



Night Noise Quotas at Heathrow, Gatwick and Stansted Airports

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Introduction

1. In June 1999, following consultation, the Government announced new restrictions on the numbers and types of aircraft permitted to operate at Heathrow, Gatwick and Stansted airports during the night period. Those restrictions came into effect in October 1999 and remain in force.

2. At the same time the Government announced that it would carry out a review of the "Quota Count" (QC) system which forms part of the present night restrictions regime for those airports. The purpose of the Review was to examine whether stronger incentives should be built into the QC system to ensure that it is as effective as possible in encouraging airlines to use quieter aircraft. The Review also examined the methodology used for calculating the classification of arriving aircraft and the weight limit for jet aircraft that may be classified as exempt.

3. It was the intention when the QC system was introduced in 1993 that it should be long lasting and would be reviewed only if an international or EU-wide system of aircraft classification for night restrictions purposes was in prospect. This recognised the need to provide a degree of certainty for airlines in planning their fleets and future acquisitions and a stable reference for aircraft and engine manufacturers due to the long lead times for developing new aircraft.

4. The present QC system is based on a 1991 analysis of aircraft noise completed before the international agreement was reached on the compulsory phase-out of Chapter 2 aircraft. The composition of the airline fleet has changed significantly since 1993 as a result of the accelerated phase out of Chapter 2 aircraft (completed on 31 March 2002) and the introduction of a new generation of long haul aircraft, such as the Airbus 340 and Boeing 777. A section of the turbo prop fleet has also been replaced by the growing family of "regional jets", which includes the Embraer 145RJ, Bombardier-Canadair 700RJ and BAe-AVRO RJ.

5. The QC system generally has worked well since its introduction in 1993. The QC/2 limit ¹ on aircraft permitted to be scheduled to land or take off during the night quota period (2330-0600) has become a key design parameter for Airbus and Boeing in their development of long haul aircraft such as the new A380. For this sector of the market the London QC/2 limit sets the de facto world-wide noise standard as it is more stringent than the Chapter 4 standard agreed by the ICAO ².

6. The Review was guided by the following principles:

- that the likely benefits from any proposals to strengthen incentives to use quieter aircraft should outweigh the benefits of continuity;
- the quota count should remain proportional to noise energy;
- the system should be easy to operate, simple to understand and fair;
- that care should be taken to avoid unintended outcomes.

7. Progress on the Review was reported to and discussed with members of the Aircraft Noise Monitoring Advisory Committee (ANMAC).

¹ The present QC/2 upper limit is applied on a voluntary basis (between 2330 and 0600) by local arrangement between the airlines and the airport operating companies. A decision on whether to incorporate the voluntary scheduling ban on QC/4s into the formal night restrictions set by the Government remains subject to the outcomes of EPNL-QC Study and this Review of the QC system.

² International Civil Aviation Organisation. The Chapter 4 standard will come into force for newly certificated aircraft types on 1 Jan. 2006.

The present QC System

8. The central feature of the system is that each aircraft is given a quota count (QC) rating (e.g. QC/0.5, QC/1, QC/2, etc.) according to how much noise it makes. Aircraft are classified separately for landing and take off. The data used are the noise certification data: aircraft are required to possess a noise certificate demonstrating their compliance with the appropriate ICAO noise certification standards (the current standard is Chapter 3 and a Chapter 4 standard for new aircraft types will come into effect on 1 January 2006). The data is therefore readily available in almost all cases.

9. The metric 'EPNL' (Effective Perceived Noise Level) is used for noise certification and it is measured in Effective Perceived Noise Decibels (EPNdB). Decibels are logarithmic units and a 3dB difference in noise level corresponds to a two-fold difference in noise energy. So the QC bands increase by multiples of two in step with the 3dB doubling of noise energy principle. The present QC system classifies aircraft into the seven bands:

QC/0	Less than 87 EPNdB, and in the case of jet aircraft, also having a maximum certificated take-off weight not exceeding 11,600kg (Exempt)
QC/0.5	Less than 90 EPNdB
QC/1	90 - 92.9 EPNdB
QC/2	93 - 95.9 EPNdB
QC/4	96 - 98.9 EPNdB
QC/8	99 - 101.9 EPNdB
QC/16	More than 101.9 EPNdB

10. So in principle, an aircraft classified QC/1 is half as noisy as one classified QC/2 and twice as noisy as one classified QC/0.5. However, this is only approximate as an aircraft with noise certification data of say 90.1 EPNdB and classified just inside the lower boundary of the QC/1 band is not twice as noisy as one certificated at 89.9 EPNdB and classified just within the upper boundary of the QC/0.5 band; in fact the 0.2dB difference would not be perceptible to the human ear, whereas for most people a 3dB difference (the width of each band) would be. By the same token, aircraft rated at 90.1 and 95.9 EPNdB would differ by 5.8dB, representing almost a four-fold difference in noise energy.

