Research Networks: Supporting Aviation Noise Reduction

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Summary
Over the last 20 years, large, ambitious national and regional programmes have been initiated to support research aimed at further reducing noise from aircraft operations. The emergence of dedicated network structures has played a key role in the elaboration and successful implementation of these various initiatives. Such structures have been instrumental in developing and consolidating detailed research strategies in line with the high level goals set by relevant national and regional research frameworks.

While combining the complementary skills and expertise required to cover the whole field of interest, research networks provide the capability to effectively manage clusters of basic research projects and facilitate the transition towards further stages of technology demonstration, Moreover, as a lasting organizations beyond the limited timeframe of individual projects, they ensure the needed continuity aimed at longer term strategies.

The current European noise research network situation is described as well as the most recent efforts aimed at engaging like-minded research networks to address wider environmental issues as well as develop international cooperation opportunities.

1. Introduction

Over the last 20 years, large, ambitious national and regional programmes have been initiated to support research aimed at further reducing noise from aircraft operations. Such initiatives have been established in the European Union, the United States, Japan, Canada, Brazil and the Russian Federation.

A definite trend, as observed in particular in Europe and in the United States, has been the integration of noise technology aspects into even larger initiatives dealing simultaneously with a number of environmental goals to be addressed within an operational context. 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.

The emergence of dedicated network structures has played a key role in the elaboration and successful implementation of these various initiatives. Such structures have been instrumental in developing and consolidating detailed research strategies in line with the high level goals set by relevant national and regional research frameworks, establishing the conditions for a more active and coordinated research covering all areas related to the International Civil Aviation Organization (ICAO) Balanced Approach.

While combining the complementary skills and expertise required to cover the whole field of interest, a research network typically provides the capability to effectively manage clusters of basic research projects and facilitate the transition towards further stages of technology demonstration, Regular research network features also include assessment of the state-of-the-art, gap analysis, mechanisms to gather novel ideas and concepts as well as actions aimed at structuring the research community.

The European situation is described in the following pages as well as the most recent efforts aimed at engaging like-minded research networks across the globe.

2. Supporting Research aimed at Reducing Aviation Noise in Europe

The European Coordination Action X-NOISE may be considered as a typical example of such networks. Since its effective start in 1998 as the strategy-oriented element of the European aviation noise research effort, it has developed its activities along three main directions:

a) The elaboration, coordination and assessment of research strategies aimed at supporting the comprehensive development of research projects with a view of meeting the 2020 and 2050 ACARE goals.

b) The dissemination of European projects scientific and technological achievements as well as issues and priorities for the future.

c) The improved integration of European research community activities in the field of air transport related noise research.

The successive Strategic Research Agendas developed by the Advisory Council for Aeronautics Research in Europe (ACARE) have established a general framework for European Aviation related research, including the definition of quantified noise targets for 2020 and 2050 [1][2][3][4]. To successfully address these objectives, a key step was the elaboration of a detailed noise research strategy. A consensus on associated priorities was achieved as well as regularly reassessed through a network-led process involving several layers of brainstorming and consultation with the scientific community as well as with other major stakeholders.

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.

In parallel progress assessment exercises aimed at the 2020 targets have been actively supported through contribution to the successive projects undertaking such tasks on behalf of ACARE, in particular AGAPE (2010) and OPTI (2013) [5][6][7].

3. European Aviation Noise Research Network Development

Early on, a network of National Focal Points has been established together with appropriate resources tailored to the specific national situations, now covering most of the EU member states and several framework programmes associated states as shown on Figure 1

Figure 1. Countries involved in the European Aviation Noise Research Network as of 2018.

Three priorities have then driven the network efforts in the community building area:

a) Coordination of expertise at national level around a common set of well disseminated European priorities and objectives, also leading to a better exploitation of national funding around similar priorities.

b) Identification and exploitation of national upstream research into larger European technology validation projects.

c) Development of national networks in order to foster participation in future projects, with a particular focus on small and medium companies.

Through the various individual projects and the networking efforts carried out over the last 20 years, the European Aviation Noise Research Community

has now reached a critical mass. As of 2017, some 200 different organisations had participated in at least one project proposal over the last five EC framework programmes.

This can be seen as resulting from the network comprehensive workplan, involving experts groups, scientific workshops and a common information system, ensuring dissemination and exploitation of research findings as well as seeking innovative contributions from its constituents at large, as illustrated in Figure 2.

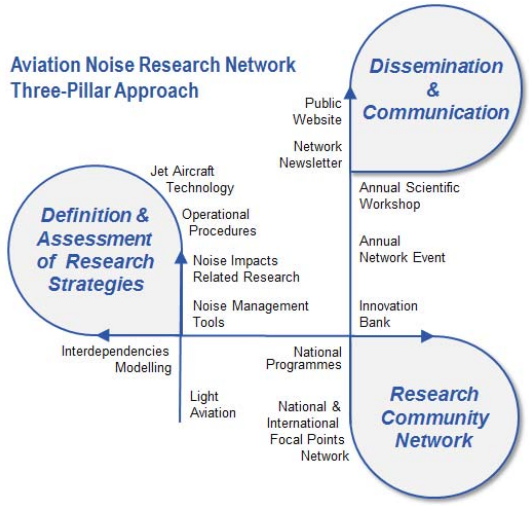

Figure 2. Scope of the Aviation Noise Research Network activities

4. Addressing Environmental Synergies and International Collaboration

Another remarkable aspect of research networks involves the capability to join forces and regroup with counterparts. As shown in Figure 3, in linking together networks can address and explore wider issues such as the development of a concerted research approach for transport noise as whole, improved knowledge of noise-emissions interdependencies and the development of international cooperation opportunities.

