Bickerdike Allen Partners
Architecture
Acoustics
Technology

BRISTOL AIRPORT

12MPPA PLANNING APPEAL

REBUTTAL PROOF OF EVIDENCE

NOISE

Report to

Bristol Airport

A11339_01_RP005_3.0
6 July 2021

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1.0 INTRODUCTION

1.1.1 I am Nicholas Anthony Williams, an Associate at Bickerdike Allen Partners LLP (BAP). I work as an acoustic consultant and have over 12 years' experience. I have prepared evidence on noise for this inquiry on behalf of Bristol Airport Limited (BAL). I have also read the evidence prepared by Mr Dani Fiumicelli on behalf of North Somerset Council (NSC) and by Mr Laurence Vaughn, My Ryan Densham and Mr David Vaughan on behalf of the Parish Council Airports Association (PCAA).

1.1.2 The issues raised are largely dealt with in my own Proof of Evidence (POE) or by other experts, in particular Mr Alex Melling for issues relating to planning policy and Mr Ryngan Pyper for issues relating to health impacts. Having now had the opportunity to review the other Proofs of Evidence, I would like to take the opportunity to provide further details for the following areas:

- Consideration of the WHO Environmental Noise Guidelines 2018 [CD10.10]
- Number Above assessment of the ESA forecasts
- Awakenings assessment of the ESA forecasts
- Discussion of proposed conditions

2.0 CONSIDERATION OF THE WHO ENVIRONMENTAL NOISE GUIDELINES 2018 [CD10.10]

2.1.1 Mr Fiumicelli highlights the failure to utilise the dose response relationship contained in WHO Environmental Noise Guidelines 2018 [CD10.10] as an issue (para 6.80 to 6.89 of his POE). He asserts that it should have been used as a sensitivity test for the assessment of annoyance, and that the value of 40 dB L_{night} should have been adopted as a LOAEL.

2.1.2 Taking first the annoyance assessment, as Mr Fiumicelli acknowledges the 2018 WHO Guidelines state (section 5.5) that dose response relationships based on local research should be used in preference, and it is clear that the 2014 SONA study [CD10.9] should therefore take priority for the assessment of annoyance in the UK. On this basis it was not considered necessary to present information for alternative dose-response relationships.

2.1.3 Regarding the value for the LOAEL at night, it is clear, in accordance with UK Government policy, that this should be 45 dB $L_{Aeq,8h}$, as stated in para 2.72 of the 2017 Consultation Response on UK Airspace Policy [CD10.43]. This document is also referenced by Mr Fiumicelli in his POE at para 3.18. The UK Government states in para 3.106 of the strategy document Aviation 2050 [CD9.29] that it is considering the 2018 WHO Guidelines and agrees with the general principle to reduce noise, but has not given any indication that the current policy will change with regard to LOAELs.

3.0 NUMBER ABOVE ASSESSMENT OF THE ESA FORECASTS

3.1.1 Mr Fiumicelli asserts in his POE (para 6.3 to 6.28) that the use of the $L_{Aeq,T}$ metric alone to determine significance is flawed.

3.1.2 As I set out in my own POE, UK policy refers to the $L_{Aeq,T}$ metric as the primary metric for determining significance, with other supplementary metrics recommended to be presented for information. Many other UK airport assessments also rely on the $L_{Aeq,T}$ metric as the primary metric.

3.1.3 Mr Fiumicelli relies heavily on a reference to the Heathrow 3rd Runway Preliminary Environmental Information Report (PEIR), as this is an example of an assessment which sought to incorporate supplementary metrics into the assessment of significance. This is a consultation document which was trying to develop an assessment method for dealing with an entirely new noise source (i.e. the third runway), and as such would have large variations in the number of flights overflying specific receptors. This is in contrast to an application for expansion such as is the case at Bristol Airport, where there is an incremental increase of existing noise sources.

