

# Future of Aviation Noise Management – Case for Change

## Annoyance and complaints

### Summary

Growth in air traffic prior to the Covid-19 pandemic contributed to increasing levels of noise, both in terms of frequency and intensity of events. There is a large body of evidence proving the association between aircraft noise and annoyance for communities and residents ([WHO, 2018](#)). Annoyance impacts people's quality of life and wellbeing and can lead to complaints. The stress associated with annoyance and deteriorating quality of life can also lead to health effects such as changes in heart rate and blood pressure. These are distinct from the direct health effects from exposure to noise. Studies exploring the health effects have recently been reviewed in the ICCAN report Aviation Noise and Public Health ([ICCAN, 2020a](#)) and more detail on the relationship between noise and health is provided in the Case for change on health, wellbeing and quality of life.

Growth in the demand for aviation and subsequent increases in air traffic create annoyance for a number of reasons. This can be due to both frequency and intensity of events, absolute volume, greater temporal duration and dispersal. Annoyance is increasing due to the growth in air traffic, but also because new communities may be affected by new routes, airport expansion or because flights are starting earlier or finishing later.

### Key issues

#### Annoyance leading to impacts on quality of life

##### Concerns

Increased aviation noise is associated with increased levels of annoyance for residents living around airports. Aviation noise has been linked to adverse effects on quality of life due to its impact on behaviour (communication, concentration) and desired state (sleep and relaxation), with the ability to cope with such disturbance being important for health and well-being ([Miedema, 2007](#); [Lawton & Fujiwara, 2016](#)).

The last national aviation noise attitudes survey was undertaken in 2014 ([CAA, 2014b](#)). More recently ICCAN conducted a noise attitudes survey around five airports within the 54 dB LAeq, 16h contour band in summer 2020. This found that 66% of residents said they were bothered, disturbed or annoyed by aviation noise during the day and 45% were bothered at night (pre Covid-19 lockdown) ([ICCAN, 2019](#)).

##### Improvement opportunities

The evidence on national aviation noise annoyance will be updated when we complete our aviation noise attitudes survey (ANAS) which is likely to take place in 2022 with results in 2023. The new survey design will provide more up to date and robust data to inform policy than is currently available.

#### Annoyance leading to complaints

##### Concerns

The increasing number of complaints from the public regarding airports reflects negatively on the aviation industry, particularly if complaints are not promptly addressed. This may also result in airports devoting more resource to dealing with them in order to protect relationships

with local communities. Whilst most airports will have an agreed formal procedure for handling complaints, the approach to complaints differs from airport to airport and not all residents will have access to the same level of response.

### [Improvement opportunities](#)

Implementing a review of how complaints are handled and making improvements to complaint handling systems at airports might foster better communication between the airport and their local communities. It may also strengthen the use of complaints as a tool to improve aviation noise management. Complaint mechanisms should be clear and easy to follow. There should be clear guidance on how complaints teams can provide the support and information required to address complaints. Airports should be transparent about complaints received (including the number of both complaints and complainants) and improvements could be identified through engagement with local communities and the Airport Consultative Committees.

## **Annoyance leading to impacts on health**

### [Concerns](#)

Annoyance caused by exposure to aviation noise and the related deterioration in quality of life can ultimately lead to adverse health effects. Annoyance from disturbance to sleep or other activities can have negative impacts on health via the emotional response and raised cortisol levels ([ICCAN, 2020a](#)). For more information relating to health impacts of direct effects of noise on the body, refer to the Case for change on health, wellbeing and quality of life.

### [Improvement opportunities](#)

Reviewing daily aviation activities and the amount of noise created could help to shape more appropriate policies. However, the annoyance of populations exposed to noise depends not only on the acoustic characteristics of the noise but a range of non-acoustic factors which can be of a social, psychological and environmental nature. Evaluating other non-acoustic factors such as housing type (for example, flat or house), time of year, noise sensitivity, mental health, and working patterns would provide more comprehensive evidence on which to base future policy ([CAA, 2018](#)).

