Airports Commission Discussion Paper 05
Aviation Noise
Consultation Response October 6th 2013
Tunbridge Wells Borough Council

There are a number of consultations on aviation noise all coming out at the same time it is imperative that these are linked rather than kept separate as each will impact upon the other.

The introduction of this paper talks abut the concept of noise envelopes where the Government wishes to see further work done. The concept of a noise envelope – not exceeding the noise levels currently produced – may look like a very appealing concept that will not make matters worse and can only improve the situation. However, this is far from the truth as it does not take account of the number of aircraft noise events (ANE's) that take place. In theory it could reduce aircraft noise by 3dB which is a barely noticeable reduction in noise levels BUT would allow a doubling of the number of ANE's with no degradation of the noise envelope. This would clearly not be of benefit to complainants and would massively impact on their amenity. The paper provides a review of existing research and literature to open up a number of key issues for debate so hopefully this can redress the fundamental flaws inherent in a noise envelope system.

Chapter 2 Noise exposure and Health

This issue was thoroughly examined in the Night Time Noise consultation. The links between noise and health were discussed but there will always be differences of opinion on methodology and interpretation with each side drawing upon information that appears to support its own interest or discredit information that negatively impacts on its interests. From the information there is clear evidence that there are adverse health effects particularly in night flying which will affect sleep (awakenings, non-awakenings and alterations to brain patterns that demonstrably affect sleep patterns even where the events do not consciously affect the person at the time of the event). The key principle should be one of following a precautionary principle which means that unless scientific evidence indicates conclusive or near conclusive evidence of levels that will not affect health then lower levels should be imposed to protect the public.

The key deficiency of research into the health effects is the lack of research into annoyance particularly annoyance at levels further out from the departure and more specifically the approach flight paths. It is agreed that studies into annoyance are indicating that attitudes towards aircraft are changing over time and that people are getting more annoyed at levels lower that previous and it is absolutely imperative that any assessment methods reflect this shift in increased sensitivity towards aircraft noise.

Most alarming is that some well established and frequently used metrics for measuring the noise drastically alters predictions of the number of people affected depending on which is utilised. The Heathrow metric based upon $57L_{Aeq,16hr}$ shows 258,500 people within the contour whereas the (sort of equivalent) $55L_{DEN}$ contour shows 725,500 affected. Choice of metric can therefore potentially underestimate the numbers of people affected.

Chapter 3 Measurement Methodologies.

There are a number of methods used to assess noise from aircraft and the report looks at several including

- single aircraft event either as Aircraft Noise Events as a number of overflying aircraft or aircraft exceeding a pre-determined noise level or as Sound Exposure Level (SEL or L_{AE}).
- Average noise levels over longer periods such as $L_{Aeq,16hrs}$ or $L_{Aeq,8hrs}$ or similar metrics. This includes the European L_{DEN} metric which averages noise over 24 hours with additional penalty weighting for day, evening and night levels.
- Average Levels as contours
- Number related numerical frequency contours or "number above" pre-set levels.

The current $57L_{Aeq,16h}$ contour method – It would only be suitable as a quantitative method for proximity to the airport. In places such as Tunbridge Wells where we have fly-overs from aircraft in the approach to Gatwick this metric would be unsuitable for assessing the annoyance to aircraft on local residents. To assess the annoyance factor of flights in these areas a wholly new metric will need to be used.

Annoyance is perhaps the most difficult to evaluate as it is a subjective response to a noise stimulus. I would agree that the level of annoyance will be based upon an interwoven relationship between,

- Noise exposure (probably based on absolute noise levels or relative noise levels such as actual noise level compared to background or ambient noise levels., This will be particularly relevant to areas further away for the airport and associated urban environments where the "aircraft free" background or residual noise levels are substantially lower. This would make aircraft noise that might be acceptable in a busy urban environment unacceptably intrusive in a more rural environment. It is vitally important to note that the same noise level can have different effects in different locations and this needs to be accounted for in any metric used to assess annoyance.
- The number of Events during a period that the listener is subjected to,
- The tonal quality of the noise, and
- The activity being undertaken at the time of the noise (relaxation or sleep will have a greater annoyance than working).

