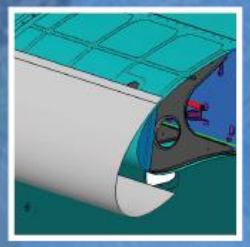












Innovation Takes Off

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Clean Sky 2

Clean Sky 2
Information Day dedicated to the
4th Call for Proposal (CfP04)

AIRFRAME

Brussels, 22nd June 2016

Innovation Takes Off

www.cleansky.eu

Clean Sky 2

From *Clean Sky* towards *Clean Sky 2*

eco DESIGN

- Greener Airframe Technologies
- More Electrical a/c architectures

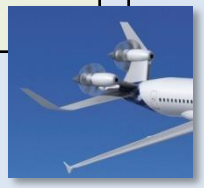
- More efficient wing
- Novel Propulsion Integration Strategy
- Optimized control surfaces

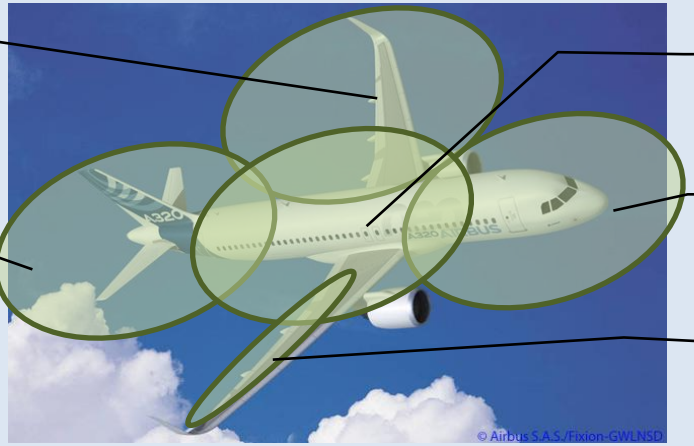
GRA GreenRegionalAircraft

- Integrated Structures
- Smart high lift devices

Re-think the wing

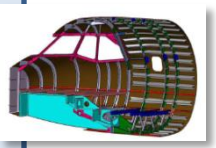
Re-think the a/c architecture





Re-think the cabin

Re-think the fuselage



Re-think the control

Step changes in the "efficiency" of all airframe elements by the means of a systematic "re-thinking"

Clean Sky JOINT UNDERTAKING

Overall Technical Overview

	High Performance & Energy Efficiency					High Versatility & Cost Efficiency			
	Innovative Aircraft Architecture	**Advanced Laminarity**	**High Speed Airframe**	**Novel Control**	**Novel travel experience**	**Next generation optimized wing**	**Optimized high lift configs.**	**Advanced integrated structures**	**Advanced Fuselage**
Focused Integrated Demonstrations 	*Investigate advanced engine integration & novel overall architecture*	*Laminar nacelles; NLF smart integrated wing fitting the industrial environment*	*High efficient multi-disciplinary flexible wing; fuselage changes in shapes, & structure*	*Smart multi-function control surfaces & load & flutter alleviation*	*Passenger friendly cabin; ergonomic & flexible, new volume utilisation*	*Low cost composite structures*	*Efficient architectural concept for turbopropeller high wing – composite nacelle & adaptative wing*	*New structural paradigm for optimised integration of systems in airframe, electrical wing*	*Novel composite fuselage & cabin; tailless or pressurized fuselage for rotorcraft*
Transverse Enabling Capability	Novel Certif. Process	Extended Laminarity				More Efficient Wing		Advanced Manufact.	
			Eco Design			Flow & shape Control			

