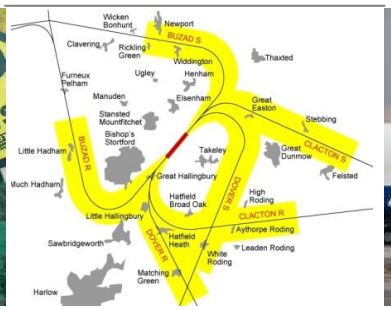

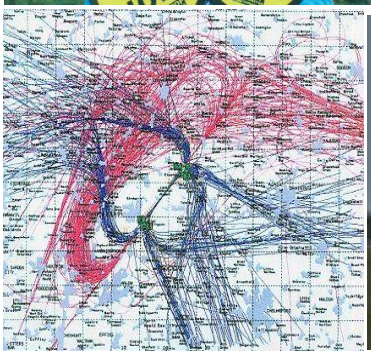


Submission to the Airports Commission

Aviation Noise

Stop Stansted Expansion ('SSE') was established in 2002 in response to Government proposals for major expansion at Stansted Airport. We have some 7,500 members and registered online supporters including 150 parish and town councils and local residents' groups and national and local environmental organisations. Our objective is to contain the development of Stansted Airport within tight limits that are truly sustainable and, in this way, to protect the quality of life of residents over wide areas of Cambridgeshire, Essex, Hertfordshire and Suffolk, to preserve our heritage and to protect the natural environment.

Stop Stansted Expansion
September 2013
www.stopstanstedexpansion.com

STOP STANSTED EXPANSION

Structure of this submission

This submission is divided into two parts:

SECTION A - General commentary on the impact of aircraft noise on local communities.

SECTION B - Responses to the specific questions listed in the Airports Commission's '*Discussion Paper 05: Aviation Noise'* dated July 2013.

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SECTION A

1. Introduction

1.1 We welcome this opportunity to respond to the Airports Commission's Discussion Paper on *Aviation Noise* ('the Discussion Paper'). The March 2013 *Aviation Policy Framework* ('APF'), published by the Department for Transport ('DfT') makes clear that *'The Government recognises that noise is the primary concern of local communities near airports and we take its impact seriously'*.[1] The section on noise and other environmental impacts was the longest chapter in the consultative draft APF and *'noise was the most popular theme in responses to the consultation, the majority of which were from local residents expressing concern about the level of existing and/or future aircraft noise'.*[2]

1.2 The Discussion Paper acknowledges at the outset that *'aircraft noise is a significant concern*' and that '*these concerns have appeared to have deepened, even as aircraft have become progressively quieter'.*[3] Firstly, it would be more correct to use the description 'aircraft have become progressively less noisy'. Secondly, we submit that there is a simple explanation for the apparent enigma - the present method of assessing aircraft noise is inadequate, based as it is on an averaging metric, not taking account of background noise levels and failing to give proper recognition to the increasing numbers of flights.

1.3 We are particularly concerned that the operation of Stansted Airport – which, since its inception, has been known as *'the Airport in the Countryside'* – should be environmentally sustainable especially bearing in mind the largely rural location where local communities are otherwise able to enjoy a good quality of life, partly as a result of low ambient (background) noise levels. In this submission we also provide information specifically for Stansted Airport.

2. Measuring aviation noise

2.1 While the Discussion Paper is well researched and well documented, it does not tackle the fundamental reason as to why the *'significant concerns'* about aircraft noise *'have appeared to have deepened'.*[3] In November 2007, when publishing the Attitudes to Noise from Aviation Sources in England ('ANASE') study, the then Secretary of State said that *'people are more annoyed by all levels of aircraft noise than they were in 1985'.*[4] It is

[1] *'Aviation Policy Framework'* Mar 2013, Executive Summary, DfT, para 16.
[2] *'Draft Aviation Policy Framework consultation: Summary of responses'*, DfT, Mar 2013, para 22.
[3] *'Discussion Paper: Aviation Noise'*, Airports Commission, Jul 2013, para 1.1.
[4] The Rt Hon Ruth Kelly MP, Secretary of State for Transport, letter dated 2 Nov 2007.

disappointing that nothing has been done since 2007 to address the issues raised by ANASE.

2.2 Aircraft are inherently noisy and it is disappointing that the Discussion Paper does not make this clear. Table 3.1 in the Discussion Paper gives approximate sound levels for different activities or situations. It has one major omission when compared with the referenced source material[5]: 'jet aircraft, 50m away'. In the referenced source material, the sound pressure level for a 'jet aircraft, 50m away' is given as 140dB – at the top of the table for loudness and twice as loud as the 130dB threshold of pain. It would have been a more balanced comparison of sound pressure levels if this evidence of aircraft noise had been included in the Discussion Paper.

2.3 Aircraft noise is not only loud; it also has a large low frequency content. Low frequency noise encounters less absorption than higher frequencies as it travels through the air and it persists for longer distances. Additionally, the amount of sound transmitted from the outside to the inside of buildings is greater at lower than at higher frequencies. Furthermore, modern high ratio bypass turbofan engines are characterised by a tonal (whine) feature which increases the likelihood of complaints.

3. Why has aircraft noise become more annoying?

3.1 There is considerable research, some of which is referenced in the Discussion Paper, which shows that aircraft noise is more annoying now than in the past. For instance, in November 2009, the European Commission published a paper which said:

> *'Aircraft noise has become more annoying for European citizens in recent years, according to new research. The research found that annoyance with road traffic noise had not increased, suggesting attitudes to aircraft noise have changed. The researchers call for changes to the standard procedure used in the EU to predict aircraft noise annoyance'.*[6]

3.2 In searching for reasons, a 2009 Omega study concluded:

> '*It seems plausible that, for reasons which are presently unknown, people may be noticing or otherwise paying attention to a higher proportion of aircraft sound events than in the past. If true, this could be because of the general increase in traffic, meaning that event frequencies have increased in recent years, or it could be because of changes in the character or sound quality of the sound (which is not necessarily the same thing as differences in sound level measured in dBA or EPNdB), or it could be simply because people's expectations and tolerance levels have changed*'.[7]

3.3 As noted in para 1.2 above, the apparent enigma of less noisy aircraft and more noise annoyance is fundamentally due to:

- the wholly inappropriate method of measuring and assessing aircraft noise; and
- the increased numbers of aircraft flights.