There will probably not be a perfect way of assessing the impact of aircraft noise as laboratory work tends to be more accurate whilst disengaging from real activities that also play a part. Surveys are subject to bias and inaccuracy. However the general relationship trend of increased sensitivity is evident, to a greater or lesser extent, between the methods. This trend indicates that people are becoming more sensitive to aircraft noise. This fact is also highly significant and should be reflected in any metric that will equate noise levels and numbers of ANE's to annoyance. The ANASE study, despite its methodology being criticised, suggested that people were becoming more sensitive to NUMBERS of aircraft movements rather than the noise levels from single movements. This is more in line with my anecdotal experience relating to complaints made to our service. This is also one of the major problems with any envelope system in that these could further exacerbate the problem by allowing extra flights to airlines where individual aeroplanes have marginal reductions in noise levels.

The report indicated that numbers of complaints vary dependant upon specific local issues (such as press coverage or perhaps consultations such as the multiple aircraft consultations during the last year). The implication is that this could be caused by people being focused on issues rather than being affected on a day to day basis. I believe that this is probably not the case and it is more likely to do with the psychology of complaining. If people do not see any benefit from complaining about situations that disturb them they will NOT complain about it as there is no tangible benefit. However, if there is interest or a possibility that someone will listen to the complaint then they may be prepared to complain. It should therefore not be a surprise that complaint activities increase as a result of a "specific local issue" as this could make people more incentivised to complain. In addition it must be accepted that there is likely to have been massive under estimation of complaints as a result of people not being bothered to complaint in the first place because they think others will do it for them or believing (probably rightly so) that it will not change anything anyway. This concept of under reporting is very common other scientific or medical studies such as epidemiological studies and this concept would be even more so in studies involving a subjective concept like noise.

It should be noted that the category for all these assessment is "highly annoyed" which is a small proportion of the annoyed demographic. It would be useful if there was inclusion of a category of "moderately annoyed" as this would involve a higher proportion of the population affected by aircraft noise than just "highly annoyed".

There is good evidence that there are negative effects on cognitive skills in children as a result to chronic noise exposure. Again is more likely to have tangible effects closer to airports than further out along the incoming flight paths.

Chapter 4 – Assessment of Noise to obtain acceptable levels

The report indicates that the proportion of people annoyed by given levels of aircraft noise has increased over time postulating that this is likely due to increasing (numerical) frequency of flights. It is therefore totally appropriate to,

- Ensure that new metrics and assessment methods are suitable and possibly linked to the number of flights or ANE's that people are exposed to not just a single averaged noise metric such as an $L_{Aeq,16hr}$.
- Assume the continuation of the trend and that this is built into the chosen metric to allow for the fact that a level chosen to represent onset of annoyance is likely to be insufficient in future if people become more annoyed. Page 48 indicated that the government were inclined such that "within the limits of the envelope, the benefits of future technological improvements should be shared between the airport and its local communities, thereby achieving a balance between growth and noise reduction". The increasing annoyance with passing time to annoyance would suggest that this should not be the case and that airlines should be forced to become quieter for the community without getting increased numbers of flights. To see real tangible improvements for residents the sharing would need to be done on a skewed basis so that the benefits are given to the residents not used to get more flights squeezed in to day or night time slots. See previous comments about noise envelope schemes.

Night time noise should be avoided as these cause the most disturbance to residents who expect not to be disturbed by aircraft noise whilst trying to get asleep, being asleep and staying asleep for the duration of the night time period to get the full restorative process that is associated with undisturbed sleep. There is very little evidence to support the need for night time flights until every aircraft during the day is totally full. The need for aircraft at night should be based upon,

- Could the customer have caught a daytime flight (number of empty seats). The way it would work in practice is that the airline industry would argue that customers should have the choice of when they would fly and what time they would arrive at their destinations. They might even argue that they would use alternative methods of transport. This will not be the case as people will just have to go a bit earlier that they expected and use a hotel if this is necessary. In reality the vast majority of flights into Gatwick at night are flight of people returning from holidays abroad and will have relatively little economic impact from the rescheduling of these to more appropriate daytime slots.

