Evidence to the Airports Commission from the Aviation Environment Federation

Comments on Discussion Paper 05: Aviation Noise

31.8.13

The Aviation Environment Federation (AEF) is the principal UK NGO concerned exclusively with the environmental impacts of aviation. Supported by individuals and community groups affected by the UK's airports and airfields or concerned about aviation and climate change, we promote a sustainable future for aviation which fully recognises and takes account of all its environmental and amenity effects. As well as supporting our members with local issues, we have regular input into international, EU and UK policy discussions. In 2011 we acted as the sole community and environmental representative on the Government's South East Airports Taskforce. At the UN we are the lead representative of the environmental umbrella organisation ICSA, which is actively engaged in the current talks aimed at agreeing global climate measures for aviation.

1. Summary

1.1 Current levels of aviation noise are in many cases unacceptable. It would be a mistake for the Commission to consider noise only in terms of which of the various expansion options is the least bad. Instead, it should seek to develop an intellectually robust approach to noise management including setting out appropriate limits. Short, medium and long-term proposals under consideration by the Commission should be tested against how well they can tackle the current noise problem.

1.2 The Commission should recommend to Government that notwithstanding its retention of the 57Leq marker for significant annoyance, the Government should regard the WHO recommendations for the protection of public health from excessive noise as long-term goals and should set out a pathway for achieving them. As above, proposals under consideration by the Commission should be tested against their ability to deliver this aim and in particular, should be ruled out if they would either exacerbate noise at airports currently in breach of the recommendations or would prevent noise from falling to within safe levels.

1.3 The Commission should consider the use of additional noise metrics that more accurately reflect the findings of recent research, including research on health impacts. 'Number above' contours, as described in the Commission's paper, could for example be used in the definition of night noise limits, alongside the WHO's recommended Lnight metric.

1.4 Improved aircraft technology, better land use planning and improved operational procedures all offer some opportunities for helping to tackle the noise problem. But all have limitations and cannot be relied on to make noise reductions that would be sufficient to compensate for any overall increases in aircraft movement numbers.

Our response to the Commission's noise paper begins by setting out our views on what we regard as the key topics and goes on to address the Commission's questions specifically.

2. The importance of quantitative noise objectives

2.1. When AEF first formed in the 1970s, noise was regarded as the key environmental impact of aviation. While our work programme has evolved significantly since then, noise remains the dominant concern for the large majority of our members, and our participation over the years in a range of UK, EU and global policy discussions in relation to noise, including representation on behalf of ICSA at the UN ICAO's Committee on Aviation Environmental Protection (CAEP) leaves us well-placed, we believe, to respond to the Commission's consideration of aviation noise.

2.2. There are some significant policy differences between noise and climate change in terms of the Government's approach, of which the most significant is that while in the case of CO2 emissions, the UK is legally committed to a clearly defined, quantitative objective (namely to cut emissions by 80% of 1990 levels by 2050), no similar targets have been adopted for noise. We are pleased that you refer in this paper to the WHO guidelines on the protection of public health in relation to noise. While we accept that currently these guidelines may seem so out of reach that it must be tempting to ignore them, we consider the WHO work to be much more strongly evidence-based than the current patchwork of noise policy, and we suggest both that the Commission should use them as a reference base, and that you recommend to Government their adoption as long-term targets. Section 4.21 of your paper suggests that the WHO 2009 Guidelines were published in response to a single study by the German National Aeronautics and Space Research Centre. In fact, the guidelines are the result of a long-term work programme reviewing a very wide range of available evidence, and 24 full pages of references are provided.

2.3. In the present situation:

- The objective to 'limit and where possible reduce' aviation noise is effectively meaningless as it lacks either quantitative targets or baseline reference points to protect health, prevent annoyance, or tackle existing noise problems, and does not prevent an increase in noise
- The reference point of the 57 Leq contour, as noted in your paper, has been widely discredited as a threshold to reflect those significantly annoyed by aircraft noise, being based on a study published more than 30 years ago and not verified by more recent research suggesting both that people are affected by noise at lower levels than in the past and that Leq cannot tell the whole story on annoyance
- The retention in Government policy of 69 Leq as the point at which airports should provide assistance with the cost of moving away, and of 63 Leq as the level at which compensation should be provided have no valid evidence base

