Clean Sky

Innovation Takes Off

www.cleansky.eu

Not legally binding

Clean Sky 2

Clean Sky Joint Undertaking

Airframe ITD

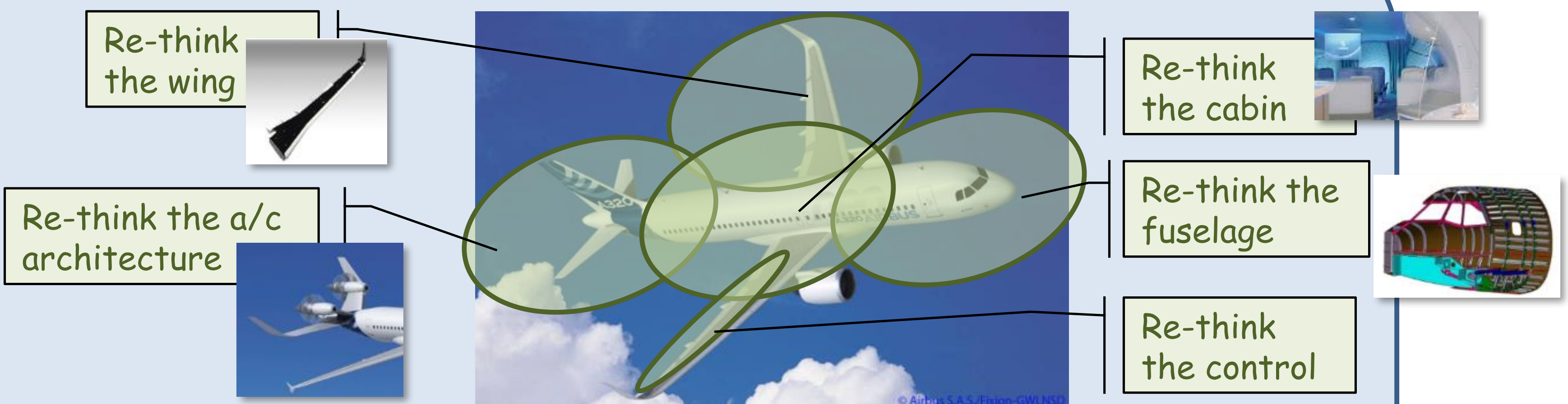
Background

- Greener Airframe Technologies
- More Electrical a/c architectures

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

GreenRegionalAircraft

- Integrated Structures
- Smart high lift devices



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

Key General Objectives

More Efficient Airframes — ✓ Weight ✓ Drag ✓ Cabin ✓ Noise ✓ New Materials ✓ Maintenance

Efficiency of the engineering & manufacturing process — ✓ Manufacturing Cost ✓ Time to Market (lead Time)

IADP/Integrated Demonstrators

SUPPORT TO IADP: Maturate technologies **up to TRL 6**

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

TRANSVERSE **Eco-Design** for Airframe & **Modeling to certification ability**

FUTURE: De-risk novel generation product in the prospect of changing step by 2030+

Clean Sky JOINT UNDERTAKING

Airframe Community (→ CfP08)

CfP PROJECTS

DIMES
RYTHMS
[DAHLIAS]
RATIOS
COMBO3D
RADIANT PANEL
ACCURATE
BALANCE
DADIYSO COMP
GUDGET
ADDAPTA SEALS
DEMOS
BRIDAS
COCOON
NEODAMP
IIAMS
FRCDOORDEMONSTRATOR
ASPIRE
HEFESTO
SHERLOC QSP
[FITCOW]
SIMCODEQ
LIGHTAIR
TESTCONCERT
CUSTOMIZE
RESET
HAIRMATE
MOTIVATE
IOVISTAS VIRTEST
NEWCORT
VULCAN
OPTIMORPH
ELCOCOS
DISTRACTION
IAWAS
[C-JOINTS]
COMFDEMO
BLADEOUT
FLEX
PSIDESC
MICTEST
INSCAPE
COMBUSS
RIB-ON
NADIA
REDISH
BINCOLA
AMTRAS
[WIBOND]
ERACLE
EULOSAM II
ARIESS
SUTK
HEPODIS
MAF
MISSP
[FUNHEAD]
CRORTET
DILECO
CRISTA
DIGESTAIR
ELEMENT
ASTRASY
FORMIT
[CO3]
CRO-INSPECT
ADD-ON
RODEO
WELTMAP
COFRARE 2.0
AFPMET
CORDIAL
OLFITT
AMULET
COBOMEGA
PIPS
I3PS
PILOT
E2S2A2
OASIS
SMART-LAYUP
INDUCTICE
OPTIWIND
TR4EMACS
IMCA
INNOHYBOX
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SAAB

**incl. Affiliates and Third Parties

[Project] = related to Small Air Transport

CfP Status – CfP10

CfP Title	WP	Type	Month	M€	TM
HPE					
Low speed wind tunnel tests of a new configuration aircraft	A-1.3	IA	24	0,70	DAV / NACOR
Development of a methodology (test, measurement, analysis) to characterize the behaviour of composite structures under dynamic loading	A-1.4	IA	36	0,50	DAV
Verification of advanced simplified HLFC concept with variable porosity	A-2.3.1	RIA	12	0,75	DLR
Development of a methodology to optimize a wing composite panel with respect to tyre damage certification requirement	A-3.1	RIA	32	1,40	DAV
Coupon and element testing and manufacturing of test article for morphing technologies	A-4.1.2	IA	36	0,90	FAE
HVC					
Increasing the efficiency of pulsed jet actuators for flow separation control.	B-1.4	RIA	24	0,70	AIB
Development of FEM fastener parametric/adaptable sizing tool including EMC impact + manufacturing and EMC/LSP testing of demonstrators	B-3.4.2	IA	30	0,48	EVE
Advanced Aerodynamic Flight Test Instrumentation applied on a high speed helicopter demonstrator	WP-3.5	IA	24	1,20	AH
Application of graphene based materials in aeronautical structures for de-icing, lightning strike protection, fire barrier and water absorption prevention purposes	B-3.1	IA	30	0,475	LDO VEL
Innovative weight measurement system for Tilt Rotor application	B-4.2	IA	36	0,80	LHD
Modular platform development for Tilt Rotor final assembly	B-4.2	IA	36	1,00	LHD
Active Flow control on Tilt Rotor lifting surfaces	B-4.2	RIA	24	0,60	LHD
Innovative approaches for interior Noise Control for Next Generation Civil Tilt Rotor	B-4.2	RIA	36	0,65	LHD
Development of a multifunctional system for complex aerostructures assembly, assisted by neural network softwares	B-4.3	IA	18	0,90	LDO VEL
Eco-Design (ED)					
Development of equipment for composite recycling process of uncured material	C-2.1.4	IA	36	0,80	LDO VEL
Disassembly and recycling of innovative welded structures made of different Al-Li alloys	C-2.1.4	RIA	30	0,35	AM
EoL for Biomaterials	C-2.1.1	RIA	30	0,35	INVENT
Scrapping TP materials	C-2.1.2	RIA	24	0,35	NLR

18 Topics – 12,925 M€

AIR TS A-1: Innovative Aircraft Architecture

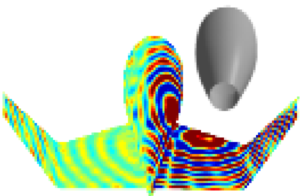
Innovative Aircraft Architecture, to investigate some radical transformations of the aircraft architecture.

The aim of this Technology Stream is to demonstrate the viability of some of the most promising advanced aircraft concepts (identifying the key potential showstoppers and exploring relevant solutions, elaborating candidate concepts) and assessing their potential.

Embedded engines, Noise Shielding, Innovative Overall Configurations.