[5] http://www.sengpielaudio.com/TableOfSoundPressureLevels.htm.
[6] European Commission, Science for Environment Policy paper, Nov 2009 - http://ec.europa.eu/environment/integration/research/newsalert/pdf/173na1.pdf.
[7] *'Advanced Open Rotors - Balancing noise costs against reduced carbon emissions for future aircraft'*, Ieish Gamah and Rod Self, Technical Report, Omega, Feb 2009 - http://www.cate.mmu.ac.uk/wp-content/uploads/2012/06/36-Final-Report-AOR1.pdf.

4. The scope to reduce aviation noise

4.1 While Table 5.1 of the Discussion Paper shows a historic reduction in cumulative certified aircraft noise levels, the improvement curve is clearly flattening out and becoming asymptotic to zero. There are no grounds to expect the noise performance of aircraft to improve much further. In addition, the concept of the Advanced Open Rotor ('AOR') engine which has the prospect of reducing fuel burn and emissions is likely to be noisier than equivalent high bypass turbofan engines.[8] Furthermore the thrust limitations of AOR engines are likely to limit their use to short to medium haul aircraft.

4.2 There is, in the present state of technology, a trade-off between reducing noise and reducing greenhouse gas emissions and nitrogen oxides which are harmful to human health in most flight operations. We believe that high priority should be attached to overcoming this dilemma, but in the meantime, while this unenviable trade-off between two health hazards exists, we believe that close to airports and along flight paths up to 5,000 feet, preference should be given to reducing noise, particularly on take-off.

4.3 The Discussion Paper describes future technical and operational improvements that could reduce aircraft noise nuisance but there is no mention of any financial measures for noise reduction or management other than acoustic insulation for households. We believe that financial measures can be a powerful management tool and, without entering into the debate on taxation and duty, there is surely a place for financial incentives for noise reduction. A differential scheme for landing charges is already proposed in the APF which states:

> *'As part of the range of options available for reducing noise, airports should consider using differential landing charges to incentivise quieter aircraft. The Government has asked the CAA to investigate the use of these charges and the CAA will be publishing its findings later this year'.*[9]

4.4 We very much support this approach, particularly at night, and suggest there may be other financial measures that could help reduce noise impacts and this should be further researched. An obvious example is to raise the level of fines for noise and off-track infringements for departing aircraft. It is recognised that these measures might be seen as restrictions by the airlines, but they should be explored and evaluated.

4.5 Financial incentives could be helpful in deterring unnecessary or inappropriate sleep disturbance from night flights. There will be stronger justification for community disturbance and sleep deprivation caused by night flights in the case of a CATM carrying express parcels or fresh produce as compared to a CATM carrying non-urgent or non-perishable goods. An illustrative example is a noisy Boeing 747-200 freighter which arrived at Stansted Airport around 4.30am one morning from Guangzhou giving rise to numerous noise complaints. It was learned later that its cargo had been 22 pallets of sex toys and lingerie destined for the Ann Summers central warehouse in Surrey. It is, in our view, not possible to justify extensive community disturbance and sleep deprivation for this type of non-perishable, non-urgent imported cargo and it is difficult to demonstrate that it has such economic value to the UK as to merit its arrival at night rather than during the day.

4.6 It is also worth reflecting that many of those whose sleep was disturbed by this aircraft would have been up early the next morning to travel to high value jobs in the City of London or may have had equally high-pressure jobs in, say, healthcare or teaching. A cost benefit analysis on night flights should be able to reflect these realities.

[8] *'Discussion Paper: Aviation Noise'*, Airports Commission, Jul 2013, Box 5.1.
[9] *'Aviation Policy Framework'*, DfT, Mar 2013, para 3.27.

4.7 A number of operational improvements could reduce noise nuisance near airports and under flight paths as well as improving operational efficiency for airline operators. Many of these are currently being trialled. We support their expeditious early implementation and give the following examples:

- Continuous Descent Approach ('CDA'), for example to runway 04 at Stansted Airport;
- Continuous Climb Departures (CCD');
- Steeper descents;
- Reduction in the number and use of holding stacks;
- Tailored lateral flight paths;
- Reduced Engine Taxiing; and
- Banning the use of reverse thrust at night except in emergency.

5. Further work programmes

Following the publication of the APF, the Government proposed a number of further work programmes to be taken forward by the DfT, its Aircraft Noise Management Advisory Committee, the Civil Aviation Authority and the Airports Commission. We very much support this programme of work and look forward to making a full contribution.

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Section B

(Responding to the questions asked in the Discussion Paper)