## Supplementary information

### Annoyance leading to an impact on quality of life

#### Concerns

Increased aviation noise is associated with increased levels of annoyance for residents living around airports. Aviation noise has been linked to adverse effects on quality of life due to its impact on behaviour (communication, concentration) and desired state (sleep and relaxation), with the ability to cope with such disturbance being important for health and well-being. ([Miedema, 2007](#); [Lawton & Fujiwara, 2016](#)).

The relationship between aircraft noise and annoyance is also affected by a variety of non-acoustic factors. Non-acoustic factors can be of a social, psychological and environmental nature and can include factors such as age, gender, socio-economic status, housing type (for example, flat or house), time of year, noise sensitivity, attitudes to aviation and mental health.

Research suggests that annoyance can increase after a change in noise levels. Changes to the experience of aviation noise can be brought on by a number of developments, including airport expansion and alterations to established flight paths. These changes introduce a degree of volatility to the experience of noise and this volatility has been shown to increase sensitivity to noise, ([ICCAN, 2019, p. 11](#)). This is known as the change effect and describes an increase in the percentage of a population who report high levels of annoyance above the increase accounted for by the baseline exposure-response curve. There is also evidence that annoyance can increase from the announcement that there will be a change even before a change has occurred ([Bröer, 2008](#)).

There is limited evidence on the extent of the increase caused by the change effect and its duration; however, current indications suggest that an increase in annoyance after a change can last for at least two years. Part of the uncertainty surrounding the change effect is caused by the difficulty in defining what constitutes a change and what is part of the normal variation in operations.

There is anecdotal evidence to suggest that sensitivity to aviation noise, leading to greater annoyance, has increased over time. For example, the same percentage (9%) of respondents said by ANIS ([CAA, 2015a](#)) to be highly annoyed at 57 dB LAeq,16h occurred at 54 dB in 2014. Therefore, annoyance levels are being driven not only by increasing air traffic but also by people's heightened sensitivity to it. Airports may find people annoyed by levels of noise when previously they may not have been.

In the UK the lowest observable adverse effect level (LOAEL) is set at 51 dB LAeq,16hr. This was based on the results from the most recent national aviation noise attitudes survey ([CAA, 2014b](#)) which found that 7% of residents around airports were highly annoyed at this level (using the ICBEN standardised, 5-point scale for social surveys on annoyance). However, the survey did not sample below 51dB, so it has been questioned whether significant proportions of residents are highly annoyed below this level. Annoyance studies conducted in other countries have found evidence of community annoyance below 51 dB.

More recently ICCAN conducted a noise attitudes survey around five airports within the 54 dB LAeq, 16h contour band in summer 2020 ([ICCAN, 2020b](#)). This found that, before Covid lockdown, 66% of residents said they were bothered, disturbed or annoyed by aviation noise during the day and 45% were bothered at night (Using the International Commission on the Biological Effects of Noise (ICBEN) standardised 5-point Likert scale for social surveys on annoyance) ([Preedy & Watson, 2010](#)). This annoyance decreased significantly during the Covid lockdown. Again, this survey was not able to sample residents at lower exposure levels.

