



*Clean Sky 2*  
Information Day dedicated to the  
CFP04

ITD Systems

Brussels, June 2016

**Innovation Takes Off**

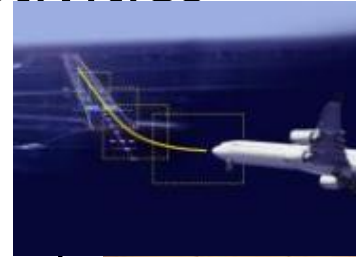
[www.cleansky.eu](http://www.cleansky.eu)



# From *Clean Sky* towards *Clean Sky 2*

## Systems ITD follows and expands Clean Sky SGO activities

- Management of Trajectory and Mission is included in wider, more integrated cockpit & mission demonstrations
- Management of Aircraft Energy carries on in work-packages dedicated to innovative wing, electrical chain, ... new domains of aircraft power management are explored. Demonstrators and test rigs used in Clean Sky are continued in Clean Sky 2 and completed with new integration environments.
- Systems ITD focuses on demonstration and tight integration with IADPs.



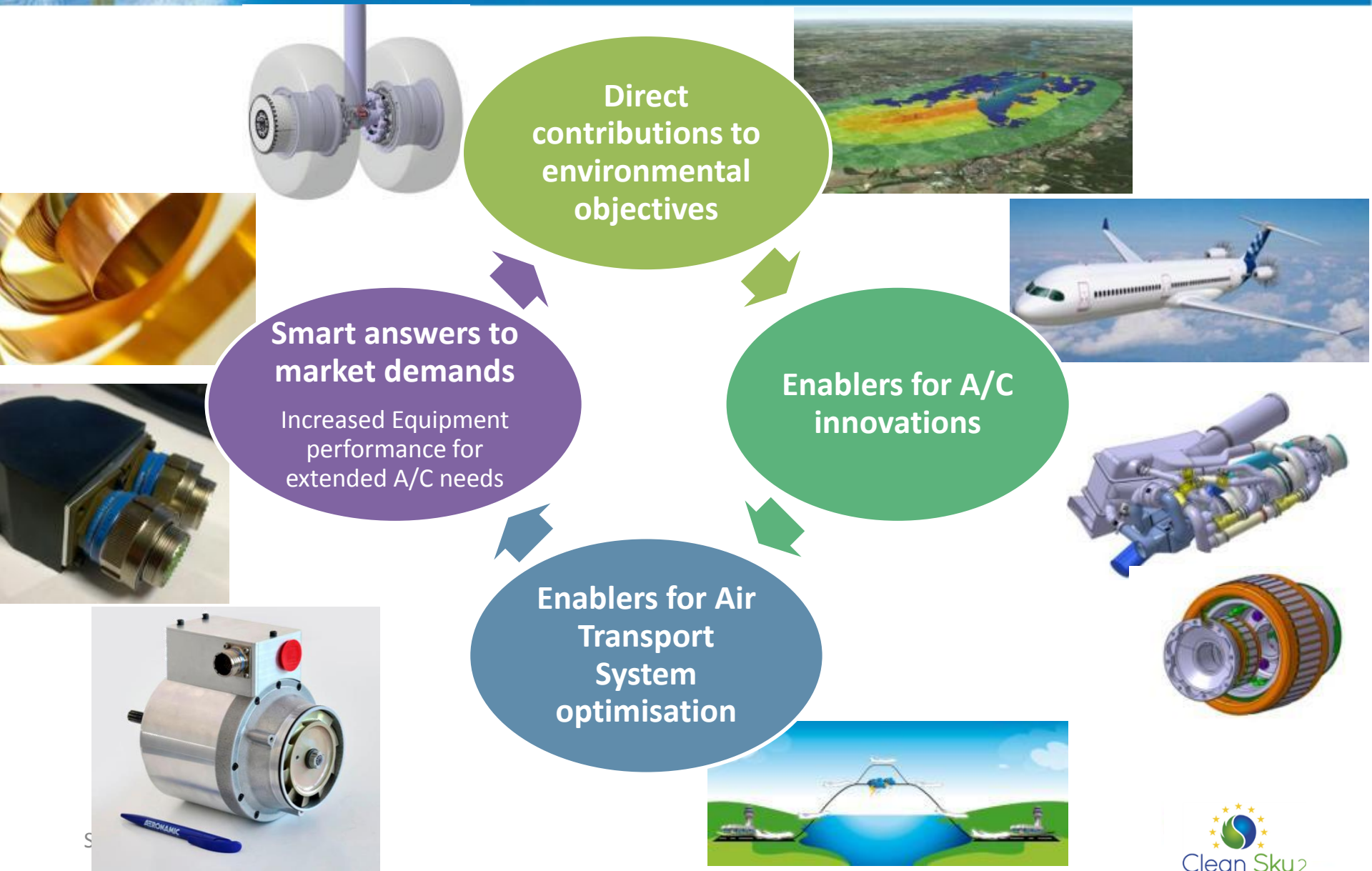
Systems ITD

IADPs

TRL up to 5

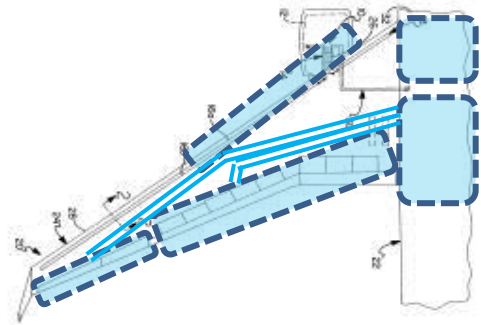
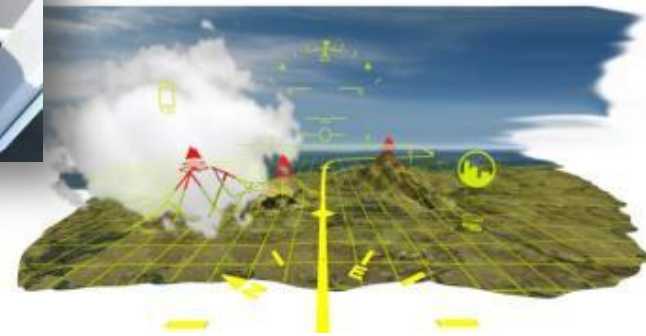
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# System Demonstrations – Context & objectives



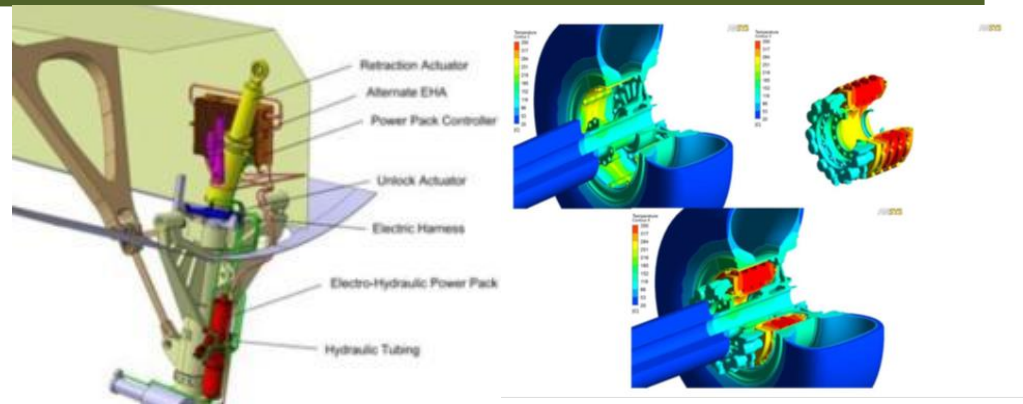
# Systems ITD main demonstrations (1/2)

## Integrated Cockpit



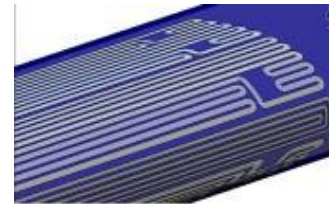
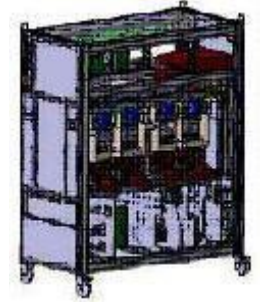
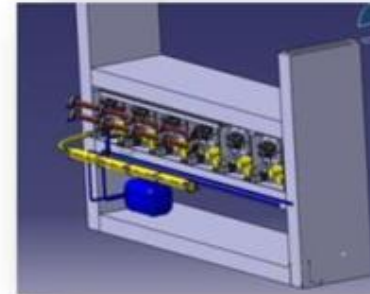
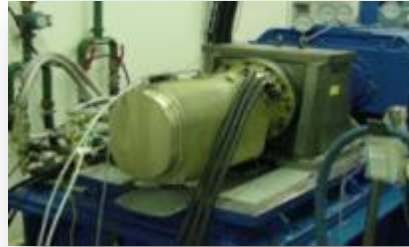
## Innovative Electrical Wing