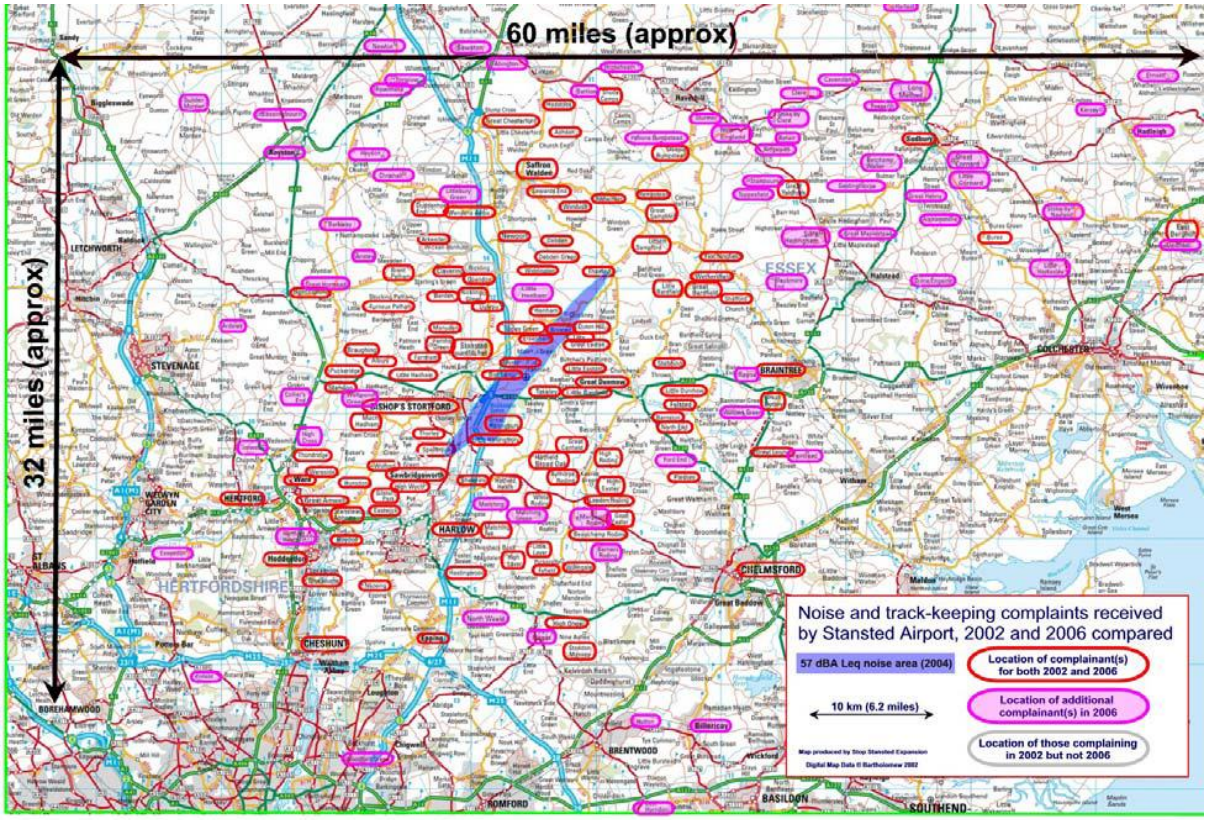
Q1: What is the most appropriate methodology to assess and compare different airport noise footprints? (Chapter 3)

A1.1 Any methodology based on the LAeq averaging system is not a reliable measure of the extent of aircraft noise disturbance around airports and under flight paths. Measurement of average noise over a length of time is insensitive to the frequency of aircraft noise events and it understates the impact of aircraft noise intrusion on local communities – especially in rural areas where ambient noise levels are very low and which consist largely of pleasant, natural sounds.

A1.2 The area enclosed by the 57dB LAeq16-hour noise contour at Stansted Airport is limited by planning condition to 33.9 sq km. However, evidence presented to the Stansted 'Generation 1' Public Inquiry in 2007[10], based on registered noise complaints, demonstrated that the area adversely affected by aircraft noise is far greater than the 57dB LAeq16-hour contour limit area as shown on the map overleaf.

It can be concluded that the 57dB LAeq 16-hour contour limit area at Stansted Airport bears very little relationship to the area where people are actually complaining about aircraft noise. As can be seen by the locations of complaints overleaf, they bear more relationship to areas under flight paths and areas of low ambient background noise.

[10] *'Proof of Evidence on Air Noise'* (Stansted G1 Public Inquiry), SSE, Apr 2007, Annex 1, Figure 2 - http://www.stopstanstedexpansion.com/documents/PI_SSE6a-Proof-Air%20Noise(amended).pdf.



Key: Locations coloured in red are those for complainants in both 2002 and 2006. Locations coloured in magenta are those for additional complainants in 2006. The 57dB LAeq 16-hour contour limit area is coloured in blue.

A1.3 It is not only local airport community groups, like SSE, who have little faith in the LAeq 16-hour system for assessing aircraft noise impacts. The Inspector at the Heathrow T5 public inquiry stated in his report:

- *'The survey on which the use of the LAeq 16-hour is based was carried out in 1982 and the relationship between the LAeq and community annoyance was statistically weak even at that time';*
- *'…it does seem likely that the weight attached to the 57dB LAeq by the Department* [for Transport] *as the measure of the overall noise climate is greater than the original research would support';*
- *'…*[the LAeq 16-hour index] *was the subject of severe criticism much of which I consider to be well-founded. …I believe that it fails to give adequate weight to the number of aircraft movements';*
- *'Even the Department* [for Transport] *recognized the deficiencies of the LAeq system. They also accepted that it is difficult to establish the true relationship between the noise of individual events and their number and that it would have been useful if further social surveys had been carried out';*
- *'If parties are to have confidence in the indices used to measure the noise climate they need to be founded on a sound basis of up-to-date research. Unfortunately the Department's own evidence suggests that this does not apply to the use of LAeq in spite of their argument that research had guided the choice of noise indices since 1967'.*[11]

A1.4 The present methodology has the following main shortcomings:

A1.4.1 The most significant shortcoming of LAeq 16-hour averaging measurements is that they are very insensitive to the number of aircraft noise events. A doubling of like-for-like

[11] *'Report of the Inspector at the Heathrow Terminal 5 Inquiry'*, Dec 2000, paras 21.3.31-35.

aircraft movements will increase the LAeq by only 3dB. Barely perceptibly 'quieter' aircraft would effectively permit more aircraft movements for the same average sound pressure level LAeq. To illustrate this, a simple example is to take Stansted Airport with its current throughput of some 130,000 air traffic movements per year (which is approximately half the current planning condition cap on the number of air traffic movements). If all these aircraft were to reduce their noise emissions by 3dB and at the same time the number of movements were to double (to the planning condition cap) with the same fleet mix, the size of the LAeq 16-hour contour would stay the same. The reduction in noise of each aircraft would barely be perceptible as a change of 3dB is the minimum perceptible under normal conditions. But a doubling of air traffic movements would be very noticeable.

