Sir Howard Davies, Chair
Airports Commission
Sanctuary Buildings
20 Great Smith Street
London
SW1P 3BT
United Kingdom
Noise.paper@airports.gsi.gov.uk

Dear Sir Davies,

We are submitting this letter in response to the 'Discussion Paper 05: Aviation Noise' dated July 2013.

Answers to questions below are numbered in the order they appear in the discussion paper.

Best regards,

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Response to Airports Commission Paper for Noise

Reconciling inconsistencies

Resolving the following inconsistencies would strengthen mutual understanding among the diverse group discussing airport noise:

First Inconsistency:

Commission Discussion Paper:

> "For communities adjacent to airports, and people living or working under flight paths, aircraft noise is an issue of significant concern… If anything, these concerns appear to have deepened even as aircraft have become progressively quieter, probably due to the increasing frequency of flights at the UK's busiest airports."

In the mitigation section of the discussion paper:

> 'noise from UK aviation will not increase despite a near doubling in flights over the next 40 years'

Second Inconsistency:

Commission Discussion Paper:

> Implicitly assumes that wind patterns will stay the same for London in 70/30 split.

Climate Scientists:

> Climate change may alter local weather patterns or prevailing winds. [1]

Third Inconsistency:

Commission Discussion Paper:

> Leaves out discussion of noise issues from climate change.

FAA and SA:

> Aircraft noise depends somewhat upon unknown economic policy surrounding carbon prices since the price to airlines of "fuel burn" to "noise fines" is unknown.

[1] http://www.environmentalevidence.org/SR91.html

Fourth Inconsistency:

Commission Discussion Paper:

> "The industry group Sustainable Aviation…has predicted that 'noise from UK aviation will not increase despite a near doubling in flights over the next 40 years'", implying that aircraft noise will follow a predictable pattern of decline regardless of decisions upon the need for capacity.

FAA and SA:

> Single aisle (narrow-body) aircraft may benefit from emerging engine technology of geared-turbo fans, open-rotor, and three shaft designs.

Exhaustless:

> Without more slots from increased infrastructure, only larger wide-body aircraft will meet the demand for more passengers out of hubs, crowding out quieter new narrow body aircraft used for short haul.

Logical Fallacy:

Commission Discussion Paper:

> "Noise will be a central issue for the Airports Commission, both in its assessment of options to make better use of existing airport capacity and in considering proposals for new infrastructure, should the Commission identify a need to expand capacity in the longer term."
>
> "Limit and where possible reduce the number of people significantly affected by aircraft noise."

Exhaustless:

> Proposals for new infrastructure should not be solely limited to expanding capacity. New technology or infrastructure that reduces noise for existing capacity should certainly be considered.

1. Stated Government Objectives:

From the Commission Discussion Paper:

> "If anything, these concerns appear to have deepened even as aircraft have become progressively quieter, probably due to the increasing frequency of flights at the UK's busiest airports."
>
> "Noise will be a central issue for the Airports Commission, both in its assessment of options to make better use of existing airport capacity and in considering proposals for new infrastructure, should the Commission identify a need to expand capacity in the longer term."
>
> Primary objective: Limit and where possible reduce the number of people significantly affected by aircraft noise.
>
> Secondary objective: Strike a fair balance between the negative impacts of noise and the positive economic impacts of flights.
>
> General principle: Share any benefits from future noise improvements between industry and affected communities.

How big is the noise problem?

To say that noise is a central issue doesn't quantify the problem or rank it relative to other problems. We suspect that a likely range would be between £10B and £100B to outright pay a "pied piper to lead" the noise from the UK.

The reason for the thought experiment is to highlight how significant the problem is but how little funding the problem receives. The FAA CLEEN program cited by the paper has proven as productive as expected for a collaborative symposium with the spirit of exchanging proprietary designs. The 5 participating companies pay a mere $5M a year to the cost-sharing program that the FAA hopes will yield shared creative designs. The total federal investment over the entire 5-year program will be $125M or $25M per year. That is roughly the amount of annual CEO compensation for each of the participating companies. For this little amount of money, at most the FAA may get some preliminary measurements of fuel savings and noise for new engine concepts.