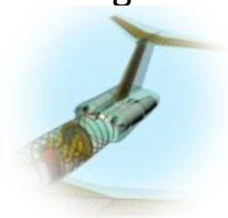
TS A-1: Innovative Aircraft Architecture

- WP A-1.1: Optimal engine integration on rear fuselage
- WP A-1.2: CROR & UHBR configurations
- WP A-1.3: Novel high performance configuration
- WP A-1.4: Virtual modelling for certification

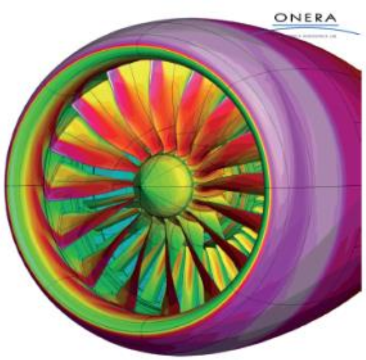


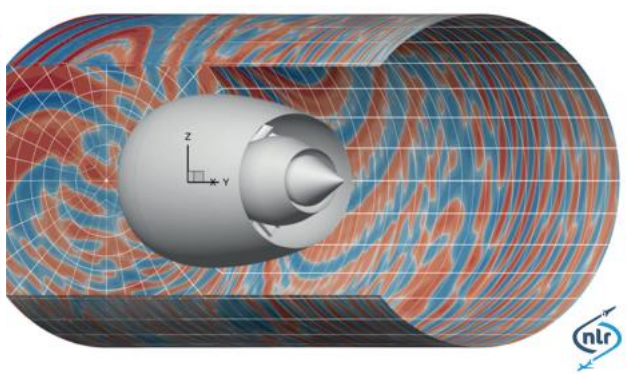
U-Tail Shielding

Classical BLI configuration



Two engines ingesting all the fuselage BL





CfP Status – CfP10

AIR TS A-1: Innovative Aircraft Architecture

CfP Title	WP	Type	Month	M€	TM
HPE					
Low speed handling quality and innovative engine integration of a new configuration aircraft	A-1.3	IA	24	0,70	DAV / NACOR
Development of a methodology (test, measurement, analysis) to characterize the behaviour of composite structures under dynamic loading	A-1.4	IA	36	0,50	DAV

JTI-CS2-2019-CFP10-AIR-01-41

Low speed handling quality and innovative engine integration of a new configuration aircraft

The purpose of this topic is to design, manufacture (using **Additive Layer manufacturing technology**) and test at **low speed a model** representative of a new configuration. This model will consist of a **new fuselage**, **new tails** and **new nacelle** and an **existing wing in high-lift configuration** (that will set the model scaling). Wind tunnel tests will be performed to analyze the handling quality, air intake distortion and flow topology (using PIV for example) of this new configuration in low speed configuration. Different geometries will be tested on the fuselage and the tail. New measurement techniques as PSP and PIV will be applied to low speed wind tunnel tests in order to better understand local phenomena.

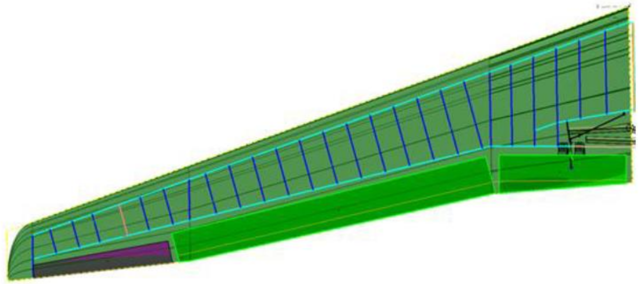


Figure 1 : Planform of the wing that will be used

The wing scale is 1/10 with mean aerodynamic chord equal to 0.25 m and spanwise length equal to 2.5 m (full span). The planform of the wing is presented on Figure 1. The high-lift configuration of this wing already exists.

The remaining parts of the model to design and to manufacture are:

- A new fuselage that will have to be adapted to the existing wing in high-lift configuration.
- Three variants of geometry for HTP and for VTP
- Three nose cones
- Two sets of nacelles. The nacelles will be transparent.
- Two geometries of after-body for the fuselage.

CfP Status – CfP10

AIR TS A-1: Innovative Aircraft Architecture

CfP Title	WP	Type	Month	M€	TM
HPE					
Low speed wind tunnel tests of a new configuration aircraft	A-1.3	IA	24	0,70	DAV / NACOR
Development of a methodology (test, measurement, analysis) to characterize the behaviour of composite structures under dynamic loading	A-1.4	IA	36	0,50	DAV

JTI-CS2-2019-CFP10-AIR-01-42

Development of a methodology (test, measurement, analysis) to characterize the behavior of composite structures under dynamic loading

The purpose is to develop a **methodology** (including innovative tests, measurements, and analysis methods) to properly **characterize the dynamic behavior up to rupture of composite structures submitted to a dynamic loading**. Typical structural items (material, stacking, geometries, fasteners etc.) will be provided by the Topic Manager. Simulations could be used to prepare and analyze tests. A methodology will also be developed to demonstrate prediction capabilities.

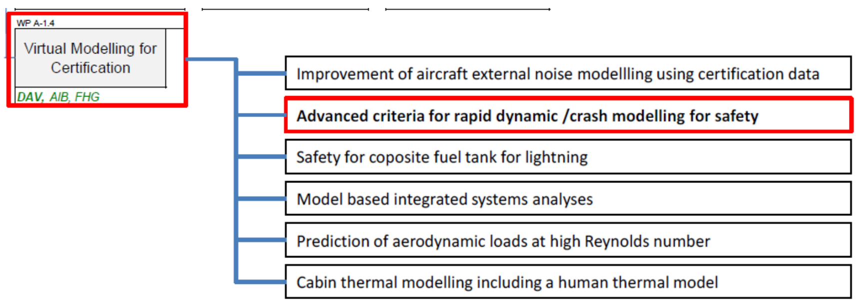
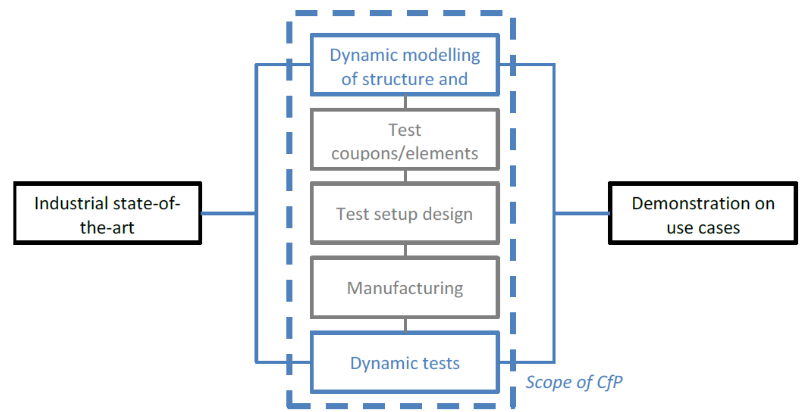


Figure 1 - ITD Airframe Activity Line A WBS structure

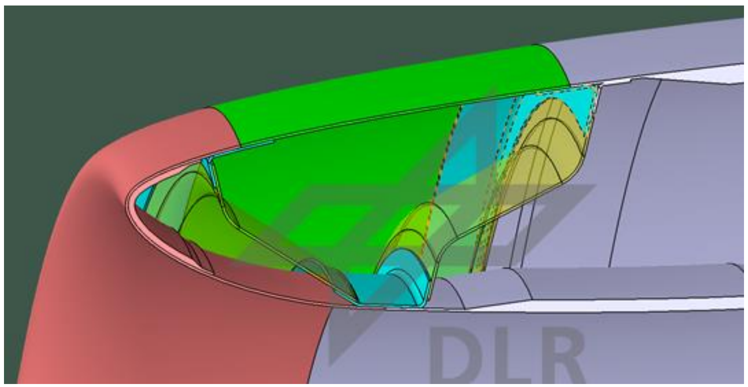


Main objectives are to:

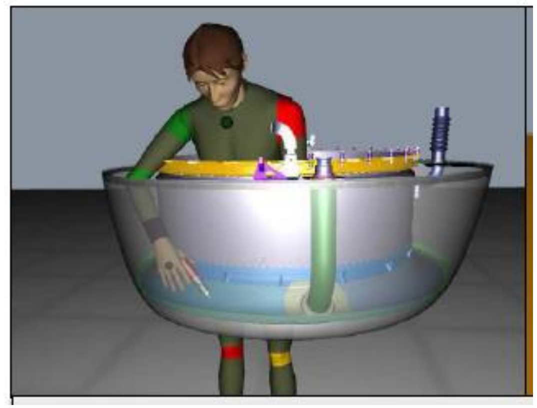
- Identify available dynamic structural and material modelling, tests and analysis methods.
- Develop a calibration and validation process at coupon and element levels suitable for industrial application.
- Demonstrate how the new methods contribute to more efficient and robust design and certification processes.

AIR TS A-2: Advanced laminarity

Advanced **laminarity** a key technological path to make further **progress on drag reduction**, to be applied to **major drag contributors**, especially the **nacelles** and **wings**. This Technology Stream aims to increase the Nacelle and Wing Efficiencies by means of Extended Laminarity technologies.



