



Department for Transport

**Survey of Noise Attitudes (SoNA) 2014:
Aircraft Noise & Sleep Disturbance**

Peer Review

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1 Introduction

- 1.1 Placewise Limited (PW) and Stephen Turner Acoustics Limited (STA) have been commissioned by the Department for Transport (DfT) to carry out a peer review of the analysis carried out on the SoNA2014 data focusing on Aircraft Noise and Sleep Disturbance (SoNA-Sleep).
- 1.2 The comments set out below provide the outcome of this peer review. They should be read in conjunction with the report PW/STA3 published as CAP1506c which describes the peer review of the first edition of CAP1506, published in 2017 and report PW/STA4 which describes the peer review of the second edition of CAP1506, published in 2021.
- 1.3 It is understood that the Department for Transport commissioned further analysis of the SoNA2014 data to see what conclusions might be drawn regarding the impact of aircraft noise on sleep disturbance. One key issue for that analysis is that the design and sampling of the SoNA2014 was aimed at understanding the impact of aircraft noise during the day. The data analysis regarding the impact on sleep disturbance could be no more than exploratory and great care is needed when drawing any conclusions from that analysis.
- 1.4 Having said that, some interesting results did arise and it has been possible to identify some recommendations for any future study into Aircraft Noise and Sleep Disturbance.

2. Review Process

- 2.1 The report's authors provided the peer reviewers with an initial draft of the analysis. The reviewers raised several issues ranging from:
 - Keeping the scope of the analysis reasonably contained given that the SoNA2014 survey did not have in mind exploring in detail the impact of aircraft noise on sleep disturbance. This had the effect of reducing

the detailed content of the report. To do otherwise risked conclusions being drawn that could not be robustly sustained by the data; to

- Recommending that full references to the various studies mentioned in Section 2 should be included.

- 2.2 The reviewers also agreed with only using data from around Heathrow, Gatwick and Stansted because there was more comprehensive night noise exposure near those airports.
- 2.3 The reviewer's noted that whilst the responses to question CAN1vii and CAN7b provided information on sleep disturbance, the number of people responding to question CAN 7b was lower than those responding to CAN1vii because there was a preceding screening question. This meant that not all respondents were asked question CAN 7b. The authors agreed that the analysis would focus on the responses to question CAN1vii.
- 2.4 During the review of the second edition of SoNA2014 – Aircraft Noise and Annoyance, it was noted that one of the reasons for producing the second edition was the discovery of an averaging error relating to the calculation of the N70 and N65 values in the original analysis. The reviewers recommended that, given the importance of the study and the possibility that further analysis and reports would be based on it, DfT commission an appropriately qualified expert to liaise with ERCD and check the various datasets and calculations undertaken.
- 2.5 The DfT followed the reviewers' recommendation and appointed the University of Salford's Acoustics Research Centre (Salford) to undertake that review. Their results are published in a report entitled:

USAL-SoNA1: Technical Review of Phase 1 of the Survey of Noise Attitudes (SoNA) studies¹

¹ USAL-SoNA1: Technical Review of Phase 1 of the Survey of Noise Attitudes (SoNA) studies (University of Salford), December 2020

- 2.6 PW and STA reviewed this report for the peer review of the second edition of CAP1506 and noted that Salford were satisfied that the calculations were robust. In particular, Salford stated:

These reviewers are confident that the analyses undertaken are accurate, reliable and robust, and meet standard practice in the field.

- 2.7 A revised draft of CAP 2161 was produced and further liaison occurred between ERCD and the reviewers. The outcome of the peer review is set out in Section 3.

3 Peer Review

- 3.1 As noted above, the reviewers agreed with the proposed scope of this analysis, confining it to respondents affected by operations at Heathrow, Gatwick and Stansted. They also agreed that the impact of the aircraft should be quantified through the responses to question CAN1vii.
- 3.2 The background set out in the second section of the report was helpful but the reviewers did suggest that the more recent work on using the probability of noise induced awakenings as a measure of sleep disturbance was included.
- 3.3 The structure of the report reflected that used for CAP1506. The reviewers identified two interesting results which could be investigated further. These were:

- In Table 12 and Paragraph 5.25 where the results show that the N60 indicator correlates almost as well with the responses as $L_{Aeq,8h}$; and
- In Table 13 and Paragraph 5.29 where the results show that the best correlation with responses is with the highest noise level ($L_{Aeq,8h}$) of either westerly or easterly mode (i.e. single mode).

- 3.4 Caution needs to be exercised with both these conclusions, however. Firstly, as explained several times in the report, this analysis is, of necessity, exploratory as the SoNA2014 survey design was aimed at understanding the annoyance caused during the daytime and not the impact of aircraft noise on sleep disturbance. Therefore, the N60 result is no more than being of interest.
- 3.5 Furthermore, the difference between the r^2 values in Table 13 for the various measure of night disturbance is very small.
- 3.6 The inherent limitations of the data also means that the results shown in Figure 8 also need to be treated with caution. However, it is interesting to note that the direction of travel suggests greater night disturbance at a given exposure than was found with the pre-1990 Miedema work, but not as great as Miedema's post-1990 results.
- 3.8 In the CAP1506 report, Section 7 considered the effects of non-acoustic factors. In this report no such analysis could occur as it required responses on an 11-point scale, which were not available from the CAN1vii question. The reviewers agree that it would not be appropriate to try to look at the effect of non-acoustic factors in this situation.

4 Overall Conclusions

- 4.1 A peer review has been carried out of the analysis undertaken to produce the report Aircraft Noise and Sleep Disturbance (CAP2161).
- 4.2 The reviewers are satisfied that the analysis presents what is possible to obtain from the source data, given that the original SoNA2014 study was designed to understand the impact of aircraft noise during the daytime.
- 4.3 Some interesting results emerged, but as indicated above, they must be treated with caution and probably used only as issues that should be explored in any future night time disturbance study.
- 4.4 The reviewers support the conclusions set out in Section 8 and, in particular, Paragraphs 8.14 and 8.15 where the report states:

8.14 *Despite the exploratory nature of this analysis, it has been possible to identify some areas where further research would be beneficial, If the objective is to understand better the relationship between night exposure and the effect on sleep, the following recommendations are made:*

- *Conduct research in the summer so that attitudes and exposure are aligned;*
- *Respondent selection to take into account night noise exposure levels and, in particular, any dominance of arrival noise at night;*
- *Adequate sampling to enable further investigation of any association between self-reported night-time disturbance and single-mode LAeq,8h night exposure.*

8.15 *Optimising respondent selection to achieve the criteria above will probably mean that it is not possible to investigate daytime annoyance with the same sample.*

4.5 The reviewers also recommend that in any future study:

- The main night disturbance questions use an 11-point scale; and
- Attention is paid to the use of any screening questions ahead of the key night disturbance questions, to avoid affecting the usable sample size.
