

Operational Opportunities to Reduce Aircraft Noise

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Learning from others is an efficient way of ensuring progress, and international aviation stakeholders often look for guidance on best practices in the area of environmental protection to help them identify and reduce their environmental impacts. ICAO has a robust track record of providing guidance documents to benefit its Member States as well as the entire aviation community. One example is the ICAO Document – *Operational Opportunities to Reduce Fuel Burn and Emissions* (Doc 10013), which has proven so successful that a decision was made to develop a similar document aimed at reducing noise from aircraft operations. The purpose of this latter document is to build on the willingness of all parties in the aviation sector to learn from each other in order to help them advance their performance, and ensure that good practices for minimizing aircraft operational noise are implemented globally.

INTRODUCTION

ICAO's Balanced Approach on aircraft noise management around airports (Doc 9829) is the only globally recognized policy for managing noise impacts around airports, and is implemented world-wide. It is based on four pillars consisting of: reduction of noise at source, effective land-use planning, operational procedures, and the use of operating restrictions, as a last resort.

In this context, the ICAO Guidance Document “*Operational Opportunities to Reduce Aircraft Noise*” would complement the work carried out for one aspect of the implementation of the Balanced Approach on aircraft noise, by providing comprehensive information about operational techniques to help reduce aviation noise, where practicable, and operationally safe to do so.

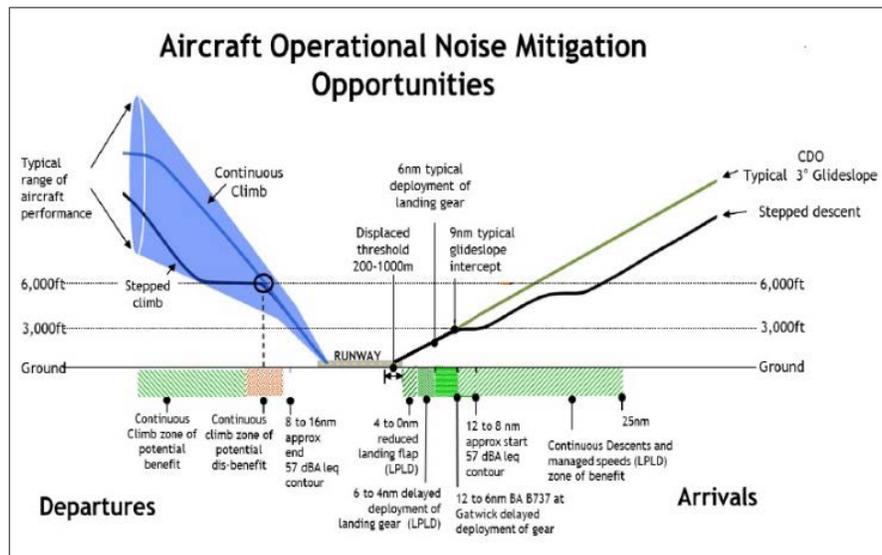
This work is being performed by a task group as part of ICAO's Committee on Aviation Environmental Protection (CAEP), for an expected delivery in 2022.

THE DOCUMENT – OPERATIONAL OPPORTUNITIES TO REDUCE AIRCRAFT NOISE

The manual is being developed to provide a reference to airlines, airport operators, air traffic management and air traffic control service providers, airworthiness authorities, and environmental agencies, as well as other government bodies and interested parties. Its objectives are to:

- Document industry experience and the benefits, in terms of operational noise exposure resulting from optimizing the use of current aircraft and infrastructure, and the related benefits of technology and infrastructure improvements.
- Identify opportunities that could result in measurable noise impact reductions.
- Highlight emerging technology that, when used, could result in reductions in operational noise impacts.
- Demonstrate that a more efficient use of infrastructure is an effective means of reducing civil aviation noise impacts and therefore promote enhanced use of the capabilities inherent in existing aircraft, ground service equipment and infrastructure including airspace management.
- Highlight the importance of stakeholder collaboration to address operational changes that impact community noise exposure.

FIGURE 1: Example of noise mitigation opportunities during aircraft operations.¹



It is important to note that it may not be possible to realize the benefits from every opportunity at every airport; and for this reason, the document is not prescriptive and is not intended to be the basis for regulatory action. The choice of the operational procedures presented depends upon many factors other than noise benefits, as highlighted by the interdependencies section, and it may not be appropriate for certain of them to be implemented everywhere. For this reason, local issues need to be addressed locally, and this document is aimed at helping inform that process.

Departure (take-off and climb) operations



CONTENT

The document will be a reflection of the actual experience collected from aviation practitioners and will cover the following elements.

Collaborative aspects

Collaboration with local communities is of paramount importance when new operational procedures are considered; as is pointed out in ICAO Circular 351 *Community Engagement for Aviation Environmental Management*. Collaboration among industry and regulator stakeholders is also an important factor to be able to share good practices and identify potential unintended consequences of not thoroughly evaluating all environmental impacts.