HLFC nacelle leading edge with TKS anti-icing fluid



Rain erosion test

TS A-2: Advanced Laminarity

- WP A-2.1: Laminar nacelle
- WP A-2.2: NLF smart integrated wing
- WP A-2.3: Extended laminarity

CfP Status – CfP10
AIR TS A-2: Advanced laminarity

CfP Title	WP	Type	Month	M€	TM
HPE					
Verification of advanced simplified HLFC concept with variable porosity	A-2.3.1	RIA	12	0,75	DLR

JTI-CS2-2019-CFP10-AIR-01-43

Verification of advanced simplified HLFC concept with variable porosity

The main objectives of this topic are:

- Verification and **validation of the aerodynamic and structural design** of the advanced, simplified Tailored Skin Single Duct (TSSD) HLFC suction segment, featuring **variable porosity** and an easily demountable leading edge in low-cost design.
- Realization (design, manufacturing, calibration and application) of a high-precision mass flow measurement, necessary for the validation of single suction duct concepts within wind tunnel tests.
- Investigation of “natural transpiration” effects (adverse off-design condition)

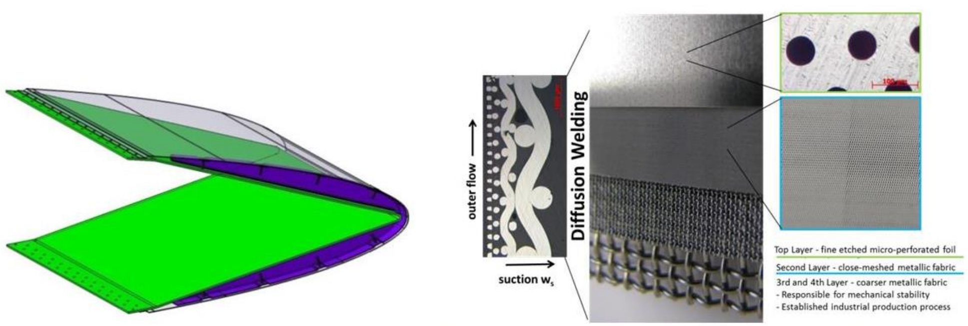


Figure 1. Structural design of nose (left), TSSD leading edge concept; multi-layered hybrid suction skin (right)

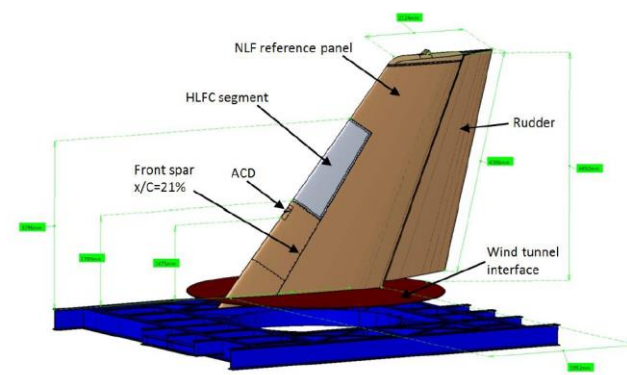


Figure 2. Carrier fin with exchangeable HLFC nose segment

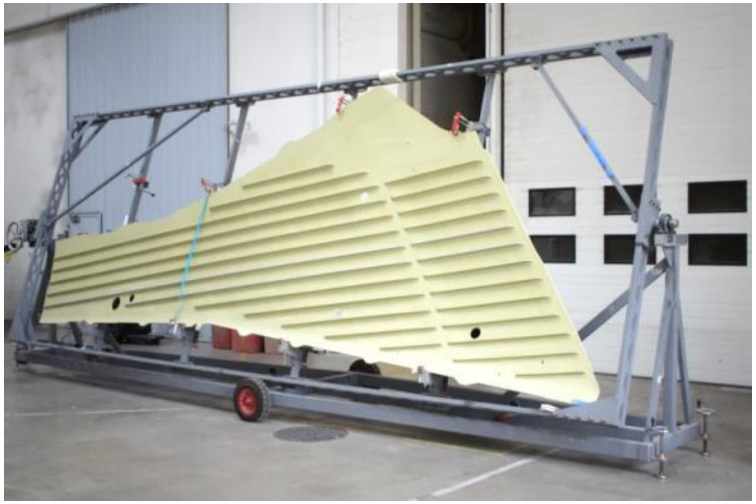
The main focus will be on the execution of the **wind tunnel test campaign**. The objective of the wind tunnel test is to verify and validate the aerodynamic and structural design of the TSSD concept developed for the purpose of HLFC. Figure 1 shows the schematic design of the leading edge and the outer skin to be tested.

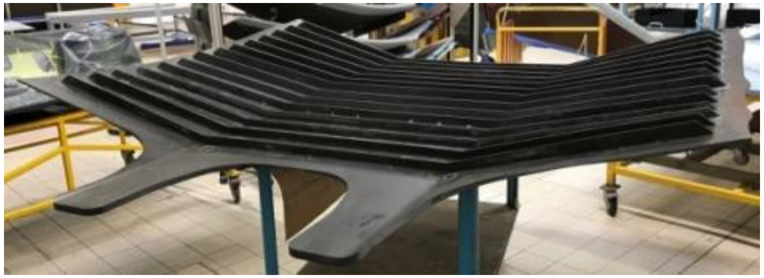
AIR TS A-3: High Speed Airframe

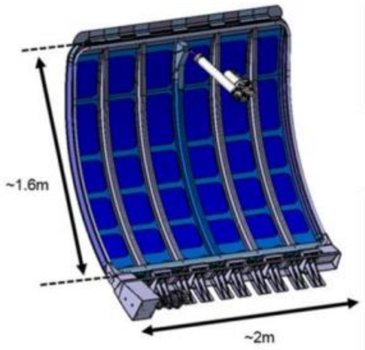
This will focus on the **fuselage** and **wing**, enabling **better aircraft performance** and quality of the delivered mobility service, with **reduced fuel consumption** with no compromise on overall aircraft capabilities (such as low speed abilities and versatility).

TS A-3: High Speed Airframe

- WP A-3.1: Multidisciplinary wing for high & low speed
- WP A-3.2: Tailored front fuselage
- WP A-3.3: Innovative shapes & structure





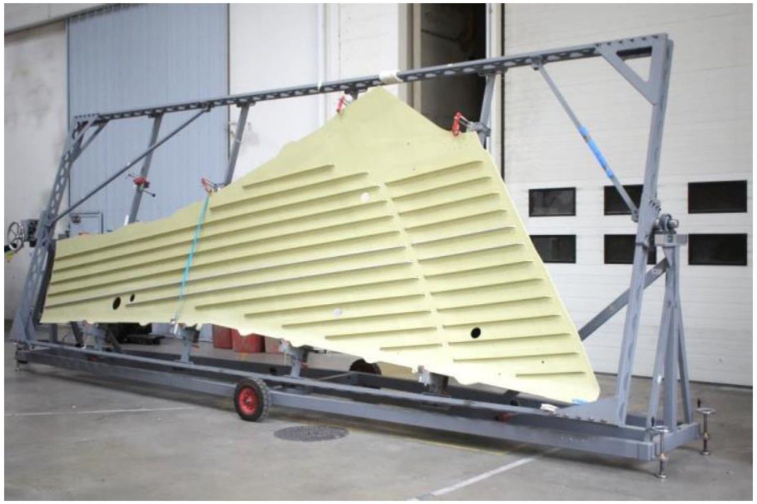


CfP Status – CfP10
AIR TS A-3: High Speed Airframe

CfP Title	WP	Type	Month	M€	TM
HPE					
Development of a methodology to optimize a wing composite panel with respect to tyre damage certification requirement	A-3.1	RIA	32	1,40	DAV

JTI-CS2-2019-CFP10-AIR-01-44
Development of a methodology to optimize a wing composite panel with respect to tyre damage certification requirement

The objective is to develop the **criteria** and the **methodology** to predict adequately the **behavior of a composite stiffened wing panel with respect to the tyre impact threat**. Based on tyre impact and **mechanical test campaign** of typical configurations, both simulations and failure criteria will be developed for damage and residual strength predictions capability. This development shall lead to a simple methodology applicable to support the design of composite wing panels, allowing to take into account certification constraint while minimizing weight penalty. This exercise will be performed on a panel geometry provided by the Topic Manager.



Typical composite wingbox panel

The project will perform a number of representative tyre impacts on components at different levels of complexity, analyse the damages and will then perform mechanical test to assess the residual stress of the structure. This experimental base will be used to develop the criteria and methodology to predict the structure behaviour, the level of damage and the residual strength, and to derive simple rule to adapt existing design to tyre burst requirements.

AIR TS A-4: Novel Control

This will **introduce innovative control systems and strategies to make gains in overall aircraft efficiency**. New challenges that could bring step-change gains do not lie in the optimisation of the flight control system component performing its duty of controlling the flight, but in opening the perspective of the flight control system as a system contributing to the global architecture optimization. It could **contribute to sizing requirement alleviations thanks to smart control of the flight dynamics**.