## Landing Gears Systems



# Systems ITD main demonstrations (2/2)

## Power Generation & Distribution



## Major Loads

## Systems for Small Air Transport



## Cabin and Cargo



# Project Members

**THALES**

Clean Sky2 – SYSTEMS ITD

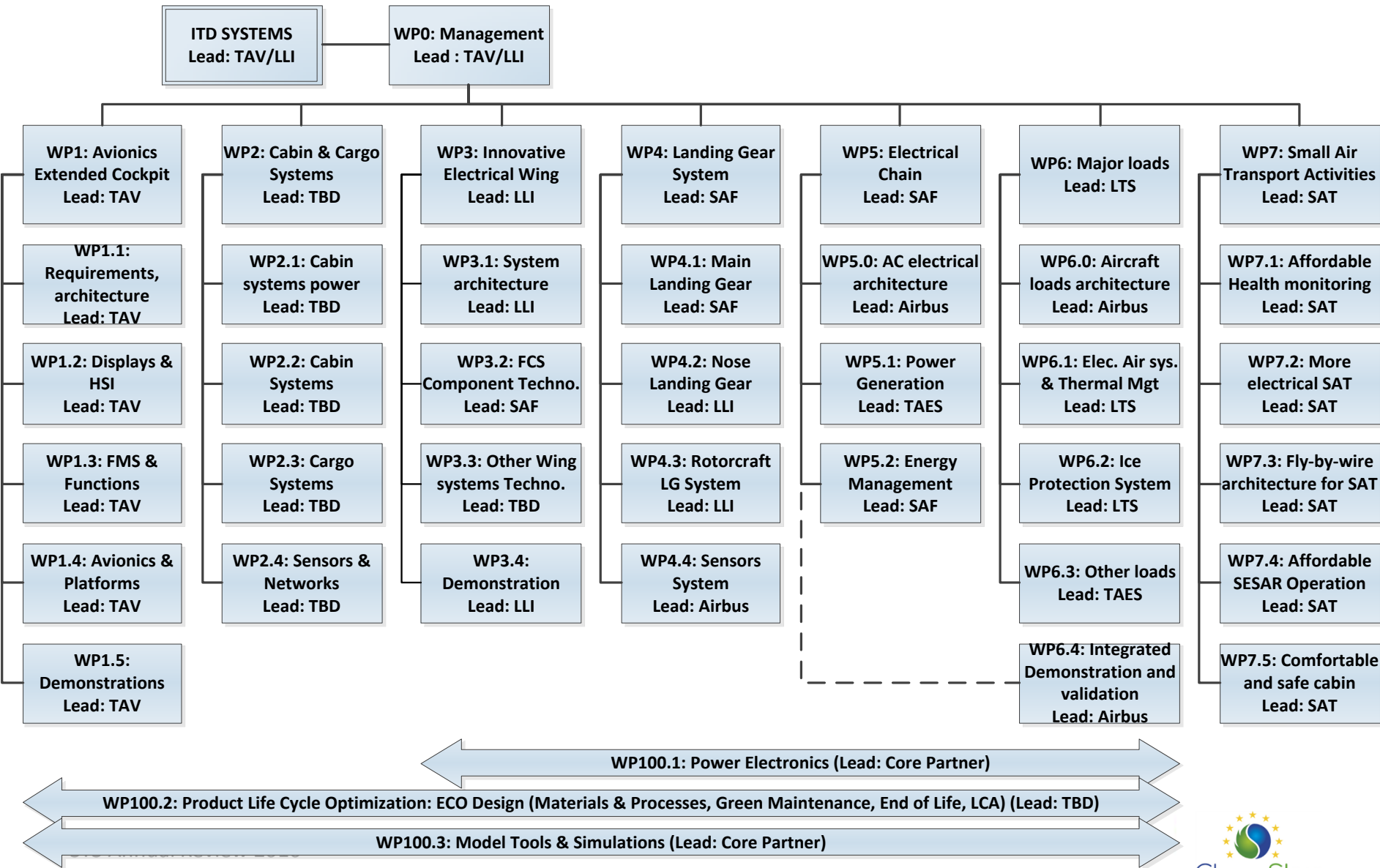
**LIEBHERR**



**... and more  
to join soon**



# Setup and Implementation





# Overview of the CFP04 topics

Identification	Title	Value	Action type
		(Funding in M€)	
JTI-CS2-2016-CFP04-SYS-02-27	Alternative recirculation filter for better cabin air quality	1,1	IA
JTI-CS2-2016-CFP04-SYS-02-26	multivariable control approach for electrical air conditioning pack	0,5	IA
JTI-CS2-2016-CFP04-SYS-03-07	AN INNOVATIVE ELECTRICAL POWER DISTRIBUTION SYSTEM (EPDS) FOR SMALL AIRCRAFT	1	IA
JTI-CS2-2016-CFP04-SYS-03-07	Electromechanical actuation for landing gear	1	IA
JTI-CS2-2016-CFP04-SYS-02-24	Electrical simulation model identification method and tool	0,35	IA
JTI-CS2-2016-CFP04-SYS-02-28	Analysis, validation and data collection of design and operating parameters for advanced cabin ventilation concepts related to future aircraft energy management systems	2	IA
JTI-CS2-2016-CFP04-SYS-01-03	High brightness microdisplay system for Head Up Displays	3,8	RIA
JTI-CS2-2016-CFP04-SYS-02-25	innovative cooling system for embedded power electronics	0,8	IA
JTI-CS2-2016-CFP04-SYS-02-22	Validation tests of electromechanical actuators and its dedicated control units at TRL 6 level	0,74	IA
JTI-CS2-2016-CFP04-SYS-02-23	ECO-design based techniques and machinery for improved racking and distribution boxes manufacturing.	1	IA

# JTI-CS2-2016-CFP04-SYS-02-27

## Alternative recirculation filter for better cabin air quality

### Context and applications :

The objective of this call is to provide an alternative purification solution to improve the efficiency of air filter dedicated to the elimination of VOCs (excluding CO<sub>2</sub>) and bio-contaminants



### Technical Target in the project:

- Investigation of solution which improves air quality and cabin comfort for more electrical aircraft.
- Development of devices enabling to remove VOCs generated in the cabin (foods, material in the cabin) and entering in the cabin through the air conditioning system

