IDEALVENT

Integrated Design of Optimal Ventilation Systems for Low Cabin and Ramp Noise

Funding: European (7th RTD Framework Programme)
Duration: Oct 2012 - Sep 2016
Status: Complete with results
Total project cost: €3,729,596
EU contribution: €2,608,271

Call for proposal: FP7-AAT-2012-RTD-1
CORDIS RCN: 104301

Background & policy context:

Reaching low levels of cabin and ramp noise is crucial to ensure the satisfaction of aircraft passengers and a safe working environment for the crew and personnel servicing the grounded aircraft. From the passenger and personnel standpoint, good thermal and acoustic comfort is important to minimize both stress symptoms and tiredness.

Required to provide satisfactory air quality and temperature, the Environmental Control Systems (ECS) currently used are key contributors to the acoustic nuisance within the cabin and around the grounded aircraft. Reducing the amount of noise produced by the ECS will therefore have a direct impact on the passenger satisfaction and personnel health and safety.

Objectives:

Unlike aircraft exterior noise, which has received considerable attention in past and currently running research projects, the noise emitted by confined flows in ECS assemblies involves complex mechanisms that haven't been sufficiently investigated to permit the noise reduction wished by passengers and regulators. Acoustic and hydrodynamic interactions between subcomponents have so far been largely neglected despite being crucial. The objective of this project is to investigate these mechanisms in order to achieve the maximum noise reduction.

Methodology:

Thorough experimental studies will be conducted in order provide a deeper understanding of these mechanisms. A combination of accurate scale-resolved methods with low-CPU cost statistical/stochastic methods will then be proposed as an original modelling and design approach. Integrated passive flow and noise control strategies will be explored both experimentally and numerically. The knowledge gained in the experimental and numerical investigations of the installation effects will permit devising and optimise strategies having the best potential for reducing ECS noise. The best noise reduction strategies will be finally tested on a full-scale ECS system, and their impact towards improved passenger comfort and airport personnel health will be assessed with respect to the objectives of the Work Programme and relevant regulations.

Parent Programmes:
FP7-TRANSPORT - Transport (Including Aeronautics) - Horizontal activities for implementation of the transport programme (TPT)

Institute type: Public institution
Institute name: The European Commission
Funding type: Public (EU)

Lead Organisation:

Institut Von Karman De Dynamique Des Fluides
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<tr>
<th>Organisation</th>
<th>Address</th>
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<tbody>
<tr>
<td>Institut von Karman De Dynamique Des Fluides</td>
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<td>Sontech Ab</td>
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<td>Deutsches Zentrum Fr Luft Und Raumfahrt E.v</td>
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<td><strong>Siemens Industry Software Nv</strong></td>
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Technologies:

Noise testing, modelling and reduction
Aircraft noise reduction at source

Development phase: Research/Invention

Key Results:

Quieter aircraft cabins

An EU project is examining ways to reduce aircraft cabin noise. Focusing on environmental control systems (ECSs) and aerodynamic interaction between components, testing to date has determined key issues and set the parameters for later design modelling.

Aircraft cabin noise is a comfort concern for passengers, and an occupational health and safety issue for cabin and maintenance crews. Aircraft ECSs — i.e. cooling and ventilation systems — are a key contributor, yet the fundamental physics of confined-flow turbulence remains poorly understood.

The EU-funded project 'Integrated design of optimal ventilation systems for low cabin and ramp noise' ([IDEALVENT](http://www.idealvent.eu)) is investigating. The 10-member consortium will study aircraft
noise, focusing on modelling the acoustic and aerodynamic interaction between ECS sub-components.

Additionally, the team aims to develop new computation-efficient research methods, expected to yield a new modelling and design approach. Resulting noise-reduction strategies will be tested at full scale. IDEALVENT runs over four years to September 2016.

The project's first 18 months focused on experimentation. Various ECS configurations were designed and manufactured, then tested for acoustic and flow characteristics. The results revealed installation issues affecting noise and will help to define the boundary conditions to be used in subsequent modelling. Other experimental outcomes confirmed the relative importance of noise emitted by the ECS with respect to the auxiliary power unit.

In terms of developing prediction methodologies for an integrated ventilation system, the project first determined the applicability of candidate modelling approaches. Relevant interfacing strategies were subsequently developed. The research also yielded low-computation methods for acoustic modelling of sound generation and propagation.

The IDEALVENT project will yield new concepts for the design of aircraft ventilation systems, leading to reductions in cabin noise of 3-10 decibels. Such improvements will reduce the adverse health effects of noise, and the techniques will be applicable to other forms of noise reduction.

**STRIA Roadmaps:** Vehicle design and manufacturing

**Transport mode:** Air transport

**Transport sectors:** Passenger transport

**Geo-spatial type:** Other