3.1.4 As Mr Fiumicelli acknowledges, the process is relatively complex, however in simple terms the first step is an assessment of likely significant effects using the primary metrics (i.e. $L_{Aeq,T}$ and change in noise level, as has been used for the assessments at Bristol). The second step is then to look at supplementary metrics to see if any of the identified likely significant effects can be discounted.

3.1.5 The Heathrow PEIR used these Number Above metrics to determine that a change was <u>not significant</u> if the number of aircraft events above the noise threshold value (e.g. 60 dB for N60) was either below a certain number (20 per day, 10 per night), or changed by less than 25%.

3.1.6 The Heathrow PEIR did not consider the opposite scenario to be a significant effect in isolation. For example, if the number of aircraft events above 60 dB was greater 10 per night and changed by more than 25%, this was only considered to be a significant effect if there was also a likely significant effect identified by the assessment of the $L_{Aeq,T}$ metrics.

3.1.7 The assessments at Bristol did not find any likely significant adverse effects based on the primary ($L_{Aeq,T}$) metrics. Therefore following the same methodology as that referenced by Mr Fiumicelli, the supplementary metrics would not be used.

3.1.8 However, in the interests of transparency, the assessment of the N70 and N60 metrics has been updated using the ESA forecasts and is presented below.

Scenario	No. Dwellings Exposed to No. Events Above 70 dB L_{ASmax} per Day				
	10	**20**	**50**	**100**	**200**
Scenarios Assessed in the ES					
2017	3100	1450	650	20	0
10 mppa 2021	3300	2350	600	250	0
12 mppa 2026	2800	1300	650	350	0
10 mppa 2026	2500	1050	550	250	0
Scenarios Assessed in the ESA					
10 mppa 2024	2650	1300	650	20	0
12 mppa 2030	2200	1350	750	500	0
10 mppa 2030	1950	1200	700	20	0

Table 1: Summary of N70 Dwelling Exposure – Day

Scenario	No. Dwellings Exposed to No. Events Above 60 dB L_{ASmax} per Night				
	10	20	50	100	200
Scenarios Assessed in the ES					
2017	3800	90	0	0	0
10 mppa 2021	5150	2050	0	0	0
12 mppa 2026	6350	3300	1	0	0
10 mppa 2026	4400	2000	0	0	0
Scenarios Assessed in the ESA					
10 mppa 2024	5150	250	0	0	0
12 mppa 2030	5400	3150	0	0	0
10 mppa 2030	4800	100	0	0	0

Table 2: Summary of N60 Dwelling Exposure – Night

3.1.9 The number of dwellings exposed to the ESA contours are in most cases a little lower than the corresponding numbers presented in the ES. The exceptions to this are the N70, 50 event contours for all three scenarios, and the N70, 100 event contour for the 12 mppa 2030 scenario. The contour values presented are somewhat arbitrary, i.e. there is no effect linked specifically to 50 or 100 aircraft events per day. These increases are due to the change in the assumptions for the Airbus neo aircraft which now have in-service data available.

3.1.10 The relationship between the different scenarios is generally consistent with that for the ES, although there are some exceptions which are good examples of one of the shortcomings of Number Above metrics, i.e. that substantial changes in the number of dwellings exposed to a certain threshold can arise despite relatively small changes to the number of flights. The exceptions are discussed below.

3.1.11 The N70, 20 event contours for the ES showed that the 10 mppa 2021 scenario had a larger number of dwellings than the other two scenarios. In the ESA they are all similar.

This decrease is due to a reduction in the number of Boeing 737-800 departures compared to the ES scenarios.

3.1.12 The N70, 100 event contours for the ES showed similar numbers of dwellings exposed for all three scenarios. In the ESA the 12 mppa 2030 scenario has increased while the two 10 mppa scenarios have reduced. The increase is due to the change in the assumptions for the Airbus neo aircraft. The decrease is due to a reduction in the total flights by commercial aircraft in the ESA scenarios meaning that the combination of runway 09 departures and runway 27 arrivals, and vice versa, no longer reaches 100 flights by these aircraft in the ESA 10 mppa scenarios.