The use of cost benefit analysis (CBA) by policy makers is also inherently flawed and bias towards the airlines. They can easily identify profit to themselves and other job related (direct and indirect) from increased flights. They also often exaggerate the negative financial effects such as cessation of night flights counting the current number of passengers using the service as "lost income" when in fact they are more likely to have to reschedule to a daytime flight so the income is not lost. Perhaps the worst flaw of any CBA is that it does not count the true cost against the proposal. By not being able to put a monetary value to annoyance the balance in the CBA is weighted in favour of the airlines. It should be relatively easy to put a value on annoyance by looking at;

- The decrease in property price as a result of the aircraft overflying. However, buying a property is more of a one of payment and is more associated with ability to afford property and so property prices should not be the only factor in assessing loss to an individual.
- How much people would pay not to have the aircraft flying (a notional sum that they would, in theory, voluntarily add to their council tax to re-route the aircraft (this does not actually have to be paid but would give a figure of what its worth would actually be!).
- Sound Insulation Schemes are targeted towards properties closest to the airports who are most effected. However in a truly global CBA scheme costing's would be for sound insulation to put people back to the position where they would be prior to the flights. Thus costing's for increased glazing specs and/or individual room mechanical ventilation such as Titon F+ would be incorporated into the scheme. These do have costs and it would be necessary to determine a level where noise levels exceed a set level (much lower that is set at present) to at least trigger a monetary sum for mitigation to ensure that internal noise levels with the equivalent of windows partially open for ventilation are fully costed when assessing the scheme.

There are even flaws with the assessment of health impacts being monetised. It may be possible to look t as costs for more serious events with QALY's and DALY's but again smaller impacts on health that are much more widespread are not costed against in the CBA. It would be necessary to put a cost to the smaller and less quantifiable issues that will affect a large number of people for reductions in their wellbeing as a result of noise.

Similarly the disadvantage to children who's cognitive development is impaired by noise needs to be factored into any meaningful CBA – It is possible to establish the average salary of a university degree (it was part of the rational by the Government for increasing University Fees) it would therefore be possible to calculate the impact of children exposed to noise who do not get to University and add this detriment to the CBA. It should also be possible to do job prediction for those that do not attain GCSE or GCE qualifications as well so that the full impact is accounted for in the analysis.

The key point is that **ALL** the costs should be given a value – just because it is sometimes difficult to do so should not preclude the necessity to be fully inclusive of all dis-benefits.

The view of Tunbridge Wells Borough Council is that there needs to be system that takes more account of the "precautionary principle" to both health and annoyance factors. This would avoid the confusion and uncertainty over the results of different studies being manipulated or skewed to allow a tendency to accept higher levels of noise because there was debate over the findings of results. Our view is that Cost Benefit Analysis should developed more to calculate all the negative impacts as well as the positive impacts. We also have concerns that the focus on "highly annoyed" as a category does a massive disservice to the vast majority of people who are disturbed by aircraft noise. I do not have a copy of the 11 point scale used in ISO 15666 but there will be a spread from some notional extremely high disturbance down to not at all annoyed. In the consultation report circulated terms such as "moderately", "very" "extremely" "seriously" "significant" and "highly" annoyed have been used. This does not deal with the lower categories of annoyance". Focus on this category will do noting to deal with the issues further out along the landing flight paths.

Chapter 5 Noise Mitigation

The noise management and the EU's Operating Restrictions Directive for dealing with mitigation in a cost-effective manner by sequential priority focusing on;

- Reduction of noise at source (quieter aircraft),
- Land use planning and management,
- Operational procedures and
- Operating Restrictions.

Technological advances have undoubtedly had success but as speculated the increases in aircraft size and number of movements has offset the advantage achieved. However, most of the noise assessment is associated with take-offs and as such may have less impact on approaches to landing particularly out further into the approach zone. The fact that there are still large quantities of noisier aircraft out there is testimony to the lack of incentive to switch through the use of landing and take-off fees that reflect the "noisiness" of the aircraft. There is a limit to what land use planning around airports can achieve – it can effectively blight land in favour of the airport and whilst it would not increase the number of people that experience the worst excesses of aircraft noise it does not deal with those that are already affected and it does not deal with those that are affected by landing aircraft particularly where the effect of noise causes disturbance to communities substantial distances from the airport in quieter rural or semi-rural environments.

