

Future of Aviation Noise Management – Case for Change

Future landscape of aviation

Summary

Aviation technology is progressing rapidly and is expected to be a key element of the Government's Future Aviation Strategy ([UK Government, 2018a](#)). A range of new aircraft types are currently being developed and promoted as providing new approaches to mobility and the delivery of goods (such as medical supplies). These include vehicles that provide urban air mobility (UAM) for example electric vertical take-off and landing (eVTOL), beyond visual line of sight (BVLOS) aircraft, UAV (unmanned aerial vehicles) and existing aircraft retrofitted with electrical propulsion systems. Such aircraft are likely to be smaller than current commercial types and could operate more frequently in, or around, populated areas. This may ultimately give rise to more distributed regional aviation, where passengers are transported from major aerodromes into large urban environments using eVTOL.

As new modes of air transport are developed for commercial use in populated areas, there is a need to ensure that such technologies incorporate appropriate noise standards with respect to product design, and operating procedures and conditions. This would help to ensure that new aircraft do not generate more noise than current aircraft, and that the way they are used does not increase noise exposure for local communities. Any regulatory and funding initiatives designed to encourage the development and adoption of such technologies should have a greater focus on those innovations with the potential to reduce aviation noise for local communities.

With the continuation of the Airspace Modernisation programme following the COVID-19 pandemic, noise impacts will be redistributed across local areas possibly resulting in some communities being more adversely affected than before. There is a need to ensure that these impacts are properly understood, and that decision-making considers people's lived experience of aviation noise.

Key issues

Lack of consideration of the noise impacts of new technologies

Concerns

New aviation technologies may come into use without careful consideration of their noise emissions and the impact of these on local communities. Such impacts may result from an increased number of smaller aircraft used for UAM, potentially flying closer to communities with increasing frequency. New air mobility could be used for leisure activities (e.g. jet-powered wing suits and UAV racing) which could further increase the number of new aircraft technologies in operation at any given time.

Improvement opportunities

A holistic approach to agreeing noise standards and operating procedures should be adopted, including new aircraft designs, aircraft operations and airspace management. This would consider aviation noise when licensing new aircraft and agreeing operating procedures, and ensure that innovative aircraft are not noisier than previously used aircraft and the way they are used does not increase noise exposure for local communities.

Noise impacts of airspace modernisation

Concerns

The Airspace Modernisation programme could result in some communities being exposed to a greater level or frequency of aviation noise, and there is a risk that the noise benefits and dis-benefits are not shared equitably across communities or groups of people.

Improvement opportunities

Guidance for sponsors on identifying and assessing the noise impacts of proposed airspace – including how they could reflect people’s lived experience of noise – would help to ensure that these are understood and carefully considered during the design process.

Limiting innovation

Concerns

New forms of aircraft innovation and design that could reduce aviation noise might not be developed or adopted in a timely way, due to barriers created by a regulatory regime that is not advancing at the same pace as aviation technology.

Improvement opportunities

There are regulatory and funding initiatives that are designed to stimulate and facilitate innovation across different industries such as the [Future Flight Challenge](#) managed by UK Research and Innovation, set up to support the development of sustainable air travel, including UAV and electric passenger flight. Such initiatives are not solely focused on aviation noise and further work may be needed to ensure it is an important consideration when encouraging innovation and developing regulatory practices to support it.

Supplementary information

Lack of consideration of the noise impacts of new technologies

Concerns

Recent years have brought rapid advancements in aviation technology and innovation, and this is expected to be a key element of the Government's Future Aviation Strategy ([UK Government, 2018a](#)). However, local communities may be at risk of exposure to aviation noise from the introduction of new aircraft such as UAV, eVTOL and BVLOS. These would be subject to the same safety standards and aeronautical regulations and permissions as existing commercial aircraft, but may be used in a different way to existing aircraft. For example, UAV being used to deliver goods across urban areas may result in an increased number of smaller aircraft flying at lower altitudes and closer or more frequently to local communities. This could increase the aviation noise to which communities are exposed, as well as having possible privacy concerns and safety implications. This may render the current regulatory framework inadequate to address the potential adverse impacts of any new aircraft technology.

Further, the design of new aircraft may result in a very different noise emission than existing aircraft, in terms of noise intensity, pitch and frequency. This may also increase the resulting annoyance and wellbeing impacts on local communities exposed to aviation noise from such aircraft.