3.1.13 The N60, 20 event contours for the 12 mppa scenario are similar in the ES and ESA, but for the two 10 mppa scenarios are substantially lower in the ESA. This is due to a lower number of flights which means that the intersection of runway 09 departures and runway 27 arrivals no longer reaches 20 flights.

3.1.14 When considering the results in Table 1 and Table 2, it is important to keep in mind that the thresholds for numbers of events are not based on research finding that particular effects occur at different thresholds, but rather they were largely arbitrarily chosen for the Airports Commission assessments. In the UK the convention has been to use the same thresholds for consistency.

4.0 AWAKENINGS ASSESSMENT OF THE ESA FORECASTS

4.1.1 Mr Fiumicelli asserts in his POE (paras 6.29 to 6.34) that the omission of an assessment of additional awakenings due to the development is not in line with good practice.

4.1.2 As I set out in my POE (section 5.13) I do agree that an assessment of awakenings is required, however in the interests of transparency I have carried out such an assessment using the ESA forecasts and this is presented below.

4.1.3 As referred to by Mr Fiumicelli, I have utilised the probability of awakening presented in the 2018 Basner paper as follows:

Probability of Wake of S1 = -3.0918 – 0.0449 – L_{ASmax} + 0.0034 * $(L_{ASmax})^2$

4.1.4 The following assumptions have been made:

- With windows open, the reduction in sound level from outside to inside is 15 dB
- With windows closed, the reduction in sound level from outside to inside is 25 dB
- Windows are open at night for 25% of the flights

4.1.5 For comparison, if combined to an annual average, the above assumptions result in a reduction in sound level from outside to inside of 20 dB. The 2009 WHO Guidelines [CD 10.44] discuss a study which carried out simultaneous measurements of internal and external noise levels over long time periods. This resulted in an annual average reduction at night of 21 dB for properties with single glazing and 22 dB for properties with double glazing, although it did note that there was a large variation in the results. The study did not include any properties which had been specifically insulated against noise. Therefore the above simplistic assumptions are slightly conservative.

4.1.6 The receptors assessed were those which were identified in the ESA assessment as being exposed to a noise level of at least 80 dB L_{ASmax} (external) at least once per night in the 12 mppa scenario. These comprise 52 post code locations. These receptors would be expected to be those awoken most often.

4.1.7 The expected number of awakenings has been assessed by considering the flights forecast to operate between 23:00 and 07:00 for an average day over the year. Using the same methodology as the ESA, the L_{night} noise level has been modelled for each receptor location. This has then been converted into an expected number of awakenings for each aircraft event using the process described above. The total awakenings due to aircraft for each receptor for the year have then been added.

4.1.8 The recommendation from the 2006 Basner paper is to avoid people being exposed to at least 1 additional awakening due to aircraft noise per night on average over the year, i.e. at least 365 additional awakenings per year.

4.1.9 Only 1 of the assessed locations exceeds this threshold, and it does so in both the 10 mppa 2030 and 12 mppa 2030 scenarios.

4.1.10 Considering all of the 52 assessed locations, the average number of additional awakenings is 0.56 per night in the 10 mppa 2030 scenario, which increases to 0.66 per night in the 12 mppa 2030 scenario. This is below the Basner recommendations and should be considered in the context that various studies find that people experience spontaneous awakenings unrelated to noise around 20 times per night. For example, the 2018 Basner study found that for the subjects studied for aircraft noise there was a 7.7% chance of a spontaneous awakening in a 90 second period with no noise event, which equates to 25 such awakenings per night.

5.0 DISCUSSION OF PROPOSED CONDITIONS

5.1.1 There are a number of planning conditions proposed in the POE of Mr Fiumicelli, in the event that the appeal is allowed. These have been formally proposed by NSC. In this section I will discuss the proposed conditions that are related to controlling the noise effects and their merits.

