SSE Briefing Note on Planning Application UTT/18/0460/FUL

Assessment of Noise Impacts – Main Shortcomings

1 Fleet replacement assumptions

1.1 MAG's fleet replacement assumptions, as summarised in the table below (taken from the Environmental Statement[1]) are wholly implausible and are not supported by the evidence.

Fleet mix assumptions used in modelling[2]

Modelling Category	*Aircraft Type*	*Base Year 2016*	*Base Case 35mppa 2028*	*Development Case 43mppa 2028*
1	BAE ATP/DH4	13,869	15,193	7,736
2	B738	128,211	81,461	94,200
	B737 MAX8	0	98,779	117,724
3	A319	25,143	10,185	12,107
	A320neo	145	20,561	23,673
4	B757	943	1,011	381
6	B777F	5,538	11,694	12,208
7	MD11F	1,102	1,178	1,163
8	B747-8F	2,071	4,787	4,473
9	Embraer 190	1,452	1,670	293
10	EC155 Helicopter	2,145	2,301	7
Total		**180,619**	**248,820**	**273,965**

Source ES 2, Appendix 2, Table 10.2.2. Note: Category 5 not used.

1.2 This is an example of the devil being in the detail. MAG's implausible assumptions are perhaps best illustrated by looking at the example of Ryanair, which dominates Stansted, carrying 82% of its passengers and accounting for 78% of Passenger Air Transport Movements ('PATMs') in 2016.As at 31 October 2018, Ryanair had a fleet of 460 aircraft, all B737-800s. Ryanair has a further 5 of the same model on order, with delivery of these expected over the next few months, taking its fleet of B737-800s to 465 by March 2019. The average age of the Ryanair fleet is 6.4 years.

1.3 The Department for Transport ('DfT') advises that the average service lifespan for UK civil passenger aircraft on scheduled operations is 22 years. On a 22 year life cycle, only 52 of Ryanair's current aircraft would be replaced by 2028. Ryanair has placed firm orders, and has delivery dates agreed over the next six years, for 135 new B737-Max 8 aircraft. It has options for a further 65 B737-Max 8 aircraft but it is questionable whether, even if these 65 options were confirmed now, the additional aircraft could all be delivered by the end of 2027.

1.4 The Boeing order book for the B737-Max 8 currently stands at 4,783 aircraft and continues to grow significantly each month. Only 219 have so far been delivered, leaving a backlog of 4,564 aircraft. Current production is 42 aircraft per month, which Boeing plans to increase to 57 per month next year. Allowing for this, the waiting list currently is about 7 years; in other words, options confirmed now, should start to be delivered towards the end of 2025.

[1] Volume 2, Appendix 10.2,Table 10.2.2.
[2] Aircraft type described as B738 in Table 1 is shorthand for Boeing 737-800.

1.5 If Ryanair confirms its 65 options within the next few months (Ryanair may simply be waiting to see what happens with Brexit), the Ryanair fleet at the end of 2027 is likely to comprise around 613[3] aircraft, compared to 465 today. This is in line with Ryanair's (slowing) growth trajectory. The 'central case' scenario is therefore that Ryanair will have 613 aircraft at the start of 2028 with 200 of these (32.6%) being the new Max variant of the 737-800.

1.6 SSE has carried out similar analysis for easyJet, with a similar result. The current easyJet workhorse, the Airbus A319/A320, will gradually be replaced by 'quieter and cleaner' neo[4] variants. EasyJet has 100 of these on order and options for a further 100. The Airbus order book for the neo variants of A320 series currently stands at 6,142 aircraft (and is increasing every month) and just 434 have so far delivered, leaving a backlog of 5,708 aircraft. Airbus plans to increase production to 60 per month by the end of next year. Allowing for this, the waiting list is about 8 years; in other words, options confirmed now should start to be delivered towards the end of 2026.

1.7 There is, however, another factor to consider with regard to easyJet's fleet replacement programme, namely, it is not like-for-like replacement. EasyJet's A319s (156 seats) and A320s (180-186 seats) are mostly being replaced by the larger A321neo (235 seats). The comparative benefits in terms of noise and emissions are therefore much reduced. MAG's noise assessment takes no account of this. It can be seen in Table 1, para 1.1 above that there are projections for A319neo and A320neo aircraft but not for A321neo aircraft.