At the very least, and as a first step towards properly tackling aircraft noise disturbance, an improved measurement system for aircraft noise should be introduced, such as that described in the ANASE report.[12] Moreover the evidence gathered in the course of the ANASE study clearly showed that the DfT was not only relying upon the wrong system for measuring aircraft noise impacts but was also applying the wrong standards of what constitutes low, moderate and high levels of noise annoyance. The LAeq averaging system for assessing noise disturbance, based upon dose/response surveys in the early 1980's is now wholly inadequate. It is not sufficiently sensitive to the number of aircraft noise events and takes no account of background noise levels against which each noise event is heard. The Government should take forward the work of ANASE as a priority and develop a new framework for the measurement and control of aircraft noise impacts, taking account of the recommendations set down in the World Health Organisation ('WHO') *Guidelines for Community Noise*[13].

A1.4.2 The second main shortcoming in the current methodology is the common use of A-weighting for all metrics or indices when measuring aircraft noise. A-weighting under-estimates the sound pressure level of noise with low frequency components. It is disappointing to note that the Discussion Paper does not mention this effect whereby A-weighting, originally intended only for the measurement of low-level sounds, largely discounts frequencies below 200Hz. At lower amplitudes of sound this gives a reasonably accurate assessment of the way sound is perceived. However, the noise spectrum of aircraft engines has a large proportion of total noise below 200Hz. A-weighting measurements use filters to attenuate frequencies below 200Hz whereas C-weighting, originally intended for high-level sounds, will give a more accurate assessment of aircraft noise. The WHO *Guidelines for Community Noise* state:

> *'The evidence on low-frequency noise is sufficiently strong to warrant immediate concern. Various industrial sources emit continuous low-frequency noise (compressors, pumps, diesel engines, fans, public works); and large aircraft, heavy-duty vehicles and railway traffic produce intermittent low-frequency noise. Low-frequency noise may also produce vibrations and rattles as secondary effects. Health effects due to low-frequency components in noise are estimated to be more severe than for community noises in general (Berglund et al. 1996). Since A-weighting underestimates the sound pressure level of noise with low-frequency components, a better assessment of health effects would be to use C-weighting'.*[14]

As a general rule where C-weighted measurements exceed A-weighted measurements by more than 10 dB, there is a large content of low frequency sound present. And as stated earlier, low frequency sound travels further and is more penetrating through buildings.

Noise measurements for A-weighted and C-weighted noise values were undertaken for the National Trust in 2007 close to Stansted Airport by MAS Environmental for a number of departing aircraft flying over Hatfield Forest (a Site of Special Scientific Interest and the

[12] *'Attitudes to Noise from Aviation Sources in England',* Report for DfT, Oct 2007.
[13] WHO '*Guidelines for Community Noise*',1999.
[14] Ibid, para 3.8.

UK's only remaining intact Royal Hunting Forest). These measurements were used in the National Trust's evidence to the Stansted Airport 'Generation 1' Public Inquiry in 2007.[15] They compared 1/3rd octave spectrum graphs of A-weighted and C-weighted average sound energy of over-flying aircraft after take-off. The increase in values from A-weighted to C-weighted in these measurements of each aircraft on take-off was between 13dB and 14dB. This is a considerable increase is noise disturbance. A-weighting underestimates the aircraft noise footprint for both maximum noise levels and average noise levels and this should be remedied.

A1.4.3 The third main shortcoming in the current method of measuring aircraft noise is the total absence of the use of background (or ambient) noise levels as a component in assessing noise harm. Each discrete noise event such as an aircraft movement will be heard against the background noise levels of the particular location at the time. The Discussion Paper mentions comparing noise to pre-existing background sound levels as one approach. It is hard to see how this should not be universally good practice since it would enable noise nuisance to be assessed around each airport, each with different levels of local activity and background noise. However the Discussion Paper does recognise the importance of preserving areas of tranquillity and environmental noise quality where it is already regarded as 'good'. The use of absolute levels of noise suggested by the Discussion Paper as a baseline for assessment is not thought to have merit compared with changes relative to the existing noise environment (i.e. background noise levels).

Failure to take into account background noise levels and solely using the LAeq noise averaging system understates the true adverse impact of aircraft noise intrusion on local communities, including around Stansted Airport where the region is mostly a large number of small villages and a few market towns. The ambient noise levels in such a rural region are very low, particularly at night, and consist largely of pleasant, natural sounds. Among the reasons why people decide to live in this region of East Hertfordshire, Essex, South Cambridgeshire and Suffolk are the quality of life benefits afforded by the largely tranquil environment. The use of population numbers within a 57dB LAeq contour as an assessment of noise nuisance is not an appropriate measure of noise nuisance impacts upon the community living and working here. It follows therefore that the Discussion Paper's proposals on the 'productivity' of an airport is not only over-simplistic but also deeply flawed. Comparing the population living within the 57dB LAeq 16-hour contour to the airport's throughput - whether passenger or ATMs - is fundamentally flawed at the outset by virtue of using 57dB LAeq metrics and ignoring background noise levels.

A1.4.4 A fourth shortcoming in the LAeq noise averaging system is that it is difficult to explain to communities affected by aircraft noise the concept of the averaging method of assessment. This averaging method is also complicated by the use of logarithms to encompass the very large acoustic range of the human ear. The subtleties of the use of logarithms add to the difficulties of communicating the largely counter-intuitive LAeq averaging method. Moving towards a more robust system should also endeavour to overcome the difficulties of communicating current measurement practice.

A1.5 People hear aircraft noise as a discrete number of events with associated noise levels, noise characteristics and durations as well as the frequency of these events. They do not hear aircraft noise as a constant 16 hour equivalent noise level. However the averaging measurement LA90 that is the universally accepted indicator of background noise is a good example of where an averaging measure is appropriate. It is the threshold below which the community noise levels seldom drop and, as an accepted reference, is a good datum against which to assess aircraft noise events.