5.2 Limits on Number of Aircraft Movements

5.2.1 In summary, the proposal is for the following limits on the number of flights, excluding exceptional circumstances such as emergency flights, but including non-commercial flights such as general aviation:

- 75,500 per calendar year
- 259 on the busiest day of the year (24h)
- 207 on the 93rd busiest day of the year (24h)
- 40 on the busiest night of the year (8h, 23:00-07:00)
- 32 on the 93rd busiest night of the year (8h, 23:00-07:00)

5.2.2 I have two objections to these conditions. Firstly, a limit on the number of flights is not an effective method to control noise effects; a noise contour area limit (discussed later) is much more effective. Secondly, if limits of this form are to be imposed, the number of flights suggested is well below what has been forecast as part of the ES or ESA, and therefore would restrict Bristol Airport to well below the proposed capacity of 12 mppa; that is simply derogating from the grant of planning permission.

Limiting the number of flights is not an effective method to control noise effects

5.2.3 The noise effects are based primarily on the $L_{Aeq,T}$ metric. It is therefore increasingly common practice at UK airports for there to be a limit on the maximum area of specific noise contours using the $L_{Aeq,16h}$ metric for daytime effects and the $L_{Aeq,8h}$ metric for night-time effects. This allows airports to trade off quieter aircraft with greater numbers of them. Limits of this kind are proposed and are discussed later.

5.2.4 The only justification provided for the imposition of limits on the number of flights is in para 9.2 and 9.3 of Mr Fiumicelli's POE, which state:

"To manage the potential trading off, of individually slightly less loud aircraft for a greater number of still noisy ATMs inherent in the energy averaging of the LAeq,T noise metric used to develop noise contours, there needs to be a cap on the number of ATMs at the airport."

5.2.5 The justification for limits on the number of flights therefore appears to be based on Mr Fiumicelli's assertions in his POE that the $L_{Aeq,T}$ metric is not a good measure of the noise effects, despite it being supported by UK policy and the most recent UK study confirming that it correlates the most closely with effects.

5.2.6 In addition, the number of total flights is already controlled indirectly by the number of passengers.

5.2.7 Appropriate noise controls are considered in the CAA document CAP 1731 [CD 10.13]. On the subject of aircraft movement limits it states the following (section 2.5.1):

"The number of aircraft 'movements' (total number of arrivals and departures) which occur at the airport over a given period can be set at an agreed amount based on an equivalent level of noise exposure that is not to be exceeded. There is, however, no

precise relationship between the number of movements and amount of noise produced as larger aircraft produce more noise than smaller ones at the same technology level."

5.2.8 This was not selected as one of the limit schemes for further investigation.

5.2.9 The relevant point here is that if an aircraft movement limit is utilised, it should be on the basis of an equivalent level of noise exposure. If said noise exposure is itself separately limited, there is no basis for a limit on the number of aircraft movements.

5.2.10 While limits on the number of aircraft movements do exist at some other airports, such conditions will have been imposed for reasons specific to that airport which may not apply at Bristol. Indeed, the airport operator may simply have accepted an aircraft movement limit proposed by the planning authority if it did not view it as restrictive.

5.2.11 There is no policy or evidence basis that the busiest day or the 93rd busiest day need to be controlled. Aviation noise policy and research is primarily based on long term average noise levels, either the 92-day busy summer period as is commonly used in the UK or the calendar year as is commonly used in many European countries for example.

Limits proposed are well below what has been forecast

5.2.12 Although I disagree that limits of this form are necessary, if they are to be imposed then the limits suggested are significantly lower than what is contained in the forecast.