1.8 In summary, whereas MAG has assumed that 57% of the 'mainstay' Stansted PATMs (Ryanair/ Jet2/easyJet) will be 'Max/Neo' types by 2028, the evidence indicates 30%-35%. The significance of this is that Max/Neo types are modelled as **40%-50%** quieter than current B737/A319/A320s. It is therefore inevitable that MAG's modelling has significantly understated the noise impacts.

2 Average summer day

2.1 The DfT requires[5] noise contours to be modelled based on noise impacts on an average summer day ('ASD').[6] This is a well-established, longstanding convention.

2.2 MAG's modelling assumes a total of 818 ASD aircraft movements at Stansted in 2028 in the 43mppa case. This is just 9.2% higher than the daily average for the full year, i.e. 749 aircraft movements. SSE has checked the position and found that ASD aircraft movements were 12.1% above the annual daily average in 2017 and are projected to be 12.4% above the annual daily average in 2018.

2.3 The significance of this is that MAG's noise modelling of noise impacts in 2028, in the 43mppa development case, is based on 818 daily movements but it should be based on 840 daily movements. In other words, about a third of the increase in daily movements in the 43mppa case, compared to the 35mppa case, have been 'air-brushed' out.

3 Combined modelling error factor

3.1 Combining the effects of MAG's implausible fleet replacement assumptions and understated ASD aircraft movements, our estimate is that MAG's modelling of the noise impacts for 43mppa in 2028 understates the true impacts by between **15% and 20%**.[7]

[3] Current fleet of 465 minus 52 retired plus 200 new deliveries.
[4] neo = 'new engine option'.
[5] Based on CAA policy CAP 1616A.
[6] The 92 days between June 16th and September 15th.
[7] Comprising 13%-16% understatement arising from the implausible fleet replacement assumption issue and about 3% arising from the understated ASD assumption, rounded to 15%-20% range. Further information explaining the basis for SSE's estimate, and the underlying calculations, are available if required.

4 Noise metrics

4.1 The application relies on noise assessment metrics solely based on the average noise levels over a 16-hour day and an 8-hour night, which are not sufficiently sensitive to the frequency of aircraft noise events and take no account of background noise or of the impact of cumulative effects.

4.2 The Department for Transport ('DfT') now accepts that it is not sufficient to rely solely on average noise metrics and the Government's new aviation strategy – due for publication as a Green Paper in December 2018 and as a White Paper (i.e. a formal statement of official Government Policy) around the middle of 2019 – is expected to set down a more comprehensive basis for assessing aircraft noise impacts. This will be only the third Aviation White Paper since 1985 and so it will be an extremely important document in terms of setting future aviation policy for many years to come.

4.3 Meanwhile, MAG has used the $57dBLA_{eq.16h}$ noise contour[8] as its principal yardstick for defining the daytime onset of significant community annoyance. This noise contour is now widely discredited, but MAG argues that it still the correct yardstick to use until the new policy is adopted. This may be part of MAG's rationale for the unseemly haste behind this planning application.

4.4 The DfT now recognises that significant community annoyance is observed from $54dBLA_{eq.16h}$. Importantly, the dBA scale is logarithmic, whereby a doubling of like-for-like aircraft movements results in an increase of just 3dBA. The converse also applies. There is therefore a vast difference between 54dBA and 57dBA.[9]

4.5 Moreover, the officers' report[10] relies on community noise tolerance levels claimed by MAG in its Environmental Statement for the LOAEL[11] and SOAEL[12] thresholds which are far higher than the values set down in the DfT SoNA[13] report. This fundamental misinterpretation has seriously skewed officers' conclusions regarding the significance of noise impacts.

4.6 The officers' report (para 9.179) contains the following table:

Effect level *	Noise level (dB)		Typical Action
	Daytime	Night-time	
NOEL	LAeq, 16h ≤ 51	LAeq, 8h ≤ 45	None required
LOAEL	51 < LAeq, 16h ≤ 63	45 < LAeq, 8h ≤ 54	Identify, mitigate and reduce to a minimum
SOAEL	63 < LAeq, 16h ≤ 69	54 < LAeq, 8h ≤ 63	Avoid
UAEL	LAeq, 16h ≥ 63	LAeq, 8h ≥ 63	Prevent

* NOEL – No observed level of effect
* LOAEL – Lowest observed adverse effect level
* SOAEL – Significant observed adverse effect level
* UAEL – Unacceptable adverse effect level

4.7 The above table is taken from the MAG Environmental Statement (Volume 1, Chapter 7) and the figures shown are simply wrong. Again, the devil is in the detail, as below:

[8] LAeq denotes the A-weighted equivalent sound pressure level – a notional continuous level that, over the defined time period (for example 16 hours i.e. LAeq16) contains the same sound energy as the actual fluctuating sound over that same time period. LAeq16 is thus the average sound pressure level over the 16 hours from 0700 hours to 2300 hours.
[9] For further detail see App C, p.169 in SSE's Main Submission (April 2018) to UDC on Application UTT/18/0460/FUL. http://stopstanstedexpansion.com/documents/UTT-18-0460-FUL-SSE_submisson_incorprating_corrections_18_May_2018.pdf.
[10] Officers' report, para 9.179, e.g. shows daytime SOAEL as 63-69dB LAeq whereas it should be 54dB LAeq.
[11] Lowest Observed Adverse Effect Level.
[12] Significant Observed Adverse Effect Level.

4.8 In 2014, the DfT commissioned the 'Survey of Noise Attitudes' ('SoNA')[14] study to investigate changes in public attitudes towards aircraft noise. This was published in 2017 and it builds on the levels outlined in the Department for Environment, Food and Rural Affairs ('Defra') Noise Policy Statement for England ('NPSE')[15] referred to in the officers' report (para 9.179).

4.9 The SoNA paper states that significant community annoyance previously observed around 57dBLA$_{eq.16h}$ is now observed from 54dBLA$_{eq.16h}$ ('SOAEL'). This finding is supported by another study by Defra indicating an aviation LOAEL in the range of 50dBLA$_{eq.16h}$ to 54dBLA$_{eq.16h}$. The above table wrongly shows the SOAEL daytime lower range value as 63dBLA$_{eq.16h}$.

4.10 In August 2017, the DfT published an Impact Assessment for Assessing Aviation Noise Impacts[16] setting out its intention to set 51dBLA$_{eq.16h}$ for daytime and 45dBLA$_{eq.16h}$ for night-time as the LOAEL threshold. The daytime contours are used to show the population affected in para 9.189 of the officers' report which includes Tables 7.14 and 7.15 below.

Table 7.14 – Population within Daytime Observed Adverse Effect Level contours

Year	dB LAeq, 16h		
	LOAEL: 51	SOAEL: 63	UAEL: 69
2016 Baseline	12,600	200	0
2023 Do Minimum	16,944	384	0
2023 Development Case	17,634	384	0
2028 Do Minimum	11,884	284	0
2028 Development Case	15,336	334	0
25+ Permission	15,480	484	0

Table 7.15 - Population within Night-time Observed Adverse Effect Level contours

Year	dB LAeq, 8h		
	LOAEL: 45	SOAEL: 54	UAEL: 63
2016 Baseline	17,800	1050	0
2023 Do Minimum	24,830	2334	<50
2023 Development Case	25,430	2834	<50
2028 Do Minimum	22,630	2084	<50
2028 Development Case	21,980	2734	0
25+ Permission	15,980	1384	0

4.11 It can be seen from the above that UDC officers assumed a 63dBLA$_{eq.16h}$ threshold for the population within the daytime SOAEL contour. The correct basis for SOAEL assessment is the 54dBLA$_{eq.16h}$ contour, which would significantly increase the population figures affected.

4.12 MAG did in fact provide the 54dBLA$_{eq.16h}$ figures in its Environmental Statement, based on CAA analysis. The 54dBLA$_{eq.16h}$ for the 2028 Development Case as assessed by the CAA covers an area of 53km^2 and a population of 6,150, not 334 as stated in Table 7.14 above. This is 18 times as many people affected at the 'Significant Onset of Adverse Effects' Level. Such a massive discrepancy clearly affects the validity of the officers' conclusions.

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[13] Survey of Noise Attitudes, DfT, 2014.
[14] CAP 1506: '*Survey of Noise Attitudes*', CAA, Feb 2017. http://publicapps.caa.co.uk/modalapplication.aspx?appid=11&mode=detail&id=7744.
[15] *'Noise Policy Statement for England'*, Defra, Mar 2010.
[16] '*Assessing Aviation Noise impacts during Airspace Changes'*, DfT, Aug 2017.

5 Noise Action Plans

5.1 Noise Action Plans ('NAPs') must, by law, be prepared every five years by airports using noise mapping carried out by the CAA showing the population within the 55dB L_{den}[17] contour. L_{den} contours are different from LA_{eq} contours but the principle of averaging noise over a defined time period is the same. L_{den} is the prescribed metric for airport NAPs.

