ADVISORY CIRCULAR

Subject	Issuance Date	AC Number	Version
Guidance Material on Noise Abatement Procedures	1-September-2024	156-03	1.0

Note: This Advisory Circular is published to provide additional information and recommended actions that further elaborate on provisions or concepts prescribed in GACAR part-156.

1. Introduction

1.1 Purpose

The purpose of this advisory circular is to introduce ICAO's Balanced Approach to Aircraft Noise Management and deep dive into noise abatement procedures.

1.2 Applicability

This advisory circular is applicable to air traffic management, airplane operators, aerodrome operators.

1.3 Cancellation

This is the first official version of this advisory circular, and it cancels no other advisory circular on the subject matter.

1.4 Related regulatory references

a) GACAR Part-91

b) GACAR Part-93

c) GACAR Part-156.

d) GACAR Part-171.

e) GACAR Part-172

1.5 Related reading materials and references

a) ICAO Doc 9829, Guidance on the Balanced Approach to Aircraft Noise Management, available at: https://store.icao.int/en/guidance-on-the-balanced-approach-to-aircraft-noise-management-doc-9829

b) ICAO Doc 9888, Noise Abatement Procedures: Review of Research, Development and Implementation Projects Discussion of Survey Results, available at: https://store.icao.int/en/noise-abatement-procedures-review-of-research-development-and-implementation-projects-discussion-of-survey-results-doc-9888

c) ICAO Doc 8168, Procedures for Air Navigation Services — Aircraft Operations (PANS-OPS)) Part I and Part II, available at: https://store.icao.int/en/procedures-for-air-navigation-services-pans-aircraft-operations-volume-i-flight-procedures-doc-8168

d) ICAO Doc 9931 - Continuous Descent Operations (CDO) Manual available at: https://store.icao.int/en/continuous-descent-operations-cdo-manual-doc-9931

e) ICAO Doc 9993 - Continuous Climb Operations (CCO) Manual available at: https://store.icao.int/en/continuous-climb-operations-cco-manual-doc-9993

f) ICAO Doc 10031, Guidance on Environmental Assessment of Proposed Air Traffic Management Operational Changes, available at: https://store.icao.int/en/guidance-on-environmental-assessment-of-proposed-air-traffic-management-operational-changes-doc-10031

g) ICAO Doc 10177, Manual on Operational Opportunities to Reduce Aircraft Noise, available at: https://store.icao.int/en/manual-on-operational-opportunities-to-reduce-aircraft-noise-doc-10177

1.6 Approval

This advisory circular has been approved for publication by the Executive Vice President for Safety and Environmental Sustainability of the General Authority of Civil Aviation.

Background

a) Solving the noise issues resulting from aviation has always been a priority for ICAO. ICAO first started focusing on noise in the 1970s, when it adopted the first noise standards for subsonic jet aircraft in 1972. Following this adoption many standards and manuals have been developed to minimize the aviation sector's impact on the environment.

b) GACA has always been committed to international civil aviation environmental goals as well as the national targets for environmental sustainability. To steer the Saudi civil aviation industry toward environmental sustainability, GACA has developed the Saudi Civil Aviation Environmental Sustainability Program (CAESP). This plan covers 7 environmental pillars. This strategy has set noise related goals for the aviation sector, aiming at "minimizing the noise nuance from aeronautical activities on nearby communities".

c) Hence, this advisory circular is aimed to raise the stakeholders' awareness of the noise abatement operational procedures.

2. Overview of the Balanced Approach to Aircraft Noise Management

The Balanced Approach to Aircraft Noise Management is the main comprehensive policy adopted by ICAO Assembly in its 33rd Session (2001). It is meant to be used at any airport with a perceived problem with noise that is served by international air traffic. It is necessary to tailor solutions to noise issues and specific characteristics faced by the concerned airport. This necessitates an airport-by-airport approach and acknowledges that if similar noise issues are identified, similar solutions could be applied.

According to ICAO (2008) *Guidance on the Balanced Approach to Aircraft Noise Management*, the Balanced Approach entails determining the issue with noise at a particular airport and evaluating the various options for reducing it. These options can be broken down into four main principles, as shown in **figure 1**. Using objective and measurable criteria, the objective is to address noise issues at each airport and determine the noise-related measures that provide the greatest environmental benefit at the lowest cost.