	Pollutants to be eliminated		Environmental constrains	Targeted size
<ul style="list-style-type: none"> <li>• Acrolein</li> <li>• Toluene</li> <li>• Formaldehyde</li> </ul>	Conversion efficiency → min. 85% for 3000FH	Biocide effect on bacteria and virus elimination	<ul style="list-style-type: none"> <li>• Relative humidity</li> <li>• Variation of pressure</li> <li>• Cabin temperature</li> </ul>	<ul style="list-style-type: none"> <li>• Length : 550mm</li> <li>• Width: 500</li> <li>• Weight : 9Kg max</li> <li>• ΔPressure: 6-10mbar</li> </ul>

### Timeframe and funding:

Foreseen start : May-2017

Foreseen end : Jan-2020

**Indicative Funding Topic Value**

**1100K€**

# JTI-CS2-2016-CFP04-SYS-02-26

## Multivariable control approach for electrical air conditioning pack

### Context and applications :

More electrical air conditioning pack uses several high level control modes. The objective is to develop a multivariable control approach for that pack, based on models and test data available, in order to reduce complexity, development costs and improve transient performance.



### Technical Target in the project:

- First Objective :
  - to develop a multivariable control approach for electrical conditioning pack
  - covering all or most of the control modes
  - In order to reduce complexity and to improve performance (transient performance, robustness performance)
- Second Objective :
  - to improve model calibration methods (improve calibration results, lower calibration times)
  - with associated 'tools', re-usable for other similar systems

### Timeframe and funding:

Foreseen start : Feb-2017

Foreseen end : Feb-2020

**Indicative Funding Topic Value**

**500K€**

Context and applications :

A demonstrator of a complete EPDS prototype for Small Aircraft will be designed and manufactured, containing modules commanded and monitored in accordance with an intelligent power management system. Virtual and laboratory test benches will be used to identify problems and risks related to the selected architectures. The design and development of the said EPDS shall be based on high level specification defined by TM.