5.2 The Lden metric covers the full 24-hour day but with evening values (1900 – 2300) weighted by the addition of 5dBA, and night values (2300 – 0700) weighted by the addition of 10dBA. This weighting endeavours to emulate the additional noise nuisance experienced during the evening and night periods, when background noise levels are lower and people are more affected by sleep disturbance. NAPs are a legal requirement arising from an EU Directive.

5.3 The most recent Stansted NAP approved by the Secretary of State covers the period 2013-18 based on noise mapping carried out in 2011. The next NAP will cover the period 2019–23 based on noise mapping carried out in 2016. The 2016 mapping shows that the population within the 55dBA Lden contour, defined in the EU Directive (and transcribed into UK law) as the threshold for significant noise impacts, increased by 1,300 (18%) to 8,700, in the five years from 2011 to 2016.

5.4 Furthermore, over the same five-year period the number of local residents within the other applicable noise contours, i.e. L_{day}, $L_{evening}$, L_{night} and $LA_{eq.16,}$ has increased, as shown below:

Number of Local residents within a range of noise contours

Noise Metric	Population adversely affected		% Increase
	2011	***2016***	
L_{day}	4,500	5,300	+17.8%
$L_{evening}$	4,100	4,900	+19.5%
L_{night}	1,800	3,000	+66.7%
$LA_{eq.16}$	4,400	5,200	+18.2%

6 Noise Complaints

6.1 The above table helps explain the huge increase in residents' noise complaints in recent years:

Year	Number of complaints
2013	907
2014	1,022
2015	747
2016	4,170
2017	8,411

[17] Lden is the LAeq for 00.00–24.00 hours with the evening values weighted by the addition of 5dBA and night values weighted by the addition of 10dBA. The 'den' stands for 'day, evening, night'.

6.2 It is important to point out that a large part of the increase is as result of the February 2016 flight path changes, sponsored by NATS and supported by Stansted Airport, which has had a particularly severe impact on villages to the east of the airport, notably Felsted, Stebbing and High Easter.

7 Additional issues

7.1 Further shortcomings in the Environmental Statement include:

- Arrivals and departures are aggregated for both runway directions (NE/SW), whereas in reality aircraft can only use one runway direction at any time depending on wind direction;
- Adequate allowance for wind speed and direction has not been made and so a reasonably realistic 'worst case' scenario has not been assessed;
- Noise impacts are not adequately assessed in areas under flight paths where satellite-based navigation results in concentrations of flight paths;
- Helicopter noise impacts have not been assessed, despite the UDC officers' Scoping Opinion (December 2017) requesting MAG to provide this assessment;
- The study area of 25km x 30km is insufficient. It needs to cover an area of 30km x 40km to provide a satisfactory assessment of noise impacts including those arising from more intensive use of PBN[18] departure routes introduced in February 2016 when outbound daytime 'Dover' route traffic was switched to the 'Clacton' route, to the severe disadvantage of communities to the east of the airport.

7.2 Night flights are a particularly sensitive issue at Stansted where the number permitted is more than twice as many as allowed at Heathrow, where night flights will be prohibited from 2026 as a condition of expansion. In addition, the rural environment around Stansted means that background noise levels are low, especially at night, and so aircraft noise impacts cause far more disturbance and community annoyance compared to aircraft noise in an urban area. None of this is addressed in MAG's assessment of noise impacts, even though an increase in night flights looks likely due to the predicted 58% increase in cargo movements.

8 Key statistics

8.1 MAG's own modelling (which, as explained above, significantly understates the true level of impacts) shows as follows (based on MAG's favoured 57dB$LA_{eq.16h}$ yardstick):

57dB $LA_{eq.}$16-hour contour	Area (Km^2)	Households	Population
2028 with 35mppa	25.5	650	1,750
2028 with 43mppa	28.7	1,100	2,800

8.2 Despite the above showing many more local residents adversely impacted, the officers' report considers the additional noise impacts to be "insignificant". The reality is that if the 43mppa application were to be approved by UDC Planning Committee:

- More than a thousand extra local residents would suffer significant aircraft noise impacts – and far more than a thousand if the new – much lower – 54dBA yardstick was applied.
- The 2013 'Aviation Policy Framework' 2013 White Paper (para 3.12) states:

[18] Performance-Based Navigation.