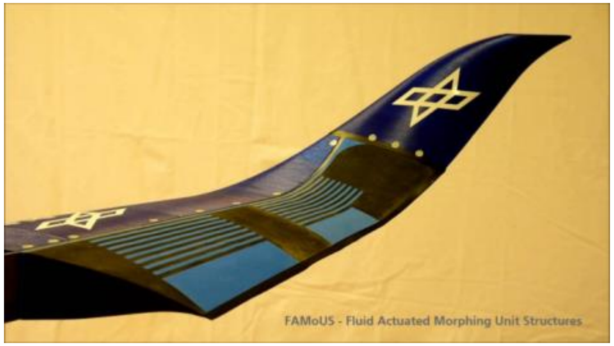
TS A-4: Novel Control

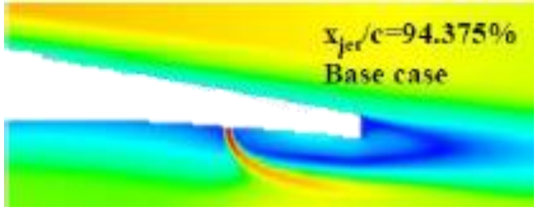
WP A-4.1

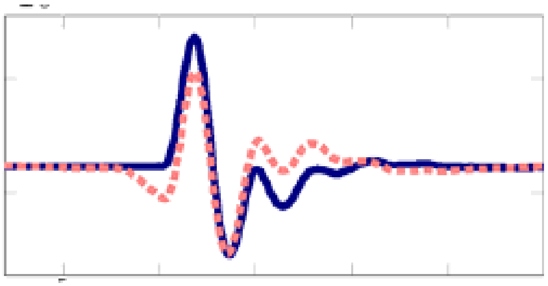
Smart mobile control surfaces

WP A-4.2

Active load control







Flutter control/alleviation
Gust control/alleviation
Vibration control

Clean Sky JOINT UNDERTAKING

CfP Status – CfP10
AIR TS A-4: Novel Control

CfP Title	WP	Type	Month	M€	TM
HPE					
Coupon and element testing and manufacturing of test article for morphing technologies	A-4.1.2	IA	36	0,90	FAE

JTI-CS2-2019-CFP10-AIR-01-45
Coupon and element testing and manufacturing of test article for morphing technologies

In line with the Clean Sky 2 objectives, the main objective of this topic is to contribute to the reduction of fuel consumption and CO2 emissions by increasing the effectivity of movables through application of **morphing technology**. The applicant will develop a **test plan and execute coupon and elements tests**. Furthermore, the applicant will use a **simulation tool** to correlate the test results with analysis results. In addition, the applicant will develop a **manufacturing process for a morphing structure using fluid actuated cells**. Based on this, the applicant will manufacture and deliver a full-scale test article, which will be used for further testing, which is not part of this call.

This topic will focus on two aspects of morphing:

A. Morphing material characterization testing of coupons and elements
   - **A. Execute coupon and element testing**
   - **B. Evaluate and correlate simulation with test results**

B. Design and manufacturing of morphing pressurized cell demonstrator
   - **A. Develop a manufacturing process for FAMoUS**
   - **B. Manufacturing of a FAMoUS-demonstrator**

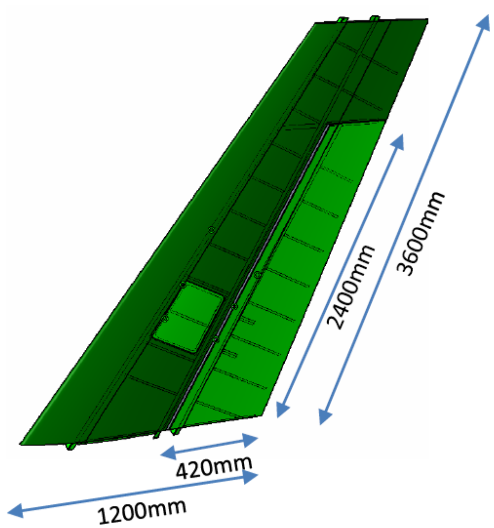


Figure 1: Impression of winglet with morphing technology

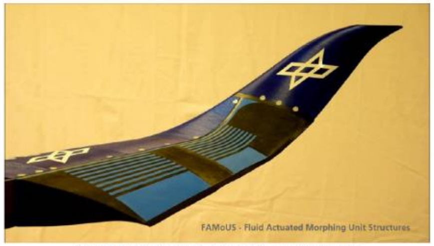


Figure 3: Fluid Actuated Morphing Unit Structure

AIR TS A-5: Novel Travel Experience

This will investigate **new cabins** including layout and passenger-oriented equipment and systems as a key enabler of **product differentiation**, having an immediate and direct physical impact on the traveller, and with potential in terms of **weight saving** and **eco-compliance**.

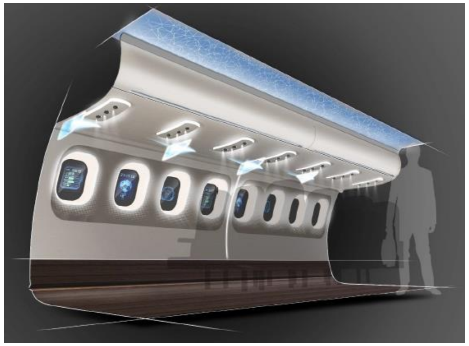
TS A-5: Novel travel experience

WP A-5.1

Ergonomic flexible cabin

WP A-5.2

Office Centered Cabin



CfP Status – CfP10
AIR TS A-5: Novel Travel Experience

CfP Title	WP	Type	Month	M€	TM
HPE					

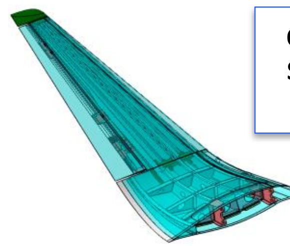
NO TOPICS

AIR TS B-1: Next generation optimized wing box

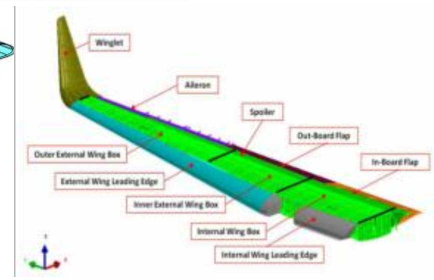
This will lead to progress in the **aero-efficiency** and to better, more durable, **affordable** and **lighter-weight wing structures** through the design, build and ground testing of innovative wing structures. The challenge is to develop and demonstrate **new wing concepts** (including architecture) that will bring significant performance improvements (in **drag** and **weight**) while improving affordability and enforcing stringent environmental constraints.

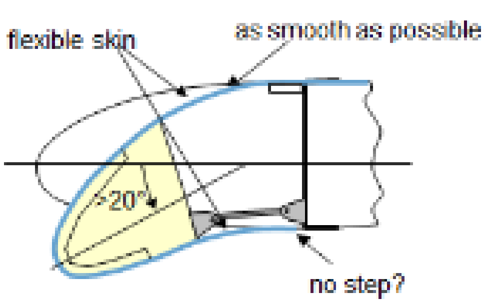
TS B-1: Next Generation optimized wing box

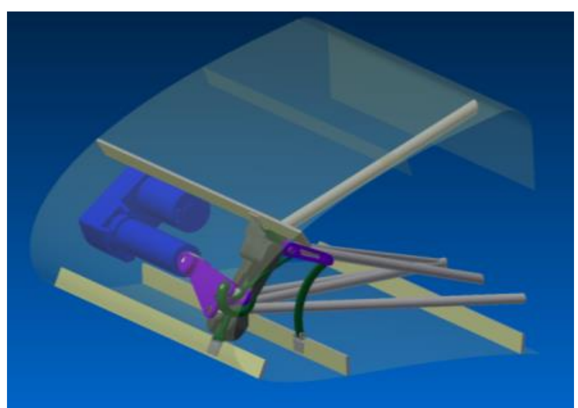
- WP B-1.1 — Wing for incremental lift & transmission shaft integration
- WP B-1.2 — More affordable composite structures
- WP B-1.3 — More efficient wings technologies
- WP B-1.4 — Flow & shape control



ON GROUND STRATIC/RIG WING







CfP Status – CfP10

AIR TS B-1: Next generation optimized wing box

CfP Title	WP	Type	Month	M€	TM
Increasing the efficiency of pulsed jet actuators for flow separation control.	B-1.4	RIA	24	0,70	AIB

TI-CS2-2019-CFP10-AIR-02-77

Increasing the efficiency of pulsed jet actuators for flow separation control

The objective is the **optimization of pulsed jet actuators for flow control** leading to a minimized demand of net mass flow for the actuation. Several **new types of actuator layouts shall be developed, designed and manufactured**. The subsequent tests shall be done in a **medium scale wind tunnel**. The design of the actuators shall be backed by **numerical simulations**. Furthermore a comprehensive analysis and characterization of the free stream flow influenced by the jets shall be assured using the test results and numerical simulations.