2.4 Aviation is currently exempt from noise nuisance law. As the impact of aircraft noise has historically been described in terms of annoyance, it has therefore been difficult for any successful claims to be brought against an airport as a result of noise impact, regardless of its severity[1]. But the growing body of evidence in relation to the health impacts of aviation noise could imply a legal duty on the state to protect people from harm. While significant uncertainties remain in relation to the specific 'dose-response relationship' between noise and some health effects, the evidence is now sufficiently strong not only for the WHO to have issued the guidance to which you refer, but also for the UK Government's Interdepartmental Group on Costs and Benefits (the IGCB(N)) to conclude in its recent advice to the Department for Transport in relation to night noise that "the science is mature enough to include monetary estimation of the effects of sleep disturbance and acute myocardial infarction. Evidence is due to be put to the Committee that the science has developed sufficiently also to include monetary impact of noise on hypertensive strokes and dementia and hence the methodology has been included here for completeness."

2.5 While noise from aviation does not necessarily lead to a given health impact, it is clear from the conclusions of the detailed review of evidence undertaken by WHO Europe and by IGCB that aviation noise significantly increases the risk of certain conditions, notably heart attack and sleep disturbance, the latter of which in turn increases the risk of a wide range of health impacts. In terms of public policy, in order to avoid future legal liability for such impacts, it may soon be necessary to take measures to limit aircraft noise with reference to health impact risk assessments rather than annoyance. Currently, public exposure to the risk of aircraft crashes is managed through Public Safety Zone policy, which limits increases in population around the ends of busy runways. We would encourage the Commission to undertake, perhaps in collaboration with the CAA's ERCD, a consideration of how the risk posed by noise compares with that posed by aircraft crashes and what kind of public policy response to recent evidence would be appropriate.

2.6 To consider another example, just as action would be taken to prevent people from facing unacceptable risks from radioactivity or hazardous chemicals (rather than allowing people the opportunity to choose whether or not to take on this risk), so the public may in future expect to be protected from unacceptable noise risk.

3. Is there a noise problem today?

Yes. A wide range of evidence suggests that noise is a significant concern at airports around the UK. As pointed out in your paper, WHO in 1999 indicated that serious annoyance from environmental noise begins at around 55 Leq 16 hr, and recommended a night noise limit of

[1] In 2001, eight members of the community group HACAN made a successful claim in the European Court of Human Rights that their rights under Section 8 of the Human Rights Act to peaceful enjoyment of their homes were breached by night flights. But in 2003 the UK Government successfully appealed, with the Grand Chamber ruling that while night flights could cause a breach of a human rights, the responsibility of Government was to balance the interests of the residents under the flight path against the competing interests of the national economy, the profitability of British Airways, and the convenience of passengers.

45 Leq 8 hr outside bedrooms, and 60 dBA LAmax FAST. In 2009, WHO Europe recommended that for the protection of public health, noise should not exceed 40 dB Leq at night, with 55 Leq being a valuable interim target. At Heathrow, as you also note, 258,500 people are annually exposed to noise levels of 57 Leq 16 hr. We are not aware of any assessment of the number affected at 55 Leq. Night noise is not even mapped to the level recommended by WHO, but more than 200,000 people are affected by noise of 50 Leq or above at night at Heathrow, according to the Defra noise mapping site.

3.1. As noted in our section 2.5 above, legal protection for aviation leaves very few channels through which affected individuals can take their own action with respect to noise nuisance from aircraft. Prevention of harm from noise therefore requires either voluntary action by airports or public policy measures.

4. Is it likely that future airport expansion will be resisted on the basis of noise concerns?

4.1. Absolutely. Noise was one of the key reasons for the cancellation of the previous Government's plans for a third Heathrow runway, and has been an important motivation for the protracted and committed battles fought by local communities against expansion at both Stansted and Gatwick. In Frankfurt, noise concerns now bring thousands of protesters to the airport weekly calling for the closure of the airport's fourth runway, which opened in October 2011.

4.2. The absence of any long-term noise targets creates uncertainty for residents who fear piecemeal and incremental developments without any overall framework to limit noise.

5. How then can we characterise the current and potential problems from aviation noise?

5.1. The Commission presents evidence of several important characteristics of the current noise situation:

5.1.1. In many cases noise contours, as measured in Leq, have been shrinking in terms of the area covered. This is clearly the case for Heathrow, as illustrated in Annex C. The paper also points out, however, that the number of people exposed to noise of 57 Leq or greater has in some cases increased. Table 2.1 provides a snapshot of the number of people exposed to noise of 57 Leq or greater at the UK's largest airports in 2006 and Table 3.5 builds on this list.