Boeing's most recent financial outlook reduced research and development by $3.3B in 2013. This is with a back-order than includes 600+ B737s, 88 B787s, and 37 B777s, or around $120B. In addition, the U.S. government sequester reduced the FAA budget, just as NextGen is set to be implemented. Other than fines, there

is no budgeted funding for research in noise reduction methods at airports on par with the magnitude of the problem.

The government should directly fund research and development of solutions to a problem that is this central and this significant.

Bold Steps

The government has set too low a bar if all it accomplishes is spreading existing or new noise onto new communities. The UK is in a unique position to take bold steps to modernize its aviation infrastructure. The Airports Commission and its expert panel, with the political, technical and scientific breadth of knowledge they encompass, have the focused attention of the aviation world. The 'Submitting Evidence' discussion paper welcomed and inspired creative thinking to address the problems, while the noise discussion paper seems resigned to limiting noise, even though the concerns regarding noise have deepened.

2. How Does Noise Affect People:

Productivity and learning issues

For productivity and learning issues, there are other cost-effective solutions to consider beyond building insulation. Recent models of *noise-canceling headphones* are quite common among passengers on aircraft. At a retail price of $300 per headset, the per-student price might be much lower for a government bulk purchase. Foreign language instruction, reading, math, and teacher instruction could all occur while students where headphones that cancel out aircraft noise.

Avoid unintended consequences

In 2012, in an attempt to accelerate adoption of NextGen and reliance on performance-based navigation, the U.S. passed a law that gave the FAA the authority to change individual flight paths without going through a lengthy environmental study. Because the FAA did not have a process for evaluating impacts of individual flights, it appointed an advisory committee to recommend a method. The committee determined that concentrating noise for better overall fuel performance at the individual flight level would lead to concentrating that noise for many flights and cause that community to experience a noise level in excess of the maximum DNL level. The committee recommended that the FAA use cumulative noise data from multiple flights in order to prevent tipping a community past the maximum DNL noise level of 65dB (US maximum).[2]

[2]http://www.rtca.org/Files/Miscellaneous%20Files/CatEx2%20Report%20NAC%20June%202013final.pdf

3. Measuring aviation noise

Any 'scorecard' approach should include:

1. Some note of power spectral density, A-weighted, but with at least some idea of frequency distribution issues like PBN - used during certification.
2. Distribution in time between successive flights (Poisson distribution parameters).

Noise baselines for currently unaffected areas should be based upon changes to existing noise environments. This environment might be multi-faceted or contain many scores, but this would provide more meaningful comparison than a single "blended absolute metric" of L_{EQ}. For example, two communities may measure at the same noise level under the current accumulative noise method (such as SEL), but upon analysis of more data, one of these has 12 flights that go overhead all at once at the top of each hour, whereas the other may have 1 flight every 5 minutes. The current method does not provide any way to discern the quantity of interruptions. If we measured both the mean takeoff distribution (for example, 5 minutes with a standard deviation of 2 minutes) and the accumulated noise level, this data would better inform the analysis than just the measured accumulated noise level alone.

In addition, the annoyance from an interruption is difficult to quantify if the activity interrupted is not known. For example, a large water park near DFW airport has so many fountains creating white noise that aircraft overhead are not noticeable. We recommend categorizing interruptions based on the type of activity that was interrupted, such as:

1. Listening to media
2. Talking on the phone
3. Teaching a class/listening to lecture
4. Gardening
5. Eating dinner or lunch
6. Driving and listening to others in the car or the radio
7. Playing an outdoor game of football, tennis, or golf
8. Listening to sports game announcer
9. Riding bike

Contour maps and tables that list equivalent noise levels, or cumulative noise levels are certainly needed, but without interpretation within the scope of human activities interrupted by noise, how annoying each averaged level is perceived may have little bearing on actual citizen complaints or productivity impact.

Modern information technology tools that could help in gathering this type of data include:

- Mobile application for modern smart phones that would allow people to log complaints and have their location sent along with an audio intensity level recording. The data gathered could be combined into a more responsive map of NNI.