CFP04 Overview of AIRFRAME ITD topics

JU Ref.	CfP Title	WP/Task	RIA or IA	Duration (Month)	Est. budget [k€]
JTI-CS2-2016-CFP04-AIR-01	Project HPE				
JTI-CS2-2016-CFP04-AIR-01-20	**Development of a highly instrumented, modular fan module for aerodynamic and acoustic wind tunnel testing**	A-1.2.1	RIA	18	600
JTI-CS2-2016-CFP04-AIR-01-21	**Integrated Automated Test Bench Control System with Certifiable Test Documentation Functionality**	A-1.4.6	IA	18	600
JTI-CS2-2016-CFP04-AIR-01-22	**Laminated and panoramic Cabin Windows for Business Jet applications**	A-3.2	IA	24	400
JTI-CS2-2016-CFP04-AIR-01-23	**Novel manufacture of low weight skin without chemical milling**	A-3.3	RIA	30	900
JTI-CS2-2016-CFP04-AIR-01-24	**Multi-functional cabin rest area**	A-5.1	IA	30	500
JTI-CS2-2016-CFP04-AIR-02	Project HVC				
JTI-CS2-2016-CFP04-AIR-02-28	**Development of methods for deriving optimized shapes of morphing structures considering both aerodynamic performances and specific mechanical morphing boundary conditions**	B-1.4.2	RIA	25	350
JTI-CS2-2016-CFP04-AIR-02-29	**Development and Manufacturing of Prototype metallic parts.**	B-2.2	IA	24	750
JTI-CS2-2016-CFP04-AIR-02-30	**Development and manufacturing of innovative stamping dies for aluminium ribs Hot Stamping**	B-2.2.1	IA	12	350
JTI-CS2-2016-CFP04-AIR-02-31	**Numerical methodologies and related tools for effect of defect prediction in manufacturing**	B-3.3.2	RIA	36	500
JTI-CS2-2016-CFP04-AIR-02-32	**Testing matrix optimization by interaction between numerical modelling and innovative non-contact measurement technology**	B-3.3.2	IA	36	500
JTI-CS2-2016-CFP04-AIR-02-33	**Developing innovative joining concepts and their manufacturing methodologies**	B-3.4.2	IA	30	500
JTI-CS2-2016-CFP04-AIR-02-34	**Hardware demonstrator development and deployment on Future Industrial Human Machine Interface (HMI) and Connected factory technologies**	B-3.6	RIA	30	300
JTI-CS2-2016-CFP04-AIR-02-35	**Development and deployment of new procedures and PLM Tools for A/C Ground Functional testing with Eco-design criteria**	B-3.6	RIA	26	650
JTI-CS2-2016-CFP04-AIR-02-36	**Development of prototype system based on Laser UT technology for high speed contactless no-couplant inspection of hybrid and thick composite structures**	B-4.3	IA	24	2500
JTI-CS2-2016-CFP04-AIR-02-37	**Quilted Stratum Processes (QSP) for low cost and eco thermoplastic manufacturing of complex composite parts**	B-4.3	IA	18	400

Additional content

AIR-02-36

- Estimated Funding Topic Value: **2,5M€**
- Duration: **24** months
- Start date: **Q2 - 2017**
- SoW overview:

  The aim of this Topic is to develop a prototype system based on Laser UT (LUT) technology to be used for NDI inspection of hybrid composite structures, containing damping materials that absorb most energy of the ultrasonic wave at 5 MHz, and as well as on laminates "thick" or made of very attenuative materials. This system will also be used to inspect the Long Barrel Demonstrator, that will be developed in Clean Sky 2 Programme using the hybrid technology.

- The activity is divided into the following Tasks:
  - **LUT Prototype System Requirements**
  - **LUT Prototype System Design**
  - **LUT Prototype System Development**
  - **LUT Prototype System Validation**

LUT Prototype System Requirements

- Analysis of the inspection requirements, in terms of typology and location of defects to be detected, minimum detectable defect size and maximum acceptable defect size, inspection method/technique, inspection parameters, signal-to-noise ratio, etc.

- Analysis of the configuration of parts to be inspected, in terms of geometrical/dimensional features, materials and fabrication process.