## Current approach and limitations

1. The CAA webpage 'Noise' states 'Aircraft noise is not currently a statutory nuisance in the UK ([CAA, 2015b](#)). It is not covered by the Environmental Protection Act 1990 or the Noise Act 1996. This means that local authorities do not have the legal power to take action on matters of aircraft noise, and nor does the CAA have the legal power to prevent aircraft flying over a particular location or at a particular time for environmental reasons.'
2. The CAA discuss annoyance in their publication 'Managing aviation noise' ([CAA, 2014a](#)). The Report states that the government accepted LOAEL is 51 dB LAeq, 16hr for daytime and 45 dB LAeq, 8 hr for night time ([link](#)). The WHO strongly recommends reducing average noise levels produced by aircraft below 45 dB Lden, as aircraft noise above this level is associated with adverse health effects. For night noise exposure, it recommends reducing noise levels produced by aircraft during night time below 40 dB Lnight, as aircraft noise above this level is associated with adverse effects on sleep ([WHO, 2018](#)).
3. There are insulation schemes in place for those who live in certain areas close to some airports e.g., triple glazing which aims to reduce the amount of noise people hear within their homes and therefore decrease annoyance. Further details on noise mitigation schemes around UK airports can be found in the ICCAN report on noise insulation schemes ([BRE, 2020](#)). ICCAN's review of noise insulation schemes did not find any available data on how effective householders found them.
4. The Airspace change portal allows people to review proposed changes and what stage they are at in their area ([link](#)). If used by communities around airports, it could better inform them of changes happening which may affect them. If communities understand what is happening it may reduce annoyance. Further research into the use of the portal and its effect on annoyance is needed.
5. Transport Analysis Guidance (TAG) is a transport appraisal guidance and toolkit and is a requirement for all interventions that require government approval ([DfT, 2014b](#)). It is a way of looking at the cost benefit ratio of interventions. The TAG Noise Workbook assesses the expected impacts of transport policy proposals and projects ([DfT, 2017](#)). Using a baseline scenario, TAG calculates a monetary cost and/or benefit when that baseline scenario experiences a change. For each one decibel change in average noise level, a monetary value is assigned for the change in the following health impacts: amenity (annoyance), sleep disturbance and health impacts including acute myocardial infarction, dementia and stroke. These values are based on a range of evidence developed over many years and the values that inform TAG's calculations can be reviewed. One of the aspects that is assessed for aviation noise is annoyance. The relationship between noise exposure and annoyance is described by an exposure–response curve. It shows how annoyance increases as noise exposure increases. The exposure–response curve that guides TAG's aircraft noise and annoyance calculations is the EU's Miedema curve. Detail on TAG is also included in the Case for change on health, wellbeing and quality of life.

## Opportunities for improvement and challenges

A lack of recent and robust research data on annoyance in the UK means current policies are based on data that is out of date, the last survey being carried out in 2014 ([CAA, 2014b](#)). The survey also came under some criticism by stakeholders and community groups for its design and the robustness of its findings. Based on this survey, the onset of community annoyance is set at 51 dB LAeq 16hr for daytime and 45 dB LAeq 8 hr for night time. However, SoNA did not survey any lower than this level so it is unknown if community annoyance occurs at lower

levels. There is also limited evidence on the change effect (a change in annoyance levels after a change in noise) or how long it lasts (it has been found to last at least 2 years).

To gain evidence on the change effect, a study specifically focusing on a localised change needs to be carried out in the UK where residents are surveyed before and after a change, and then surveyed again in future years. This evidence is needed as current policies do not take this into account. There are some international studies on the change effect but these are difficult to apply to the UK due to the uniqueness of the UK's airports, particularly Heathrow. Further work is needed to explore whether future research into the change effect is possible and what the best approach would be.

Currently the TAG Noise Workbook cannot take account of the change effect in its analysis. If further research is undertaken to assess the extent of the increase in annoyance caused by the change effect, this could be incorporated in TAG calculations in the future.

### Example 1: Annoyance studies

1. **Annoyance studies included in WHO** - The WHO review ([WHO, 2018](#)), which determined the onset of community annoyance at 45 dB, included the following studies which examined annoyance and aviation noise as either the whole, or part, of the study:
2. **ANIS 1985** - this study used face-to-face questionnaires, with 2,178 successful interviews around Aberdeen, Manchester, Luton, Gatwick and Heathrow. The results found 3% of respondents were annoyed at 51 dB LAeq, 16h.
3. **ANASE 2007 (Attitudes to Noise from Aviation Sources in England)** - a national survey consisting of 2,733 face-to-face interviews. Consequently, the peer review concluded that "there were sufficient technical and methodological uncertainties still remaining with the study... [that] the reviewers would counsel against using the results and conclusions in the development of government policy".

### Annoyance leading to complaints

#### Concerns

When residents are annoyed by aviation noise, they may choose to make a complaint to the airport and other relevant organisations such as local authorities, their MP, NATS and CAA. Resources have to be provided to handle these complaints in a timely way, to avoid negative impacts on reputation or engagement with communities, which could affect future expansion plans. In addition, there is evidence to suggest a link between aviation news stories and complaints about aircraft noise. A study at Schiphol airport in Amsterdam found that noise complaints and protest closely followed announcements of changes to policies. News stories, therefore, can generate complaints as communities become aware of and are sensitised to the issue ([bas, 2021](#)).