It is worth noting both that this single year may not be representative in all cases, and that it is not always the biggest airports in terms of number of movements that affect the largest numbers of people. We are aware that at Belfast City Airport, for example, in 2010 that over 11,000 people fell within the 57 Leq contour[2], and the airport has submitted a planning application for expansion that would result in both

[2] Published in analysis for the airport by consultant Bickerdike Allen Partners, made available to us by an AEF member organisation

the area of the contour and the number of people within it rising significantly, yet the airport does not even make it onto the list used in tables 2.1 and 3.5.

5.1.2. An overall pattern of shrinking Leq contours is, however, likely to continue in future such that it will be possible either for aviation to expand without an increase in overall Leq or, if aviation were to stay at today's levels, for the Leq exposure to decrease. On this point the Sustainable Aviation noise road map is accurate, we believe, if the lower growth rates in traffic projected in the UK (based on the Dft forecasts) are accurate. This is in contrast with European and ICAO noise forecasts that show an increase in noise exposure levels given the same technology uptake but higher growth in demand.

5.1.3. People are significantly annoyed by noise at lower Leq levels than was the case in the past. AEF was part of the ANASE process, having held a seat on the Steering Group, and we agree with the Commission's assessment that notwithstanding the concerns expressed by some peer reviewers in relation to the study's use of the 'stated preference' approach to cost benefit analysis "generally accepted is its conclusion that more people are now annoyed by a given level of aircraft noise exposure than they were when ANIS was conducted." This finding reflects both the noise experience reported to us by our members, and the conclusions of numerous other European studies. This pattern appears to be exclusive to aviation noise and does not apply to other sources of transport noise such as road and rail where the relationship between noise and annoyance has remained more constant over time.

5.2 A fourth point comes across less explicitly from the Commission's analysis (though we warmly welcome the detailed consideration provided of alternative noise metrics), namely that

5.2.1 In understanding current and future levels of annoyance and health risk from noise, we cannot rely on Leq as a sole measure.

5.3 As noted in your report, a 3 dB increase in Leq allows for a doubling of aircraft movements. Thus use of the Leq metric implies that it is possible for movement numbers to increase significantly with only small changes in Leq, even if each aircraft movement is loud enough to cause awakening, for example. Our members have been telling us for some time that Leq does not accurately capture their experiences of noise, and the CAA ERCD report of the work of the IGCB(N) work, published alongside the DfT night Stage 1 night noise consultation, provides some more formal evidence of the need for alternative additional noise measures:

5.3.1 Some noise studies, particularly those undertaken in the USA, have found that for night noise, the most significant factor in terms of the likelihood of awakening is the presence of absence of a single flight with SEL above a given threshold rather than cumulative noise exposure. The work by Fidell in 1995 falls into this category and concluded that Lnight was not a valid predictor for awakening. Similarly Finegold in 2010 proposed a dose-response function based on the SEL of each event. This supports the community viewpoint that respite is preferable to marginally-quieter aircraft.

5.3.2 Basner et al in 2010 undertook work on sleep fragmentation. While the results gave support to the WHO's recommended and interim targets given in 2009, it also looked at the number of noise events correlating with a given Lnight. At 55 dB Lnight the number of awakenings was found to vary between just over 100 (at 20 noise events) to nearly 400 (at 100 noise events).

5.3.3 Jansenn in 2011 also undertook work on the number of aircraft events and motility during sleep and suggested that there may be a greater public health advantage in reducing the number of noisy events than with reducing average noise.

5.4 We recognise that after consultation, the Government decided to keep 57 Leq as its measure for the onset of significant community annoyance, despite the fact, highlighted in your paper, that the majority of respondents to that consultation felt that it was outdated and no longer valid. Clearly the Commission must be guided by the aviation framework given by the Government. Nevertheless, there is nothing to prevent the Commission from proposing that additional metrics be used alongside the 57 Leq contour for assessing the noise impacts of airports proposals, especially given the Government's recommendation in its final aviation policy that airports should consider the use of such metrics when communicating about noise to the local population.