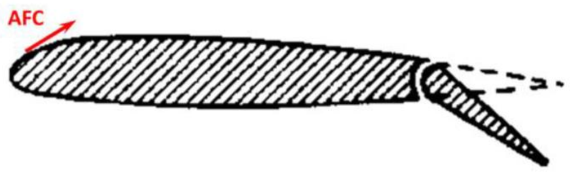


Fig1: Main wing element with installed flow control at the leading edge

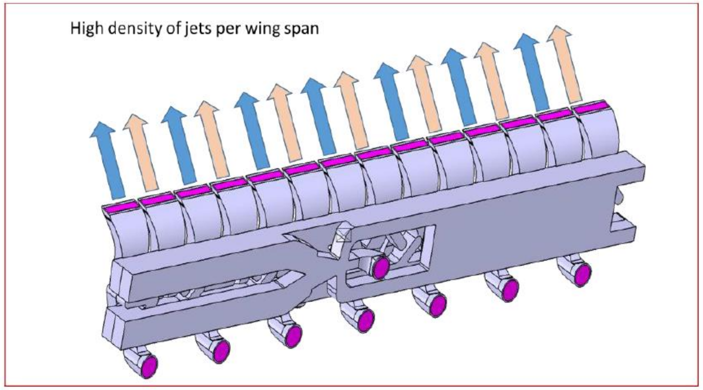


Fig2: Example of a baseline PJA configuration

The studies to be performed have to include the following aspects:

- Modification of an existing wind tunnel model so that a system of pulsed jet actuators (PJA) is installed into the leading edge of the WT model.
- Development, design and manufacturing of PJA including several variations of their design.
- Ground testing of the new type of PJA.
- Numerical simulations of the internal and of the outer flow including the interaction between the AFC jets and the outer flow.
- WT Testing of the AFC technology

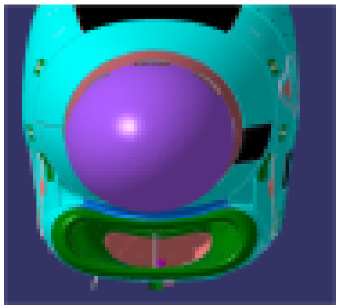
AIR TS B-2: Optimized high lift configurations

This will progress the **aero-efficiency of wing**, engine mounting and **nacelle integration** for aircraft that serve local airports thanks to excellent field performance.

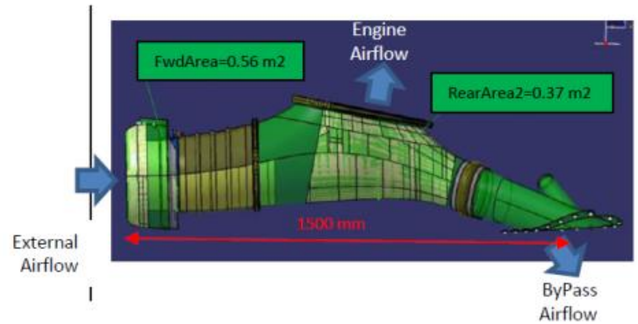
TS B-2: Optimized high lift configurations

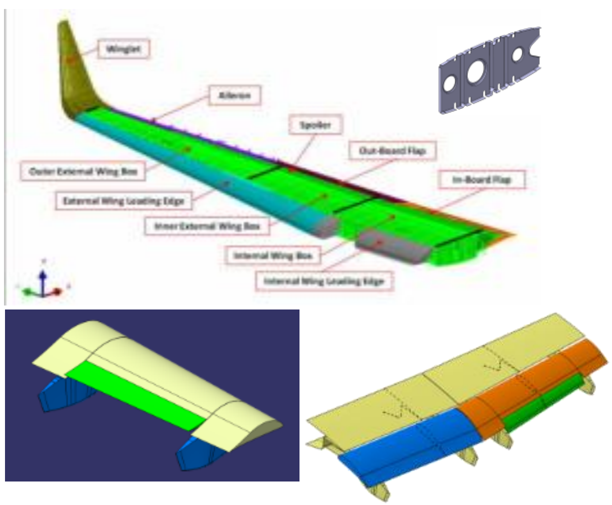
WP B-2.1
High wing / large Tprop nacelle configuration

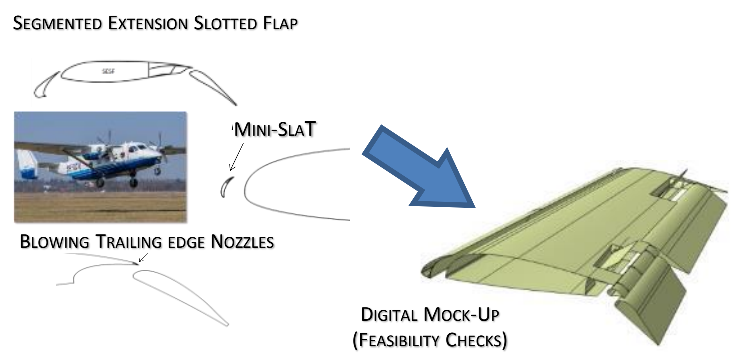
WP B-2.2
High lift wing



Innovative Anti-icing systems







CfP Status – CfP10

AIR TS B-2: Optimized high lift configurations

CfP Title	WP	Type	Month	M€	TM

NO TOPICS

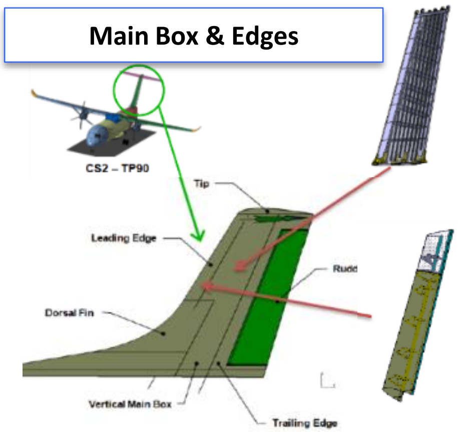
AIR TS B-3: Advanced Integrated Structures

This will **optimize the integration of systems in the airframe** along with the validation of important structural advances, and to make progress on the **production efficiency** and **manufacturing of structures**.

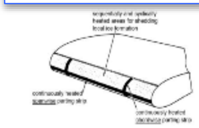
TS B-3: Advanced Integrated Structures

- WP B-3.1 — Advanced Integrated Empennages for Regiona Aircraft
- WP B-3.2 — All electrical wing
- WP B-3.3 — Highly integrated cockpit
- WP B-3.4 — More affordable small a/c manufacturing
- WP B-3.5 — Assembly of Fast Rotorcraft airframe

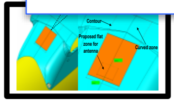
Main Box & Edges



Induction Anti Ice on LE Icing Tunnel

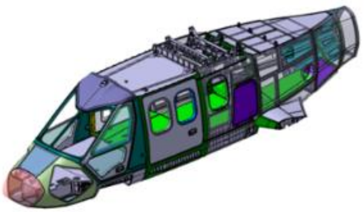


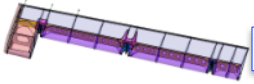
Embbeded Antenna



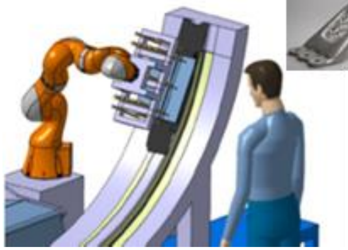
Engine nacelle

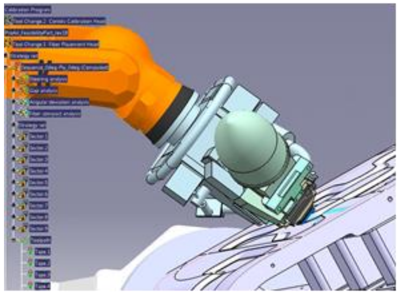
Cockpit segment

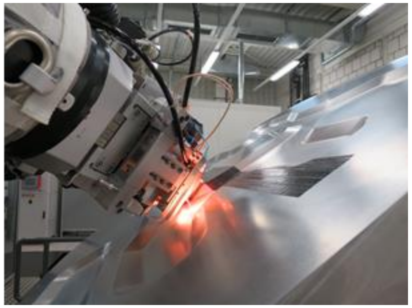




Aileron jigless assy.







Clean Sky JOINT UNDERTAKING

CfP Status – CfP10

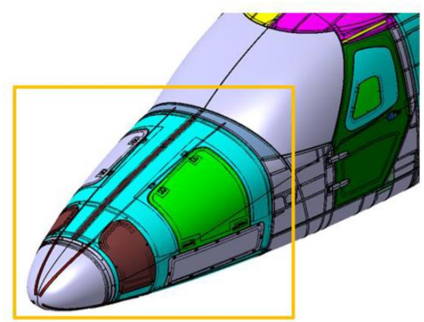
AIR TS B-3: Advanced Integrated Structures

CfP Title	WP	Type	Month	M€	TM
Development of FEM fastener parametric/adaptable sizing tool including EMC impact + manufacturing and EMC/LSP testing of demonstrators	B-3.4.2	IA	30	0,48	EVE
Innovative flight data measurements to support the aerodynamic analysis of a compound helicopter demonstrator	WP-3.5	IA	24	1,20	AH
Application of graphene based materials in aeronautical structures for de-icing, lightning strike protection, fire barrier and water absorption prevention purposes	B-3.1	IA	30	0,50	LDO VEL

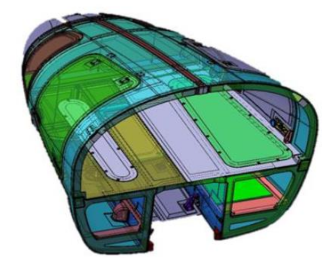
JTI-CS2-2019-CFP10-AIR-02-79

Development of FEM fastener parametric/adaptable sizing tool including EMC impact, and manufacturing and EMC/LSP testing of demonstrators

The scope of the project is to develop **FEM sizing methodology** and **parametric/adaptable sizing tool for CFRP-metal or CFRP-CFRP joint interfaces**. The Topic manager will provide experimental data of tested specimens and appropriate CAD data to facilitate completion of FEM models and manufacturing of innovative composite part referring to the nose part of EV-55. The sizing tool shall be **free-expandable for different fasteners**, providing that developed sizing methodology will be kept together with appropriate strength/EMC test validation. Final evaluation of innovative joining solutions will be carried out by EMC tests on reference and innovative demonstrators conducted in relevant EMC test facilities.