The use of operational procedures is potentially one of the most important ways of dealing with noise from aircraft. However, the way aircraft are managed causes problems with Air Traffic Control taking control of aircraft above 4,000 ft and the airport taking control of aircraft under 4,000 ft. An immediate improvement for those on the landing path could be achieved by increasing the descent angle from the current 3° to closer to 6°. This has been done for City Airport where approach angles are over 5° but for unspecified operational reasons these have not been adopted by the major airports. There should be controls over angle of approach and using continuous descent technology to reduce the impact further from the airport. Airports have been very reluctant to embrace

steeper descent angles (possibly on safety basis arguments) but are very willing to adopt these where planning permission might otherwise be refused. There needs to be more control so that airports have to implement best policy and that this is not based on whims or for trade off that allow more flights. The angles could be implemented on an incremental basis of 0.5° to 1° per year to evaluate the noise and other performance of the change and arrive at the optimum.

There is a dilemma with policy in relation to having tighter flight paths or wider flight paths. The National Air Traffic Service (NATS) are about to consult on new proposals to improve air traffic control based upon advances in aircraft navigation that allows greater accuracy in achieving flight paths down narrower corridors. This is likely to result in an improvement in noise for a number of residents whilst making the noise substantially worse for others. One resident in Tunbridge Wells complained that occasionally aircraft flying overhead were at a rate of one every minute and a half indicating that he had barely recovered from one aircraft disturbance when another one would start. This could be a major problem if there are tighter routes in that some properties will experience vastly increased ANE's.

The current sound insulation schemes would not extend to people further out in the landing approach flight path as trigger levels are intentionally designed to target those in relative proximity to the airport. Again in any CBA any increases in noise level for households should be mitigated when they exceed a target level. The target level should be set so that it reflects the area affected so a property in an area with a low background noise level would expect to have less noise than a property with a high background noise level.

The measurement of noise and applying it to assess annoyance is difficult and would require a lot of study to get a suitable metric which will inevitably still be challenged within the scientific/acoustic community. There will also be challenges by the airport owners or residents depending on how this impacts on potential restrictions in flight numbers and times. However there are a few issues that appear to be fundamental to assessment,

- It is imperative to maintain historical measurement metrics as they can keep track of changes.
- New metrics can be added as primary or secondary assessment measures. Most modern noise monitoring equipment is capable of measuring many metrics simultaneously and computer programs can use the data to produce multiple assessment techniques. So it is not necessarily a case of just picking one and never thinking of other methods. It will be necessary to have a main one for assessing noise with the others as additional data to try an correlate noise levels with actual community reaction around a specific airport.

A metric to assess noise annoyance will have to take account of all the issues that give rise to annoyance such as,

- Noise level (metrics like L_{AE}, L_{Aeq} and others)
- Time of the day there should be weightings for noise that occurs at anti-social hours (as per L_{DEN}). The reports suggest that there is debate over the use of such penalties but in common sense terms they make perfect sense – most people would rather be disturbed by a given noise level during the day than for the same noise level at night. To cause less annoyance at night the noise level should be lower so it is self-evident that noise at night needs to be weighted to reflect the impact on the public.
- Tonal noise levels associated with aircraft (frequency analysis in third octave band possibly) to levy penalties on aircraft with particularly annoying tones or flown carelessly to cause excessive accelerating and decelerating noise.
- The number of over-flights (ANE) is crucial to annoyance. This is backed up by studies showing that tolerance to aircraft noise levels is dropping (despite the technical reductions in aircraft noise due to improved technology) and that numbers of disturbances should be a heavy weighting on any assessment method. This is always going to be the flaw in any assessment that purely uses long term average noise levels as these allow small reductions in noise level to justify more ANE's and still have the same overall noise levels whereas there is mounting evidence that numbers of flights is a fundamental issue in annoyance.

The Noise and Number Index (NNI) had the strength associated with combining noise exposure and the average number of aircraft heard. This introduced the number of aircraft as an important factor in calculating annoyance. It also established a relationship of 4.5dB increase in noise exposure per doubling of the number of aircraft flights

rather than the 3dB increase using L_{Aeq}. This is important considering the evidence for decreasing tolerance to aircraft noise that is associated with more ANE's being able to take place within the same L_{Aeq} noise exposure levels.) Low annoyance (35NNI) and moderate annoyance 45NNI needs to be reflected more in whatever metric is incorporated so that those that residents below the "highly annoyed" bar are represented in any meaningful discussion on aircraft noise. NNI may well be out of line with current L_{Aeq} based metrics but some of the principle involving ANE's should be re-incorporated into an L_{Aeq} type metric.