6. How should we mitigate noise?

AEF, through our participation as ICSA representative on CAEP, is familiar with the ICAO 'balanced approach' to noise mitigation, to which the UK is committed, and we comment below on each of the four 'pillars' of this approach. Overall, while there are various ways in which noise can and should be more effectively tackled through the approaches considered below, there are significant limitations to the extent of noise improvement that we can expect to come through improved technology, better land use planning, or improved operational procedures.

6.1. *Reduction of noise at source*

We agree with the Commission's view that aeronautical improvements to date in relation to noise performance have made more of an impact on take-off noise than on landing noise. We agree also with the assessment that while improvements in noise performance are still anticipated, they are likely to slow after 2020, and we note that ICAO predicts an overall increase in noise exposure from aviation at the global level.

While the noise certification process has had some positive effect in terms of ensuring that noise remains an important factor in the minds of manufacturers who might otherwise focus on reductions in fuel burn, two weaknesses have prevented the system from being more effective in tackling noise:

6.1.1 First, ICAO's assessment process for setting standards includes a requirement that potential improvements are technically feasible. For this reason, the standards imposed have always followed the development of a given technology rather than being used to drive such development resulting in limited advances in stringency.

The most recent decision at ICAO's CAEP 10 meeting in 2013 recommended a new stringency that improved upon the previous standard by 8 EPNdB measured across 3 measurement points (i.e. based on a cumulative reduction). Prior to this decision, the Chapter 4 standard agreed in 2001 (but taking effect in 2006) improved upon Chapter 3 by a cumulative reduction of just 10 EPNdB (Chapter 3 being agreed in 1977).

6.1.2 Second, new noise standards do not apply retrospectively to aircraft already in the fleet. The agreement of the Chapter 4 and 5 standards has been accompanied by a decision not to retire older, non-compliant aircraft. Without doubt, one of the most significant impacts on noise exposure levels at airports came from the phase-out of Chapter 2 aircraft, but there has been little international appetite to extend this to Chapter 3 aircraft.

6.1.3 With appropriate commitment from all parties, more could be done through the noise certification process to reduce noise at source. The effectiveness of this approach is likely to remain limited, however, by the fact that small reductions in the noise emitted from individual aircraft, while they can significantly reduce an airports Leq footprint, may not be sufficient to prevent annoyance and disturbance, particularly if offset by increasing flight numbers.

6.1.4 Europe has set ambitious technology goals for the future in the form of ACARE and Flightpath 2050. Whether long-term goals can be met whilst simultaneously addressing the need to develop cleaner aircraft is unclear, but the long lead times needed to bring radical new technology to the marketplace and for it to enter the fleet means that it will be several decades before any new technologies can make a meaningful contribution. Some technology proposals may also create new noise issues. Open-rotor aircraft, even if they comply with current noise standards, are likely to have unique tonal characteristics that could generate noise disturbance.

6.2 Mitigation through land-use planning

We share the Commission's concern about the number of people newly exposed to noise as a result of land-use planning decisions, while recognising that local authorities are under increasing pressure to provide adequate housing with limited opportunities to identify suitable sites that are quiet. PPG 24 previously provided guidance to planning authorities on how to treat applications for residential development close to transport noise sources but its application was not mandatory. Furthermore as noise contours shrank, development often occurred up to the boundary so any future increase in noise affected a larger population.

6.3 Mitigation through operational procedures

We agree with the Commission that operational measures are likely to have a limited impact on the number of people affected by noise. However, we support efforts to trial new approaches, which may bring localised benefits.

In 2010, AEF was commissioned by HACAN to provide an analysis of the noise problems potentially associated with a simple policy of noise concentration, and of the opportunities for possible alternative approaches to noise management at Heathrow. The report, *Approach noise at Heathrow: concentrating the problem*[3], argued that:

- Significant noise concerns exist beyond the 57 Leq contour.
- The use of operational restrictions at EU airports as a means of improving the noise environment has been limited, and EU policy on noise mapping and action plans has been largely ineffectual.
- Looking at Heathrow in particular, an increased use of Continuous Descent Approach, generally presented as a noise benefit, has led to a greater concentration of arrivals over Southwark, Wandsworth, Lambeth and Greenwich boroughs, as a result of its tendency to lead to greater convergence on a single centreline. These were all areas that lay outside the 57 Leq contour for Heathrow for 2008 but in which significant community annoyance was apparent to us from residents' concerns. Possible alternatives include curved or advanced CDAs, which would allow greater flexibility with respect to avoiding densely populated areas, and the use of more than one CDA approach path, with varied entry points, for each runway.
- Steeper approaches, with an initial descent undertaken at 2 degrees and then the final descent at between 3-4 degrees, may be feasible and could deliver noise benefits.