Current approach and limitations

Under the five Airspace Classifications used in the UK most controlled airspace around aerodromes and above cities would typically fall into Class D, which restricts the types of aircraft and operations that are permitted within it ([NATS, 2021](#)). However, other areas may be outside controlled airspace (Class G), in which there are no restrictions on which aircraft are permitted to enter it or the routes they should take (though aircraft and pilots must still adhere to basic aeronautical regulations). The CAP 1616 airspace change process would not be triggered by possible increased noise exposure from use of smaller aircraft (for example, UAM aircraft or UAV) in closer proximity to communities. It would only be triggered if use of the new technology posed safety concerns or affected airspace to the extent that airspace change was required (for example, if lateral aircraft tracks, dispersion, or flight paths were affected) ([CAA, 2020a](#)). However, it is possible that such aircraft would operate at sufficiently low altitudes that neither of these triggers would occur. This means that once the technology is approved, there may be no noise basis on which its use can be challenged.

Existing mechanisms to mitigate the impact of aviation noise on local communities may not apply to the noise generated through new technologies. For example, current airport noise insulation schemes are administered by the airports themselves and only apply to local communities in their proximity. Use of smaller aircraft (such as UAM aircraft or UAV) to deliver goods or services may not be related to the local airport and so would likely not fall within these initiatives.

Opportunities for improvement and challenges

Noise standards and operating procedures should be agreed for all new aircraft technologies (including new aircraft designs, aircraft operations and how airspace is managed). This would help to ensure that innovative aircraft are not noisier than previously used aircraft, and that the potential noise exposure to communities is carefully considered when agreeing operating conditions. Where communities are exposed to noise, future research could seek to investigate community perceptions and the possible resulting annoyance of the noise emitted from these new technologies. Insulation schemes mitigating the effects of noise from new technologies may be necessary.

Airspace management procedures are complex and take account of a range of issues including aviation noise, and so it is unlikely that they would be revised based on noise alone. A more pragmatic approach would be to work with existing regulators (both within the UK and internationally) and innovators, including the CAA Innovation Hub ([Appendix 2](#)), to more carefully consider noise impacts and raise awareness of the possible noise impacts of innovations.

Example 1: World-wide approaches to managing innovation

Who, What and How?

The World Bank established the Sustainable Mobility for All (SuM4All) coalition of public and private organisations to deliver international cooperation on issues related to transport and sustainable mobility, including aviation ([Sustainable Mobility for All, 2021](#)). This is in part to support achievement of the 2030 Sustainable Development Goals (SDGs) that were adopted by all United Nations Member States in 2015. The approach of SuM4All is to provide thought leadership through information and education to influence transport decisions internationally, prioritise policies and investments, and source finance to achieve sustainable mobility through technology. Their Green Mobility objective includes specific noise-related aims such as reducing global mortality and burden of disease from transport-related noise levels ([Sustainable Mobility for All, 2017](#)). They provide a tracking tool for countries to measure their progress on specific issues, and case studies of policies that could be implemented to address local issues.

How could best practice be applied to UK aviation?

This could be adapted to the UK in the form of transparent tracking tool for innovations/new technologies and their impact on the noise exposure of local communities. Case studies highlighting best practice could also be used to influence how new technologies are adopted and operated to manage their noise impact. For example, a potential case study could examine how new BVLOS technologies and best practice have been used by the University of Southampton to fly medical supplies from mainland UK to St. Marys Hospital, Isle of Wight ([Solent Transport, 2019](#); [University of Southampton, 2020](#)).

Example 2: EASA/FAA safety objectives (not noise specific)

Who What and How?

In 2016, the EASA coordinated with the FAA to ‘rethink’ their aircraft certification rules for small aircraft, implementing a more outcomes-based approach where safety rules describe the performance to be achieved, rather than the technological solution to be used ([EASA, 2016](#)). They proposed to reduce the number of 399 prescriptive and design-detailed requirements to 67 safety objectives. This was expected to enable innovative solutions and new technologies to meet those safety objectives.

How could the best practice be applied to UK aviation?

This approach already reflects the UK government’s recent shift from prescriptive rules-based regulation to an outcomes-based model that provides more flexibility and autonomy to the regulated entities.

Noise impacts of airspace modernisation

Concerns

The UK Government’s Airspace Modernisation programme is expecting to achieve a ‘reduction in the average noise levels per flight’ through, for example, enabling aircraft to climb more quickly and descend more quietly ([CAA, 2018](#)). However, the redistribution of air traffic – which in some areas may result in increased volumes or concentration of traffic – could mean that some communities are exposed to a greater level or frequency of aviation noise than before. Analysis and consideration of the noise impacts of any airspace change proposals are required

to ensure that noise exposure is limited; and that the noise benefits and dis-benefits resulting from airspace modernisation are shared equitably across communities.