The WHO has proposed general day time noise exposure of 55dB LAeq where few people will be "seriously annoyed" and 50dB where few people will be "moderately annoyed". These are good starting points for a baseline above which aircraft noise should not be able exceed. However, they are generic number for generic populations and probably reflect noise in build up areas. The intention of these levels is to ensure that there is a downward trend towards these levels in the nosier urban environments. This level is not a justification for areas with lower levels to have increased to these levels and still be deemed to be satisfactory. Tunbridge Wells Borough Council suspects that even levels of this magnitude would cause problems in areas that are inherently quiet with background noise levels of around 30dB in the countryside and quieter residential areas. To assess these properly an "outer area" metric could be devised that has L_{Aeq}'s, compared against background L_{A90}'s or ambient L_{Aeq}'s when aircraft noise is not present with weightings to take account of numbers of aircraft flying over.

The best method of comparison would be indoor levels as these would best correlate with disturbance when sleeping but these are not practical. The metric chosen will have to be based on outdoor monitored levels that correspond to indoor levels based upon average sound attenuation of windows that are open for ventilation.

The worst scheme suggested in the report was "noise efficiency" related to productivity which is absolute madness if examined fully. This allows ratings for airports to be changed due to the number of passengers they fly per person in the 57LAeq contour. Under this scheme if Heathrow were able to double the number of flights (even if they could do this at night) or use bigger planes their rating would increase and be regarded as very efficient and productive despite the whereas if we have it in the middle of a city where it affects lots more people it will be an massive increase in efficiency and be classed as an improvement despite the fact that the same number of people would experience an increase in the number of aircraft flying overhead. This sort of scheme would only really be of benefit to airport owners to screen annoyance behind a smokescreen of productivity.

The reduction of annoyance would inevitably involve reducing or banning night flights, modifying aircraft to minimise noise and changes to the operation of the aircraft incorporating continuous descent at steeper angels.

Airports should be required to prepare noise reports for enhanced contours including.

- $L_{Aeq,16\ hrs}$ and $L_{Aeq,\ 8hrs}$ for levels down to around 35-40dB
- $L57L_{Aeq}$ with additional levels from L55 down to about L30-40.
- L_{DEN} Noise Levels for Levels from 55dB down to 35-40dB

Summary of response based on questions in the consultation paper conclusion

Appropriate method for assessment of noise,

- **Metric to be used** – one that incorporates the number of aircraft (ANE) in addition to an averaged noise level such as $L_{Aeq,16hr}$, L_{DEN}.
- **Use of multiple metrics** – there is nothing wrong with multiple metrics as modern equipment can measure many parameters and software can run many algorithms simultaneously.
- **Additional Metrics not discussed** – not aware of any but perhaps a hybrid of existing ones might be feasible.
- **Baseline of noise** – it is not appropriate to base assessment on just a absolute noise level. It is essential that there is a comparison of the existing noise climate (L_{A90} or residual L_{Aeq}) to assess true impact on people affected. This will be particularly relevant in rural areas and semi rural areas under the flight paths.

