evektor

SACC

Small Airplane Cockpit Climate

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3rd Call FP7

7.1.3. ENSURING CUSTOMER SATISFACTION AND SAFETY

AREA 7.1.3.3. - Aircraft safety

AAT.2010.3.3.1. Aerostructures

Project Objectives: The aim of this project is to propose a methodology to ensure enhanced flight environment and health conditions in the cabin.

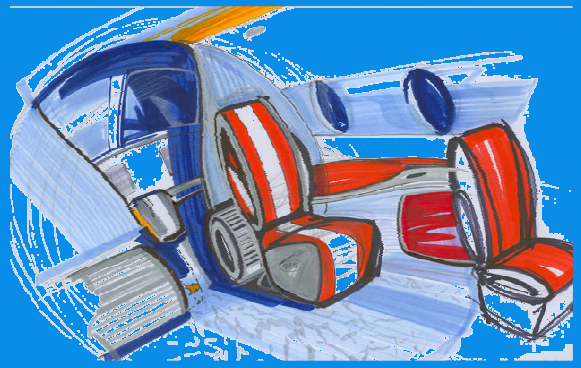
The output of the project will be a methodology, that will gather the experience obtained during the project and make recommendations for the design of systems provided comfort, eventually may be supplemented by simple user computing 1D model

Experimental validation of the methodology will be part of the SACC project.

Cockpit Climate Generaly

Cockpit climate affects:

- Thermal and environmental comfort of passengers
- Thermal comfort and fatigue of crew
- Safety of airplane operation
- Health of passengers and crew



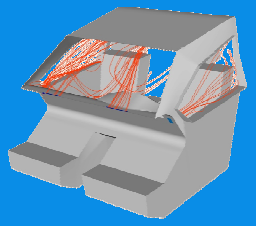
Cockpit climate consists of:

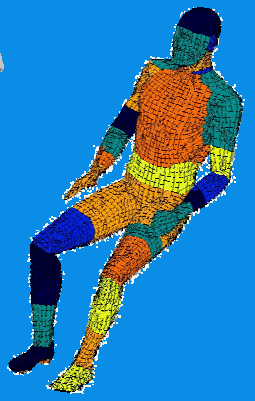
- Thermal comfort: Operation Temperature
  PMV - Predicted Mean Vote,
  PPD - Percentage People Dissatisfied
- Draft rating
- Noise, vibrations
- Air pollution

Cockpit Climate Improvement

Computer simulation

- CFD (flow velocity, pressure, ...)
- Thermal calculations (radiation, heating, ...)





Measurements

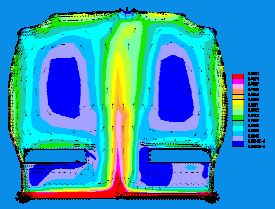
- anemometry (PIV, thermal anemometry, ...)
- flow visualization (smoke, He bubbles, ...)
- thermal field
- thermal dummy

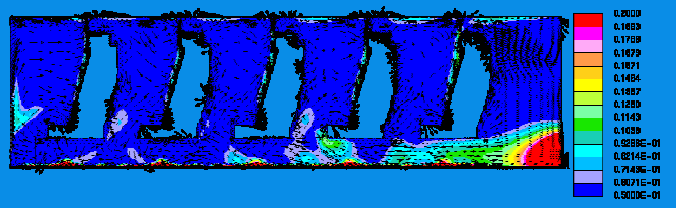
Validation of calculations

Methodology creation

Applicability on small aircrafts

- General aviation and small commuter category airplanes cockpit climate are usually not systematically solved (experience from previous design is used)
- Air condition and ventilation systems are not operating during engine OFF (parking, waiting for take-off) - overheating
- Not pressurized cabin - pollutants (fuel vapors, hydraulic liquid vapors, dust, etc.) can penetrate into cabin
- Lack of methodology to design ventilating and air-condition systems
  - optimizing manifolds and blowers from point of view of pressure drops and direction of flow
  - individual ventilation settings
  - using natural convection for ventilation (system of slots)





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Goals of project:

Main objective of the project:

Development of analytic and experimental environment for small commuter and normal class airplane design, regarding satisfaction of thermal comfort of passengers and crew requirements.

Subtasks:

- Reducing thermal inputs inside the cabin (i.e. reduce heat transfer, especially by solar radiation, into cabin)
- Suggesting a solution of standing airplane cooling by means of ventilation slots (natural convection)
- Preventing from lengthwise increasing of concentration of dangerous substances in a cabin (i.e. preventing from lengthwise flow)
- Optimizing manifolds to blowers from point of view of pressure losses
- Suggesting a system of individual ventilation settings

Benefits:

- rationalize airplane structure
- increase the comfort of passengers and crew (and **thus operational safety**)
- create conditions to increase value of airplane

Wayes to achieve the goals

- Numerical simulation – CFD

- Experiment on full-scale model of fuselage, pointing on:

* flow field character (thermal distribution, thermal dummy)
* pressure drops in ventilation system
* thermal field in cabin - passenger and crew comfort
* particle transport from sources placed in several places in cabin (source - receptor relations)
* effect of different materials covering outer surface of fuselage on heat gain

- Validation of CFD models and their checkout

- Computer modeling with proved models - creation of methodology

Extra benefits of the project

- Creation of coupling between basic and applied research.

Transfer of up-to-date piece of knowledge towards design office and on the other hand information about problems solved during airplane design towards basic research.

- Creation of methodology of designing the systems affecting cockpit climate

Increasing the comfort of passengers and crew of small commuter airplanes, allowing achieving the goal with minimum effort and design costs.

Consortium and budget

Consortium:

- EVEKTOR, spol. s r.o. (Czech republic) – project coordinator
- Piaggio Aero Industries S.p.A. (Italy)
- TU Brno, Dept. of Thermodynamics and Environmental Engineering (Czech republic)
- TNO (Netherlands)
- VZLÚ (Czech republic)
- IBK Technology (Germany)
- Paragon Ltd. (Greece)
- HumanSolutions (Germany)

Budget:

Targeted budget : 3.2 M€ (under development)

Proposal status

Finished:

- composition of the consortium
- project structure – work packages
- deliverables defined
- milestones partly defined

Under development:

- choice of task leaders
- work distribution between participants
- time schedule of the project

Thank you

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