- Definition of a Test Book to be used for pre and final verification and validation of LUT Prototype System

LUT Prototype System Design

The aim of this task is the design of LUT prototype system. That means the design of the following subsystems:

- *High speed scanning system,* able to assure the coverage of inspection area, a high scanning speed (at least, 8 m^2/h) and a scanning index variable between 0.5 mm to 3 mm with 0.5 mm steps.
- *High peak power short-pulsed laser,* for generation of ultrasonic wave directly in the part, without damage the part.
- *Detection long-pulsed laser,* to "read" the surface displacement induced by ultrasonic wave propagation in the material.
- *Interferometer,* to demodulated the information detected by the detection laser,
- *Opto-electronic circuit,* for the detection of small signals reducing the noise in order to obtain acceptable signal-to-noise ratio.
- *Acquisition module,* to synchronize laser shots and digitizer for fullwave acquisition of ultrasonic signals (maximum sampling frequency = 100 MHz, 10 bit for each sample).

LUT Prototype System Development and Validation

LUT Prototype System Development

- Development of each component of LUT system.
- Preliminary test at Partner factory to verify the performance of each component and of whole LUT system, in terms of scanning ability and detectability of the defects.
- Optimization of the key parameters of the inspection process (in particular, the generation laser, the detection chain and post-processing algorithms), to assure the correct inspectability of hybrid composite structures with damping materials or thick/very attenuative laminates.
- Installation of the system at Topic Manager plant. The installation shall be performed by Partner according to the current safety regulations.

LUT Prototype System Validation

- Validation of LUT prototype system performing all the tests foreseen in the Test Book.
- Inspection of the Fuselage Barrel demonstrator.

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Schedule, Deliverables and Milestones

	Months from T0																							
N.ro Task - Title	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
01-LUT Prototype System Requirements																								
02-LUT Prototype System Design																								
03-LUT Prototype System Development																								
04-LUT Prototype System Validation																								

Deliverables			
Ref. No.	***Title - Description***	***Type***	***Due Date***
D1	Test Book for LUT Prototype System Validation	Document	T0 + 2
D2	Design of LUT Prototype System	Document	T0 + 11
D3	Pre-validation Report	Document	T0 + 17
D4	Providing LUT Prototype System	Document/Hardware/Software	T0 + 21
D5	Validation Report	Document	T0 + 24

Milestones (when appropriate)			
Ref. No.	***Title - Description***	***Type***	***Due Date***
M1	Design of LUT Prototype System	Document	T0 + 11
M2	Pre-validation Report	Document	T0 + 17
M3	Providing LUT Prototype System	Document/Hardware/Software	T0 + 21
M4	Validation Report	Document	T0 + 24

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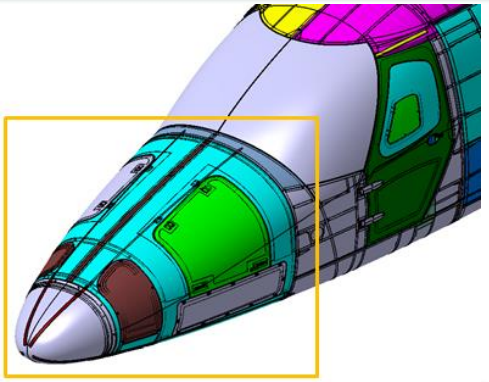
Skills, Capabilities expected from the Applicant(s)

- Proven experience in Laser UT technology applied to aeronautical structures.
- Proven experience in Non-destructive inspection based on ultrasound method applied to aeronautical structures.
- Proven experience in the realization of the system for Ultrasonic Inspection of aeronautical structures.

JTI-CS2-2016-CFP04-AIR-01-16 : Development of innovative joining concepts and their manufacturing methodologies

Context and applications :

The scope of CfP is focused on the improvement of mechanical and electromagnetic properties of hybrid joints, their durability and resilience against environmental and operational effects, and facilitating their manufacturing and integration into the real aircraft structure. Secondary scope is to assess the feasibility of innovative solutions and their potential use in commercial products of small aircraft producers.



