

# Aircraft Noise: Research Challenges and European Approach

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## ABSTRACT

International standards governing the noise of newly manufactured aircraft are developed by the International Civil Aviation Organization (ICAO). In view of the long cycles (research, design, development, production, operation, evolution of infrastructures) involved in the air transport business, its purpose is to provide the needed stability, supporting a global long term view for the manufacturers to anticipate future needs through development of affordable technologies. Within ICAO, standards are being developed by the Committee for Aviation Environmental Protection (CAEP). In 2001 CAEP approved the definition of more stringent noise limits (Chapter 4) now effective as of 2006.

As another significant outcome of the whole process, recommendations were made in favour of a "Balanced Approach" encompassing four elements: reduction of noise at the source, land-use planning, noise abatement procedures and aircraft operating restrictions. This concept implies the elaboration and implementation of a process meant to help the assessment and resolution of noise problems at airports in the most cost-effective manner. The Balanced Approach in effect challenges the ICAO member states to "study and prioritise research and development of economically justifiable technology", to foster the development of noise abatement procedures, while emphasizing the importance of land-use planning and environmental management aspects.

Both aircraft noise certification requirements and airline/aircraft operators (customer) requirements, define noise level design requirements. Thus a new aircraft design must be very carefully selected so as to provide an attractive, competitive product at reasonable cost to the initial purchasers (operators). At the same time it must keep enough growth capability to meet extended capacity requirements, while still complying noise regulations and local restrictions. In this way the product has some assurance of a long production life and will provide reasonable return on investment in a reasonable time for the manufacturer.

Novel technology developments are generally supported by means of significant national / regional technology initiatives. The recent trend has then been the integration of the noise technology aspects into larger initiatives dealing simul-

taneously with a number of environmental goals to be addressed within an operational context, covering major elements of the Balanced Approach. As such, they offer a combination of technological and operational solutions that can be effectively associated towards the satisfaction of environmental goals at air transport system level.

As part of a global forecasting effort, a process was initiated by CAEP in 2006 to develop mid and long term ICAO Technology Goals by means of Independent Experts panels reviewing potential achievements from research programs worldwide. While technology related research remain of a highly competitive nature, a definite level of collaboration has been achieved to communicate about future technology implementation prospects towards Aviation Authorities. The recent CAEP Noise Technology Review featured contributions from industry and research organizations involved in the research programs supported by Canada, the European Union, Japan, Russia and the United States.

Now focusing on the European approach, the ACARE Strategic Research Agenda (SRA) established in 2002 a general framework for European Aviation related research, including the definition of quantified targets for 2020.

While noise remains a significant factor potentially affecting infrastructure capacity, a definite challenge for future products is to deliver significant CO<sub>2</sub> benefits associated with acceptable noise impact, in particular through innovative integration concepts for future engine and aircraft designs. To reach the ACARE 2020 noise targets and beyond, this approach is being complemented by efforts aimed at a new generation of individual noise reduction solutions with reduced fuel burn impact.

For maximum effect at community level, as recommended by ICAO's Balanced Approach, noise benefits provided by such novel technologies will have to be associated with operational optimization, also considering improved efficiency in land-use / zoning practices. In this wider context, establishing the conditions for a more active and coordinated research covering all areas related to the Balanced Approach will clearly enhance the possibilities of taking maximum advantage at airport level of the technology and operational solu-

tions developed since the initiation of the ACARE related effort.

To successfully address these objectives, a dedicated European Aircraft Noise Research Network (X-NOISE) has been established to elaborate a detailed research strategy, supported by state-of-the-art assessments, gap analysis as well as mechanisms to gather of novel ideas and concepts. A consensus on priorities has been achieved through a process involving several layers of brainstorming and consultation with the scientific community as well as with the other major stakeholders. The scope and ambition of the network proposed strategy has also ensured that all aspects of research were covered; in particular activities that go beyond the development of quieter individual technologies and would support the implementation of operation and environmental practices aimed at managing the noise impact around airports. This strategy has now produced results consistent with the stated mid-term objectives and contributed to the effective implementation of the next research phase.

In parallel, improved integration of the research community at European level has been pursued. Through the various individual projects and the networking efforts carried out over the last ten years, the European aircraft noise research community has now reached a critical mass. A network of national Focal Points has then been established to favor efficient coordination of expertise at national level, leading to a better exploitation of national programs around common European priorities. Representatives of CIS, South America and Mediterranean regions have also been included in the network to foster further international cooperation.