SIPAL

Scoop Intake and Channel with Ice Protection and Acoustic Absorbers.

State of the art – Background

Future aviation demands significant fuel economy improvements and reduced environmental impact. Potential solutions may be found in the 'More-electric' aircraft concept, promoting greater engine efficiency. The Environmental Conditioning System (ECS) and Ice Protection Systems are presently heavy users of engine power in the form of 'Engine Bleed Air'. Whereas the proposed use of electrical power generated by the engines is more efficient, but requires new supporting technologies.

One such technology is an ECS Scoop to gather air from the atmosphere. The Scoop must perform a number of new duties together with its primary function of ducting breathable air to the ECS on its way to the cabin interior.

The scoop sits directly in the air-stream making new demands on its structure and environmental (icing) protection system. The scoop and ducting must also absorb sufficient ECS compressor noise in line with future aircraft noise reduction initiatives.
The combination of requirements on the Scoop represents the unique challenge.

Presently, acoustic panelling used on aircraft is not protected from icing and yet this may be necessary to optimise the Scoop performance.

Objectives

SIPAL aims in this first project phase to create a ground based demonstrator Scoop by:

- Developing a Scoop design to meet the requirements.
- Studying the ice accretion behaviour with computer simulation techniques.
- Optimising weight.
- Design and integration of acoustic absorbers.
- Investigating the use of low production energy materials.
- Providing erosion and lightning protection.
- Building physical demonstrators for ground based icing tunnel and acoustic testing.

Description of work

The key challenges in realization of the Scoop with embedded electrical ice protection and acoustic absorbers are in the design realisation and manufacturing methods required.

The work includes:

- **Determine the most efficient ice protection system architecture in consideration of power use, weight and system robustness.**
- **Determine the most efficient structural design considering thermal and mechanical loads.**
- **Consider the electrical design aspects related to high voltage power supply, such as corona discharge prevention and general insulation requirements.**
- **Design study to examine appropriate lightning diversion path.**
- **Design and develop manufacturing techniques for the Scoop test articles using the project learning.**
- **Manufacture and supply a Scoop for acoustic testing.**
- **Manufacture and supply Scoops for Icing Wind Tunnel testing.**

Expected results

a) Timeline & main milestones

At the project completion SIPAL will deliver the hardware test articles to other Clean Sky projects.

SIPAL will also produce a final technical report.

b) Environmental benefits

The SIPAL project supports the feasibility and eventual use of electrical ECS that supports more-electric aircraft architectures. In so doing SIPAL becomes part of the development history of the next generation of more efficient aircraft.

The SIPAL project also examines the use of materials requiring lower energy in manufacture and new methods of additive manufacturing that also support reduced energy use and waste.

c) Maturity of works performed

SIPAL will mature the Scoop concept sufficiently to build hardware for ground based test evaluations and also form an analytical opinion on the feasibility of the concept suitability for a future production aircraft.

Picture, Illustration

Project Summary

Acronym :	**SIPAL**
Name of proposal:	**Development and Manufacture Scoop Intake and Channel Including Ice and Debris Protection and Acoustic Absorbers.**
Technical domain:	**Involved ITD**
Grant Agreement:	**255742**
Instrument:	**Clean Sky**
Total Cost:	**460 897 Euros**
Clean Sky contribution:	**230 448 Euros**
Call:	**JTI-CS-2009-1-SGO-02-005**
Starting date:	**1-1-2010**
Ending date:	**31-3-2011**
Duration:	**15 months**
Coordinator:	**Mr Paul Nicklin** **GKN Aerospace Services Limited** **Paul.Nicklin@gknaerospace.com** **+44 (0)1582 811123**
Project Officer:	**Ruud Den Boer** **Ruud.DenBoer@cleansky.eu**
Participating members	**Airbus Deutchland GmbH** **AeroTex UK LLP**