#### Current approach and limitations

1. Currently people can make complaints about aviation noise to the airports they think the aircraft has come from. Airports will often have designated webpages on how to make a complaint and the relevant contact details ([Budd & Ison, 2017](#)). However, these web pages are not always easy to locate or intuitive to use. Those without internet access may not know how to complain.
2. The CAA webpage advises that complaints about aircraft noise should be directed to the airport where they think the aircraft was operating from. The airport is expected to investigate the complaint and respond. Therefore, the current approach to complaints

differs from airport to airport and not all local residents will have access to the same level of response, or clarity on how to complain.

3. The Airport Consultative Committees (ACC) guidance ([DfT, 2014a](#)) says:

While the airport should have an agreed formal procedure for recording complaints about aircraft noise as well as passenger service issues, Airport Consultative Committees are well placed to monitor trends or patterns of complaints (both noise related from residents and business related from customers), to consider specific issues (for example how the airport responds to persistent complainants), and to monitor the airport's ongoing performance in dealing with complaints. The number, and for noise complaints general location, should be made available to the committee. It should be recognised however, that some airports provide this data on their websites ([Budd & Ison, 2017](#)).

Airports might suggest that complainants, if dissatisfied with the airport response on a matter of wider interest, could contact the Airport Consultative Committees to raise the matter for discussion (details of ACC structure and procedures can be found on the UKACC website ([UKACC, n.d.](#))). However, it should be noted that the consultative committee is not an arbiter of last resort, and its recommendations are not binding on the aerodrome. So, it should not be the committee's function to investigate individual complaints as a matter of routine and may leave the complainant disappointed with the outcome.

4. Data on complaints is held by individual airports and is not generally in the public domain. Thus, it is difficult to understand issues which drive complaints at a national level ([Budd & Ison, 2017](#)). This includes repeat complaints on the same issues, which may require time and resource to address that airports could otherwise direct toward improving aviation noise management.
5. Some airports with access to more resources are able to have more sophisticated complaints systems. Heathrow Airport Limited have a separate website detailing all their complaints including associated analysis. However, many smaller airports are unlikely to have the resources to provide such detailed information.
6. Examples of legislation or policy good practice have been noted in Australia where the Aircraft Noise Ombudsman conducts independent reviews of the handling of complaints or enquiries made to Air Services Australia or Defence ([ANO, 2021](#)). It will also consider complaints if the complainant is not satisfied. In Germany, Frankfurt airport provides real time information online about noise values measured at its monitoring points as well as details of landings and take offs ([Fraport, 2021](#)). Schiphol also has a webpage providing real time information about flights and updates on airport operations ([bas, 2021](#)).

## Opportunities for improvement and challenges

1. Whilst there has been a UK wide survey of how airports operate their complaints systems, there has been no review or user research of complaint systems to determine how best to deal with complaints from both the complainant's and the airport's perspective ([Budd & Ison, 2017](#)). For example, whether there is a clear distinction between noise complaints and noise enquiries, how easy different systems are to use, and if people are satisfied with how their complaint was dealt with. However, there may not be a 'one size fits all approach' to best practice for complaints in the UK due to the different type of airports.
2. Work could be undertaken to compile complaints data at a national level and allow detailed analysis of the key issues motivating people to complain.

3. There has been no research exploring why people may also choose not to complain and it would be useful to understand what acts as obstacles to complaining (for example, lack of access to internet, not expecting it will have an effect, or lack of time).
4. More work could be undertaken to understand the effects of announcements about planned changes on the level complaints and how these could be handled to minimise the increase in complaints.

Complaints handling in the public sector suggest some best practice approaches that should be addressed for complaints to be resolved promptly. Whilst many airports are not wholly in the public sector, some of the approaches will still be relevant. Best practice guidance suggests adopting some of the following:

- Responses should be personalised to the person who made the complaint and not sound automated, have a human touch.
- Responses should be quality assured.
- Complaint teams should be fully supported, correctly resourced and have a good structure. There should be a proactive complaints manager to oversee and guide.
- Complaints should be logged and tracked to help identify improvements in organisation and identify patterns.
- Complaints audit should be run to set a criterion to get a rating at how complaints are performing for user experience.
- Consistent approach across departments (in this case airports where appropriate)
- System/guidance in place to manage unreasonable behaviour including criteria of behaviours this entails. Such as complainers who are aggressive, repeatedly lying, demanding unreasonable time scales, refusing to cooperate etc.
- Offer channel options to complain.