> *"The Government's overall policy on aviation noise is to* ***limit and, where possible, reduce the number of people in the UK significantly affected by aircraft noise****, as part of a policy of sharing benefits of noise reduction with industry."*

- The EU Environmental Noise Directive defines its objective as: "to avoid, prevent or reduce on a prioritised basis the harmful effects, including annoyance, due to exposure to environmental noise."
- Emerging Policy SP11, unanimously agreed by UDC Cabinet, and decisively endorsed by Full Council just five months ago in June 2018, states that development proposals for Stansted would only be supported where they would: ***"Achieve further noise reduction or no increase in day or night time noise …"***
- Despite the officers' recommendation, councillors are bound to be very reluctant to disregard a policy which they themselves decisively supported just five months ago.

9 Community health considerations

9.1 The UDC officers' Scoping Opinion (December 2017), advised MAG as follows:

> ***"In the event that the World Health Organisation ("WHO")'s new evidence on the impacts of aviation noise is published before a determination to grant planning permission, the environmental statement assessment must incorporate this evidence (for example, by way of supplementary assessment)."***

9.2 The WHO published its long-awaited new environmental noise guidelines on 10 October 2018.[19] The underlying theme is that the adverse health impacts of aircraft noise are significantly more serious than previously believed and so there is a need for stricter controls.

9.3 The WHO "strongly recommends" reducing aircraft noise levels below 45dB Lden for daytime exposure and below 40dB Lnight, at night in the light of evidence that aircraft noise above these levels has adverse effects on community health. The WHO says that policy-makers should:

> ***"…implement suitable measures to reduce noise exposure from aircraft in the population exposed to levels above the guideline values for average and night noise exposure."***

9.4 Accumulated data from numerous studies strongly suggests that those living in the vicinity of airports have a higher risk of cardiovascular damage. This conclusion is also supported by experimental evidence[20]. It is also likely that further damage may occur in those who already have compromised cardiac function.[21]

9.5 Sleep deprivation arising from aircraft noise impacts at night gives rise to fatigue and higher levels of stress and anxiety. All of this causes further adverse health impacts. Vulnerable

[19] Environmental Noise Guidelines for the European Region, WHO, Oct 2018.
[20] Schmidt F et al. 'Night-time aircraft noise impairs endothelial function and increases blood pressure in patients with or at high risk for coronary artery disease'. Clin Res Cardiol, Aug 2014. DOI 10.1007/s00392-014-0751-x.
[21] Van Kempen E, Casas M, Pershagen G & Foraster M. WHO Environmental Noise Guidelines for the European Region: 'A Systemic Review on Environmental Noise and Cardiovascular and Metabolic Effects: A Summary'. International Journal of Environmental Research and Public Health, Feb 2018.

groups, particularly the elderly, and those with pre-existing conditions are at higher risk from the adverse effects of aircraft noise.

9.6 Finally, there is also clear and substantial international evidence showing that aircraft noise has an adverse effect on the cognitive development of schoolchildren arising (a) because it causes sleep deprivation and (b) because it can interrupt classroom learning – the 'Jet Pause' effect.[22] None of this is adequately addressed in the Environmental Statement.

9.7 These issues are not simply of academic interest. Catherine Dean spoke to the UDC Planning Committee on 7th November and referred to the fact that there are two schools in Stansted Mountfitchet in close proximity to the airport boundary. In addition, Lt Hallingbury Primary School, Howe Green School, Hatfield Heath Primary School, Thaxted Primary School, Spellbrook Primary School and The Leventhorpe School are all either close to the airport boundary or almost directly under the main flightpath. Supplementary data provided by MAG in July 2018 shows significant daytime noise impacts on all of these schools.[23]

9.8 There can be no excuse for UDC officers and councillors to ignore the clear evidence of adverse health effects of aircraft noise and its adverse impact on children's learning.

9.9 At the very least, UDC officers' should insist that MAG does what it was told to do in the UDC Scoping Opinion (December 2017) which (as a reminder) was as follows:[24]

> ***"In the event that the World Health Organisation ("WHO")'s new evidence on the impacts of aviation noise is published before a determination to grant planning permission, the environmental statement assessment must incorporate this evidence (for example, by way of supplementary assessment)."***

9.10 The new WHO evidence was published on 10 October 2018. It is not even mentioned in the officers' report published on 22 October 2018. The WHO report states:[25]

> ***"To reduce health effects, the GDG*** [the Guideline Development group of the WHO] ***strongly recommends that policy-makers implement suitable measures to reduce noise exposure from aircraft in the population exposed to levels above the guideline values for average and night noise exposure."***

9.11 Approval of the current Stansted Airport planning application for 43mppa would have the very opposite effect to that which is **strongly recommended** in this latest WHO report.