We are pleased that subsequent to the report's publication the CAA has indicated that it is undertaking work to assess whether the very small increase in risk associated with steeper approaches is outweighed by the potential environmental benefit. And we welcome the fact that Heathrow airport has agreed with local community representatives to trial a system whereby a degree of alternation is provided by routing aircraft along alternative paths within the existing NPR, to test whether or not this provides any valuable respite from departure noise.

6.4 Mitigation through operational restrictions

EU Directive 2002/30/EC gave airports new powers to impose noise -based operating restrictions. However, since it came into force in 2002, few airports have voluntarily imposed operating restrictions and only one airport has applied the phase-out of marginally

[3] http://www.aef.org.uk/uploads/Approach_Noise_at_Heathrow_Concentrating_the_Problem.pdf

compliant aircraft. Airport operators have no shortage of tools to manage noise, including powers to levy financial penalties and charges as well as operational restrictions where justified. But while it may appear coherent to take action on an airport-by-airport basis by limiting action to airports with, or anticipating, a noise problem, the Directive gives no guidance on what constitutes a 'problem' and sets no thresholds above which airports must take action. As a result, the Directive succeeds only in harmonising a process without requiring common and equivalent action for all airports. The response by airports to a European Commission survey reviewing the effectiveness of the policy provides evidence of this, with both a low level of implementation and with some airports specifically citing competition as a reason for not proceeding.

This Directive is subject to review and amendment as part of the Airports Package. While the proposals will allow an increase in the number of marginally-compliant aircraft that can be phased out, they also contain some worrying additions including a "call-in" power for the European Commission that could be used at the request of non-EU countries to scrutinise the case for operating restrictions. Furthermore, there is a proposal to drop the definition of "city airport" which noted that special consideration should be given airports operating in very close proximity to city centres, such as Belfast City and London City.

6.5 Directive 2002/49/EC on noise mapping and action plans has similar shortfalls. Without specifying common thresholds for action, and making the airports the competent authorities for fulfilling the Directive's requirements, it is unlikely that any airport will produce a Noise Action Plan that goes beyond existing noise arrangements.

The enforcement of operational restrictions such as night flight bans through the planning system, by contrast, is in our view one of the most effective means of controlling aircraft noise impacts, providing long term assurance to communities. Noise envelopes could similarly include operational restrictions; definition of an envelope only in terms of an Leq footprint would be much less effective.

7. Mitigation and monetisation

Construction of a new runway anywhere in the UK would be likely to trigger claims under the Land Compensation Act, as for example was the case when a second runway was constructed at Manchester. But the scope for using financial measures to tackle noise impacts is much wider, and should, in our view, reflect the fact that noise at current levels is in many cases unacceptable.

There are two possible approaches to monetising environmental effects, as can be illustrated by considering the policy approach to climate change.

(i) Damage costs

Prior to the development of the EU Emissions Trading System and similar market mechanisms, emissions costs were generally estimated according to the cost of the damage likely to be caused by climate change, for example in terms of lives lost, properties damaged,

increased disease levels and increased flood risk. So far, academic and official estimates of aviation noise cost have all, as far as we are aware, taken this approach, whether in terms of the impact on house prices of being near an airport or, as with the recent work by the CAA's ERCD for the DfT, the cost of damage to human health as a result of aircraft noise.

(ii) Abatement costs

In the case of noise, lack of any targets at either EU or UK level means that no official estimates of abatement costs have, to our knowledge, been calculated, although some airports have introduced insulation programmes to reduce indoor noise exposure with costs often recovered from airlines using noise-related landing charges.

AEF's preference would be for any approach to the monetisation of noise impacts to prioritise the setting of health-based targets over a defined period, with noise cost then determined by the cost of achieving these targets. This could be the cost of

a. introducing new technologies or mitigation procedures as considered above,

b. reducing the noise effect to the required safe level (through double glazing with appropriate ventilation systems, re-siting properties, or organising regular trips to quiet places for schoolchildren for whom outdoor learning is made difficult or impossible in their playgrounds as a result of aircraft noise[4]), or

c. using noise charges to bring aviation activity to within target-compatible levels.