Technical Target in the project:

- Production and testing of reference hybrid joints (strength + electromagnetic properties)
- Proposal of new design of hybrid joints with application of more suitable or innovative manufacturing methods
- Production and testing of innovative hybrid joints + test results comparison (strength + EMC)
- Development and validation of manufacturing methodology for innovative joining

- Main characteristics :
  - Proposing of testing methods will be fully managed by CfP-partner but verified by Topic Manager.
  - Strength of innovative hybrid joints should be at the same level or better and costs reasonably preserved.

Timeframe and funding:

Foreseen start : Q3/2017

Foreseen end : Q4/2019 (30 months)

Indicative Funding Topic Value

500K€

JTI-CS2-2016-CFP04-AIR-01-16 : Development of innovative joining concepts and their manufacturing methodologies

Proposed WBS

To be refined by applicant

Deliverables			
Ref. No.	***Title - Description***	***Type***	***Due Date***
D1	Report: test specification of reference specimens Report: test methodology	R R	T0 + 4 months
D2	Test results of reference specimens	D / R	T0 + 7 months
D3	Feasibility study of joint optimization	R	T0 + 9 months
D4	CAD data of innovative joints Description of production technology of innovative joints	D R	T0 + 13 months
D5	Test results of innovative specimens (1st round) Test results of innovative specimens (2nd round)	D / R D / R	T0 + 18 months T0 + 24 months
D6	Validation of innovative joints for application into demonstrator	R	T0 + 26 months
D7	Report on innovative joining methodology	R	T0 + 30 months

CfP04-Airframe-AIR-01-21

- **JTI-CS2-2016-CFP04-AIR-01-21**
- **Title:** Integrated automated test bench control system with certifiable test documentation functionality

- **Objectives:**

  Design, realization and validation of a control and test system, with following features:
  - Control over the Clean Sky Thermal Benches at Fraunhofer –IBP- Holzkirchen
  - Provision of a Beckhoff based control system
  - Standardized interface to other measurement and control systems
  - Full adaptable control laws for the regulation of thermodynamic control parameters (e.g. PID controller have to be fully selectable and editable by the user)
  - Integration of new HW shall be completely manageable by the user
  - Test procedure editor, which creates interactive test procedures with direct control over the test bench installation
  - Certifiable automated document creation for test procedures and test reports
  - Training, support and introduction of the users

- **Volume:** 600 k€ funding

Thermal Bench information

Parameters to be controlled and measured:

- Tube Pressure Control (116hPa – 940hPa)
- Climatisation of outer fuselage skin (-35°C - +55°C)
- Supply of arbitrary cabin air (-10°C – +55°C, rH 5% - 65%)
- Artificial heat sources (equipment, heated Dummies)
- Additional ventilators/ fans
- Fluid pumps
- Temperature, Pressure, Humidity & Convection measurement probes (system shall be extendable for more than 1000 sensors, sensors have to be supplied for exemplary usability only)

CfP04-Airframe-AIR-01-21

Schedule (Mile stones):

- Definition of detailed requirements: t0+ 3M
- PDR t0+ 6M
- CDR t0+ 9M
- Manufacturing and installation of HW t0+12M
- Development of SW t0+15M
- Testing and acceptance t0+18M
- Support online & on-site t0+18M - t0+30M

Targeted applicant:

- Availability on Holzkirchen site
- Authorized for installation of electric constructions in the main electric network in Germany
- Conformance with BGV A3

Required skills:

- Control and measurement system programming
- HMI-Design
- Familiar with Beckhoff HW
- TwinCAT experience
- Automated testing
- Test documentation
- Certification rules

Contact Person:

Markus Siede
Fraunhofer Gesellschaft
Email: Markus.siede@ibp.fraunhofer.de
Tel. : 08024 643 674

JTI-CS2-2016-CFP04-AIR-02-28

- **CfP number: JTI-CS2-2016-CFP04-AIR-02-28**

- **Title:** Development of methods for deriving optimized shapes of morphing structures considering both aerodynamic performances and mechanical/structural boundary conditions.