[15] *'Proof of Evidence to Stansted G1 Public Inquiry'*,, Mike Stigwood, MAS Environmental (for the National Trust), Apr 2007 - http://www.stopstanstedexpansion.com/documents/NT_Environmental_MASMainProof70430.pdf.

A1.6 Finally, we would re-emphasise that it is not so much the absolute aircraft noise impact that matters, but its relative impact, compared to the ambient noise level. Thus, if you live and work next to a busy road or an otherwise noisy environment you will, in all likelihood, be far less disturbed by aircraft noise than if you live and work in a rural and otherwise peaceful environment. Clearly this is an extremely important issue in the case of Stansted and other airports located in a rural setting and it must be given due consideration.

Q2: How could the assessment methods described in Chapter 4 be improved to better reflect noise impacts and effects? (Chapter 4)

A2.1 A key improvement should be to take forward the ANASE work and devise a better method for assessing aircraft noise nuisance that is not solely based on LAeq averaging measurements. A better framework for the measurement of aircraft noise levels, spectral content, time duration and frequency of occurrence of noisy events needs to be implemented. The new framework should also take full account of the recommendations set down in the WHO *Guidelines for Community Noise*.

A2.2 The need for improvement has been recognised in the APF which states:

> *'... the Government recognises that people do not experience noise in an averaged manner and that the value of the LAeq indicator does not necessarily reflect all aspects of the perception of aircraft noise. For this reason we recommend that average noise contours should not be the only measure used when airports seek to explain how locations under flight paths are affected by aircraft noise. Instead the Government encourages airport operators to use alternative measures which better reflect how aircraft noise is experienced in different localities ... developing these measures in consultation with their consultative committee and local communities'.*[16]

We very much support this statement and support these first steps to use alternative measures. As part of this work, it surely must be a priority to better understand the enigma of why '*aircraft noise…… concerns have appeared to have deepened, even as aircraft have become progressively quieter.'*[17]

A2.3 The Australian N70 type metric has merit in that it was devised to represent 'Number Above' contours, combining information on single event noise levels with aircraft movement numbers. It directly represents an assessment of the noise level of each flight and the number of flights as clearly audible events. Other things being equal, if the number of aircraft movements over an area doubles, the N70 doubles. Contours can be drawn for lower levels such as N60 at night. The N70 type is a useful metric as it permits measured noise levels to be very neatly summarised for any given period. However, as the Discussion Paper points out, N70 contours do not differentiate between the level of noise above a certain threshold or the duration of noise events. So the N70 metric, as we have argued earlier, needs to be used together with and measured against background noise levels.

A2.4 We do not agree with the implied criticism of the N70 system in respect of the duration of noise events given in para 3.28 of the Discussion Paper. While aircraft noise event durations are variable, we doubt whether the example given of '*an event of 40 second duration with a maximum level of 91 dB(A)'* is a frequent occurrence. The UK AIP Noise Abatement Procedures at Heathrow, Gatwick and Stansted airports set limits for maximum levels of departure noise for the day, night and night quota periods of 94, 89 and 87dB(A) respectively at 6.5km from start of roll. Taking the example of Stansted Airport, there were only five noise infringements throughout the whole of 2012 for some 65,000 departures.

[16] *'Aviation Policy Framework'*, DfT, Mar 2013, para 3.19.
[17] *'Discussion Paper: Aviation Noise'*, Airports Commission, Jul 2013, para 1.1.

These figures also demonstrate that the Government's noise infringement limits for Stansted are set too high since there were nearly 750 noise complaints made to the airport in 2012.

A2.5 Additionally with regard to the duration of noise events, it is important to note that the Sound Exposure Level ('SEL') metric is available as a supplementary indicator. SEL measurements are another way of measuring the noise of a single aircraft flyover by accounting for both the duration and intensity of the noise and the SEL metric has the added advantage of complementing the N70 type metric.

A2.6 Furthermore, the European Noise Directive ('END') recommends the use of *'LAmax, or SEL (sound exposure level) for night period protection in the case of noise peaks'.*[18] Additionally, the WHO *Night Noise Guidelines for Europe* (2009) state:

> *'Much attention has been paid to the use of single event descriptors such as LAmax (maximum outdoor sound pressure level) and SEL (sound exposure level). As the Position Paper on EU noise indicators (European Commission, 2000) points out, this is an important laboratory tool to describe instantaneous reactions to noise. But when it comes to long-term protection, the number of events is equally important'*
> *...'There is no generally accepted way to count the number of (relevant) noise events. Proposals range from the number of measured LAmax, the number of units (vehicles, aeroplanes, trains) passing by, to the number exceeding a certain LAmax level (commonly indicated by NAxx; NA70 is the number of events higher than 70 dB)'.*[19]

A2.7 It is recommended that a combination of N70 and SEL metrics should be considered as part of establishing an improved measurement system for aircraft noise. It is closer to what people actually hear and much easier than LAeqs to explain to the general public.

A2.8 Additionally we believe that there is merit in developing a system along the lines of BS4142 which is the method for rating industrial noise affecting mixed residential and industrial areas. BS4142 is already in common use for measuring background noise levels in all noise environments and is used where certain acoustic features increase the likelihood of complaints over that expected from a simple comparison between the specific noise level and the background noise level. The types of industrial noise embraced by BS4142 are those having a distinguishable continuous note or whine and the noise is irregular enough to attract attention. This description is very similar to aircraft flying near airports with modern high bypass ratio turbofan engines. Aircraft engine noise is characterised by having a tonal ('whine') content and a large component of low frequency noise particularly on take-off. It should be possible to devise a similar approach for aircraft noise measurement where the probability of the increase in the likelihood of complaints can be assessed. It would have the added advantage of comparing aircraft noise levels against background noise.