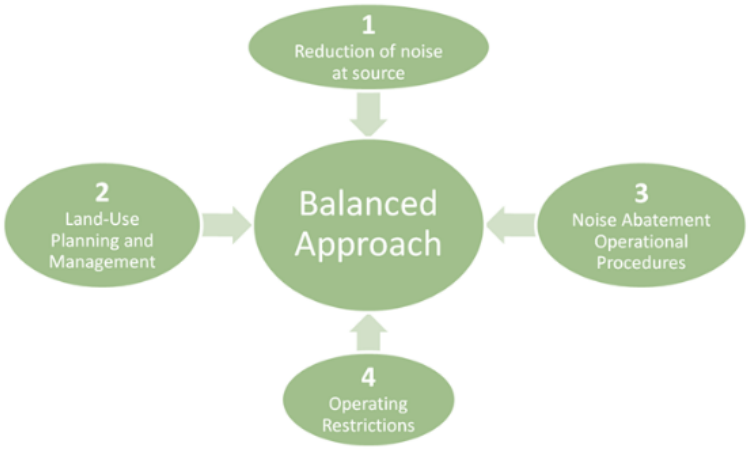

Figure 1: The four principal elements of the Balanced Approach to Aircraft Noise Management

1) Reduction of Noise at Source (Technology Standards):
   - Introducing new technologies that produce significant noise reductions
2) Land-use Planning and Management
   - Planning (zoning, easement, etc.)
   - Mitigation (building codes, insulation, real estate disclosure, etc.)
3) Noise Abatement Operational Procedures (focus of this document)
   - Aimed at reducing and/or redistributing the noise around the airport.
4) Operating Restrictions
   - Any noise-related action that limits or reduces an aircraft's access to an airport.
   - Not to be used as a first resort, only after consideration of benefits gained from other 3 elements.

3. Noise abatement operational procedures

The objective of implementing noise abatement procedures is to reduce the level of noise perceived at specific locations in order to minimize the number of people affected by noise.

Safety remains the highest priority in aviation, and the safety of air traffic continues to be the most important consideration in the development and implementation of noise abatement operational procedures. The use of noise abatement operational procedures must ensure that the necessary safety of flight is maintained by considering all factors that might affect a particular operation. These include, but are not limited to, current and forecast weather, runway conditions and available navigation aids.

Noise abatement operational procedures should not be introduced unless a noise problem is demonstrated to exist or is anticipated in the future based on appropriate studies and consultation.

Noise abatement operational procedures include the use of noise preferential runways and routes, as well as specific noise abatement procedures for take-off and landing operations.

The appropriateness of these measures depends on the physical layout of the airport and its surrounding environment. However, in all cases, the implementation of these noise abatement procedures must prioritize safety considerations above all else.

The airport operator, in coordination with the relevant stakeholders and authorities, is responsible for designing and implementing the most appropriate noise abatement procedures for the airport it operates, considering the unique characteristics of the airfield and its surrounding areas.

This section presents several examples of noise abatement procedure categorized into ground-based operational procedures, use of runways and arrival/departure operations.

3.1 Ground-based operational procedures

a) Auxiliary Power Unit (APU) management

Airports employ several operational measures to reduce noise pollution on the ground. As part of noise abatement operations, providing alternative sources of power such as ground support equipment (GSE) and/or terminal bridge services may be possible to restrict APU usage to reduce noise in the vicinity of parked aircraft.

b) Taxi power control (N-1) engine taxiing.

In taxiing, aircraft should use the least amount of engine power possible. Three- or four-engine aircraft are instructed to taxi to and from the runway with one engine off. The exception to this is when it is deemed unsafe or impedes the aircraft's normal operation.

3.2 Use of runways

a) Noise preferential runways

Noise preferential runways are chosen to minimize aircraft noise over sensitive areas during takeoff and landing. Using a preferred runway can shift air traffic direction, reducing noise exposure in one area while potentially increasing it in another, thus altering the noise impact and potentially reducing the number of people affected by noise.

As per GACAR Part 171 § 171.307, runways must not be selected for noise abatement purposes for landing operations unless they are equipped with suitable glide path guidance, e.g., ILS, or a visual approach slope indicator system for operations in visual meteorological conditions.