Should the Government continue to avoid setting noise targets, however, we would support the use of evidence-based damage cost estimates for noise that take account of the impacts on human health and wellbeing, as well as on property prices (which may not accurately reflect costs given a lack of adequate understanding about likely noise impacts on the part of people making purchases). The money raised could be used for targeted mitigation measures, such as those outlined in point b above, or alternatively for direct periodic compensation to those affected, through a council tax rebate offered by local authorities to whom a compensation payment had been given in bulk.

Current approaches to the monetisation of noise impacts, through differential landing charges or the limited noise compensation schemes available at some airports, fall a long way short of anything we would consider to be an effective, evidence-based approach to either noise abatement or compensation for noise damage.

We will be interested to see what kind of results the methodology proposed in the Stage 1 night noise consultation for valuing the health-based impacts of noise will generate. Our response to the consultation on that methodology, however, included the following caveats:

> Our understanding is that the proposed methodology may potentially have a role to play when weighing up the impact of a potential policy change compared with a 'business as usual' scenario

[4] While it is government policy that all children in the UK should have access to outdoor learning opportunities, for those whose schools are under busy flighpaths this may be possible only if children are taken away from the area. In 2011, AEF ran a pilot project called 'Soundscape' at two schools in Hounslow to take pupils out to nearby countryside. Feedback was very positive, but funding from airports themselves would be required for the programme to be sustainable in the long term.

reflecting the current situation. We can see how a system that allows the total environmental impact of a certain option in terms of actual likely outcomes for people (as opposed to simply Leq contours) could usefully help guide decision-making, as long as all appropriate variables were taken into account (see our response to Q16 for example). We would not, until feeling much more confident about the validity and reliability of the models and their ability to compare direct with indirect economic impacts, support their use in comparing the financial impacts of an airport development with the monetised impacts in environmental terms….

We consider that some decisions simply cannot be determined on the basis of cost benefit analysis. The setting of social and environmental objectives – without attempting to speak in monetary terms – is one example. The analysis presented notes that the impact of noise on children's learning has not yet been monetised, but that it may be possible to do this in future by considering the economic 'productivity' in adulthood of those who were affected as children. The common understanding of the value and purpose of children's education goes so much wider than the opportunity it can provide to secure future high earnings that this perhaps provides a useful reminder of the shortcomings of cost benefit analysis in valuing what matters.

Commission questions

What is the most appropriate methodology to assess and compare different airport noise footprints? For example: What metrics or assessment methods would an appropriate 'scorecard' be based on?

We consider that the best approach will be to consider not only how various proposals for expansion compare with each other in terms of noise impacts, but to assess all short, medium and long-term options in terms of their ability to deliver noise improvements compared with the current situation (see our section 3.1).

A scorecard should make reference to:

- the number of people exposed to noise levels exceeding the WHO recommended and interim targets for average noise
- the number of noise events above the level at which they are likely to cause disturbance
- the number of people newly exposed to significant noise, or to significant noise increases
- the amount of noise increase compared with current level
- the extent to which tranquil areas and noise-sensitive buildings such as schools and playgrounds are protected
- the time of day when flights are expected to operate (day, evening or night)
- the extent to which flights will be spread throughout the year, or bunched during certain periods such as in summer, as average contours may disguise seasonal activity when noise disturbance could be higher

Our section 5 above details our comments in relation to noise metrics.

To what extent is it appropriate to use multiple metrics, and would there be any issues of contradiction if this were to occur?

Our view, based on our involvement with academic work on this subject as well as experience with our members, is that no single metric can communicate all relevant noise information, and that use of a suite of noise metrics would be the best approach at present. This is likely to include those metrics currently referred to in UK and EU policy, including Leq 16 hr, Lden and Lnight; airport noise action plans are required to be based on the results of noise mapping carried out using Lden and Lnight though in practice many refer principally to noise information based on Leq contours. But as we have argued, averaged noise metrics can only ever tell part of a story and may not adequately predict either annoyance or health impacts, such that information on flight paths and 'number above' contours may both be valuable complements.

The Commission's suggestion of a noise efficiency metric suffers the same weaknesses as Leq in terms of how noise disturbance is captured, while a simple figure about the number of flights passing through an airport gives little indication about the economic importance or otherwise of those flights.