5.2.13 The proposed annual limit of 75,500 is based on paragraph 3.2.7 of the ESA. This states that around 75,500 annual commercial ATMs are forecast for 12 mppa in 2030. However there are also forecast to be around 10,500 non-commercial flights per year, resulting in an annual total of 85,990 flights that were used in the noise modelling, as stated in Table 6.1 of the ESA. The proposed condition specifically includes both commercial and non-commercial flights and therefore is around 10,500 flights lower

than forecast. Some or all (it is not clear) of the proposed daily limits are derived from this annual total and so would need adjusting accordingly if they remain so.

5.2.14 For this reason if a limit on the number of annual flights were to be set, some allowance above what is forecast would seem sensible, in conjunction with a limit on the overall noise effects.

5.2.15 The proposed limit on the busiest 24h period is based on it having at most 25% more flights than the average day. This is justified by Mr Fiumicelli in para 9.5 of his POE which refers to it ensuring that noise levels would increase by no more than 1 dB $L_{Aeq,T}$. There is no policy or evidence basis that the busiest day should be limited in this way for noise reasons. The proposed limit takes no consideration of how the airport operates in practice, for example in 2017 the busiest day of the year had over 50% more flights than the average day. If such a limit is imposed then it would seem reasonable that at the very least it is in line with what has actually occurred in recent years (prior to 2020).

5.2.16 The proposed limits on the number of flights for the 93rd busiest day appear to have be the average of the permitted annual flights (i.e. 75,500/365 = 207, to the nearest whole number). The concept that the airport would only be permitted to exceed the annual average number of flights for 92 days of the year is not practical and would be far more restrictive than an annual limit.

5.2.17 It is not clear how the limits for the busiest or 93rd busiest night have been derived, other than that 25% more flights are permitted on the busiest night, as no justification or explanation is given. Table 6.1 of the ESA shows that the total number of night flights in the 92-day assessment period is forecast to be 3,940 for 12 mppa in 2030, which equates to an average of 43 per night. This is clearly incompatible with a limit of 40 for the busiest night of the year, which would likely not even accommodate the 10 mppa forecast. A suitable limit for the busiest night, if applied, should as a minimum

accommodate the forecasts that are the basis of the consented noise effects. Detailed analysis of these would be required by experts in this field.

5.3 Limits on Noise Contour Areas

5.3.1 In summary, limits have been proposed on the areas of the 51 dB $L_{Aeq,16h}$ and 45 dB $L_{Aeq,8h}$ noise contours to match the assessment of the core case presented in the ESA. There is some ambiguity regarding the proposed limit for night-time as both 40 dB and 45 dB are mentioned. It appears that the proposal is that the limits should align with the LOAEL (this is not disputed for daytime, for night-time NSC feel that 40 dB should have been adopted rather than 45 dB).

5.3.2 Limits are proposed based on the three future scenarios assessed in the ESA; 10 mppa in 2024, 10 mppa in 2030 and 12 mppa in 2030.

5.3.3 Conditions of this form are an appropriate method of controlling the noise effects; they relate directly to the assessed effects.

5.3.4 There are three main points of discussion relating to this condition; what value noise contour to set a limit at, which scenarios are appropriate to inform limits, and what area is appropriate for any limit(s) imposed.

<u>Value of noise contour to be limited</u>

5.3.5 Clearly the value of the noise contour will change the associated area limit, however the areas of the different contours vary in broadly the same way. For example, when comparing two scenarios, if the 57 dB contour is larger in one scenario by 10%, it would be expected that the 51 dB and 63 dB contours would also be larger by around 10%. There can be some variation but the general principle is robust. Therefore the choice of the specific contour value to limit is not particularly important as the associated noise

effects will be similar. This is reflected in the current conditions in place at various UK airports, which utilise a wide range of noise contour values.

5.3.6 Notwithstanding the above, clearly a value must be chosen for a limit to be set.

5.3.7 At Bristol Airport, there currently exists a condition that limits the size of the 57 dB $L_{Aeq,16h}$ daytime noise contour. There is logic in retaining a limit at this value as it would aid the assessment of long-term trends. There is no current limit on the area of the night-time noise contour at Bristol Airport.