Continuous Climb Operations are described, as well as the construction and protection of Noise Preferential Routes to avoid unnecessary exposure to aircraft noise. It is interesting to note that in addition to the differences in noise contours incurred by Noise Abatement Departure Procedures, there may be noise benefits above 3,000 feet to be considered as well. Aviation stakeholders have already flagged the importance of considering the use of noise preferential runways, as well as the possibility to alternate their use to give respite to local communities. It is also clear that the use of newer Performance Based Navigation (PBN) and aircraft-based systems Multi-Criteria Departure Procedures (MCDP) could be part of the operational toolkit to be considered in the context of the implementation of noise abatement operational procedures.

¹ <https://www.sustainableaviation.co.uk/goals/noise/>

Arrival (approach and landing) operations

Approach operations cannot deliver equivalent reductions in noise, as those resulting from improved aircraft climb performance, as aircraft are required to follow the same track within 5-10 miles of the airport at the same altitude, according to stabilized approach criteria. A few procedures can be considered, based on the principles of Standard Arrival Routes and Continuous Descent Operations, Preferential runway use, and the optimal use of PBN or the Low Power Low Drag (LPLD) procedures. Potential changes to the airport infrastructure using displaced thresholds, and possibly small increases in glideslope angle could also deliver additional noise reduction.

Airport ground operations

It is recognized that ground noise is a lesser issue than airborne noise from take-off and landing but can impact sensitive areas around the airport, especially where local communities are close to the airport boundary. A range of options can be explored to mitigate noise from ground operations, including minimizing: APU use, aircraft taxiing operations, ground running of aircraft engines, use of Ground Service and Ancillary Equipment, and noise optimized airport design (ICAO Doc 9184 *Airport Planning Manual Part 2, Land-use and Environmental Management* refers).

Helicopter operations

Some ICAO Member States and international aviation stakeholders are carrying out significant work programs to identify low noise procedures for helicopters. Similar to other types of aircraft, the operational noise of helicopters can be managed based on appropriate guidance on departure, on-route, and in arrivals phases of flight, as well as hovering operations.

Maintenance for reduced operational noise

Under specific circumstances, targeted maintenance practices are expected to help reduce the noise generated by aircraft. In this respect, the main focus areas are on: maintaining the airframe and engine gas-path 'cleanliness', minimizing and managing weight, reducing and removing acceptable defects (ADDs) affecting noise performance, and the timely incorporation of any product improvement and software packages that may help improve the aircraft's noise performance.

Potential future developments

Aircraft technology is fast-evolving and new on-board systems may pave the way to more effective noise abatement procedures. A look at what some aspects of the future may bring, will help identify potential opportunities that may result from emerging technologies. This involves considering what advances may become available in the near future from initiatives that the aerospace manufacturing industry and airspace service providers are developing. An example of this would be the possible benefits that might be gained from optimizing lateral flightpaths using concepts innovatively, such as PBN, followed by vertical flightpath optimization during both departure and arrival operations. For the latter, it may be feasible to perform novel approaches in the future such as those with two-segments. A developing issue with new aircraft designs may mean that a shallower - rather than steeper - descent angle prior to transitioning onto the normal glideslope may provide a greater noise reduction benefit with these aircraft, thus complicating the whole process. When implemented, the impact of, new operational procedures on overall traffic flow optimization, development, and implementation should be assessed and managed.



Interdependencies and trade-offs

Any decision on environmental management should result from a careful evaluation of all the possible environmental impacts. This means identifying interdependencies and trade-off among environmental impacts (e.g., noise and greenhouse gas emissions), or between environment and other strategic areas of aviation operations, such as capacity, safety, and economics. Sound guidance has been developed and documented by ICAO's CAEP group on this matter². The issue of noise displacement is also highlighted, where minimizing noise impacts in one area may lead to increases in others, and why flying at a higher altitude may not necessarily mean that the noise impacts from an aircraft operation, will be less.

Finally, it is important to recognize that all aviation stakeholders have worked hard to achieve an enviable level of safety within the sector. In this respect, safety must always be the overriding consideration in all civil aviation operations; and the operator, in conjunction with the operating crew, must remain the ultimate judge of what can be done to minimize operational noise impacts while maintaining the necessary safety margins. This is an important factor in the Collaborative aspects section of the manual, and it is inherent that by working together, the optimum outcome may be achieved while at the same time, maintaining safe operations.

THE NEXT 3 YEARS AND BEYOND...

The document is intended to be a 'living' document, updated with new information as additional good practices are identified. In particular, the impact of new technologies and the potential of newer aircraft-based systems could contribute to a further enhancement of the noise situation around airports, and these should be followed and implemented as they become readily available. ICAO's work will take this technological component into consideration with the simple understanding that all parts of the aviation sector can learn from one another to help the advancement of operational noise performance. The consequence of this will benefit all areas and communities impacted by aircraft noise by recognizing and implementing better practices where practicable and operationally safe to do so.

2 <https://www.icao.int/environmental-protection/Pages/CAEP-Operational-InterdependencyTask.aspx>