CNP dimensions (without radome):
Length = 1500 mm
Diameter = 900 → 1500 mm



The main scopes of the present topic are as follows:

- Development of joint sizing methodology and sizing SW-tool
- Providing of 2D/3D-design (Catia) and manufacturing of innovative CNP demonstrator
- High current and LSP tests of reference and innovative demonstrators

CfP Status – CfP10

AIR TS B-3: Advanced Integrated Structures

CfP Title	WP	Type	Month	M€	TM
Development of FEM fastener parametric/adaptable sizing tool including EMC impact + manufacturing and EMC/LSP testing of demonstrators	B-3.4.2	IA	30	0,48	EVE
Innovative flight data measurements to support the aerodynamic analysis of a compound helicopter demonstrator	WP-3.5	IA	24	1,20	AH
Application of graphene based materials in aeronautical structures for de-icing, lightning strike protection, fire barrier and water absorption prevention purposes	B-3.1	IA	30	0,50	LDO VEL

JTI-CS2-2019-CFP10-AIR-02-79

Innovative flight data measurements to support the aerodynamic analysis of a compound helicopter demonstrator

The aim of this topic is to provide **means** and **sensors** for **measurement of aerodynamic data** (pressure, air velocity, temperature) during **flight tests of a high speed compound helicopter demonstrator**. Specific focus and objectives will lie on the **non-intrusiveness** of these means as well as on their **ease of installation** in relevant EMC test facilities.

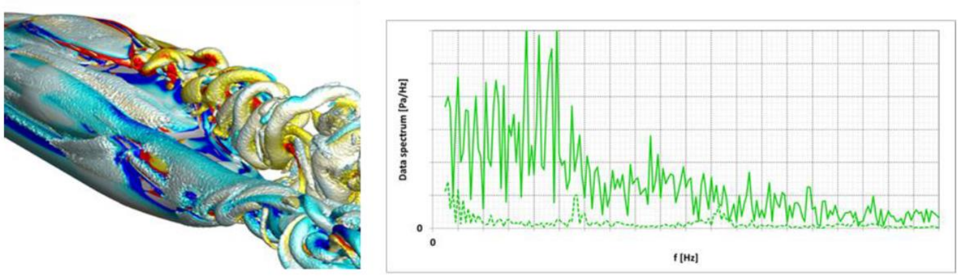


Illustration of an aerodynamic wake impinging tail and the resulting spectral density of pressure

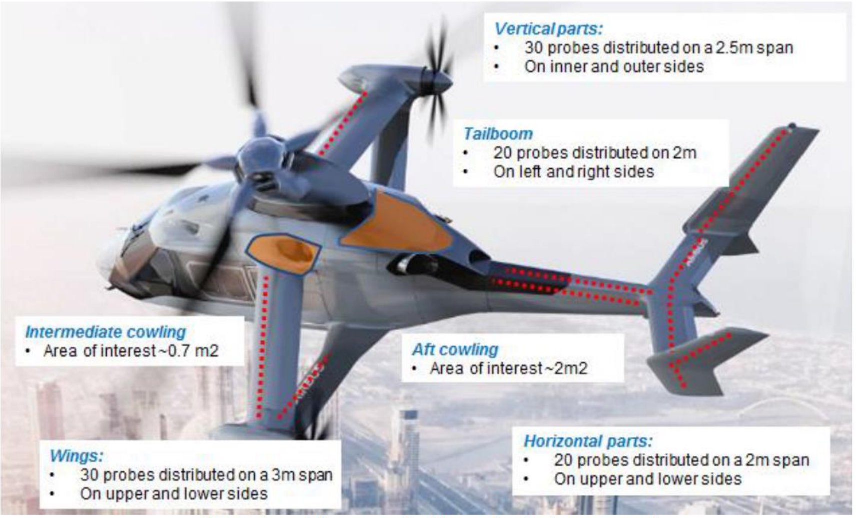


Illustration of the areas of addressed to be instrumented

This Call for Partners looks for the selection, preliminary test and delivery of innovative measurement systems (sensors and associated processing unit, if needed). The applicant shall propose instrumentation in agreement with the specifications and constraints described by the Topic Manager, deliver it and support the Topic Manager for its use.

CfP Status – CfP10

AIR TS B-3: Advanced Integrated Structures

CfP Title	WP	Type	Month	M€	TM
Development of FEM fastener parametric/adaptable sizing tool including EMC impact + manufacturing and EMC/LSP testing of demonstrators	B-3.4.2	IA	30	0,48	EVE
Innovative flight data measurements to support the aerodynamic analysis of a compound helicopter demonstrator	WP-3.5	IA	24	1,20	AH
Application of graphene based materials in aeronautical structures for de-icing, lightning strike protection, fire barrier and water absorption prevention purposes	B-3.1	IA	30	0,50	LDO VEL

JTI-CS2-2019-CFP10-AIR-02-78

Application of graphene based materials in aeronautical structures for de-icing, lightning strike protection, fire barrier and water absorption prevention purposes

The topic aims are to take **advantage from electrical, thermal and impermeable properties of graphene** and to investigate the benefits of the use of graphene on composite aeronautical structures, in order to identify the most suitable solution (in terms of amount and form of graphene) for thermal de-icing systems, lightning strike protection, fire barrier and water uptake prevention. The proposed solutions will be verified through fabrication and testing of dedicated small scale subcomponents.

The Applicant shall be responsible for:
- Graphene Based Material development and application with relevant material specification issue.
- Purchase of all components needed for graphene based material fabrication.
- Fabrication of basic panels and the small scale item.
- Characterization of mechanical, micrographic, chemical-physical and functional of basic panels and the first small scale manufacturing trial.
- Functionality tests, relevant reporting and issue of procedures and instructions for de-icing system management.
- Fabrication of small scale item and functionality test of embedded de-icing system at TM site

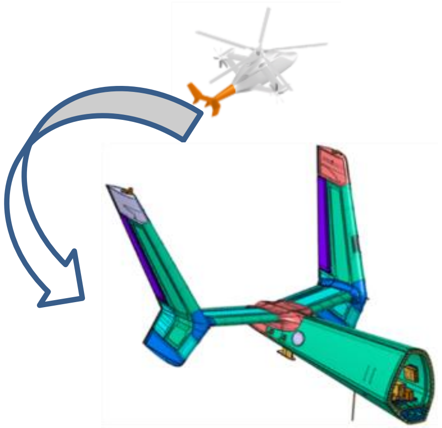
Figure 1 – Graphene possible benefits

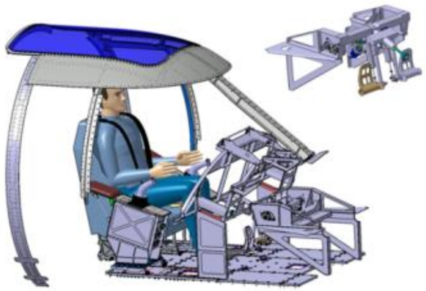
AIR TS B-4: Advanced Fuselage

This will include cockpit and cabins. **New concepts of fuselage** are to be introduced to support **future aircraft and rotorcraft**. More radical aero structural optimizations can lead to further improvements in **drag** and **weight** in the context of growing cost and environmental pressure, including the emergence of new competitors.

TS B-4: Advanced Fuselage

- WP B-4.1: Rotor-less tail for Fast Rotorcraft
- WP B-4.2: Pressurized fuselage for Fast Rotorcraft
- WP B-4.3: More affordable composite fuselage
- WP B-4.4: Low weight, low cost cabin





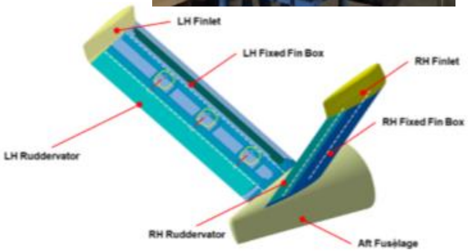
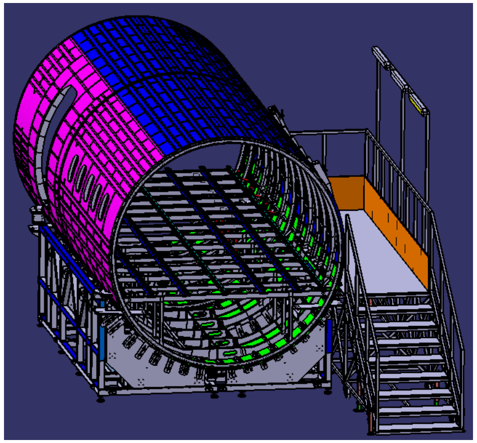
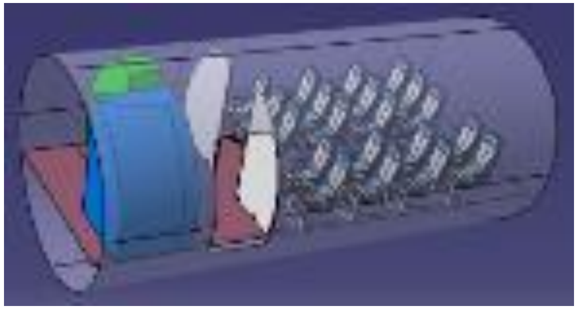