A2.9 In arriving at a more appropriate framework of assessment methods, it should be possible to overcome the shortcomings of A-weighting for aircraft noise. Most sound level meters have the capability to use C-weighting as well as A-weighting. The method of using C-weighting measurements would better reflect the noise levels and frequency spectrum of aircraft noise and provide an improved assessment method of noise annoyance. And it is worth noting here that the European Noise Directive ('END') recommends the use of supplementary noise indicators in some cases and these include when the low frequency content of the noise is strong and when the noise contains strong tonal components.[20] Both of these characteristics are present in the noise from high bypass ratio turbofan engines.

[18] '*European Noise Directive 2002/49/EC',* Jun 2002, Annex 1, para 3.
[19] *'Night Noise Guidelines for Europe'*, WHO, 2009, paras 1.3.2-1.3.3.
[20] *'European Noise Directive 2002/49/EC'*, Jun 2002, Annex 1, para 3.

A2.10 LAeq contours are nonetheless important for comparisons over time since they have been regularly used for noise compensation and form part of planning conditions. But even these criteria need to be more robustly served by improved metrics. There is also a need to update current planning guidance following the replacement of the Planning Policy Guidance 24: *Planning and Noise* with the National Planning Policy Framework in March 2012 and to set noise thresholds to be used in reaching planning decisions.

A2.11 As explained earlier, we believe that the framework of improved assessment methods must include measurement of background noise levels. The L90 noise metric is in common use for many applications, easily understood as a measure of ambient noise and has the advantage of being specific to each airport location. It provides a sensible datum against which aircraft noise is heard. Further work should be carried out into background noise levels throughout the UK including mapping and predictions of background noise levels, possibly based on population density, building on the SINTEF report into background noise levels in Europe.[21] This work would complement the strategic noise mapping carried out for airports with more than 50,000 movements a year under the END. It would provide the local datum against which the END noise mapping indicators Lden and Lnight can be compared.

Q3: 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? (Chapter 4)

A3.1 The Discussion Paper includes ERCD Report 1209 *'Proposed methodology for estimating the cost of sleep disturbance from aircraft noise'* in its list of general references but does not directly address the findings of the report. This ERCD report reflects the available evidence but states that additional research is needed in order to develop a workable methodology for monetising the effects of cognitive impairment in children. In the meantime, these effects are excluded. This is a significant exclusion because the ERCD report also states '*cognitive impairment in children is considered to manifest itself as a loss in long-term productivity*.'[22]

A3.2 Moreover, it is not clear that the ERCD report gives proper consideration to the cost of reduced employee productivity caused by aircraft noise at night, for example, where an employee - perhaps a City trader or a surgeon - turns up for work having had a disturbed night's sleep due to aircraft noise and underperforms as a result. This would clearly be to the detriment of the firm or the patients and quite possibly also to the UK economy.

A3.3 We believe that quantification of the social and environmental costs needs to be undertaken in a systematic manner which reflects the true value of a proper night's sleep for individuals contributing to the UK economy and whose efficiency is impaired by interrupted sleep. A cost benefit analysis of Heathrow night flights carried out by CE Delft economic consultancy[23] showed that a ban on Heathrow night flights could benefit the economy by £860 million over 10 years. The report concluded that a ban on night flights was likely to be beneficial to the UK economy *'as the economic costs of the ban will be outweighed by the savings made by the reduced health costs of the sleep disturbance and stress caused by the noise of the night flights'.*

[21] SINTEF ICT Report A6631 for European Aviation Safety Agency, Jun 2008 - http://www.easa.europa.eu/rulemaking/docs/research/Background_noise_report.pdf

[22] *'Proposed methodology for estimating the cost of sleep disturbance from aircraft noise',* ERCD, Jan 2013, para 1.5.2.

[23] http://www.hacan.org.uk/resources/reports/night.flight.final.report.pdf.

Q4: 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? (Chapter 4)

A4.1 The first obvious threshold is the number of events (flights). It is axiomatic that, all other things being equal, a reduction in the number of flights will reduce noise annoyance.

A4.2 Secondly, there is a timing threshold that significantly increases the level of noise annoyance and that is during the night. In the Executive Summary of the DfT Stage 1 Consultation for Night Flying Restrictions at Heathrow, Gatwick and Stansted it states '*noise from aircraft operations at night remains widely regarded as the least acceptable aspect of aviation noise and government has long recognised this.*'[24] We have responded to this consultation and proposed inter alia that:

- Night should mean night, that is to say a full 8 hour period between 11.00pm and 7.00am for the night quota period - i.e. the definition of night in the WHO *Guidelines for Community Noise* - whereas night is currently defined as just a 6.5 hour period;
- There should be a commitment to the phased introduction of a total ban on night flights, except in emergencies;
- The annual QC limit should be sharply reduced so that it begins to have some practical effect;
- There should be an immediate ban on aircraft using reverse thrust when landing at night, except in emergencies.

We believe that increasing the night quota period and reducing the number of movements will significantly reduce noise annoyance.

A4.3 The ANASE report indicated that significant annoyance was occurring at lower LAeq noise levels than 57dB. When the END noise mapping was carried out, using the weighted evening and night indicators, it showed increased areas and population within the Lden contours to those within equivalent LAeq contours. However, not only is the LAeq averaging method an unreliable way of measuring aircraft noise, the thresholds currently used to signify the onset of community annoyance are too high. The reliance on LAeq should be discontinued and an improved framework of metrics introduced as earlier described.

A4.4 A key specific threshold is the background or ambient noise level. And even more important than this is the margin between the background or ambient noise level and the noise imposed by aircraft activity. Both of those measurements should be included in an improved framework of assessment methods for aircraft noise.

A4.5 There is a good example of where the change of characteristic or nature of noise has an effect which changes the annoyance caused and this is the way in which industrial noise is rated in mixed residential and industrial areas. It should be possible to devise a similar approach that rates aircraft noise against background noise.