Current approach and limitations

As set out in the Air Navigation Guidance 2017, the CAA has responsibility for assessing the noise implications of proposed airspace changes and must follow a certain methodology for estimating and distributing the potential noise impacts of any changes ([DfT, 2017](#)). The key objective of this assessment is to limit the total adverse effects on people (related to their health and quality of life) resulting from aviation noise. It does not, however, aim to limit the absolute number of people exposed to any particular level of aviation noise (for example, who live within a particular noise contour).

For proposed airspace changes where some noise modelling is needed to understand the implications, the CAA has established the minimum modelling requirements to be undertaken by the airspace change sponsor ([CAA, 2021a](#)). These are based on the number of residents affected at different noise levels (based on average measures), and the extent to which this distribution will be impacted by the proposed airspace change. Airports are expected to model noise with greater sophistication as the number of people exposed to it increases.

When consulting on airspace change, airports must follow the CAA's CAP 1616 guidance ([CAA, 2020a](#)). This includes providing information on the expected changes in noise exposure for communities and the impacts of this. More detail on how airports should consult with communities is included in the Consultation and Engagement case for change document.

Opportunities for improvement and challenges

Guidance for sponsors on identifying and assessing the noise impacts of proposed airspace changes – including how the benefits and dis-benefits are distributed across local areas and groups – would help to ensure that these are understood and considered during both the design process and the subsequent assessment. For example, this might include how supplementary noise metrics or information may be used in estimating noise impacts to help them more closely reflect both people's lived experience of noise and the resulting health and wellbeing impacts.

Opportunities for improvements in consulting with communities on the potential noise impacts of proposed airspace changes are detailed in the Consultation and Engagement case for change document.

Limiting innovation

Concerns

There is a risk that innovators may be restricted from timely development and introduction of aircraft technologies that could reduce aviation noise. As set out in the Government's consultation on future aviation strategy, Aviation 2050 ([UK Government, 2018a](#)), the current rapid progression in aviation technology and innovation may require changes in regulation and policy to facilitate the introduction of new services and products. Without a robust and anticipatory regulatory approach that can adapt to new technologies, innovations may be delayed because the regulatory regime is not advancing at the same rate to support and manage them.

Current approach and limitations

UK aerospace companies can do little in the way of practical demonstration, testing and commercialisation of their products without regulatory approval. However, the CAA Innovation Hub has been established partly to work with innovators to understand how regulation could adapt to support emerging technologies, and is providing them with safe spaces to test their products.

These potential regulatory issues could be addressed more broadly through the UK Government's Build Back Better plan, which emphasises the need for regulation that supports innovation across different industries ([HM Treasury, 2021](#)). For the aviation sector specifically, the UK Government has committed resource to understand how new technologies can be integrated into existing airspace and systems. For example, the Future Flight Challenge managed by UK Research and Innovation is a programme to support the development of sustainable air travel ([UKRI, 2021](#)). Government and industry funding is invested in projects such as air traffic management, using UAV to deliver goods, and electric flight. With all of these possible approaches to help regulations encourage innovation, there is a need to ensure they are robust and can encourage quieter aircraft technologies.

Opportunities for improvement and challenges

Though progress is being made to support the development and introduction of new aviation technologies, there could be a greater focus on identifying new technologies that could help to reduce aviation noise specifically and any regulatory or policy barriers to the adoption of these.

Example 1: World-wide approaches to managing aviation

Who, What and How?

Internationally, regulators (such as the FAA) are providing support and financial resource to innovators designing new technologies. For example, the FAA has recently awarded grants for research at universities across the USA into how unmanned aircraft can be integrated into their existing airspace system ([FAA, 2021](#)). This means that emerging technologies may be adopted and normalised in other countries before the UK, possibly putting it behind the innovation curve.

How could best practice be applied to UK aviation?

Progress in this area has already begun with the establishment of the CAA Innovation Hub and the Future Flight Challenge. However, more work may be needed to ensure that aviation noise is an important consideration when encouraging innovation and developing regulatory practices to support it.

Example 2: General development of regulation in the UK to support innovation

Who, What and How?

