 28 to 31 of the November 1997 paper. Reasons for the choice of specific sites were given in paragraphs 32 to 35. Practicalities (land use, topography, exposure to vandalism) limit the possibilities.

67. Many responses stressed the importance of monitoring efficiency. Local authorities and environmental groups were generally content with the monitoring sites proposed (including the new Broxted site at Stansted), although critical of monitoring efficiency of 'only' 50%.

68. In contrast, the airline industry commented that better trackkeeping, bringing aircraft closer to the departure routes, and hence the monitors, will already have improved the theoretical efficiency.

69. The Secretary of State welcomes improvements in trackkeeping and in monitoring efficiency. However, the original technical study[10] which underlies our proposals discarded tracks beyond a defined envelope and so will have discounted some earlier instances of poor trackkeeping. For present purposes, we do not consider it necessary to analyse more recent noise and trackkeeeping data, as explained in paragraph 50 of the supplementary paper. We confirm that up-to-date trackkeeping performance should be taken into account in the further review of monitoring efficiency (see 93 below).

70. The Secretary of State has noted that no specific sites have been suggested as alternatives to those that he proposed. Taking account of his decision to confirm the 6.5 km reference distance, the Secretary of State considers that the sites he proposed are the best available and should be implemented accordingly.

To calculate the positional adjustments on the basis proposed

71. As it is not always possible to site monitors precisely at 6.5 km from start of roll we proposed positional adjustments to take account of the differences, to ensure consistency in the noise monitoring arrangements. We explained this and the details of our proposed new formula for calculating the adjustments in paragraphs 39-41 and Annex 5 of the November 1997 paper. A table comparing the present and proposed

[10] CS Report 9539

new adjustments was published at Annex 6 of that paper and updated at Appendix 6 to the Supplementary paper.

72. The great majority of local authorities and environmental groups that commented on this proposal accepted the adjustments in principle; some were against, largely because they considered them too generous to aircraft operators. Probably to counter this, some local responses suggested taking account also of lateral displacement of aircraft. We had considered this at an early stage. For technical reasons it was not possible to build this into the adjustments we proposed, although it was taken into account in considerations of monitoring efficiency. (The next review could consider whether it would be both feasible and appropriate to utilise track data to this end.)

73. There were only 3 responses from industry but they, particularly BA, question our proposed formula for monitors closer in than 6.5 km. This is a detailed technical argument relating to the point at which the pilot starts to cut back engine power and the way it is effected.

74. Our proposal was to calculate the adjustments as follows:

- an increase in the noise limits of 1 dB for each 100 metres that the monitor is short of the 6.5 km reference distance;

- a decrease in the noise limits of 1 dB for each 1000 metres (1 km) that the monitor lies beyond the 6.5 reference distance; and

- an increase of 0.4 dB for each 10 m of monitor site elevation above airfield level (or a decrease of -0.4 dB for each 10 m below airfield level).

BA have questioned the basis of the proposed increment for monitors closer in than 6.5 km; ie the first part of the formula. (They accept the other elements.)

75. As already noted, in the UK there is a requirement, not related to the noise limits, that pilots cannot cut back engine power until they have reached a height of 1000 feet above the ground. (In the US the height is 800 ft.) It is difficult for some aircraft to reach 1000 ft and cut back before passing over the noise monitor if the monitor is significantly nearer to start of roll than 6.5 km. As cutting back engine power reduces noise, the positional adjustments that we proposed take this into account as well as differences due to distance and elevation of the actual monitor position compared with the standard. This is why the proposed positional adjustments are much greater for monitors before the 6.5 reference distance than for those beyond (ie they would give more help to airlines to meet the noise limits at monitors nearer than 6.5 km than they would take away from them at monitors further out).

76. The adjustments relate to the monitors[11]. The adjustment at any particular monitor will be applied to every noise level recorded, day or night, at that monitor.

[11]The procedure for adjusting the noise limits to take account of distance is based on ground distances measured along a typical track which passes over the monitor. The fact that aircraft are climbing between the 6.5 km reference point and the monitor (or vice versa) is taken into account in the procedure, by considering the expected aircraft heights at both points. It is the relationship between these two heights (adjusted for ground elevation) that forms the basis of the adjustment.

The formula for calculating the adjustments therefore necessarily reflects general assumptions about aircraft performance and operation; it is not scaled to any specific aircraft type or to specific operating conditions. The key assumptions in our formula (as explained in Annex 5 of the November 1997 paper) are:

- that cut back would be initiated 700 metres before the 6.5 km reference point;
- that the ensuing climb gradient would fall to 5% on average; and
- that noise emission would fall linearly with track distance.

The cut back process, known as "spindown" or "spooldown" was assumed to finish at the 6.5 km reference point.

77. BA contest the first of these assumptions. They consider cut back would be initiated later, with spooldown taking place over a much shorter distance, 100-200 metres.

78. The Secretary of State has been advised by the Civil Aviation Authority's Environmental Research and Consultancy Department (ERCD)[12] that it is technically feasible for some aircraft, including B747s, to be operated in this way and that our proposed formula does not allow sufficient adjustment for a late, rapid cutback. Various formulae to allow for this could be devised: one, suggested by ERCD, would have the effect of increasing the adjustments for close in monitors (there are 4 of these at Heathrow, 1 each at Gatwick and Stansted) by amounts varying from 0.1-0.9 dB, with the greatest increases on monitors just before 6.5 km. However, there is no guarantee that this would be sufficient for all late cut backs. Nor would it be possible to simplify the formula in the way envisaged in the consultation paper (paragraph 40), making it much harder to apply if any of the monitors ever had to be moved.

79. More importantly, there seems to be no strong reason to assume that operators will necessarily delay cutback until the last possible moment (ie 6.3-6.4 km from sor): in the waiver that forms part of the Court Order 800 metres is allowed for the procedure. As indicated in paragraph 21 of the November 1997 consultation paper, relating the noise limits to a reference distance of 6.5 km from start of roll should encourage aircraft operators to gain height as quickly as possible and then then reduce engine power and noise at the earliest opportunity. The adjustment formula we proposed, calculated for a substantial but very gradual cutback starting well before 6.5 km, is consistent with this. Cutbacks initiated closer to the 6.5 km reference distance will be more rapid and often less deep (ie involving a smaller power reduction, and therefore a smaller noise difference). Practical adjustments at the monitor positions are not and cannot be aimed at any particular type of aircraft or operating procedure. There is no particular reason to believe that, in practice, there will be many instances of the adjustments being too small. Altering the formula in any way could lead to other distortions.

80. The Secretary of State's decision to confirm the positional adjustments on the basis put to consultation takes account of all these points.

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[12] Previously known as the Department of Operational Research and Analysis (DORA).

To allow a reduction of not more than 2dBA of the noise recorded in specified tailwind conditions, in accordance with the details set out in paragraph 43 and Annex 7 of the November 1997 consultation paper

81 We proposed a tail wind allowance to avoid penalising aircraft required to take off in that condition for separate environmental reasons (eg westerly preference at Heathrow). Details were given in paragraphs 42 to 43 and Annex 7 of the November 1997 paper. The 2dB maximum, for a tailwind exceeding 4 knots, should be adequate for the purpose for which it is intended: westerly preference does not normally apply if the tailwind exceeds 5 knots.

82. The proposal was accepted by some local authorities and environmental groups responses but opposed by almost twice as many; these mostly argued that airlines should take tailwind into account as well as other conditions. Some airlines and BAA considered the allowance should be augmented in various ways to take account of temperature and other factors that also affect aircraft performance.

83. We were aware of these factors previously. The present noise limits have never included adjustments for such factors, which aircraft operators everywhere have to take into account on a normal day-to-day basis. Any such adjustments would be very complicated both to calculate and to administer and would make the noise limits less stringent. The Secretary of State does not consider this would be justified.

84. BAA also indicated there might be problems in the measurement and management of tail wind data using the NTK system. Initially, we had technical advice that the problems could be resolved, with the wind data being obtained from the relevant weather station equipped monitors in the NTK system, as described in Annex 7 of the November 1997 paper. However, with the change of NTK operating system (referred to in the supplementary paper, paragraph 51) the technical difficulties – which relate to the way in which the wind data is recorded and processed within the NTK system - have increased. BAA, in their role as providers of the NTK system, have suggested using wind data from an alternative source, the on-airfield anemometers and wind vanes. This equipment is owned by NATS and provides the data that air traffic controllers provide to the pilot of an aircraft when clearing it for take-off. BAA propose to feed this wind data directly into the NTK system, and to match it automatically with the relevant aircraft noise events.

85. ERCD support this proposal. The NATS wind data can be used in the formula for the tailwind allowance proposed in the consultation paper (ie without any other adjustments being necessary). It is hoped that the NTK system enhancement can be can be delivered (fully functioning) within the timetable for implementation. If there is any delay, BAA can use a manual matching procedure in the interim.