Figure 1-1: Overview V-Tail





CfP Status – CfP10
AIR TS B-4: Advanced Fuselage

CfP Title	WP	Type	Month	M€	TM
Innovative weight measurement system for Tilt Rotor application	B-4.2	IA	36	0,80	LHD
Modular platform development for Tilt Rotor final assembly	B-4.2	IA	36	1,00	LHD
Active Flow control on Tilt Rotor lifting surfaces	B-4.2	RIA	24	0,60	LHD
Innovative approaches for interior Noise Control for Next Generation Civil Tilt Rotor	B-4.2	RIA	36	0,65	LHD
Development of a multifunctional system for complex aerostructures assembly, assisted by neural network softwares	B-4.3	IA	18	0,90	LDO VEL

JTI-CS2-2019-CFP10-AIR-02-77
Innovative weight measurement system for Tiltrotor application

Innovative automatic weight measurement system for tiltrotors aimed at improving the **accuracy of weight and balance data (including conversion moment calculations),** reducing **Flight Line operations times and improving operators' safety**. Once Aircraft assembly is completed Functional Tests including weight measurement are required in the two operative configurations: Helicopter Mode (VTOL) and Airplane Mode (A/P). Further to aircraft set-up for the first flight weight and balance is then performed during the demonstration phase every time that a change in configuration and/or envelope/performance exploration is required. This system is therefore aimed at providing a robust answer to the **need of accuracy and repeatability in the frame of an ergonomic environment for the operators**.

The scope of this project is to develop an innovative automatic weight measurement system for tiltrotors aimed at improving the accuracy of weight and balance data (including conversion moment calculations), reducing Flight Line times and improving operators ergonomics.

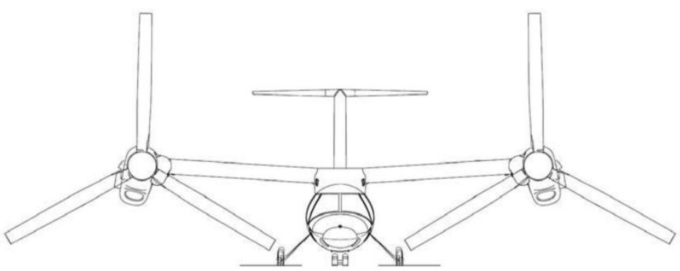


Figure 2 – Airplane mode Configuration

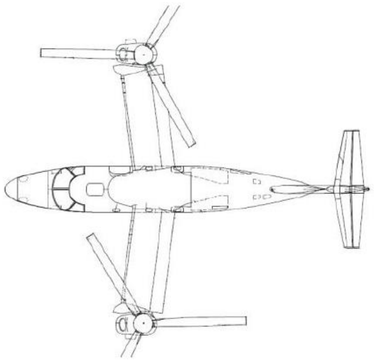


Figure 1 – Helicopter mode Configuration

Clean Sky JOINT UNDERTAKING

CfP Status – CfP10
AIR TS B-4: Advanced Fuselage

CfP Title	WP	Type	Month	M€	TM
Innovative weight measurement system for Tilt Rotor application	B-4.2	IA	36	0,80	LHD
Modular platform development for Tilt Rotor final assembly	B-4.2	IA	36	1,00	LHD
Active Flow control on Tilt Rotor lifting surfaces	B-4.2	RIA	24	0,60	LHD
Innovative approaches for interior Noise Control for Next Generation Civil Tilt Rotor	B-4.2	RIA	36	0,65	LHD
Development of a multifunctional system for complex aerostructures assembly, assisted by neural network softwares	B-4.3	IA	18	0,90	LDO VEL

JTI-CS2-2019-CFP10-AIR-02-77
Modular Platform development for TiltRotor final assembly

The aim of the activity is to **design** and **produce** an **innovative multi-functional Jig** in order to perform **structural assembly** of **Next Generation Civil Tilt Rotor wing**, wing systems installation, nacelle installation and relevant functional test. The jig will require laser alignment system and tilting concept for ergonomic purpose. Moreover through Information Technology it will possible to implement Visual progress of the assembly activities on the Jig in terms of Job Card and Overall Schedule Progress Status.

The overall objective of this Topic is to develop a new Jig concept for Tiltrotor Final Assembly Line in order to integrate the following activities in a multipurpose jig:

- Structural Completion of Wing Assembly
- Systems Installation inside/outside Wing Torque Box
- Nacelle Dressing and Installation
- Functional test: Systems installed will be then tested on the same jig in order to guarantee full completion of activities before Wing Installation on Fuselage (next step of Final Assembly)

CfP Status – CfP10

AIR TS B-4: Advanced Fuselage

CfP Title	WP	Type	Month	M€	TM
Innovative weight measurement system for Tilt Rotor application	B-4.2	IA	36	0,80	LHD
Modular platform development for Tilt Rotor final assembly	B-4.2	IA	36	1,00	LHD
Active Flow control on Tilt Rotor lifting surfaces	B-4.2	RIA	24	0,60	LHD
Innovative approaches for interior Noise Control for Next Generation Civil Tilt Rotor	B-4.2	RIA	36	0,65	LHD
Development of a multifunctional system for complex aerostructures assembly, assisted by neural network softwares	B-4.3	IA	18	0,90	LDO VEL

JTI-CS2-2019-CFP10-AIR-02-81

Active Flow control on Tilt Rotor lifting surfaces

The aim of the Topic is to investigate the **application of pulsed air blowing devices** with Zero Net Mass Flux (ZNMF) to **control the vertical flow on the relevant lifting non-rotating surfaces** (empennages, wing) on a Tilt Rotor configuration. For this application the objective is to determine the optimal flow control actuation parameters and the optimal jet positioning aimed to maximize the lifting surfaces efficiencies. The chosen configuration for this investigation is the NGCTR-TD.

The direct CFD modelling of these specific devices within the complete tiltrotor configuration at different flight conditions and attitudes is not affordable due to the huge computational resources required to manage the different scale lengths of the flow phenomena past the whole aircraft.

For this reason, it is required the Applicant to insert the ZNMF effects as a local modifications of the flow solver boundary conditions. This synthetized effect, i.e. reduced order model to be implemented through the use of User Defined Function (UDF) into the CFD solver, shall be yet available at the Applicant (with proof of methodology validation) and applied to the specific problem of the Tilt Rotor.

The outcome of the Topic is to report recommendations and guidelines for the installation of the active devices on NGCTR.

CfP Status – CfP10

AIR TS B-4: Advanced Fuselage

CfP Title	WP	Type	Month	M€	TM
Innovative weight measurement system for Tilt Rotor application	B-4.2	IA	36	0,80	LHD
Modular platform development for Tilt Rotor final assembly	B-4.2	IA	36	1,00	LHD
Active Flow control on Tilt Rotor lifting surfaces	B-4.2	RIA	24	0,60	LHD
Innovative approaches for interior Noise Control for Next Generation Civil Tilt Rotor	B-4.2	RIA	36	0,65	LHD
Development of a multifunctional system for complex aerostructures assembly, assisted by neural network softwares	B-4.3	IA	18	0,90	LDO VEL

JTI-CS2-2019-CFP10-AIR-02-82

Innovative approaches for interior Noise Control for Next Generation Civil Tilt Rotor

The aim of the topic is to investigate the following subjects:

- Advanced Transfer Path Analysis (ATPA) applied to a Tiltrotor in order to allow more precise quantification of airborne and structure-borne transmission paths and related ranking in a more sophisticated way compared to a standard TPA.

- Advanced **active control systems** to mitigate tonal noise associated with turbo-propeller BPF (fundamental blade passing frequencies and harmonics) sources, in order to improve cabin comfort at low-medium frequency range (up to 300÷400 Hz), where passive solutions are not effective. The innovation is also related to specific customization as far as new **smaller transducers**, **lower cost and weight components**, increased reliability, etc.