Q5: 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? (Chapter 4)

A5.1 Whenever there is a change to a flight path, or the location of a holding stack, or a noise preferential route, there will be winners and losers in terms of the noise impacts. Our longstanding view, however, based on representations that have been made to us by our members and the wider public, is that the harm inflicted upon those living in previously unaffected areas generally outweighs the alleviation gained by the beneficiaries. Our firm

[24] *'Night Flying Restrictions Heathrow, Gatwick and Stansted: Stage 1 Consultation'*, DfT, Jan 2013, para 1.2.

view therefore is that a premium should be placed on maintaining the status quo with regard to flight paths, holding stacks and noise preferential routes and these should only be changed where there is a compelling and overriding case for so doing.

Q6: To what extent is the use of a noise envelope approach appropriate, and which metrics could be used effectively in this regard? (Chapter 5)

A6.1 The first priority in seeking to address the problem of aircraft noise disturbance and the use of a 'noise envelope' approach should be to introduce an improved measurement system for aircraft noise in which the public could have trust.

A6.2 At Stansted Airport, there is a planning condition which limits the area enclosed by the 57dB LAeq16-hour noise contour to 33.9 sq km and another planning condition which limits the annual maximum number of aircraft movements. These planning conditions are intended to provide some surety that a given noise level will not be exceeded. While this is of value, it does nothing to reduce noise on a day-to-day basis or to provide incentives for operators to reduce noise. Moreover, the 33.9 sq km 'noise envelope' would in practice allow the number of flights to substantially increase even if there were just a slight reduction in the average noise produced per aircraft.

A6.3 It is difficult to see how the concept of a 'noise envelope' as outlined in the APF would work in practice, particularly at an airport such as Stansted where, if growth does occur (within the existing planning permission), an increase in the noise climate is inevitable. The use of the LAeq measurement alone, for the reasons already given, would not be a satisfactory basis for developing 'noise envelopes'. Nonetheless we welcome the Government's initiative in commissioning the CAA to develop further the noise envelope concept[25] and would support using measures that overcome the disadvantages outlined in our response to Q1, above, and which take account of the point made in our response to Q2 above. Local communities look forward to the time when aircraft noise becomes noticeably less. Such a benefit should not be diluted or even neutralised by an increase in the number of flights.

A6.4 On the question of an Independent Noise Regulator, for far too long airport operators have themselves been largely responsible for monitoring and reporting upon the environmental impacts of their own operations and in effect acting as policeman, judge and jury. Even in relation to implementation of the END, airport operators were given the power of competent authority and entrusted to produce their own noise action plans. We understand that the UK is the only Member State within the EU which left this important environmental task to the airport operators themselves. The result is that there is considerable mistrust amongst local communities in relation to the fairness, objectivity and transparency of the current 'in-house' arrangements for reporting upon aircraft noise and for the recording and handling of complaints from members of the public.

We submit that independent oversight of an airport's noise management is long overdue and we believe that this is a role which could be given to the CAA. This would fit well with the Government's commitment to provide the CAA with a wider environmental duty.

Q7: To what extent should noise concentration and noise dispersal be used in the UK? Where and how could these techniques be deployed most effectively? (Chapter 5)

A7.1 The advent of satellite based onboard precision navigational aids ('P-RNAV') in modern aircraft will allow more efficient flight operations with concomitant benefits to

[25] *'Aviation Policy Framework'*, DfT, Mar 2013, para 3.29.

communities living around airports and under flight paths. Aircraft are capable of vastly improved flight profiles and track keeping and this will give the opportunity to tailor flight paths to reduce noise nuisance. What is clear however is that technical advances in onboard avionics are not being implemented with sufficient urgency into operational use. If the technical advances are to help reduce adverse noise impacts the speed of implementation must be accelerated.

A7.2 Nonetheless, it is clear that P-RNAV technical advances will make it possible to either concentrate or disperse aircraft noise with consistent accuracy. It will give more flexibility to design airport approach and departure routes by either concentrating or dispersing aircraft or a mixture of both. Depending on the location, the local community and the environmental circumstances, routes and flight profiles could be tailored for minimum noise disturbance.

A7.3 One aspect is clear in our view and that is that concentration should be the preferred solution within existing Noise Preferential Routes ('NPRs'). It may also be possible to concentrate on more than just one route within the NPR to give respite at certain times, or to reduce the swathe width of the NPR if this is a better solution for the particular location.

Q8: 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? (Chapter 5)

A8.1 The Land Compensation Act 1973 needs to be amended because it allows airport operators to exploit the so-called 'golden rivet' loophole and thereby avoid their obligation to compensate local residents for property devaluation arising from airport development. An example of this relates to the approval, in July 1999, for Stansted Airport to grow from 8mppa to 15mppa. The then owner, BAA, defined the physical infrastructure which would be needed for this expansion and, under the Land Compensation Act, local residents adversely affected by the airport's near doubling in scale would be eligible to apply for compensation 12 months after the final piece of the physical infrastructure, Taxiway Echo, was completed. Passenger throughput reached 8mppa in 1999 and exceeded 15mppa in 2002 but Taxiway Echo has still not been built. In fact, it is not expected to be needed until 2019/20 and so no-one will be eligible for compensation until 2020/21 at the earliest – 20 years later than local residents expected. Taxiway Echo may never be built and, if that is the case, compensation will never need to be paid. In compensation terms, local residents around Stansted continue to live next to an airport handling less than 8mppa, which is less than half its present throughput and just a third of the throughput it reached in 2007.

A8.2 It is unsatisfactory that there is no legal obligation for an airport operator to introduce a compensation scheme to deal with the generalised blight which arises as soon as there is the prospect of major expansion at the airport. In the absence of a legal requirement, an airport operator can introduce wholly inadequate arrangements and then claim that the issue has been addressed. Furthermore – as we learned at Stansted in 2005 – there is no scope for the local community to mount a legal challenge to the terms of such a compensation scheme, no matter how unfair or unjust it is, because it is only a voluntary scheme.

A8.3 The 2003 Air Transport White Paper ('ATWP') supported a second runway at Stansted Airport and stated - with no legal force - that the airport operator would need to address the issue of generalised blight. It was left to the airport operator to define the threshold for qualification, the basis for compensation and all the terms and conditions. The result was a wholly inadequate and unfair scheme. By setting the qualification threshold at 66dBA, fewer than 500 homeowners qualified and they then had to demonstrate that they had marketed their property for at least three months on the open market at a realistic asking price, had not declined offers within 15% of that price and that they had a pressing reason to move.