To require aircraft to be at a height of 1000ft aal at 6.5 km from start of roll

86. In paragraphs 44 and 45 of the November 1997 paper we explained our proposal to restate the height requirement that has applied for noise mitigation purposes since

1966, so that aircraft will be required to reach 1000 ft aal[13] at 6.5 km from start of roll, irrespective of where the noise monitors are sited.

87. Airlines and industry organisations that commented on this proposal are opposed for the same reasons as they opposed the 6.5 km standard reference distance and the new noise limits. No airline has suggested that the height requirement will impose significant costs or operational difficulties in addition to those they will face in meeting the proposed new noise limits. The great majority of local authorities and environmental groups that comment on this proposal were in agreement with it although several raised questions about its enforceability and about whether it would lead to an increase in emissions.

88. The Secretary of State has considered the responses on this issue and has decided to implement the proposal. The height requirement will help to ensure that operators of aircraft most likely to breach the noise limits will improve their initial rate of climb in order to register less noise at the monitors and that other aircraft will also make the least noise possible when overflying the area immediately beyond the 6.5 km reference distance. It will therefore benefit, albeit modestly, communities in these areas around the three airports, where noise levels are greater than further out. The possible impact on emissions is considered at paragraphs 96 to 101: any absolute impact would be very small and there is no reason not to confirm this or the other proposals as a result.

89. Although a height requirement has been set for noise purposes since 1966, it has never been enforced. The Government's intentions in this respect, as described in paragraphs 68-69 of the November 1997 paper, were that operators should comply with the requirement, changing their operations in necessary to achieve this. However, the Secretary of State accepted that occasional and exceptional breaches of the height requirement would not be expected to lead to use of his power under section 78(2) to direct that the aircraft operator should be refused facilities for using the aerodrome. The Secretary of State confirms these intentions. Compliance with the height requirement will be monitored through the NTK system, in the same way as we and the airports currently monitor track-keeping on the noise preferential departure routes, to see whether any further action would be necessary or practicable.

To exempt from the new daytime noise limits certain aircraft given exemptions from the Chapter 2 phase out requirements in accordance with the provisions of the EC directive

90. In paragraphs 46 and 47 of the November 1997 paper we explained it would not be appropriate to **require** aircraft that have been given specific exemptions from the phase out provisions in the EC Directive 92/14 to meet the proposed new daytime [but not the night-time] noise limit. These are aircraft given exemption, on grounds of economic hardship or because they are registered in developing nations, from the requirement to phase out certain Chapter 2 aircraft <u>before</u> the final date of 31 March 2002. Some of these aircraft should have no difficulty in meeting the limit. We proposed to exempt specifically from the day time noise limit those aircraft which

[13] Above airport level.

their operators may wish to continue to fly to London but who might find the limit incompatible with the exemption given them in accordance with the provisions of the EC directive. A list of these aircraft, including their tail numbers, was given at Annex 8 of the paper and updated at Appendix 7 of the supplementary paper.

91. Several industry responses expressed the view that the regulations should be designed such that exemptions were not necessary or that all aircraft which cannot make the noise limits should be exempted as Concorde is. (Concorde has always been exempt from the noise limits, and from ICAO noise certification requirements.) 32 environmental responses questioned why there should be any exemptions, a few accepted the proposal.

92. The Secretary of State has considered all the responses on this issue. He has decided to confirm the proposal to accord with the UK's international obligations. A further updated list of these aircraft, which will be exempted from the new daytime noise limit, is at Appendix 2 of this decision. The list will be kept up-to-date. (The night restrictions will continue to apply as hitherto and the aircraft on this list will not be given any exemption from the night noise limits of 89 dBA 2300-2330 and 0600-0700, 87 dBA 2330-0600, if they take off during those hours.)

To begin a further review of both monitoring efficiency and noise limits in 2000

93. In paragraph 65 of the November 1997 paper we proposed to begin a further review of both monitoring efficiency and the noise limits in 2000, with a view to proposing any further improvements as and when practicable, and new, tougher limits, possibly incorporating a differential or tiered effect, as soon as possible after 31.3.2002, the date when Chapter 2 aircraft must cease operations.

94. Of the 47 respondents that referred to this issue all except one were in favour, although not all for the same reasons. Many made suggestions for the conduct, content and timescale for the next review. Taking account of those points and of our noise monitoring and noise abatement policies, the Secretary of State has decided to initiate the review on the basis proposed. We are satisfied that there is no need to delay the start of the review on account of the length of time we have taken with the present proposals. We are also satisfied that it would not be appropriate to widen the scope of the review to cover matters that are subject to separate processes for review, such as night flying restrictions, or on which we have consulted separately, such as possible new aircraft noise legislation[14].

95. The further departure noise limits review will be overseen by the Aircraft Noise Monitoring Advisory Committee (ANMAC), in accordance with their present terms of reference. I have asked the Chairman to ensure that approporiate use is made of noise and track monitoring data obtained from the airports' NTK system at the monitoring positions that have applied under the Court Order.

Emissions

96. In paragraph 21 of the November 1997 consultation paper we acknowledged that to meet the proposed new noise limits, some aircraft may have to climb more rapidly

[14] Consultation paper, *Control of noise from civil aircraft*, DETR, July 2000.

than they otherwise would and that use of higher power will produce more noise and emissions in the area before the 6.5 km distance.

97. This subject was mentioned by both industry and environmental respondents who stated that the need to use greater thrust on take-off would cause more emissions. BAA indicated that they understood that present use of reduced power settings on departure had the effect of achieving a 40% reduction in NO_x emissions from aircraft in the vicinity of the airport.

98. Research findings have consistently demonstrated that aircraft take off emissions are not significant contributors in terms of air quality around airports. Road traffic has been found to be the dominant source of emissions and the problem, here and elsewhere, is being addressed through technological improvements that will lead to a progressively cleaner road vehicle fleet.

99. There are many types of aircraft currently operating at the London airports that should be able to meet the new noise limits without difficulty and there should be no increase in emissions from these. It is possible that the NO_x emissions for a single take-off by one of the types of aircraft most likely to be at risk of breaching the new noise limits could rise by about 40%. For example, that is about the difference in NO_x that a B747-200, certificated to Chapter 3 noise standards and operating at a take off weight of about 340 tonnes, would produce if the pilot changed from using 15% derate to maximum thrust for take off in order to meet the new day time noise limit or the refined height requirement. "40%" may seem large but the absolute amount is very small Where aircraft currently operate with less derate the scope for increase is less, and there are other measures that operators might take to reduce the possibility of exceeding the noise limits which would not lead to any increase in emissions. Moreover, one of the objectives of the new noise limits is to encourage the use of quieter aircraft. If the new noise limits have this effect they will contribute to a reduction in NO_x as modern quieter aircraft are also more fuel efficient.

100. Standards have been agreed through the International Civil Aviation Organisation (ICAO) for the venting of fuel and the emissions of smoke, hydrocarbons, carbon monoxide and NO_X during the the landing and take-off (LTO) cycle, which is when the aircraft emissions that may affect local air quality occur. These ICAO standards have been implemented in UK domestic legislation. The UK has done much to introduce tougher standards for NO_X. As well as the 20% tightening of the NO_X standard agreed in 1993, which comes fully into effect at the end of 2000, ICAO has agreed a further 16% increase in stringency from 2004.

101. These points were all taken into account in reaching the decisions described above.

Appendix 1

1 Title

NOISE LIMITS FOR AIRCRAFT DEPARTING FROM HEATHROW, GATWICK AND STANSTED AIRPORTS – REGULATORY IMPACT ASSESSSMENT

2 (i) The Issue and Objectives

Issue

2.1 Noise limits were set for Heathrow in 1959 at 110 PNdB (day) and 102 PNdB (night). They were applied at Gatwick in 1968 and at Stansted in 1993. Noise monitors were installed specifically for recording noise against the limits. The noise limits have never been changed except that when the airports' new noise and track keeping system (NTK) was installed in 1992-93 the peak noise event levels were defined in L_{max} dBA, the equivalents of the old limits being 97 dBA (day) and 89 dBA (night). The number of noise monitors, and their locations, have varied over the years. The NTK system installed in 1992-93 comprised 7 fixed noise monitors at Heathrow, 2 at Gatwick and 3 at Stansted. In 1985, the then Government undertook to review policy on noise limits and monitoring. The commitment to do this was set out in the 1985 Airports Policy White Paper but work was deferred until BAA had installed a new noise and track keeping (NTK) system at all three airports. The proposal to begin the review was confirmed on 6 July 1993.

Objectives

2.2 The Department's general aim in noise monitoring is to help reduce aircraft noise around airports. Specific objectives and measures include :

- encouraging the use of quieter aircraft and best operating practice;
- deterring excessively noisy movements by detecting and penalising them;
- measuring the effectiveness of noise abatement measures by analysing infringement rates.