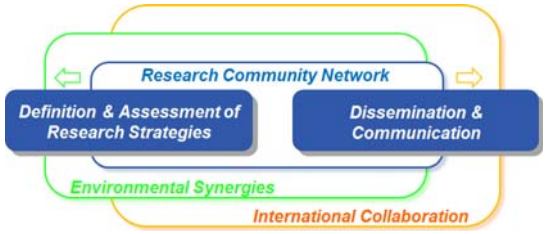

Figure 3. Expanding Collaborations

Typical examples of such collaborations at European level include the development of a strategy aimed at “Research for a Quieter Europe” through X-NOISE involvement with the CALM network [8]. The Environmental Noise Directive of 2002 focused on a common approach to address environmental noise. The associated strategic vision coordinated by CALM for noise research covered a wide range of areas including assessment of noise exposure and perception, health impacts of exposure to noise, noise abatement including cost-benefit aspects, new technologies and system approaches for improved noise control at source and the further development of legislative standards. All major transportation environmental noise sources (road, rail and air traffic) were covered.

ICAO maintains a high level of activity aimed at defining future international policies and standards in the environmental area. To this end, it is developing a forward looking view by means of technology goals definition and a modelling system predicting the interdependent impacts of future policy options. The issue of noise-emissions interdependencies also at the core of future technology efforts as absolute component performance in noise may be dependent on the trade-off positions selected with reference to CO2 or NOx. In this context, X-NOISE collaborated closely its successive counterpart networks on aviation emissions (AERONET, then FORUM-AE). Common workshops were organized to firm up a long term approach for a European framework able to manage environmental interdependencies modeling.

Such examples of multidisciplinary European collaboration only serve to emphasize the interest of available network structures to address complex environmental issues at strategic level. Similarly, a concerted approach dedicated to international cooperation and benefitting from networks support should create more opportunities for research aimed at reducing aviation environmental.

Since 2010, X-NOISE has involved in its activities International Focal Points from the Russian Federation, Brazil and Egypt, while contributing to wider European efforts aimed at investigating cooperation opportunities with US, Canada and Japan. As a result, dedicated noise topics were featured in the Joint Calls established with the Russian Federation and Canada.

To maintain a steady scientific dialogue, a forum dedicated to transatlantic exchanges (ANERS – Aircraft Noise and Emissions Reduction Symposium) has been regularly and successfully supported through a joint Planning Committee comprising members of European networks and their US and Canadian counterparts

International cooperation remains in fact a significant asset in improving knowledge of Aviation environmental impacts. It is anticipated that either fully structured or simply informal, research networks across the globe will play a key role in supporting such an extended cooperation framework.

5. Further Steps

As lasting organizations beyond the limited timeframe of individual projects, the research networks ensure a much needed structural continuity aimed at longer term strategies.

In this light, the evolution of EU funding opportunities have recently led to upgrade the approach which was successfully implemented since 1998 for aviation noise research.

Over the next four years, a dedicated “Global Coordination” activity will aim at enhancing coherence and efficiency of noise research in Europe, ensuring and reinforcing coordination between national, international and EU research activities. This activity will take the form of a Coordination Action embedded in the new project ANIMA (Aviation Noise Impact Management through novel Approaches).

Meanwhile, X-NOISE will morph into an International Association to continue providing expert advice, assessing progress vs the state-of-the-art and organize scientific exchanges on a regular basis. Maintaining such basic capabilities regardless of funding availability is definitely seen as a factor of stability in pursuing the development of long term research strategies.

As such, X-NOISE experts committees and National Focal Points network will contribute to the ANIMA efforts aimed at establishing a “common strategic research roadmap for aviation noise reduction”, also exploring possibilities and conditions for targeted international collaboration in line with the strategy for EU international cooperation in research and innovation as well as the needs put forward by the strategic roadmap for aviation noise, including aspects related to international regulatory discussions.

In view of the clear benefits exposed earlier, the noise research community will now welcome that similar European approaches are being implemented in the near future for ground transportation noise and aviation emissions, so that the fruitful exchanges developed with the CALM and AERONET / FORUM-AE networks can be resumed.

Acknowledgement

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References

[1] ACARE Strategic Research Agenda Issue 1 – October 2002
[2] ACARE Strategic Research Agenda Issue 2 – October 2004
[3] ACARE Strategic Research & Innovation Agenda - Realising Europe’s vision for aviation - September 2012
[4] ACARE Strategic Research & Innovation Agenda Update - 2017
[5] AGAPE (ACARE GoAls Progress Evaluation) Final report – 2010
[6] OPTI (Observation Platform to assess the fulfilment of Vision 2020 goals from Technological and Institutional standpoints) Final report – 2013
[7] ACARE Activity Summary 2014-2015 report
[8] Research for a Quieter Europe in 2020 - An Updated Strategy Paper of the CALM II Network - September 2007