CfP Status – CfP10
AIR TS B-4: Advanced Fuselage

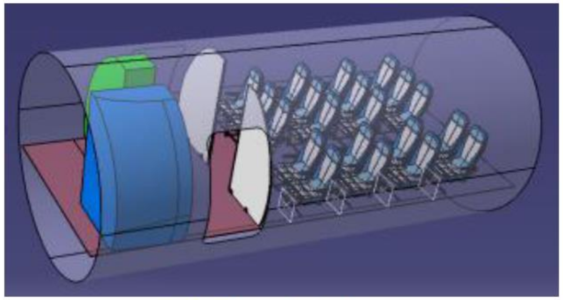
CfP Title	WP	Type	Month	M€	TM
Innovative weight measurement system for Tilt Rotor application	B-4.2	IA	36	0,80	LHD
Modular platform development for Tilt Rotor final assembly	B-4.2	IA	36	1,00	LHD
Active Flow control on Tilt Rotor lifting surfaces	B-4.2	RIA	24	0,60	LHD
Innovative approaches for interior Noise Control for Next Generation Civil Tilt Rotor	B-4.2	RIA	36	0,65	LHD
Development of a multifunctional system for complex aerostructures assembly, assisted by neural network softwares	B-4.3	IA	18	0,90	LDO VEL

JTI-CS2-2019-CFP10-AIR-02-85

Development of a multifunctional system for complex aerostructures assembly, assisted by neural network softwares

The aim of the Topic is to **develop and validate a multifunctional assembly cell**, based on **neural network software**, able to interface mixed/augmented reality devices and co-robot technologies. The **Artificial Intelligence** system with neural network will integrate different technologies, in order to achieve **higher aircraft quality targets** and to **reduce to zero the risk of failures due to manual activities**. The system will dramatically innovate the method to assembly and inspect aerostructures, with significant cost reduction and improved competitiveness. The system will be validated at Topic Manager Plant for REG IADP Fuselage/Cabin full scale demonstrator assembly.

Develop and validate a multifunctional assembly cell, able to assist manual activities as the typical fuselage systems and equipment installation, including cabling through the cabin structures.



Cabin demonstrator layout

The multifunctional assembly cell will be based on state-of-art technologies such as neural network software, mixed reality, augmented reality and collaborative robots, will reduce to zero the above risks, by mean of guiding information, model holograms overlapping real state of installation, image analysis and various sensors.

The cell to be developed and validated will be focused on an AI software with neural network.

AIR C: Eco-Design

Eco-Design related activities embedded in the Airframe ITD. These activities are mainly focused on developing **environmentally sound technologies**, and on performing **LCA** activities to quantify the benefit brought by the newly developed technologies. The Eco-Design Thematic Areas target the two following environmental benefits: **lower impacts during the production of A/C parts**, the **maintenance phase** and **end-of-life of the a/c**.

C - Eco-Design

WP C-1

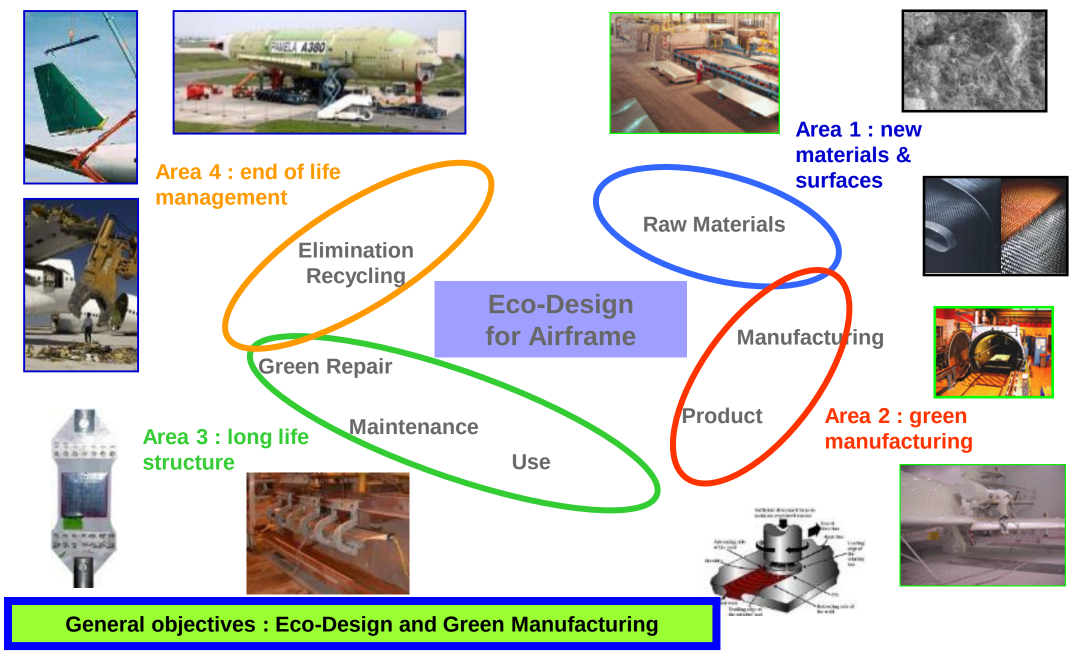
Eco-Design TA Link

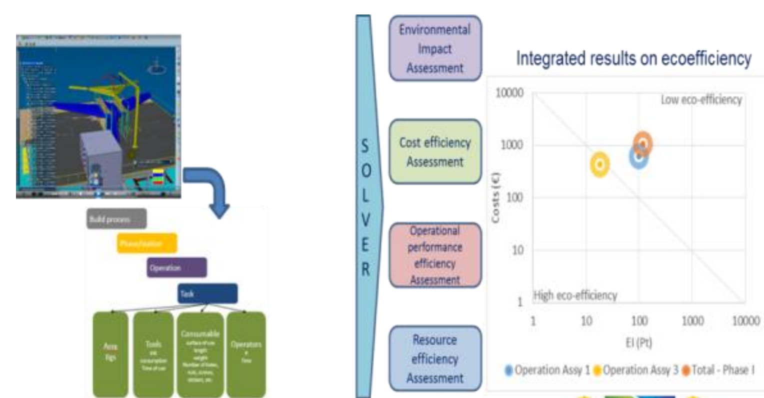
WP C-2 (ex A-3.4)

Eco-Design for airframe

WP C-3 (ex B-3.6)

New materials & manufacturing





CfP Status – CfP10

AIR C: Eco-Design

CfP Title	WP	Type	Month	M€	TM
Eco-Design (ED)					
Development of equipment for composite recycling process of uncured material	C-2.1.4	IA	36	0,80	LDO VEL
Disassembly and recycling of innovative welded structures made of different Al-Li alloys	C-2.1.4	RIA	30	0,35	AM
EoL for Biomaterials	C-2.1.1	RIA	30	0,35	INVENT
Scrapping TP materials	C-2.1.2	RIA	24	0,35	NLR

JTI-CS2-2019-CFP10-AIR-02-86 (B-4.3/C-2.1)
Development of equipment for composite recycling process of uncured material

The objective of the call is to develop a key process for **recovery** and **recycling of CFRP uncured scraps**, coming from lamination activity. In particular activities to be performed are: design, feasibility study, development and validation of an equipment that is able to cut and distribute the CFRP wet scraps in such a way to generate a new pre-impregnated material.

Figure 2: Life cycle analysis (LCA) comprises the whole life cycle of a certain product, from raw material to final disposal | Credit: sci-env.ch

JTI-CS2-2019-CFP10-AIR-03-07
End of Life (EoL) for biomaterials

The aim of this topic is the development of **new innovative** and **green technologies** for End of Life (EoL) of either common used **bio-fibres** (flax, hemp, kenaf, etc.) or **bio-resins** or both. Different approaches have to be evaluated including among others: recycling, reclaiming, incineration and others. The roadmap will cover all scientific area from small scale (proof of concept) to big real components EoL.

CfP Status – CfP10

AIR C: Eco-Design

CfP Title	WP	Type	Month	M€	TM
Eco-Design (ED)					
Development of equipment for composite recycling process of uncured material	C-2.1.4	IA	36	0,80	LDO VEL
Disassembly and recycling of innovative welded structures made of different Al-Li alloys	C-2.1.4	RIA	30	0,35	AM
EoL for Biomaterials	C-2.1.1	RIA	30	0,35	INVENT
Scrapping TP materials	C-2.1.2	RIA	24	0,35	NLR

JTI-CS2-2019-CFP10-AIR-03-08
Disassembly and recycling of innovative structures made of different Al-Li alloys

The activities in this topic will be focused on developing **innovative End of Life procedures for integral welded panels** that are under development for new lightweight and cost effective aircraft structures. These panels can be manufactured using several Al-Li alloys, enabling welding technologies, as well as **Cr-free surface treatments and primers**. The development of new disassembly and recycling procedures are part of the activities.

The activities will include:

- Development of suitable disassembly process for integral welded panels produced by LBW or FSW.
- Selection and adaptation of suitable cutting process to optimize the size of the welded panels without alloy separation.
- Development of suitable process for surface treatment and coating (primer + top-coat) elimination.

JTI-CS2-2018-CFP10-AIR-03-09
Scrapping of carbon reinforced thermoplastic materials

The aim of this topic is the investigation of suitable **scrapping methods** for **scrapping of carbon reinforced thermoplastic structures**. Part of the activities will be the **characterization** of the scrapped material and the manufacturing of test panels using the compression moulding process. The test panels will be tested to define the basic material properties.


Thank you for your Attention