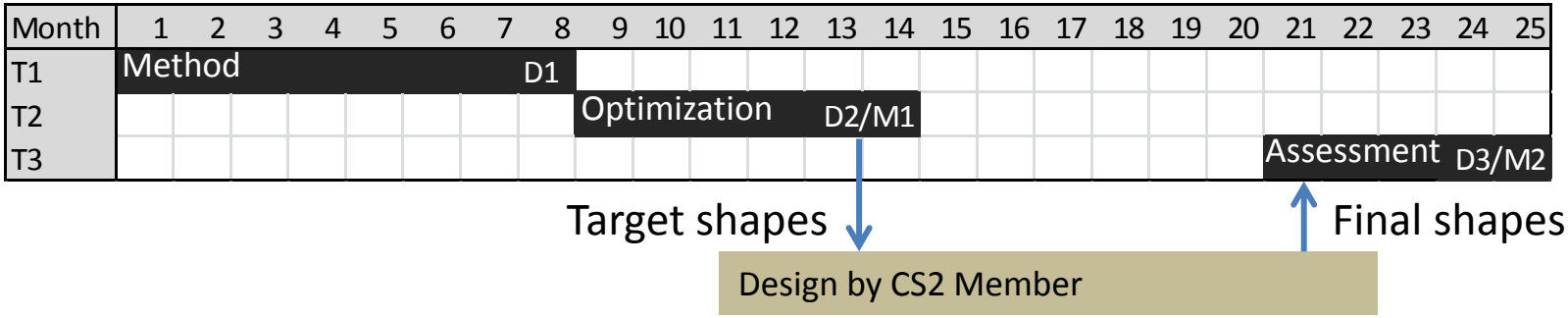
- **Objectives:**
  - Deriving shapes for morphing leading edge, which are
    - optimized regarding aerodynamic performance,
    - Feasible with given material limitations (e.g. strain/bending)
  - Numerical aerodynamic performance assessment of final shapes

- **Volume:** 350 k€ funding

JTI-CS2-2016-CFP04-AIR-02-28

- **Schedule:**

Deliverables			
Task	***Result***	***Type***	***Due Date***
T1	Method for aerodynamic optimization considering mechanical boundary conditions	Report	M8
T2	Optimization results for morphing leading edge shape	Report/ Data	M14 (Milestone M1)
T3	Aerodynamic performance estimation of different morphing leading edge design solutions proposed by Clean Sky 2 member	Report	M25 (Milestone M2)



JTI-CS2-2016-CFP04-AIR-02-28

- **Targeted applicant**: University, Research institution and/or engineering services provider in the field of numerical aerodynamics

- **Required skills**:
  - Experience in using software for computational fluid dynamics (CFD) in numerical aerodynamics
  - Experience with optimization tools allowing for integration of aerodynamic performance optimization and mechanical boundary conditions. These might be self-developed tools as well as commercial solutions.
  - Experience with stress-/strain analyses of structures, e. g. through Finite Element Analyses.
  - Possibility to handle (import/export) the file formats mentioned in the task descriptions: *.igs, *.stp, *.3dxml, *.mat

- **Contact person:**

  Volker Landersheim (Fraunhofer LBF)

  Phone: +49 6151 705-475

  volker.landersheim@lbf.fraunhofer.de

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Questions ?

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

Info-Call-CFP-2016-02@Cleansky.eu

Deadline to submit your questions:

16th August 2016, 17:00 (local time)

Thank You

AIRBUS

AIRBUS HELICOPTERS

FINMECCANICA HELICOPTER DIVISION

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