Technical Target in the project:

- design, development, manufacturing and preliminary test of an EPDS.
- Integration with the generation system
- Introducing power management electrical distribution for better integration of electrical systems on small aircraft, including special mission equipment
- To demonstrate maturity of the technologies at TRL 5 level through demonstrations in representative environment

Timeframe and funding:

Foreseen start : May-2017

Foreseen end : Apr-2020

**Indicative Funding Topic Value**

**1000K€**

# JTI-CS2-2016-CFP04-SYS-03-08

## Electromechanical actuation for landing gear

### Context and applications :

Part of WP7

Development of electromechanical landing gear actuators including locksystem, having redundant architecture for emergency extension, suitable for effectively reducing the complexity and weight of aircraft system with respect to conventional hydraulic system.



### Technical Target in the project:

- The project will develop design architectures and cost effectiveness technologies, including health monitoring, to provide reliable actuation systems (i.e. EMA/ECU's) for N/M Landing Gear application.
- Replacement of hydraulic landing gear with a new electric system will realize weight and maintenance cost savings while promoting more green aircraft

### Timeframe and funding:

Foreseen start : May-2017

Foreseen end : Apr-2020

**Indicative Funding Topic Value**

**1000K€**

# SYS-02-24 : Electrical simulation models identification methods and tools

## Context and applications :

Definition and validation of the electrical network, is usually done in a complementary way by simulation studies and demonstration of equipment and network operation on a test rig. An adequate simulation platform, including accurate and robust model library and advanced post processing tools, is required to reach simulation V&V goals. SABER RD robust generic electrical model libraries have been developed to be used as a baseline for specific model development.

## Technical Target in the project:

- To choose and adapt identification and fitting methods, based on experimental data and generic models availabilities.
- To adapt and create generic and robust models in line with our application, permitting implementing the methods chosen previously
- To develop and validate dedicated toolbox for fit the models through experimental data availability and graphical user interface mean

**The main and high level aim of this project will be to provide the capacity to adapt generic models to fit real hardware from experimental measures and/or design data.**

## Timeframe and funding:

Foreseen start : mid-2016

Foreseen end : mid-2019

**Indicative Funding Topic Value**

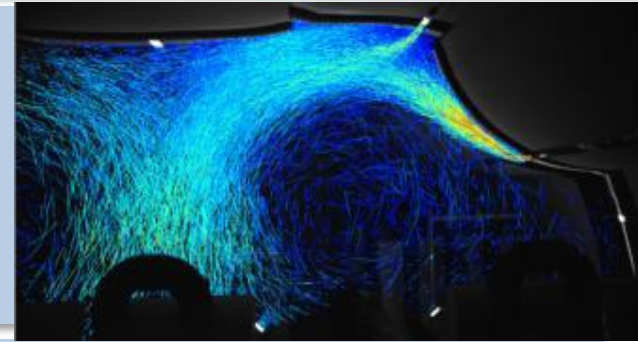
**350K€**

# Studies of for modern cabin ventilation concepts

## Context and applications :

WP6 Major Loads / WP6.4 Integrated Demonstration and Validation / WP6.4.5 Validation

**Analysis, validation and parametric studies of design and operating parameters for modern cabin ventilation concepts related to future aircraft energy management system**



## Technical Target in the project:

- Future aircraft energy management systems, aiming at smart management of electric power and thermal loads at system level, will substantially impact the cabin fluid- and thermodynamics
- The aim of this project is to set up and operate a long range-size fully representative 1:1 cabin mock-up to design new ventilation systems and study the impact of smart power / thermal load / supply air management on the ventilation efficiency and passengers/crew thermal comfort.
- Complex 3D CFD simulations will support the test rig design and initiate the solution process.

## Timeframe and funding:

Foreseen start : Q2-2017

Foreseen end : +48 months

**Indicative Funding Topic Value**

**2000K€**

# JTI-CS2-2015-CFP02-SYS-02-01 : High brightness microdisplay system for Head Up Displays - Scope and objectives

## Context and applications :

Study, design and develop a full-color-very high luminance display system based on ~1" micro LED arrays on sapphire hybridized on an active matrix backplane. The final application of the component would be for the next generation of Avionics Head Up Displays applications



## Technical Target in the project:

- Innovative solutions such as emissive micro-displays based on arrays of color LEDs structured on sapphire wafers and coupled to a silicon backplane active matrix
- Main characteristics :
  - Maximum brightness : at least of 1.000.000 cd/m<sup>2</sup> and possibly 10.000.000 cd/m<sup>2</sup>
  - Targeted Resolution : 1920x1200 pixels (WUXGA)
  - Die Size ~ 1" diagonal (inducing a Pixel pitch ~ 8-10µm)
  - Spectral Bandwidth < 50 nm
  - Selected half angle of emission ~ 30°

## Timeframe and funding:

Foreseen start : Feb-2017

Foreseen end : Feb-2020

**Indicative Funding Topic Value**

**3800K€**



# JTI-CS2-2015-CFP02-SYS-02-25 : Innovative cooling system for embedded power electronics

## Context and applications :

The purpose of this topic is to develop effective cold plates that serve as heat sinks for extracting and transferring the dissipated power from the power semiconductors with removal of heat by means of air flow through the cold plates.