Are there additional relevant metrics to those discussed in Chapter 3 which the Commission should be aware of?

No, we consider the Commission's list to be a good summary of available metrics.

What baseline should any noise assessment be based on? Should an assessment be based on absolute noise levels, or on changes relative to the existing noise environment?

Given that in many cases current noise levels exceed what is acceptable it is important that noise today is not treated as the key baseline. Noise level relative to the WHO recommendations would be a more relevant figure.

It has traditionally been understood that a degree of noise habituation can result in annoyance from a fixed level of flying reducing over time, but this pattern may not hold true in relation to health effects, in relation to which it may be the cumulative impact of noise over time that is most relevant. However, politically, it is often changes to the current environment that cause most concern and generate the strongest opposition.

How should we characterise a noise environment currently unaffected by aircraft noise?

The WHO 'low adverse effect level' for noise would provide a reasonable baseline.

How could the assessment methods described in Chapter 4 be improved to better reflect noise impacts and effects?

We comment on this on our main response above, largely in our section 2, which argues for the relevance of the WHO work in defining noise limits, and in section 5 as part of our consideration of noise metrics.

Is monetising noise impacts and effects a sensible approach? If so, which monetisation methods described here hold the most credibility, or are most pertinent to noise and its various effects?

Our section 7 above sets out our views on monetisation.

Are there any specific thresholds that significantly alter the nature of any noise assessment, e.g. a level or intermittency of noise beyond which the impact or effect significantly changes in nature?

PPG 24, to which we referred in section 6.2, advised that for measurements below 30 movements a day, Leq should not be the sole indicator, though this is unlikely to be relevant to any of the airport options under consideration by the Commission.

The Government's reference to 57 Leq as the level at which significant community annoyance begins arose from an interpretation in the ANIS report which considered it to show a marked upturn in annoyance at this level. Since then, Government has used the lack of an obvious upturn in updated annoyance curves as reason to retain the 57 Leq marker, even though there is evidence that noise annoyance for any given Leq level has increased. We have never been convinced of this logic. The 2007 ANASE report found that a similar proportion of the population was annoyed by noise at 50 Leq as had been annoyed by noise at 57 Leq at the time of the ANIS study.

To what extent does introducing noise at a previously unaffected area represent more or less of an impact than increasing noise in already affected areas?

Our thoughts on this are covered above in response to your fourth question.

To what extent is the use of a noise envelope approach appropriate, and which metrics could be used effectively in this regard?

We have welcomed the concept of noise envelopes in that it reflects the principle that an airport's operation should be bounded by environmental limits, but the appropriate definition of such limits will be critical to the effectiveness or otherwise of how an envelope would work. An Leq contour limit, for example, is unlikely to be sufficient and would need to be accompanied by a straightforward movements cap or perhaps by 'number above' limits. Noise envelopes should be adopted only as part of a strategy to bring noise levels down to within safe limits.

To what extent should noise concentration and noise dispersal be used in the UK? Where and how could these techniques be deployed most effectively?

We consider that concentration is generally the right approach for noise management. We are aware, however, that the accuracy of precision air traffic management systems has led to a situation

in which in some cases a small number of people bear a very heavy burden in terms of noise impacts. Our report for HACAN on this subject (see our section 6.3 above) argued that there are some examples, particularly from Sydney, of concentration being successfully combined with various kinds of alternation in order to provide predictable respite. As also indicated above, we welcome the willingness of CAA and NATS to trial some of these approaches in the UK, particularly at Heathrow where runway alternation has provided important respite to local communities for many years.

What constitutes best practice for noise compensation schemes abroad and how do these compare to current UK practice? What noise assessments could be effectively utilised when constructing compensation arrangements?

We note that the Commission's review of compensation schemes in other countries suggests that in general UK schemes are less generous than those elsewhere in the world, and that in some cases public money is used to supplement airports' own contributions. We would not support the use public money in the UK to pay the environmental costs imposed by aviation in this way, though we do feel, as set out in our section 7, that current compensation schemes are inadequate. We understand that a scheme is operational in relation to Schiphol Airport in the Netherlands whereby noise charges are based on an estimated mitigation cost (for example the cost of building insulation, including loft insulation, with appropriate ventilation), and we would support research into how such an approach might developed in the UK.