In 2018 the Department for Business, Energy and Industrial Strategy established a £10m Regulators' Pioneer Fund to support UK regulators for two years in developing cutting-edge regulatory practices to make the UK a leader in innovation ([UK Government, 2018b](#)). Specifically, the funding was used for projects that helped businesses bring innovative products to market and enabled major improvements in a sector.

Following the UK White Paper on Regulation for the Fourth Industrial Revolution, June 2019, the Government established the Regulatory Horizons Council ([BEIS, 2019](#)). Its purpose is to identify the implications of technological innovation with high potential benefit for the UK economy and society, and advise the government on regulatory reform needed to support its rapid and safe introduction. In general, UK regulation is moving more towards an approach where regulators specify required outcomes, but not the means or technologies used to achieve them. This gives regulated entities more flexibility and freedom to use innovative approaches to achieve those outcomes.

Example 3: UK regulators collaborating with industry to support emerging innovation

Who, What and How?

In a 2018 overview of its regulatory model, the Environment Agency set out its approach to regulation as a way that supports business and gives them the 'confidence to invest, innovate and grow' ([Environment Agency, 2019](#)). For example, their Industry Regulation team works with companies to help develop solutions for meeting new environmental targets. In one instance,

this regulatory support enabled the company to unlock significant investment for new environmentally friendly technology.

Further, Ofwat recently unveiled its innovation competition, which provides opportunities for the industry to work together (including with the supply chain) to adopt new practices and technology ([Ofwat, 2021](#)). Ofwat has made £200m of funding available during 2020-25 which can be accessed directly by water and wastewater companies through a series of annual competitions for both smaller and larger, more strategic projects.

How could best practice be applied to UK aviation?

The examples listed above demonstrate where the government and regulators are providing financial resources or support to help innovators develop, test and implement new technologies; or working with companies to understand how the current regulatory framework can be adapted to better support innovation.

Within UK aviation, progress in these areas has already begun with the establishment of the CAA Innovation Hub and the Future Flight Challenge. These initiatives aim to provide support and resources to innovators pursuing technological advances in aviation, and understand how the current regulatory framework could develop to better support innovation. For example, the CAA Innovation Hub works closely with innovators to design solutions for the safe testing of new technologies, which may include assigning a dedicated area of airspace to test new products.

Whilst these initiatives are useful in supporting innovation more generally, further work may be needed to ensure that aviation noise and its impacts are an important consideration when encouraging innovation and developing regulatory practices to support it.

Appendices

Appendix I: Legislation

In the UK, technological innovations must adhere to the existing regulatory framework in order to be adopted. Following departure from the EU, the UK is currently continuing to align with the relevant standards and procedures ([CAA, 2020b](#)). This existing regulatory framework is summarised in the CAA Innovation Hub's regulatory toolkit ([CAA, 2015c](#)) and the specific noise-related issues include:

- airworthiness – aircraft noise levels are approved by the EASA as part of the aircraft certification process. The noise levels are established in compliance with the applicable noise standards as defined in ICAO Annex 16, Volume I.
- airspace –the CAA's CAP 1616 provides guidance on the regulatory process for permanent changes to airspace ([CAA, 2020a](#)). The CAA has responsibility for deciding whether to approve changes to airspace (which includes airspace structure and air traffic control operational procedures used by aircraft within it).

Appendix II: Other guidance

- Innovations are expected to take heed of the Skyway Code (CAP 1535P) which provides General Aviation (private) pilots with information regarding the flying rules, regulations and best practice relevant to their flying ([CAA, 2021b](#)). This includes consideration of noise abatement procedures and noise sensitive areas. The Skyway Code is a practical guide and is not itself enforced, though pilots can be sanctioned for non-compliance with basic aeronautical regulations (for example infringing controlled airspace, dangerous flying, or not operating in accordance with their licence).
- The CAA Innovation Hub was established to help develop a regulatory framework that better supports aviation innovation ([CAA, 2015a](#)). As part of this, it has set up a Regulatory Sandbox ([CAA, 2015b](#)). Some innovative solutions do not fit within the scope of current regulations and are therefore unable to get regulatory approval. This approach enables innovators to test and trial their technologies in a safe environment. Innovators apply to take part in a 'regulatory challenge' and, if successful, work closely with the Innovation Hub and CAA's regulatory team to build a test plan and determine what data/evidence should be collected as part of the trial. In turn, the sandbox helps the CAA to understand how their regulations support or hinder the adoption of such technologies, and what could be done to improve this.

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