2.3 An important objective in the early days of noise monitoring was "protecting" built up areas - usually the first such area under a departure route - and the fixed monitors were positioned accordingly. Another monitoring strategy was to locate monitors as "gateway pairs" either side of a departure route on the assumption that aircraft would fly between them. Nowadays, neither of these approaches is necessarily consistent with the specific objectives detailed above, nor would they ensure uniformity of protection at the three airports or between the various departure routes at each airport. Locating noise monitors to "protect" individual communities is, at first sight, an attractive proposition but has been found not to work well in practice.

2 (ii) Risk Assessment

2.4 Nothing relating to the proposals is unsafe.

2.5 There are two points, acknowledged in the consultation paper, on which airlines have raised very specific questions. These are:

(i) that in the UK, for safety reasons, aircraft cannot cutback power until they reach a height of 1000 ft above the ground (paragraph 22 of the November 1997 paper refers);
(ii) that, largely for safety reasons, airlines usually use the same operating procedures for all departure routes from a particular airport and that some aim to use the same operating procedures at every airport from which they operate (see paragraph 18 of the November 1997 paper).

2.6 In respect of (i), we expect airlines to take this into account when considering what operating procedures and other measures (see para 48 of the 1997 paper) they will adopt in order to meet the proposed new noise limits. The requirement has applied for many years and applied when the data on which the proposals were based were gathered.

2.7 In respect of (ii), one UK airline commented that "aircraft operators have very little scope to alter departure procedures, as they are mandated to apply the requirements of JAR-OPS 1.235, which states:

"(a) An operator shall establish operating procedures for noise abatement during instrument flight operations in compliance with ICAO PANS OPS Volume 1 (Doc 8168-OPS/611).

(b) Take-off climb procedures for noise abatement specified by an operator for any one aeroplane type should be the same for all aerodromes."

2.8 PANS OPS permits special procedures subject to certain criteria so (a) above should not be a problem; (b) is a potential area of difficulty, not just for the UK but for all JAA signatories. However, JAR-OPS is not yet mandatory and we are exploring ways to get the drafting clarified.

(Many UK operators have already voluntarily adopted JAR-OPS into their procedures. As such, they are bound by the provisions but there is currently nothing to prevent them altering their procedures to meet the proposed noise limits and associated requirements at the London airports.)

3 (i) Options

3.1 There is a long standing Government commitment to review policy on noise limits and monitoring (see 2(i) above). At the commencement of the review, the Aircraft Noise Monitoring Advisory Committee decided that the review should be based on an empirical study of noise and track data collected through the NTK system

at the three airports. The study was carried out by the then Department of Operational Research and Analysis (DORA)[1] of the Civil Aviation Authority. The results are published in CS Report 9539 and some further technical work was published in CS 9539 Supplement. The work showed the scope for reducing the noise limits and improving monitoring efficiency.

3.2 As explained in the consultation paper, the review identified two central aspects of the noise monitoring regime: the setting of the noise limits, "stringency", and the effectiveness of the noise monitoring positions, "efficiency". To some extent, stringency and efficiency are interrelated. A reduction in a noise limit will automatically lead to an increase in monitoring efficiency if the monitoring arrangements and aircraft operations remain unchanged. This is because there will be more noise events that exceed the new limit and are within the lateral range of the noise monitors.

3.3 The nine proposals put to consultation are summarised at paragraph 67 of the November 1997 consultation paper as follows:

"a) to relate the noise limits to a fixed reference distance, 6.5 km from start of roll;

b) to continue to monitor noise levels at the fixed monitors in L_{max} dBA and to apply the noise limits to all departing aircraft except Concorde and a number of specified exemptions (see h below);

c) to reduce the noise limits by 3 dBA (daytime) and 2dBA (night-time), to 94 dBA and 87 dBA respectively;

d) to retain the five monitors at Gatwick and eight monitors at Stansted currently operating under the interim arrangement, but to resite a Stansted monitor to a better position. At Heathrow to keep the eight sites in the interim arrangements and to add two further monitors as previously proposed;

e) to calculate the positional adjustments on a revised basis;

f) to allow a reduction of not more than 2 dB of the noise recorded in specified tail wind conditions;

g) to require aircraft to be at a height of 1000ft aal at 6.5 km from start of roll;

h) to exempt from the daytime noise limits certain aircraft given exemptions from the Chapter 2 phase out requirements in accordance with the provisions of the EC Directive;

i) to begin a further review of both monitoring efficiency and noise limits in 2000."

3.4 Proposals a) and c) to h) all relate to detailed changes to the existing regulations and proposal b) is not to change other aspects of those regulations; proposal i) is for a

[1] Now the Environmental Research and Consultancy Department of the CAA.

further review of the arrangements. These nine proposals are closely interrelated. They are not a range of options.

3.5 The alternatives to adopting the present set of proposals would be (a) to revert to the arrangements that applied prior to the Court Order of April 1997[2] or (b) to consult on new proposals.

3 (ii) Issues of equity or fairness

3.6 Aircraft noise problems are tackled in two ways: by seeking reductions in noise at source (through developments in aircraft and engine technology) and by arrangements to control or mitigate noise around airports. Reductions in noise at source are a matter for international negotiation and agreement, implemented by national regulations. Measures to control or mitigate noise around airports (whether in the UK, Europe or in other countries that are signatories of the 1944 Chicago Convention on Civil Aviation) apply locally, in order to reflect local circumstances.

3.7 To meet the present objectives, we proposed that the noise limits should be related to a fixed reference distance in relation to the runway and aircraft departure tracks. The Government believes that this would be more equitable than the earlier non standardised arrangements. Aircraft operators will be subject to consistent requirements at Heathrow, Gatwick and Stansted and on all the departure routes at those airports. People living around the three airports will be given comparable protection from individual aircraft noise events.

3.8 To ensure consistency in the noise monitoring arrangements, the limits at individual monitors will be adjusted to account for the effects of any displacement from the standard point. (In their response to the consultation, BA questioned one element of our proposed formula for calculating these adjustments. That is addressed in the main decision document at paragraphs 71-80.)

3.9 In paragraphs 46 and 47 of the November 1997 paper we explained it would not be appropriate to **require** aircraft that have been given specific exemptions from the phase out provisions in the EC Directive 92/14[3] to meet the proposed new daytime (but not the night-time) noise limit. These are aircraft given exemption, on grounds of economic hardship or because they are registered in developing nations, from the requirement to phase out certain Chapter 2 aircraft before the final date of 31 March 2002. Some of these aircraft should have no difficulty in meeting the limit. We proposed to exempt specifically from the day time noise limit those aircraft which their operators may wish to continue to fly to London but who might find the limit incompatible with the exemption given them in accordance with the provisions of the EC directive. The current list of these aircraft, including their tail numbers, is at Appendix 2 of the decision announcement. The list will be kept up-to-date.

3.10 Concorde has always been exempt from the noise limits, and from ICAO noise certification requirements.

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[2] See November 1997 consultation paper, paragraphs 13-16 and Annex 1.
[3] Amended by Directives 98/20 and 99/28.

3.11 Tailwind: We proposed a tail wind allowance to avoid penalising aircraft required to take off in that condition for separate environmental reasons (eg westerly preference at Heathrow). Details were given in paragraphs 42 to 43 and Annex 7 of the November 1997 paper. The 2dB maximum, for a tailwind exceeding 4 knots, should be adequate for the purpose for which it is intended: westerly preference does not normally apply if the tailwind exceeds 5 knots. Some airlines and BAA considered the allowance should be augmented in various ways to take account of temperature and other factors that also affect aircraft performance. We were aware of these factors previously. The present noise limits have never included adjustments for such factors, which aircraft operators everywhere have to take into account on a normal day-to-day basis. Any such adjustments would be very complicated both to calculate and to administer and would make the noise limits less stringent. The Secretary of State does not consider this would be justified.

3.12 The proposals relate only to Heathrow, Gatwick and Stansted, as they are the only airports designated for the purposes of section 78 of the Civil Aviation Act 1982. This enables the Secretary of State to impose requirements on departing or landing aircraft for the purpose of limiting or mitigating the effect of noise. At other airports in the UK noise mitigation requirements may be imposed by the local airport management or may be the subject of planning conditions.

3.13 Herts CC considered the proposed noise limits and monitoring regime should be extended to Luton and other airports to avoid possible implications for capacity and competition, although they recognised that Luton airport could impose the same regime voluntarily. Luton BC indicated they would discuss with the airport how to move towards establishing best operating practice there.

3.14 At Manchester airport the daytime noise limit is already 2 dBA lower than the proposed new limit for Heathrow, Gatwick and Stansted.

3.15 Details of noise limits (of various sorts) at 83 airports across the world are available on the Boeing web site.

4 (i) Identify the benefits

4.1 The Government proposed to measure the noise limits at a fixed reference distance of 6.5 km from start of roll[4]. Relatively few residential areas lie closer to these airports than 6.5 km from start of roll and fixing on that distance will be of benefit to the much greater numbers of people living beyond this distance liable to be affected by aircraft noise. Relating the noise limits to the 6.5 km distance will encourage aircraft to leave the area immediately around the airport as high as possible and with the least noise impact on the people affected beyond.