11. In addition the bottom (QC/0) and top (QC/16) bands are open ended and therefore do not hold true to the 3dB doubling of noise energy principle. However, in practice this does not detract from the proper functioning of the system because all aircraft classified as QC/0 are exempt from the restrictions and those classified QC/8 or QC/16 are not permitted to be scheduled to operate between 2300 and 0700 at all; in effect they are banned.

12. The utility of the QC system is that it allows night flights to be individually counted against a noise quota (in effect a noise budget) according to the QC rating (i.e. the noisiness) of the aircraft used. The noisier the aircraft used the higher its QC rating and the fewer that can be operated, thereby also providing a built-in incentive for airlines to use less noisy aircraft where practicable. Airlines are allowed to decide which aircraft to use according to their operational needs, but whether they use for example, 5xQC/2s or 10xQC/1s or 20xQC/0.5s or a combination of these, the sum of the noise energy permitted by the quota remains the same. This does not mean that the numbers of people likely to be disturbed is necessarily the same.

13. Sleep research carried out in this country and abroad shows that the less noisy an aircraft is the lower the chance of an average person being woken up. For example, the 1992 Field Study ³ found, that for:

"...outdoor noise levels below 90dBA SEL (80dBA Lmax) ⁴, average sleep disturbance rates [all causes] are unlikely to be affected by aircraft noise. At higher [noise] levels, and most of the events upon which these conclusions are based were in the range 90 to 100 dBA SEL (80 to 95 dBA Lmax), the chance of the average person being wakened is about 1 in 75."

14. That and earlier research shows that several relatively quiet aircraft are likely to disturb fewer people than one much noisier one, which forms part of the rationale for the QC system and in particular for the quietest aircraft (classified QC/0) being exempt from the restrictions.

Aspects of the QC System examined

15. The following aspects of the QC system were examined:

- The relationship between the movement limits and noise quotas
- Extension of the QC scale and review of the weight limit for jet aircraft
- Renumbering the QC bands to whole number values
- Introducing a maximum passenger limit for exempt aircraft
- Setting average QC targets
- An unbanded QC scale
- Methodology for calculating the QC classification of arriving aircraft

The relationship between the movement limits and noise quotas

16. It would be possible to increase the incentive to use quieter aircraft and to bring about improvements in the night noise climate solely through progressive reductions in the noise quotas phased over a period of 5 years or longer. However, the Review also examined the important relationship between the movement limit and the noise quota, as this can be key factor in incentivising the use of quieter aircraft.

17. When the QC system was devised in the early 1990s it was envisaged that the 'then current' regime of night restrictions consisting solely of movement limits would be replaced by the new regime consisting solely of noise quotas; that is, there would not have been a specified ceiling on movement numbers, although movement numbers would in practice have been limited by the noise quota. This proposal was challenged in the High Court in 1993 by the London Borough of Richmond and others. The Court ruled that it would be outwith the Secretary of State's powers (under section 78 of the Civil Aviation Act 1982) to set restrictions that did not specify a limit on the numbers of movements permitted to operate. The Government therefore reconsulted on modified proposals consisting of movement limits supplemented by noise quotas. It is essentially that regime which is in place today, although changes were made in 1999 to some of the noise quotas and to several other aspects of the regime.

18. However, the Court's requirement that a limit had to be set on the number of movements permitted to operate, together with the Government's decision to proceed with the noise quotas, introduced an important new dynamic; this was the functional relationship between the restored movement limit and the noise quota. The efficiency of the noise quota in incentivising airlines to use the quietest aircraft (in each particular role) depends on this relationship. For this reason the relationship between the movement limit and noise quota was examined for each airport.

19. There are different patterns of night movements at each airport and different types of aircraft predominate. The average QC score per movement at Heathrow fell from a level of 1.8 in 1993-95 to about 1.5 in 1996-98. It rose again to over 1.7 per movement in 1998-99 before briefly falling again to about 1.6 in 2000, but has since risen again to over 1.7 in summer 2002, almost to the same level as 1993-95. At Gatwick the average QC score per movement in 1993-95 was about 1.1 and rose to over 1.2 in 1996-97 before falling to about 0.8 today. At Stansted it was approximately 1.0 in 1993-95, which it remained close to for most of the intervening period but has also fallen to about 0.8 today.

20. There are distinctive operational factors at each airport that contribute to these different outcomes, including the higher proportion (among a relatively small number of movements) of long haul traffic in the night quota period at Heathrow. However, the different functional relationship at each airport between the noise quota and the movement limit is also an important factor. In recent years at Gatwick and Stansted during the longer summer season ⁵ (the more important season for charter airlines for obvious reasons), the noise quotas have been the more stringent control measure having most influence on airlines' decision making ⁶, whereas at Heathrow it has been the movement limit.

Heathrow

21. At Heathrow the winter season movement limit is the component of the package of restrictions that most often comes under pressure (largely a consequence of differences in the time zone relationship between London and SE Asian cities where daylight saving is not generally operated, unsynchronised adjustments for daylight saving purposes in Europe and North America, as well as some weather related factors). The winter season movement limit is virtually always fully used and is sometimes exceeded within the parameters allowed for end of season flexibility (these allow a transfer of up to 5% of the summer season movement limit). The winter season noise quota was also exceeded by 3% in winter 2001/02 (by means of a similar transfer).