## **Annoyance leading to impact on health**

### **Concerns**

Post Covid-19, increasing demand for air travel and the subsequent growth in the aviation industry will lead to increases in aviation noise from the relatively low levels currently being experienced. This will cause further annoyance and greater health risks to residents around airports. Aviation noise is considered to be detrimental to quality of life, wellbeing and ultimately health. The World Health Organisation defines health as:

'a state of complete physical, mental and social well-being, and not merely an absence of disease and infirmity' ([WHO, 2006](#)).

Aviation noise and annoyance have been linked to both acute and chronic health impacts. Noise affects an individual either directly through nervous interactions of the acoustic nerve with other regions of the central nervous system, or indirectly through the emotional and the cognitive perception of sound ([Acoustical Society of America, 2015](#)). The effects can be psychological and physiological such as irritability, sleep disturbance and increased stress hormones. In the longer-term, annoyance can lead to hypertension and heart attack.

Studies exploring health effects have recently been reviewed in the ICCAN report Aviation Noise and Public Health ([ICCAN, 2020a](#)). More detail on the relationship between noise and health is covered in the Case for change on health, wellbeing and quality of life.

The ability to cope with noise disturbance is important for health and wellbeing. This ability is affected by a range of non-acoustic factors. As discussed above these factors can be of a social, psychological and environmental nature

## Current approach and limitations

As discussed above, WHO guidelines recommend reducing noise levels produced by aircraft below 45 dB L<sub>den</sub>, as aircraft noise above this level is associated with adverse health effects ([WHO, 2018](#)). For night noise exposure, they strongly recommend reducing noise levels produced by aircraft during night time below 40 dB L<sub>night</sub>, as night-time aircraft noise above this level is associated with adverse effects on sleep.

The government accepted LOAEL is 51 dB L<sub>Aeq</sub> 16hr for daytime and 45 dB L<sub>Aeq</sub> 8 hr for night time ([DfT, n.d.](#)). This is based on survey data from 2014 ([CAA, 2014](#)). The survey did not sample residents below 51 dB L<sub>Aeq</sub> so it is unknown if community annoyance occurs at lower levels.

Whilst there is evidence on the non-acoustic factors and their impact on health and wellbeing, there is still limited evidence on the change effect (a change in annoyance levels after a change in noise) or how long it lasts (it has been found to last at least 2 years).

## Opportunities for improvement and challenges

We are currently planning a national aviation annoyance study which is likely to be undertaken in 2022 with results in 2023. We are also planning health studies, but these are still being scoped. There is evidence from outside the UK examining the effect of noise on health.

More work could be undertaken to evaluate the effect of other non-acoustic factors in the UK such as housing type (for example, flat or house), time of year, noise sensitivity, mental health, and working patterns ([CAA, 2018](#)) would provide more comprehensive evidence on which to base future policy.

## Example 2: NORAH study

The multidisciplinary research programme NORAH (Noise Related Annoyance, Cognition and Health) was aimed at providing a broad and scientifically reliable description of the effects of air, road and rail traffic noise on the health and life quality of affected residents. The programme ran from 2011 to 2014 and involved 43 researchers from 11 institutes. The primary aims of the investigations were:

- to answer the question as to whether the noise effects in the Rhine-Main region can, in principle, be compared with those in other German regions, and what influence road, rail and air traffic noise has on the population
- to examine what influence the changes in airport operations in autumn 2011 had on the health and quality of life in the environs of the airport, and whether the annoyance experienced by the residential population near airports, as a result of airport expansion, differs from that experienced by people near steady-state airports.

The research was broken down into 3 modules:

- Module 1: Annoyance and Quality of Life
- Module 2: Health
  - Sub-study: Secondary data-based case-control study with detailed survey on health risks
  - Sub-study: Blood pressure monitoring
  - Sleep Study
- Module 3: Cognitive development of school children
  - Inter-module: Registration of traffic noise exposure

# Appendices

## Appendix I: References

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