4.2 The proposed reduction of 3 dB in the daytime limit represents a halving of noise energy but only a small reduction in loudness. Nevertheless, the cumulative effect of even small improvements should be of benefit to local residents. The reduction of 2 dB in the night-time noise limit is intended to ensure that the limit will be broadly

[4] start of roll is where aircraft (using the full runway length) typically begin their take-off run. It is approximately 150 metres in from the "start" end of the runway.

compatible with the night restrictions regime[5] which also applies at Heathrow, Gatwick and Stansted and reflects what is operationally practicable in that context.

4.3 The primary purposes of the height requirement are to encourage aircraft operators to use sufficient take-off power and rate of climb to avoid breaching the noise limits and to minimise noise at the 6.5 km reference distance. Operators of aircraft most likely to breach the noise limits (see paragraph 49) should consider improving their initial rate of climb in order to be at a greater height when passing over the noise monitor and thus register less noise. The height requirement also helps to ensure minimal noise from quieter types of aircraft, ie aircraft which can meet the noise limits even if they are at less than 1000 feet when passing over the noise monitor (or when at 6.5 km from start of roll) but which by being so low are noisier than necessary.

(ii) Quantifying and Valuing the benefits

4.4 As stated in paragraph 26 of the November 1997 paper, "The proposed reduction of 3 dB in the daytime limit represents a halving of noise energy but only a small reduction in loudness. Nevertheless, the cumulative effect of even small improvements should be of benefit to local residents." The first sentence is a long accepted scientific fact; it is not disputed in the responses. The point that the cumulative effect of small improvements in individual take-offs, by some of the noisiest aircraft, should be beneficial seems incontrovertible. The small improvements will benefit residents under the departure routes; a typical noise reduction being about 2.5 dB at about 6.5 km from start of roll to 0.9 dB at about 15 km from start of roll every time an aircraft that has changed its procedures (or adopted other measures to meet the new noise limits) flies overhead. A graph showing the relative population densities was provided at Annex 3 of the November 1997 paper (and is reproduced as Appendix X to this RIA).

4.5 In the November 1997 consultation paper we explained that the Government's proposals would encourage aircraft operators to gain height as quickly as possible and then reduce engine power and noise at the earliest opportunity. Some aircraft would have to climb more rapidly than they would otherwise have done, and that use of higher power would produce more noise and emissions in the area before the 6.5km reference distance. This could be referred to as "very close-in" noise displacement. In some circumstances, requiring older B747s and some other types of aircraft to produce less noise at 6.5 km may lead them to produce more noise than they did previously at some distances further from the airport, a "far out noise displacement" effect.

4.6 To consider these factors further, DORA produced a supplementary technical report: R&D report 9841 *"Review of the Departure Noise Limits at Heathrow, Gatwick and Stansted Airports: Effects of Take-off Weight and Operating Procedure*

[5] These are the night flying restrictions referred to in the Court Order: ie those announced on 16 August 1995. That announcement confirmed that the limits on the numbers of night movements by aircraft at Heathrow, Gatwick and Stansted, the noise quotas, and all aspects of the night restrictions regime would remain as previously announced on 6 May 1994. A formal Notice is published under section 78 of the Civil Aviation Act 1982 to give effect to the night restrictions each season. A copy of the Notice and a summary of the night restrictions regime may be obtained from the contact point for this RIA. See also paragraph 49 of the main decision document.

infers a 'median value' of £5. However, we do not believe that it would be appropriate to rely on this sort of analysis in an RIA for the departure limits. This is because the counter-factual cases are too difficult to identify, and because it could place too much weight on the valuation of small changes at the margin.

4.12 More importantly, a major objective of the noise limits is to present an incentive to accelerate investment in quieter aircraft; or to redeploy quieter aircraft from other routes. The local noise benefit from this, if achieved, is likely to dwarf the benefits from modified operating procedures (and/or reduced payload) for continuing noisy visitors. (And the inevitable uncertainty attaching to this outcome would swamp the range of uncertainty on the operational side. The combination of this with the range of possible valuations would render the exercise too nebulous to be of real use for the purposes of this RIA.) Operators of aircraft less likely to breach the new noise limits and/or the height requirement will also be encouraged by the new arrangements to improve their operating procedures or accelerate investment in even quieter aircraft, thus producing further noise benefits for people living around the three airports.

5. Compliance costs for business, Charities and Voluntary Organisations

5. (i) Business sectors affected

5.1 (a) Airline industry : (i) BA and Virgin Atlantic are the only UK airlines directly affected.

(ii) Foreign airlines: those most likely to be affected are operators of heavily laden services bound for Asia-Pacific destinations that are scheduled to take off in the late evening. They would have particular difficulty in meeting the proposed new night-time noise limit if they were delayed beyond 2300 hours.

5.2 (b) Aerodromes: The Government's view, as stated in paragraph 62 of the November 1997 paper, is that "Having regard to the already heavy demand for slots at Heathrow and Gatwick, and the build up of traffic at Stansted" it did not believe the proposed arrangements would be likely "to damage the international competitiveness of these airports." BAA, who operate Heathrow, Gatwick and Stansted, did not comment on this.

5.3 The Association of Asia-Pacific Airlines thought the proposals would require such unacceptably low average loads, fares and freight rates that the position of the UK as a world aviation hub would be threatened. In contrast, the **Scheduling committees** considered that the status of London is such that if the proposals are confirmed they would create a de facto international standard.

(5.4 Another counterbalancing factor is that at the London airports landing charges (which are subject to a separate regulatory regime) are very low, compared with those at other airports such as Schiphol, Frankfurt and Charles de Gaulle.)

5 (ii) Compliance costs for a "typical" business

5.5 Not applicable

5 (iii) Total compliance costs

Some of the figures provided by airlines and quoted in this section are said to be commercially sensitive and will be omitted on publication

5.6 As already noted, our nine proposals are closely interrelated: so too are the effects on the airlines. Because of this, the economic and financial information provided by the airlines in response to consultation does not generally distinguish between the cost of complying with the proposed new noise limits and the cost of complying with the proposed monitoring arrangements. What they did attempt to separate is the effects of meeting the proposed new day and night noise limits. This information is therefore summarised under those headings.

Day

5.7 BA estimated, calculated by reference to Boeing's statistical criteria[10], that 93% of all Chapter 2 B747-100s and 29% of all Chapter 3 747-200s take off at weights above those identified by Boeing. Whilst BA were planning the withdrawal of their B747-100s when responding, they estimate the new proposed limits would require significant payload reductions on some of their B747-200 aircraft (£ [11] pa); they say these additional costs would be passed on to customers, reducing the competitiveness of the airline. **Virgin Atlantic** estimated an annual cost of £ [12] for its 4 JT9D powered B747-200s and that there would also be an operational and financial impact on their RB 211 powered 747-200s, although this would be less. Additionally, BA estimate that the use of full power for take off (both day-time and night-time) would cost £ [13] pa. Virgin indicate the costs they have quoted do not cover this factor.

5.8 **Air New Zealand** stated that their B747-400 could not meet always the daytime limits at their maximum take off weights. They say that at the maximum structural take-off weight of 396.9 tonnes, the B747-400 often encounter take-off conditions that do not enable the aircraft to attain either 1,000 ft at 6.5 km or the 94 dBA limit. They and others including **Cathay Pacific, Malaysia Airlines,** and **Eva Air** considered it unreasonable and unfair to expect longhaul carriers to reduce takeoff weight (ie payload and revenue). **Malaysia Airlines** stated that they have already changed their operating procedures (to use full rather than derated thrust and to cut back at 1000 ft rather than 1500 ft) in order to meet the existing noise limits at the proposed monitor positions (most of which currently apply under the terms of the Court Order) and so would have to reduce weight to meet the new limits.

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[10] See paragraph 8.6 below.
[11] Not published on ground of commercial confidence claimed by airlines.
[12] See note 11.
[13] See note 11.

Night

5.9 **BA** have calculated (using the Boeing figures) that, in order to achieve 90% compliance, its B747-400 fleet would be restricted to a maximum take-off weight (MTOW) of 307.0 tonnes at Heathrow and 313.0 tonnes at Gatwick, as against 396.89 tonnes certified MTOW. These planes, they say, would not be able to take-off at night on a viable operation except for positioning between Heathrow and Gatwick. Their analysis suggests that the cost of the extra night stops amount to a cost of nearly £ [14]pa, and would affect about 75,000 passengers over the same period.

5.10 **Malaysian Airlines**, **Qantas**, **Singapore Airlines**, **Virgin Atlantic**, **IATA** and **AAPA** all raised the loss of payload/range jeopardising the economic operation of services, particularly to the Far East which depart late in the evening. **Singapore Airlines** say there is no scope to reschedule their flight or to use an A340 instead of a B747-400 as the A340 does not have the range to fly non-stop from London to Singapore in the winter. They also indicate the A340 would be unable to meet the proposed night noise limit of 87 dBA at the reference distance of 6.5 km from start of roll. **Virgin Atlantic** and **AAPA** also suggested difficulties with the A340 but provide no figures.