22. It is possible that the higher average QC per movement at Heathrow is entirely attributable to the operational factors (including the high proportion of long haul flights), but it is also wholly consistent with the expectation that the incentive to use quieter aircraft would be weaker where the noise quota is less stringent than the movement limit, because airlines have less incentive to reduce the amount of noise quota used per movement.

23. Airlines using the majority of the Heathrow noise quota for early morning arrivals have within their existing fleets 'suitable' long haul aircraft that could reduce the average QC score per movement from the current level of 1.7 to about 1.0. The strong environmental case for using these quieter aircraft is that they would disturb the sleep of fewer people. However, there are also strong economic counter arguments for allowing use of the noisier aircraft which are given added strength by the stringency of the movement limit.

24. The airlines could be obliged to use the less noisy aircraft, first by reducing the noise quotas to the level of use in 2001/02 and then progressively reducing them further to the point where the current movement limit could no longer be fully used if the average QC per movement exceeded 1.0 for example. However, there would be an economic price to pay for doing this; by the airlines, by the users of these important air services and by the economy generally, because the less noisy aircraft also carry fewer passengers and less cargo. The reduced capacity could be expected to lead to business being lost to competing carriers using less restricted airports at Amsterdam, Paris and Frankfurt (which, are one hour

ahead of London and have a local time advantage in the morning, but also a one-hour disadvantage in the evening).

25. Heathrow is the principal UK hub airport for long haul inter-continental traffic. As most of these services rely on heavy wide body aircraft, the average QC per movement is likely to remain higher than for Gatwick and Stansted. Reductions in the noise quota would need to take account of this difference and care would need to be taken to ensure that there was not a serious impact on the competitiveness of Heathrow as an international hub airport.

26. The Review therefore considered whether there was an alternative which would allow the airlines to use more of their quieter aircraft at night without foregoing capacity.

27. The Boeing 747-400 is the largest long haul passenger aircraft in service today. Although it continues to be manufactured in limited numbers, it is a relatively noisy aircraft based on a 1960s design and it largely accounts for the relatively high average QC score per movement at Heathrow. The B747-400 typically has about 400 seats (depending on airline configuration) and is rated QC/2 on arrival ⁷. Many airlines use it in order to maximise the number of seats they can offer on each of the strictly limited number of night movements permitted at Heathrow (i.e. compared with movement numbers permitted at Paris, Frankfurt and Amsterdam), and arguably they are also encouraged to do this by the amount of noise quota available per movement. In short, the Heathrow noise quota is not incentivising the use of the quietest suitable aircraft as effectively as it could, and may possibly be doing the opposite due to the present relationship with the more stringent movement limit.

28. Alternative quieter long haul aircraft include the Boeing 777 and the Airbus 340, mostly rated QC/0.5 on arrival. Two of these aircraft typically have a combined capacity of around 660 seats, over 50% more than that of a single B747-400 (depending on airline configuration) and a combined QC on arrival half that of the one B747-400 (rated at QC/2). If the movement limit were raised, airlines could carry more passengers, using more fuel efficient aircraft with lower seat operating costs and lower emissions per passenger/km, and at the same time produce significantly less noise and disturb fewer people, as illustrated below.

29. Drawing on the sleep research ⁸ published in 1992, and applying the findings to the population living within the 90dBA SEL arrival noise footprints of the B747-400 ⁹ and the B777-200, it is estimated that one B747-400 using the most densely populated westerly approach track into Heathrow would wake up about 353 people and the two B777s about 198 people (fewer if the two B777s or A340s landed in close succession).

30. The next major consultation on night restrictions would provide an opportunity to seek views on the possibility of progressively reducing the Heathrow noise quotas, initially to remove surplus quota, followed by further small reductions in step with small increases in the movement limits. It would be necessary to calibrate the changes carefully and also give sufficient notice of changes. The aim would be to bring about at Heathrow a position where the noise quotas also become an effective constraining measure (as they have been to good effect at Gatwick and Stansted in recent years), to increase the incentive for airlines to use quieter aircraft at night (i.e. with a lower average QC score per movement) and thereby reduce interference with sleep, but without loss of capacity.

Gatwick

31. As a result of the decisions taken in June 1999 the Gatwick noise quotas have been slowly reducing since 2001 as follows:

Winter	QC points	Summer	QC points
2000-2001	6820	2001	9550
2001-2002	6680 (-2%)	2002	9060 (-5.1%)
2002-2003	6660 (-0.3%)	2003	9030 (-0.3%)
2003-2004	6640 (-0.3%)	2004	9000 (-0.3%)

Conclusion

81. The Review has shown that there is the potential, through modification of the Quota Count system, to increase the incentives for airlines to use quieter aircraft at night. Some of the ideas explored may be considered too radical to be taken forward in the short term and others may not win sufficiently wide support. The consultation on the next night restrictions regime should offer an opportunity to present to a wider audience the potential benefits and disbenefits of the different options examined in this paper, and to invite views upon them.

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