The primary factor in choosing a runway should always be flight safety. Refer to GACAR Part 171 § 171.307 for the list of circumstances where noise abatement must not be a determining factor in runway nomination.

As per GACAR Part 91 § 91.127, where a formal runway use program has been established by the GACA, each Pilot in Command (PIC) of a large or turbine–powered airplane assigned a noise abatement runway by Air Traffic Control (ATC) must use that runway. However, consistent with the final authority of the PIC concerning the safe operation of the aircraft as prescribed in GACAR § 91.3(a), ATC may assign a different runway if requested by the PIC or his designee in the interest of safety.

b) Displaced thresholds

Displaced thresholds are placed at points other than the designated runway beginnings to reduce the runway length available for landing and takeoff to reduce the noise generated by aircraft. Takeoffs in either direction, or landing in the opposite direction are permitted on the runway behind a displaced threshold.

3.3 Approach/departure operations

a) Noise preferential routes dispersed flight tracks

Dispersed flight tracks for noise abatement refer to a strategy used in air traffic management to spread out aircraft flight paths over a wider area to minimize the noise impact on any single community or area. This approach aims to reduce the concentration of noise over specific locations by distributing the noise more evenly across a larger region.

b) Reduced power/reduced drag operations

The principle of these techniques is delaying as much as possible wing flap extension and landing gear deployment, consistent with ATC speed, height clearance and safe operation. These techniques involve changes in engine power associated with changes in aircraft configuration.

c) Continuous descent approach (CDA)

Commonly referring to the initial approach phase between 6 000 ft and the interception of the glide slope, CDA ideally allows an uninterrupted descent from cruising altitude; in practice, it is usually defined as a descent with no segment of level flight exceeding 2 or 2.5 NM. CDA reduces the noise experienced on the ground by reducing the overall thrust required during initial descent and keeping the aircraft higher for longer. In addition to noise reduction, CDA can provide emission benefits.

The implementation of descent and approach procedures, continuous descent approach in particular, will require a number of issues to be addressed related to: traffic capacity; operational and air traffic control constraints; weather conditions; airport constraints; crew workload, awareness, training and experience; aircraft and engine characteristics; regulations; and safety requirements. Successful implementation will depend on close collaboration between all parties (operators and pilots, airframe manufacturers, air traffic control service providers, airports and authorities, and research organizations).

d) Use of reverse thrust

Reverse thrust is an effective complementary way of braking an aircraft, especially on contaminated runways and serves to significantly reduce the required runway length on landing or in the case of an aborted take-off. In some cases, in order to minimize ground noise, the use of reverse thrust for jet or propeller engines can be limited to reverse idle. The use of reverse thrust above reverse idle may be prohibited during a specified period, especially during night hours; such a limitation would only apply when safety allows it

In developing noise abatement take-off procedures, operators, for safety and training issues, limit their operation to no more than two procedures. Any noise abatement procedure must demonstrate that it does not compromise safety with adequate crew training and that ATC can accommodate the procedure with minimal or no impact on airport capacity or controller workload before it can be implemented.

4. Conclusion

According to ICAO guidelines, noise abatement procedures are an important element of the Balanced Approach to Aircraft Noise Management. However, these procedures should only be implemented if a real noise problem has been identified and persists even after addressing noise at the source and implementing appropriate land-use planning and management strategies.

It is important to note that the Balanced Approach emphasizes the need for a comprehensive and integrated strategy to address aircraft noise. Noise abatement procedures should not be considered in isolation but rather as part of this complete approach, with safety always being the dominant priority.

The specific noise abatement procedures implemented at an airport must be tailored to the local conditions, considering factors such as the airport's physical layout, the surrounding environment, and the needs of the local community.

Achieving optimal results in noise abatement requires close collaboration and coordination between various stakeholders, including:

- Airport authorities
- Air navigation service providers
- Airlines and aircraft operators
- Local communities and government authorities

The design and implementation of noise abatement procedures should not compromise the safe operation of the aircraft.

The stakeholders involved in the Balanced Approach must work together to find the right balance between noise reduction and safety, ensuring that any noise abatement measures do not expose the safe execution of flight operations.

Continuous dialogue, sharing of best practices, and a strong focus on safety culture are essential to achieving this balance and delivering effective noise management solutions that are both environmentally responsible and operationally sound.

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