5.11 Costing on the basis of 80% seat occupancy, the Scheduling committees (which represent all the airlines) estimated the cost of night stops for aircraft scheduled to depart after 2200 but delayed until past 2300 as £97 million pa for passenger flights plus further costs for delayed cargo. This includes the costs of airlines, such as BA, which have submitted separate responses.

5.12 The consultation closed on 4 June 1999. After that date, in August 1999, BA wrote with some further information which has been taken into account above. No other airline or representative body has submitted additional or revised information. It should be noted that Virgin's 747-200s with JT9D engines are certificated to Chapter 2 and so cannot be operated in the UK after 31 March 2002.

6. Consultation with Small business: "The Litmus Test"

6.1 None affected

7. Other Costs

7.1 Compared with the situation before the Court Order, our proposals require the provision of 12 additional noise monitors and the resiting of 8 others. Of these, 10 of the new monitors and the resiting of 7 of the others were required under the interim arrangements that were confirmed by the Court Order and costs had already been incurred in relation to the other 2 additional monitors before they were not confirmed by the Order.

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[14] See note 11.

7.2 Under the terms of the Court Order we are required to take no account "of the mere fact that a monitor has been sited at a particular place or as part of the interim arrangements or that expenditure has been incurred in connection with such siting."

7.3 The intention was, presumably, that if the Secretary of State wished to resite all or any of the monitors neither the additional costs involved nor the fact that earlier expenditure might be considered abortive or nugatory should be taken into account. Our interpretation is that the only costs in relation to the monitors as proposed that can be taken into account is the cost involved in resiting the Broxted monitor at Stansted. That monitor is not being moved to accord with any new criterion or purpose, it is simply a better position than the site previously available, as explained in paragraph 32 of the November 1997 paper. The cost of this is approximately £1,000[15].

7.4 The costs of providing and running the noise monitors and of monitoring compliance with the noise limits are borne by the airport companies. They have not made any representations to us on this matter. Some administrative costs will inevitably be to involved in implementing the new arrangements (including the new tailwind allowance) but these should be subsumed in their normal operating costs.

7.5 As stated in paragraph 5.1 above, BA and Virgin Atlantic are the only UK airlines directly affected. Some foreign airlines, particularly operators of heavily laden services bound for Asia-Pacific destinations that are scheduled to take off in the late evening, would also be affected. Information on costs to foreign airlines is included in section 5(iii), see paragraphs 5.6-5.12 above.

8. Results of Consultations

8.1 There is an overview of all the responses at paragraphs 9-11 of the main decision document and points raised in respect of each element the proposals are considered under the appropriate headings in that document.

IATA's Core Complaints

8.2. The principal points of objection raised by IATA on previous occasions and in relation to the present consultation are:

(i) the proposals are not operationally achievable: a significant proportion of Chapter 2 B747s would fail to meet the new noise limits unless passengers/cargo were off-loaded. Airlines are entitled to fly these Chapter 2 aircraft until the end of the phase out: 31 March 2002. Even Chapter 3 B747-400s could have difficulty in complying with the requirements, in particular with the night-time limit. The impact on night-time take-off of QC/4 aircraft is cited as the key example of the impact of the proposed new night-time limit and this brings into play the policy of broad compatibility with the night restrictions regime;

(ii) for similar reasons, the height requirement is not operationally achievable;

[15] Subsequently revised to about £15, 000.

(iii) the Department's own figures on achievability are misleading. Where the Department has given weights below which a B747 could meet the new noise limits, they are based on average figures such that 49.9% of aircraft taking off at that weight would fall on the wrong side of the noise limit. Airlines cannot operate in this way but need to aim for take-off weights (TOWs) which will ensure that they are reasonably confident of meeting the noise limits. Therefore the "safe" take-off weights cited by the Department are overestimates;

(iv) far-out noise displacement (the subject of the supplementary consultation paper);

(v) 6.5 km from start of roll is an unreasonable/irrational reference distance given the inability of certain aircraft to cut-back by that distance.

8.3 These have been considered in detail in their immediate contexts. For the purposes of this RIA we are concerned here with the economic and financial information provided in response to our consultation. In both the November 1997 consultation paper and the March 1999 supplement we specifically invited any airline which considers its economic or financial position may be adversely affected by the proposals to supply information. Some individual airlines provided data, but none submitted all the information we suggested in paragraph 62 of the November 1997 paper.

8.4 The airline scheduling committees for the three airports have submitted a combined response, both commenting on the proposals and providing economic and financial information on behalf of airlines likely to be affected.

8.5 Some of the industry responses pointed out that we have not carried out a Regulatory Impact Assessment or any form of cost benefit analysis. However, we published the noise limits proposals in November 1997, before the RIA requirements came into force (10.8.98). Most of the relevant material was provided in the consultation paper and supplement and we explained the difficulties of assessing benefits and disbenefits in the context of noise displacement.

8.6 In providing their information on costs and other effects on their operations, several airlines refer to having consulted Boeing and using their 90% probability of compliance. We accept that individual operators doing detailed calculations relating to their own very specific operations may wish to use a 90% probability criterion. However, they appear to have made use of the Boeing analysis which equated 50% probability of complying with any limit (eg 94 dB), with 90% probability of complying with a limit 3 dB lower (eg 91dB). That assumed a standard deviation of 2.33dB, a figure derived from a wide range of operating conditions, including TOW itself. Application of Boeing's standard deviation to the specific conditions which operators are able to consider, when a rather lower deviation would normally be appropriate, would lead to the noise critical take-off weight being underestimated. This, in turn, would lead to payload reductions and costs being overestimated. However, having invited and received some information from the airlines on the costs to them of our proposals we have considered how it might be used in a cost benefit assessment. For the reasons explained above, which relate back to technical matters,

we consider that that information could only be used, if at all, with very substantial qualification. This is attempted at 8.7-8.8 below[16].

8.7 In their response, the Scheduling Committees give "a broad indication of the costs" of the proposed new night time noise limit on B747-400 aircraft, as about £97 million pa, with about 141107 people pa facing overnight delays, if their flights cannot take-off. (This is calculated on the basis that there are 145 services per week currently scheduled to depart from the London airports after 2200 hours, of which 106 would require night stops if delayed beyond 2300 and assume an 8% chance of such delay; 8.48 flight delays per week.) In contrast, assuming one of these flights per week is at Gatwick and the rest at Heathrow, the number of people liable to be overflown by these aircraft and who could benefit from our proposals each week is 615316[17], nearly 32 million per year.

8.8 The airline costs may be overestimated (see 8.6 above) and the population figures overestimate the number of people that would actually be overflown as not everyone within the swathe of a departure route would be overflown by (or hear the noise of) each aircraft; nevertheless, the ratio of 1 passenger in the sky to 225 persons on the ground who might benefit from a reduction in noise does not seem unrealistic.

9. Summary and Recommendations

9.1 Summary: Some major airlines argue that they will incur disproportionate costs to achieve these small benefits while residents argue is that there should be greater noise reductions, to give greater benefits.

9.2 Recommendations: To implement the proposals, with two modifications:

a) to reduce the night-time noise limit by 2 dB, to 87 dBA as proposed, but to apply it only during the night quota period (2330-0600), retaining the present night-time limit (89 dBA) for the rest of the night period, 2300-2330 and 0600-0700;

b) to implement the new daytime noise limit of 94 dBA from 25 February 2001 but to implement the new night-time noise limit from the start of the next summer night restrictions season (ie from 25 March 2001), rather than between 2 to 3 months from the date of the decision announcement, as was indicated in the consultation paper.

9.3 There are two reasons why we are now recommending that the new 87 dB limit should apply only from 2330 to 0600, with the present night-time limit of 89 dB being

[16] An alternative basis of costing at least the short term effects, would be to consider the costs of paying fines for breaches of the noise limits. In that context, it should be noted that with monitors deployed as proposed only half the potential daytime breaches, but a higher percentage at night, will be detected. This is the 50% monitoring efficiency explained in paragraph 31 of the November 1997 consultation paper.

[17] This is calculated from the population data in Annex 3 of the November 1997 [Appendix X to this RIA] consultation paper. That shows, between 6.5 and 15 km from start of roll, an average population density of 81700 per departure route at Heathrow, 4200 at Gatwick and 6300 at Stansted. As explained in that Annex, it reflects the long term average pattern of runway use at those airports and is therefore not distorted by the differences in population densities east and west of Heathrow or elsewhere.

retained for the balance of the night period. It would ensure greater consistency with the night restrictions regime and it would reduce the problem (and potential costs) that would otherwise arise for operators of the heavily laden services bound for Asia-Pacific destinations that are scheduled to take off in the late evening, which would have particular difficulty in meeting the proposed new night-time noise limit if they were delayed beyond 2300. Giving an extra half hour leeway before the new limit applies would provide considerable assurance to these operators in planning their operations and reduce the costs that they might otherwise incur.