Stop Stansted Expansion
9 November 2018

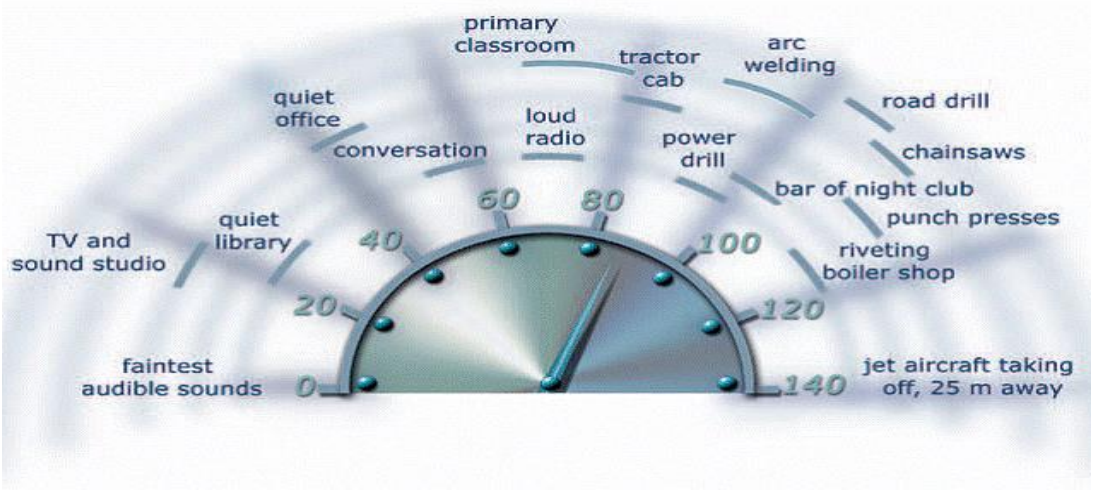
[22] Stansfeld SA1, Berglund B, Clark C, Lopez-Barrio I, Fischer P, Ohrström E, Haines MM, et al. 'Aircraft and road traffic noise and children's cognition and health; a cross-national study', (the Ranch project). June 2005.
[23] Cole Jarman Report Ref: 16/0366/M19, A7.3 Schedules 9, 11 and 12, 22 June 2018.
[24] Scoping Opinion for the 43mppa application, UDC, Dec 2017, para 47, bullet point 15.
[25] Environmental Noise Guidelines for the European Region, WHO, Oct 2018, Executive Summary.

Annex A

How Aviation Noise is Measured

The aviation industry attempts to discount the adverse noise effects of aviation growth by claiming that future aircraft are expected to be quieter. However, all aircraft are inherently noisy machines and a jet aircraft 25 metres away on take-off emits a sound pressure level of 140dB which is twice as loud as the threshold of pain at 130dB. Exposure to this level of noise would cause permanent damage to the ears. Comparisons with other noise sources are given below and every 10dB increase is a doubling of loudness since the decibel scale is logarithmic. For instance, an aircraft taking off emitting 140dB is 64 times louder than a tractor cab at 80dB. And more than 256 times louder than normal conversation.

Decibel levels of noise sources



While modern turbofan engines have reduced their noise emissions compared with earlier turbojets in the 1970s, this improvement is now becoming asymptotic to zero for the latest high bypass ratio turbofan engines in terms of the actual reduction of noise intensity. Claims that *"new aircraft are expected to be 50% quieter"* refer to calculated pressure levels (noise energy) when aircraft are certified on manufacture. Whereas what the human ear hears is loudness (noise intensity). The two are quite different.

A 50% reduction in pressure level is 3dB and is the minimum change perceptible by the human ear. It would take a 10dB reduction in pressure level (noise energy) to achieve a 50% reduction in loudness (noise intensity). Furthermore, the way that aircraft noise is assessed as equivalent continuous noise levels (Leqs) over a period of time disguises the adverse impacts of increased numbers of flights and the noise of each aircraft. Aircraft noise calculations in Leqs are given over periods of a 16-hour day and an 8-hour night. A doubling of like-for-like flights will increase the Leq calculation by only 3dB. If at the same time each aircraft were *"50% quieter"* in calculated pressure levels, not only would each aircraft be effectively imperceptibly less noisy but the Leq value over the 16-hour or 8-hour period would remain the same. However, a doubling of flights would be very noticeable.

Annex B

Adverse Health Impacts of Noise - Further References

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