A8.4 The then owner BAA would not compensate for the first 15% loss of value. All of this was against a background where it could clearly be demonstrated from Land Registry data that, in Uttlesford District alone, some £700 million had been wiped off property values as a result of the threat of a second Stansted runway, affecting some 15,000 homes.[26]

A8.5 There should be a legal obligation upon airport operators to introduce fair and reasonable compensation arrangements when airport expansion proposals give rise to generalised blight. We hope that the Airports Commission will make this a strong recommendation and it will need to be in the interim report to allow adequate time - prior to its final report being published - for consultation on the arrangements which should be put in place, the threshold for qualification, the basis for compensation and all the other terms and conditions. We would look forward to contributing to such a consultation based on the very unhappy experience of homeowners in the vicinity of Stansted in the aftermath of the ATWP.

A8.6 The qualification thresholds at Stansted for acoustic insulation – whereby the airport operator will meet either the full cost of secondary glazing, or half the cost of double glazed replacement windows are:

- the daytime 66dB LAeq 16-hour noise contour (0700 hours to 2300 hours)
- the night 90dBA SEL noise footprint (2300 hours to 0700 hours)
- within 600 metres of sources of airport ground noise but excluding properties south of the A120 and east of the M11.

A8.7 For reasons we have explained earlier, the LAeq noise averaging system is not a suitable basis for assessing aircraft noise nuisance, especially in rural areas, and so it should not form the basis for a qualification threshold for acoustic insulation. The Government should introduce an improved measurement system for aircraft noise such as that described in the ANASE report, including comparison with background noise levels, and this should be used as the basis for compensation schemes. As an interim measure, however, the LAeq 16-hour qualification threshold should be reduced from 66dB to 55dB, the threshold specified in the WHO *Guidelines for Community Noise*, as marking the onset of 'serious annoyance daytime and evening'.[27]

A8.8 Turning to night noise, any household exposed to aircraft noise at night above threshold of 60 dB LAmax (fast) set down in the WHO *Guidelines for Community Noise*[28] should also qualify for acoustic insulation. Regarding ground noise, the current qualification boundary is clearly arbitrary. We do not have any firm view on what the boundary should be, but it should be based on a proper assessment of the actual impacts of ground noise upon residents who live in close proximity to the airport, especially the impacts at night.

Q9: The Commission also invited views on Chapter 2 of the Discussion Paper

A9.1 In respect of health issues, we should like to bring to your attention the PARTNER Project Final Report[29], of a literature review of the health effects of aircraft noise. While the Discussion Paper mentions the ERCD 1208 Report, we believe the accumulated data from both the PARTNER and the ERCD reports suggests that sleep disturbance may well have an effect on cardiovascular health in relation to such conditions as hypertension and

[26] *'Proof of Evidence on Economic Impacts (Housing)',* (Stansted G1 Public Inquiry), SSE, Apr 2007 - http://www.stopstanstedexpansion.com/documents/SSE11a_Proof_Economic_Inpacts_(Housing).pdf.
[27] *'Guidelines for Community Noise'*, WHO, 1999, Table 4.1.
[28] ibid
[29] *'A Review of the Literature Related to Potential Health effects of Aircraft Noise'*, Hales Swift, Jul 2010, for FAA/NASA/Transport Canada.

ischaemic heart disease. A meta-analysis carried out by Babisch[30], as well as the HYENA study[31], found an increased likelihood of hypertension following exposure to night time noise.

The ERCD report stresses the WHO recommendation that the adverse effects of noise on sleep occurs at an aircraft noise level of 32 dB LAmax, indoors. Furthermore the effect of noise on endocrine disturbances resulting in obesity and diabetes does not seem to have been mentioned. Studies have shown an increased risk of obesity in those having shorter and fragmented sleep.[32]

A9.2 The Discussion Paper does not mention noise from helicopter operations. Helicopters operate out of Stansted Airport and noise nuisance impacts on residents living around the airport. In June 2008, DEFRA published a document *'Research into the improvement of the Management of Helicopter Noise (NANR235)'*[33]. The aims of the DEFRA study were to determine the issues and the extent of the reported problem of noise from helicopter operations in the UK, and to develop practical guidance on the management of helicopter noise, including improvements in the handling of complaints. The study also looked at comparisons with Europe, USA and Australia. The study conclusions covered nature and extent of concern, complaints procedures, rules for helicopter operations, dose/response relationships and opportunities for improvements. The study showed that there is not currently a significant helicopter noise problem across the U.K. but that reported noise problems centred on helicopter infrastructure in particular specific heliports and airports.

However, the study showed that there is currently insufficient data to determine the scale of public concern and the prediction of community response to helicopter noise. Annoyance is not well correlated with generally used acoustic measurement parameters. In addition to the unique character of helicopter noise not being fully addressed by indices, there is a 'virtual noise' factor which encompasses community attitudes and fears towards operations.

In general, the complaints system was considered less than satisfactory. It is often difficult to complain and the failure to act on complaints is one of the largest causes of dissatisfaction amongst the public.

More study was considered necessary on dose/response relationships to better determine annoyance to helicopter noise; however as a general indication it is considered that helicopters can be up to 15dBA more annoying than fixed wing aircraft. We submit that this work be taken forward to improve the noise climate around those airports which operate helicopters.

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[30] 'Cardiovascular effects of noise', Babisch, Noise Health 2011;13:201-4.
[31] '*Hypertension and Exposure to Noise near Airports'*, Larup et al, 2007.
[32] *'Impact of insufficient sleep on total day energy expenditure, food intake and weight gain'*. Markwald et al, Proceeding of the National Academy of Sciences 2013 IIO 5695-5700.
[33] http://archive.defra.gov.uk/environment/quality/noise/research/documents/nanr235-project-report.pdf.