9.4 We also recommend that the new night-time noise limit should be implemented from the start of the next summer night restrictions season (ie from 25 March 2001) rather than between 2 to 3 months from the date of the decision announcement, as indicated in the consultation paper (paragraph 72). This is because the night restrictions apply on a seasonal basis and airlines take this into account when planning their operations, including daytime operations susceptible to being delayed into the night period. It might cause additional scheduling problems and disproportionate costs for these airlines if we implemented the new night-time limit part way through a season. The new daytime limit can be implemented as proposed, within 2 to 3 months of the announcement of the decision announcement. No airline asked for any specific derogation from this, on the lines that we invited them to in paragraph 72 of the November 1997 paper.

9.5 The overall effect of these decisions is to put in place new noise limits and noise monitoring arrangements at Heathrow, Gatwick and Stansted that will apply to all aircraft other than Concorde (and with exemption from the new daytime noise limit for certain specified aircraft until 31.3.2002). This will contribute to the achievement of the Government's objectives set out in the consultation paper and confirmed at paragraphs 7 and 8 of the main decision document.

9.6 The full decision, and the reasons for it, are set out in the document 'Noise limits for aircraft departing from Heathrow, Gatwick and Stansted airports: decision of December 2000'.

10. Enforcement, Sanctions, Monitoring and Review

10.1 The noise monitors are operated by the airport companies, which levy financial penalties on operators of offending aircraft under their charging powers. The current penalties are £500 for exceeding the relevant limit (either day or night) by 3 dBA or less, £1000 for breaches of more than 3 dBA. (The money is normally used for local good causes.)

10.2 As stated in paragraph 69 of the November 1997 consultation paper, the Government expects its proposals, if adopted, to be complied with and for appropriate steps to be taken by aircraft operators to change their operations if necessary to achieve this. The Secretary of State has the power under Section 78(2) of the Civil Aviation Act 1982 to direct that facilities for using the aerodrome should be withheld from operators whose aircraft breach the requirements. However, the Secretary of State accepts that occasional and exceptional breaches of the noise limits, or of the height requirement, would not be expected to lead to sanctions under section 78(2)

and would not necessarily lead to significant fleet management changes. Such breaches would, however, run the risk of financial penalties as described above.

10.3 Proposal i), to be confirmed as part of the decision, is to begin a further review of both monitoring efficiency and the noise limits in 2000, with a view to proposing any further improvements in monitoring efficiency as and when practicable, and new, tougher noise limits, possibly incorporating a differential or tiered effect, as soon as possible after 31 March 2002.

Regulatory Quality

Declaration. I have read the Regulatory Impact Assessment and I am satisfied that a correct balance has been struck.

Signed **CHRIS MULLIN**
Minister for Aviation

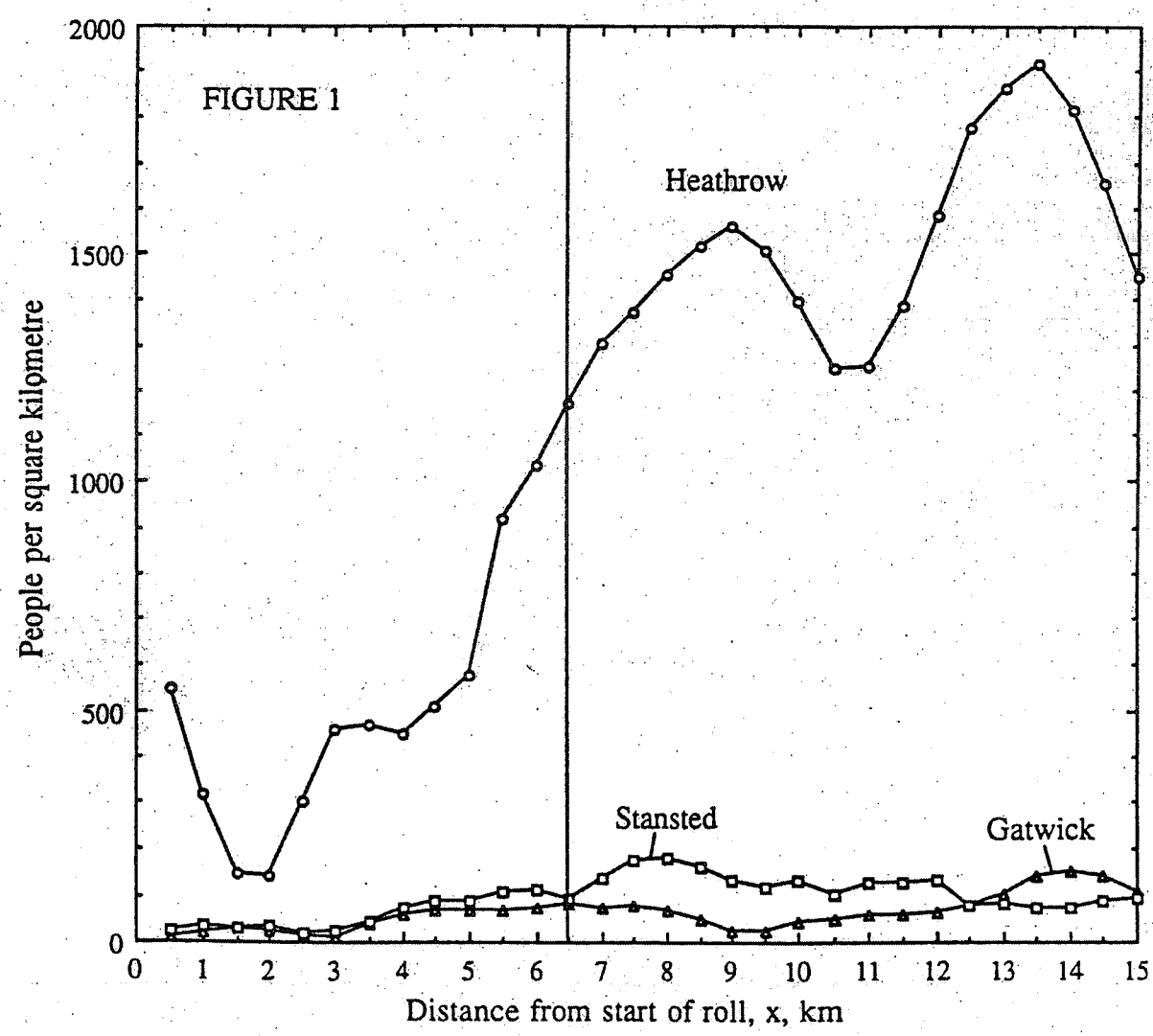
Date ....7 12.00.....

Contact Point: Roberta McWatt, Aviation Environmental Division, Department of the Environment, Transport and the Regions 020 7944 4855

POPULATION AROUND HEATHROW, GATWICK AND STANSTED AIRPORTS

The number of residents affected by the noise of a departing aircraft depends upon the density of poulation beneath its flight path. How this varies with distance along the aircraft departure routes from the three London airports is illustrated in a simple way in Figure 1. For this purpose, departure routes are the mean flight tracks already determined from radar data by DORA for the production of noise exposure contours. The graphs show, for each airport, the variation of population density with distance from start of roll, averaged over all departures, in people per square kilometre[1]. To reflect the long term average pattern of runway use (modal split), the averages are weighted: 75% for westerly departures, 25% for easterlies.

For any individual route, the representative population density at any point is taken as the average within a circle centred on that point. Thus the graph depicts a running average within 'corridors' that follow the curvatures of the mean departure tracks. At points within 5km from start of roll, where aircraft are on the runway or close to the mean flight track, the population averaging radius is 1km. To make some allowance for the greater dispersions of flight tracks further along the route, the averaging radius is increased to 1.5km at points greater than 5km from start of roll. (Provisional flight track 'swathes' of ±1.5km are used for track monitoring purposes in the NTK system.)



[1] These calculations have been performed by DORA using the same computer software developed to determine the numbers of people lying within aircraft noise exposure contours. The population densities are calculated from 1991 OPCS census data broken down into individual postcode cells.