5.3.8 NSC have proposed contour area limits based on the LOAEL values, whereas BAL have proposed contour area limits based on 57 dB $L_{Aeq,16h}$ and 55 dB $L_{Aeq,8h}$.

Appropriate scenarios on which to impose a limit

5.3.9 NSC have proposed limits based on the three future scenarios assessed in the ESA; 10 mppa in 2024, 10 mppa in 2030 and 12 mppa in 2030.

5.3.10 It is not clear what the justification is for imposing limits below 10 mppa, as this is already permitted without the application. A limit that applies once 10 mppa is exceeded would be appropriate, i.e. based on the 12 mppa in 2030 scenario only. If this limit is to apply earlier than 2030, then the faster growth scenario assessed in the ESA should be considered. This is discussed further in the next section.

Area of contour limit

5.3.11 As part of the original application process, a reduction in the daytime contour area limit from the current 12.42 km^2 to 11.5 km^2 was agreed by NSC Officers and BAL to apply from the date of permission.

5.3.12 As discussed in my POE, if growth is faster than forecast in the Core Case, i.e. if 12 mppa were to be reached before 2030, this would have a limited effect on the difference between the 10 mppa and 12 mppa scenarios and therefore the conclusion of no significant adverse noise effects would be unchanged. It would, however, increase the absolute noise levels and resulting contour areas in that faster growth earlier assessment year, although these would then decline again by 2030.

5.3.13 Thus, as stated in the ESA (para 6.7.16), the 12 mppa faster growth scenario in 2027 would have noise contour areas around 10% larger than those assessed for 12 mppa the Core Case in 2030, i.e. around 11.8 km^2. As this exceeds the 11.5 km^2 previously agreed, BAL's current position remains that this is appropriate.

5.3.14 For the proposed new night-time contour, BAL has suggested that this should be set based on a 12 mppa airport in 2030. This is in line with NSC's proposal other than for the value of the noise contour to be limited.

5.3.15 Discussions between BAL and NSC regarding potential contour area limits have recently commenced and are ongoing at time of writing.

5.4 Quota Count Scheme

5.4.1 In summary the proposal from NSC is to replace the existing Quota Count (QC) scheme which is based on a previous version of the scheme used at Heathrow, Gatwick and Stansted airports with a bespoke scheme which is designed to reduce the uncertainty by improving the resolution of the classification system from 3 dB to 1 dB. The total permitted QC is unchanged.

5.4.2 Also proposed is the phasing out over 5 years of the current facility to carry over unused allowances from one season to the next. In recent years this has been utilised to carry

over allowance from the winter season to the summer season. This means that the effective limit in the summer will reduce.

5.4.3 The proposed QC scheme seems reasonable and would reduce the uncertainty associated with the QC classification system.

5.5 Loudest Permitted Aircraft

5.5.1 Currently aircraft with a QC classification of 4 or above are not permitted to operate between 23:30 and 06:00. As part of the application BAL have proposed to reduce this to a QC classification of 2 or above.

5.5.2 NSC have proposed a condition preventing aircraft with a QC classification of 1 or above from operating between 23:00 and 06:00.

5.5.3 No justification is provided for this condition. This does not seem reasonable in the short term as it would prevent some current aircraft types, such as the Airbus A321, from operating.

5.6 Ground Noise

5.6.1 The application was to permit the use of APUs on Stands 38 and 39 from 06:00 to 23:00. NSC have proposed a condition permitted this from 07:00 to 23:00.

5.6.2 The justification provided is that 06:00 to 07:00 is during the night period which is more sensitive. However, this was accounted for in the ES and ESA noise assessments which concluded that this change would not give rise to a significant adverse effect, even when considered together with the increase from 10 mppa to 12 mppa. Clearly if this condition were imposed then the ground noise effects at night for the receptors closest to these stands would be lower than those assessed.