- **How to categorise an area under the flight paths** – use L_{A90} or residual L_{Aeq}. Possibly with a frequency analysis to identify (and penalise) the distinctive whine (as per BS4142 for tonal noise from factories).
- **Assessment methods (Ch 4) be improved to reflect noise impacts and effects** – the methods need to reflect numbers of aircraft as well as measured levels as this is fundamental to increased "annoyance" despite the fact that actual noise levels from aircraft are falling. Any metric that overlooks the ANE will therefore be fundamentally flawed.
- **Monetising noise impacts** – the use of CBA is flawed as not all the costs have to be paid by the airport as they are theoretical calculations only. The failure of CBA to "monetise" annoyance properly gives an artificial advantage to the airport companies as they find it easier to allocate a value to increased flights and to count losses if they are prevented from doing things or made to invest in mitigation. The inability to quantify losses to residents for loss of amenity and disturbance or lower levels of annoyance is a severe limitation for the whole CBA approach.
- **Levels/Thresholds** – most research has focused around airports where the noise is the loudest and the effects more noticeable. There is a lack of research into lower levels of noise that could and do cause annoyance in rural/semi-rural environments. Levels should be set based upon the precautionary principle – so it would be prudent to start with the lowest levels that show observable or measurable effects and only increase from this level when there is solid irrefutable evidence that this level will not cause any adverse effects. The use of the WHO 55dB and 50dB should be used to protect urban environments from steadily and insidiously upward creeping noise levels. They themselves would not be a useful measure for areas that have already low background or residual noise levels where a comparison with the existing levels. Indoor levels would be most pertinent for sleep disturbance but difficulties in measuring these would necessitate a outdoor level to be used (that would correlate with appropriate indoor levels with windows open for ventilation).
- **Noise in previously unaffected areas versus noise in already affected areas –** Areas that have aircraft noise will be more used to the noise and perhaps have some other noise sources as masking noise where as new routes may be more rural and the intrusion of noise into these hitherto quiet areas will be keenly felt.
- **Noise envelope approach –** this is a pretty poor idea as research has indicate that people are more sensitive to aircraft noise and getting annoyed at lower levels. Using a noise envelope based upon doubling of aircraft giving a 3dB increase in noise levels would cause major increases in annoyance. Thus a 3dB decrease in noise from aircraft (note a 3dB change is a barely perceptible decrease/increase in noise level) could allow a doubling of aircraft numbers and still allow airports to keep within the noise envelope. This would be contrary to the evidence of increases in annoyance due to ANE's. The government approach to sharing noise gains by way of an envelope will cause problems to people who are finding that is the sheer number of disturbances that affect then not minor decreases in a notional and barely perceptible decrease in an average daily noise level.
- **Noise concentration versus dispersal –** it is a difficult call to decide whether it is better to spread the noise load (as per the Australian model) or to concentrate it in one area. The government have set an aim to reduce the number of people affected and one way to achieve this would be to divert flights over sparsely populated countryside rather than over built up areas. The National Air Traffic Service (NATS) consultation, due to be circulated in October 2013, will be asking whether it is better to have narrow corridors (focusing the noise on one or two areas or have dispersed flight paths. It is likely that giving the new plans to reduce "stacking" it is likely that wide dispersion will not be favoured and the question will be focused on one route or possibly or two routes to give some respite. The NATS consultation will probably be a key factor in determining this area of policy.
- **Best practice for noise compensation schemes –** None of the schemes are sufficient to truly compensate people for noise intrusion that results from the operation of an airport. This is one of the problems with CBA approach to costings. All the schemes operate for the very high levels of aircraft noise intrusion and it would be useful for a scheme that "kicks in" at much lower actual levels where the existing noise climate means that the noise would be more intrusive than the same noise level in a more urban environment (with higher residual noise levels). The amounts of money involved can be prohibitive for extensive schemes and in the UK these are not government funded – however as the government often cites the economy benefits it would seem prudent that to achieve these goals treasury money should be used based upon this increase in economy giving rise to increased tax levels. The European levels of

$55L_{DEN}$ footprint or the $50L_{Night}$ footprints are substantially more generous than the UKs compensation scheme footprints. These deal with noise levels considered annoying that are considerably lower than ours. There is probably room for more generous schemes for lower levels of actual noise where the noise intrusion would be by way of the necessity of windows being open for ventilation. Treatment of rooms with low cost ventilators such at the Titan F+ would enable sufficient ventilation without the need to open windows and would thus deal with sleep disturbance further along the landing paths. The criteria for eligibility could be based upon the sound exposure level of aircraft or an $L_{Aeq,15sec}$ compared with an L_{A90} or residual L_{Aeq} (perhaps with a factor that adds to that based upon number of flights flying during the night.

Tunbridge Wells Borough Council

John McCullough

John McCullough MSc BSc (Hons) CMCIEH MIOA
Principal Environmental Health Officer

T: 01892 526121 **ext:** 2013 | **VPN:** 7035 2013
E: john.mccullough@tunbridgewells.gov.uk
Town Hall, Royal Tunbridge Wells, Kent, TN1 1RS

Chartered Institute of Environmental Health

Chartered Environmental Health Practitioner