Appendix 2

AEROPLANES EXEMPTED FROM CHAPTER 2 PHASE OUT PROVISIONS WHICH WILL ALSO BE EXEMPTED FROM THE PROPOSED NEW DAYTIME NOISE LIMIT[1]

Aeroplanes Exempted By UK CAA

Operator	Aircraft Type	Registration
GHANA		
MK Air Cargo	DC8F-55	9G-MKA 9G-MKC 9G-MKF
LEBANON		
MEA	B707-3B4 B707-323	OD-AFD OD-AHC OD-AHD OD-AHE OD-AHF
TMA	B707-323 B707-321 B707-327	OD-AGD OD-AGO OD-AGP OD-AGS OD-AGX OD-AGY
PAKISTAN		
Pakistan International Airlines	B707-340	AP-AXG
ROMANIA		
TAROM	B707-3K1C	YR-ABA YR-ABC
SUDAN		
Trans Arabian Air Transport	B707-321	ST-AMF

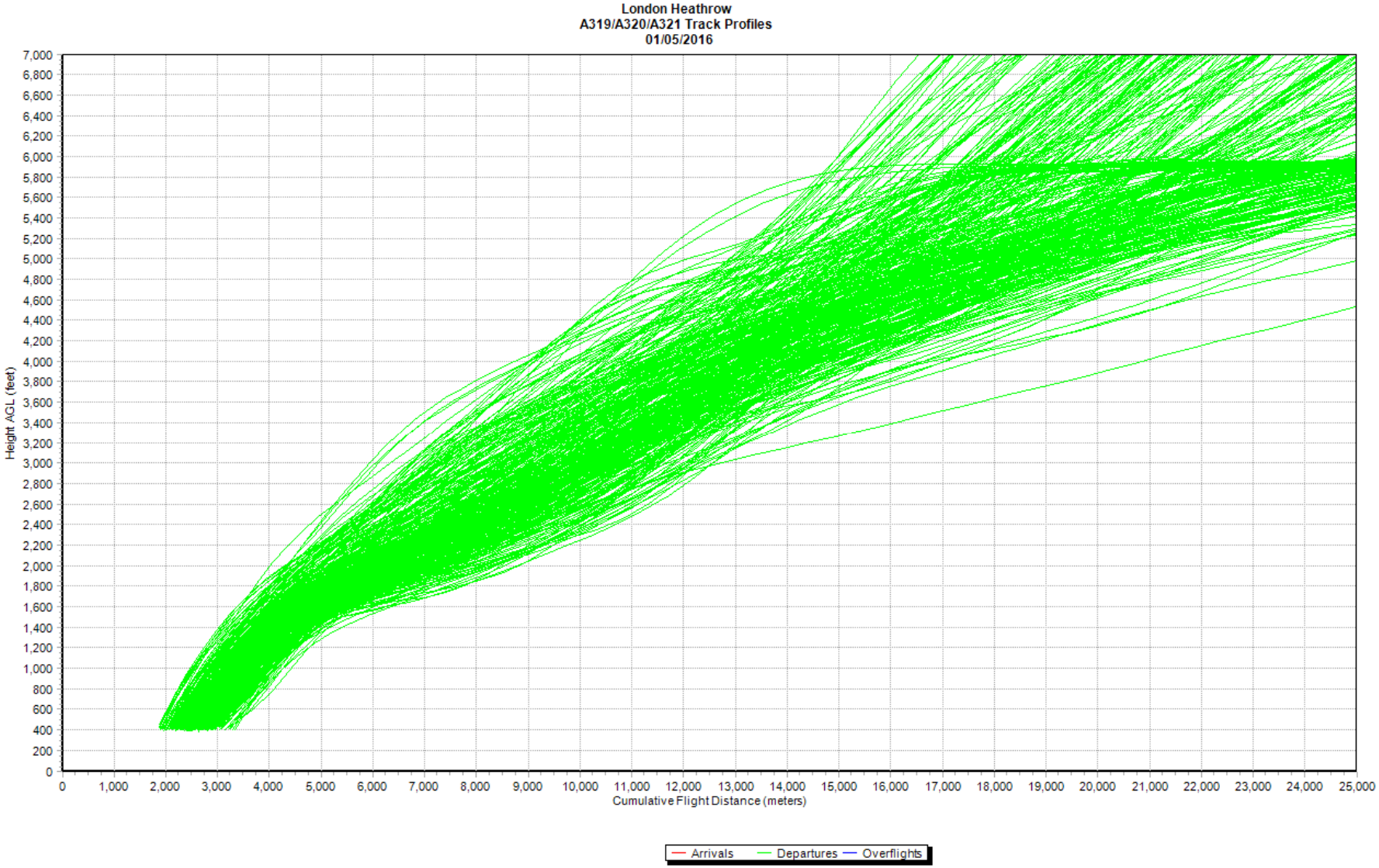
[1] These aircraft will be exempted from the requirement to meet the new daytime noise limit of 94dBA; they will continue to be required to meet a daytime limit of 97 dBA and will also be required to meet the night-time limits of 89dBA (2300-2330 and 0600-0700).

SWAZILAND

African International Airways	DC8F-54	3D-ADV 3D-AFR

UGANDA

DAS Air Cargo	B707-379 B707-351	5X-JEF 5X-JET


London Heathrow
A319/A320/A321 Track Profiles
01/05/2016
Height AGL (feet)
7,000
6,800
6,600
6,400
6,200
6,000
5,800
5,600
5,400
5,200
5,000
4,800
4,600
4,400
4,200
4,000
3,800
3,600
3,400
3,200
3,000
2,800
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1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
0
1,000
2,000
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5,000
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14,000
15,000
16,000
17,000
18,000
19,000
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21,000
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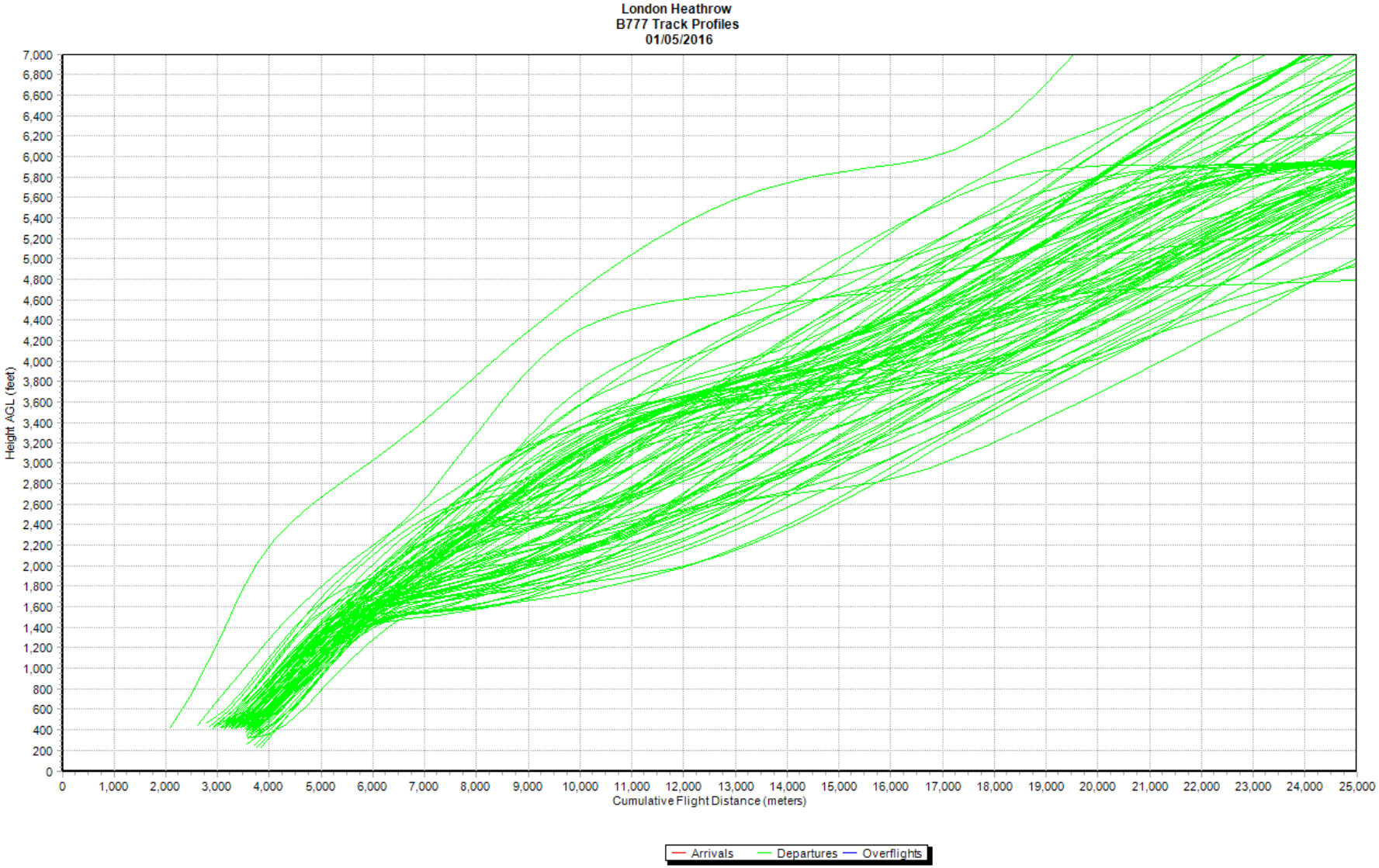
23,000
24,000
25,000
Cumulative Flight Distance (meters)
Arrivals
Departures
Overflights