- Bands worn on one's wrist while sleeping allow their smart phones to record their sleep interruptions. This data, controlled for flight records, could allow an ongoing update to NNI for the given airport and changing aircraft mix. The CAA would provide a new prediction of their expected NNI for a given flight schedule, and noise level of those aircraft. Deviations from expected levels could measure whether annoyance is going down or up relative to the frequency of flights.

- A web-based-tool could integrate the annoyance data gathered from the above tools to onto a map with cumulative noise events, instead of individual flight noise monitor measurements. The contours could be color-coded and show the accumulation of the noise, the distribution of noise by aircraft and flight number and by time of day, overlaid onto the animated flight tracker. This could help monitor and measure the reduction in noise contours as operational changes and new technology are adopted.

4. Quantifying Noise Affects

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

A. Certainly the intermittency of noise can exacerbate the impact of aircraft noise. More frequent flights might offer less interruption to life if the aircraft is half or one-third as noisy as other aircraft operated less frequently. Collecting more data, as we suggest above, would provide the activity-interruption data needed to quantify these thresholds.

Q. Is monetising noise impacts and affects a sensible approach?

A. Monetization of noise impacts may be the most sensible option for those living under the landing paths, where flights must stay in a stable path in order to see the visual guidance systems that ensure timing and separation. The NNI findings show that a halving of events produces a decline of 4.5dB

in aircraft noise. If NNI is a predictor of annoyance, that would suggest that a doubling of events would lease to an increase of 4.5dB, as compared to the estimated 3.0 dB increase presented. Rather that wait to see which of these predictions is closer, it may be more prudent for all involved to preemptively buy out these residents.

Q. 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?

A. Those areas previously unaffected may not have sufficient insulation and sound proofing such that they would experience a much higher "dose" of noise than already affected areas.

Property values may decline more drastically for the previously unaffected region compared to a decrease in prices for those areas that have previously been affected.

5. Mitigation

The discussion paper makes the following declaration in discussing mitigation:

> The industry group Sustainable Aviation, which 'speak[s] for over 90 per cent of UK airlines, airports and air navigation service providers, as well as all major UK aerospace manufacturers', has predicted that 'noise from UK aviation will not increase despite a near doubling in flights over the next 40 years'.

It is difficult to reconcile the declaration above with the following caveats mentioned in SA's paper:

> "Therefore, whilst it is possible to predict with some certainty a future reduction in individual aircraft noise, the rate of noise mitigation achieved in future engine types could be significantly affected by whether policy makers decide to prioritise reductions in aviation noise or aviation's CO_2 emissions."

> "Open-rotor engines: Whilst projected to be quieter than today's aircraft, these aircraft are likely to be noisier than aircraft that could be developed with high-bypass turbofan engines"

> "It must be emphasised again that the approach does not take account of individual airport circumstances and should not be considered as a

> replacement for detailed modeling of individual airport noise footprints."

In addition, it is unclear if the Commission's inclusion of the above prediction is intended as a promise that noise will not get worse, or a threat, that if it does, fines will be paid. In assessing the following principle in light of the above prediction:

> General principle: Share any benefits from future noise improvements between industry and affected communities

The inverse should also hold, that future noise detriments will be shared between industry and the affected communities.

The SA also makes several assumptions that seem difficult to justify. Their prediction for long-term noise reduction is based upon a linear application of an average drop in noise per year over a four-decade time period. Saying that 0.1dB reduction will occur per year for 30 years to achieve a 3dB reduction is difficult to support to any numerical significance when slight changes in other policies could completely erase the reduction. Predicting this level of precision next year is difficult enough, let alone four decades from now, which is why the paper calls this the "baseline scenario" and mentions the caveats.

Exhaustless' takeoff assist technology enables aircraft to use open-rotor engines without fear of increased noise during takeoff. Fines imposed by airports for operating more noisy aircraft without takeoff assistance may prohibit adoption of open-rotor technology in favor of geared-turbo-fans. These fines might have unintended consequences in preventing the most cruise-level fuel efficient technology from being applied to meet overall UK CO2 reduction goals because of noise during unaided takeoff.