## Technical Target in the project:

- For this application, the partner shall combine material with high thermal conductivity properties and optimized folded brazed fin cold plate (heat sink) solution. The evaluation of cold plate (heat sink) prototypes is expected as a stand-alone effort and also in a mechanical structure to represent a power management system integrating a few electronic modules equipped with the high efficiency cold plate technology

## Timeframe and funding:

Foreseen start : Feb-2017

Foreseen end : Jun-2019

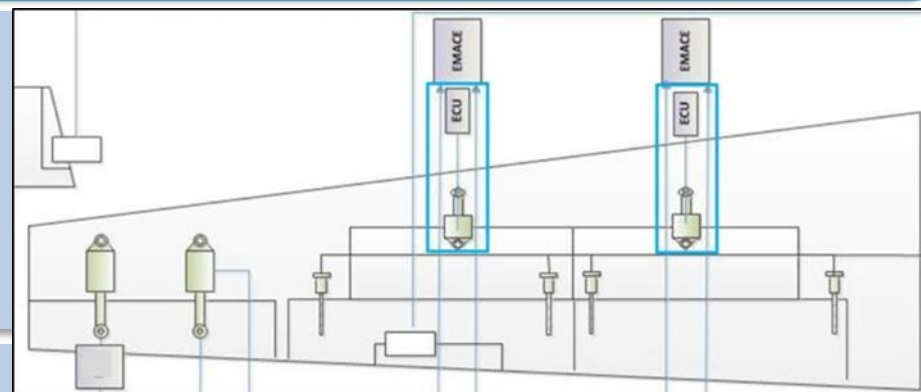
**Indicative Funding Topic Value**

**800K€**

# JTI-CS2-2015-CFP02-SYS-02-22 : Validation tests of electromechanical actuators and its dedicated control units at TRL 6 level.

## Context and applications :

This call will cover software & complex hardware certification of ECUs and manufacturing of electromechanical actuators for innovative flight control equipment to be used in the flight tests.



## Technical Target in the project:

- HW / SW Validation and design assurance according to RTCA/DO-254 and RTCA/DO-178 level A
- Design, validation, manufacturing of EMA for Aileron, spoiler, Flap Tab, Winglet Tab, Backup Aileron servo
- Permit to fly and liaison with certification for EMA and ECU
- 25 units for flight tests to be delivered in total.

## Timeframe and funding:

Foreseen start : Apr-2017

Foreseen end : Apr-2019

**Indicative Funding Topic Value**

**732K€**

# JTI-CS2-2015-CFP02-SYS-02-23 : ECO-design based techniques and machinery for improved racking and distribution boxes manufacturing.

## Context and applications :

The activity of WP 5.2.1 Innovative Electrical Network is part of WP 5 Electrical Chain. The main target of the call is to develop breakthrough & hybrid additive manufacturing/3D printing ECO-conception techniques. a Hybrid Machine will be delivered. This machine will be able to ensure additive manufacturing demonstration.

## Technical Target in the project:

- specify, design and develop additive manufacturing tool machinery based on the use of electrical conductive and non-conductive materials applied to innovative electrical distribution boxes.
- The electrical boxes thus obtained will be equipped with electrical network that will be inherent and immersed to the structure of the electrical box itself.
  - REACH compliance.
  - Optimisation in terms of weight, volume and cost.

## Timeframe and funding:

Foreseen start : Apr-2017

Foreseen end : Oct-2019

**Indicative Funding Topic Value**

**1000K€**

# Questions ?

Any questions on the Call and topics can be addressed to the following mailbox:

**[Info-Call-CFP-2016-02@Cleansky.eu](mailto:Info-Call-CFP-2016-02@Cleansky.eu)**

Deadline to submit your questions:  
**16<sup>th</sup> August 2016, 17:00 (local time)**

# Thank You





# Clean Sky

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