London Heathrow
B777 Track Profiles
01/05/2016
Height AGL (feet)
7,000
6,800
6,600
6,400
6,200
6,000
5,800
5,600
5,400
5,200
5,000
4,800
4,600
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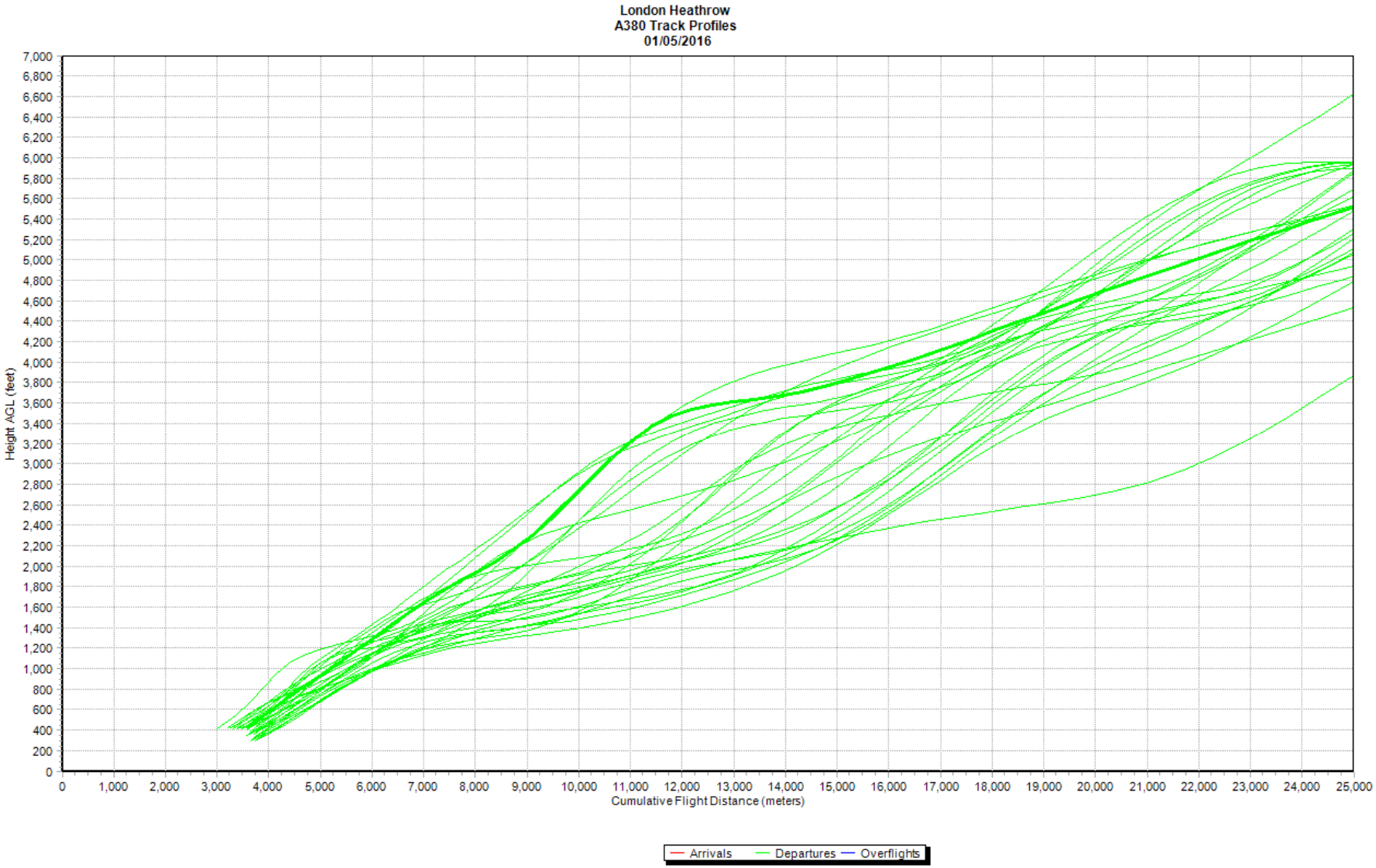
25,000
Cumulative Flight Distance (meters)
Arrivals
Departures
Overflights


London Heathrow
A380 Track Profiles
01/05/2016
Height AGL (feet)
7,000
6,800
6,600
6,400
6,200
6,000
5,800
5,600
5,400
5,200
5,000
4,800
4,600
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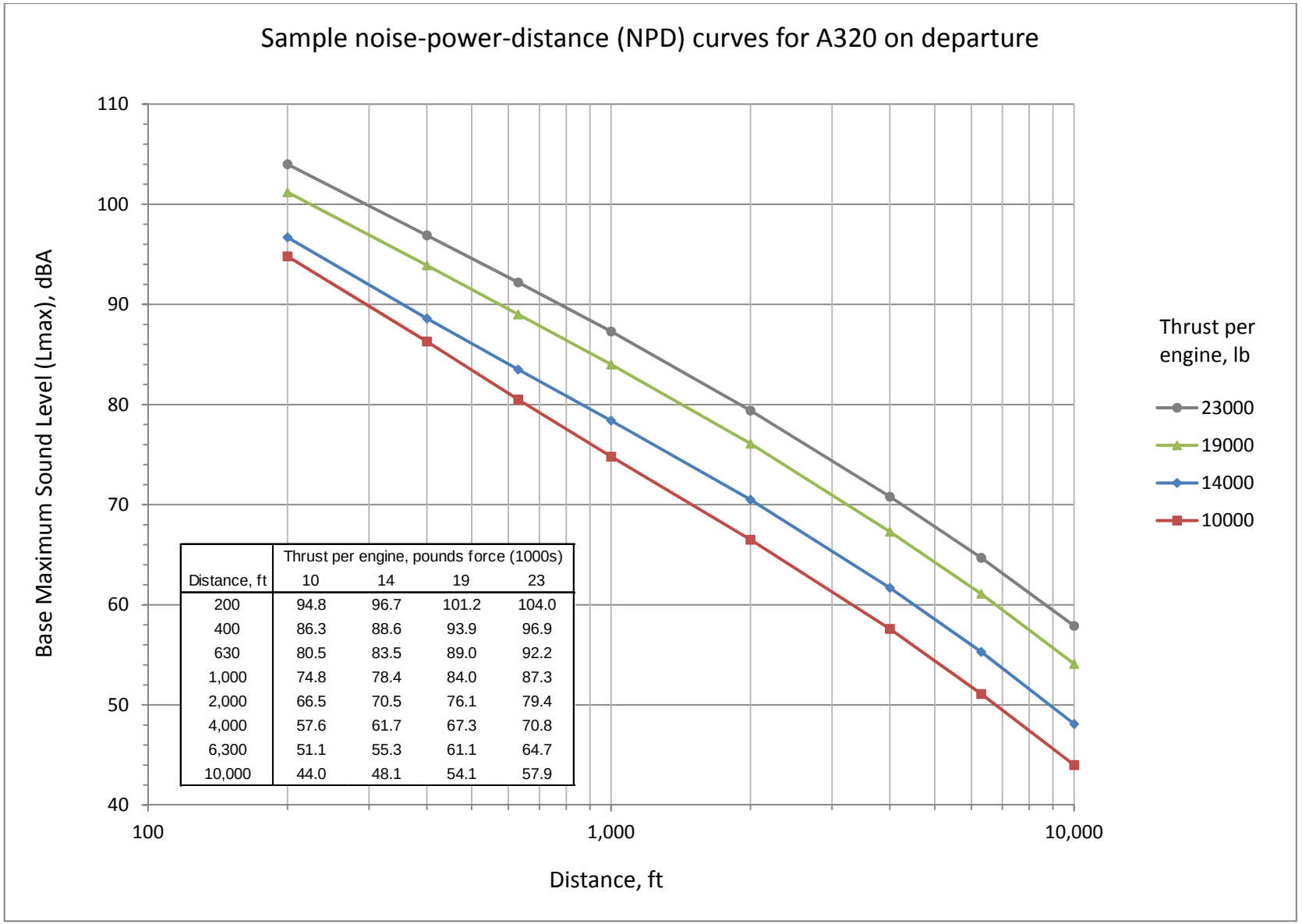
25,000
Cumulative Flight Distance (meters)
Arrivals
Departures
Overflights

Sample noise-power-distance (NPD) curves for A320 on departure



Distance, ft	Thrust per engine, pounds force (1000s)			
	10	14	19	23
200	94.8	96.7	101.2	104.0
400	86.3	88.6	93.9	96.9
630	80.5	83.5	89.0	92.2
1,000	74.8	78.4	84.0	87.3
2,000	66.5	70.5	76.1	79.4
4,000	57.6	61.7	67.3	70.8
6,300	51.1	55.3	61.1	64.7
10,000	44.0	48.1	54.1	57.9