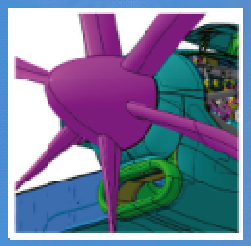
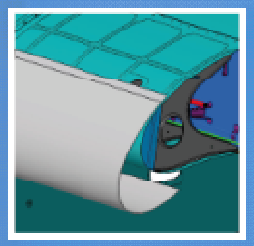


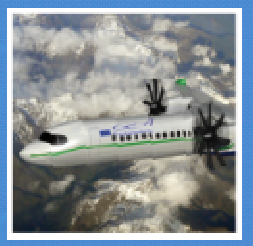


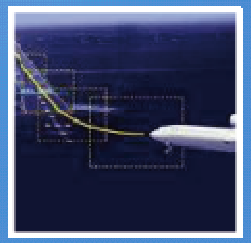


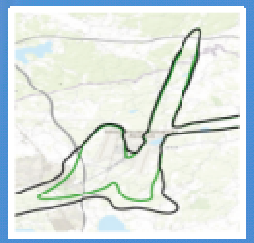


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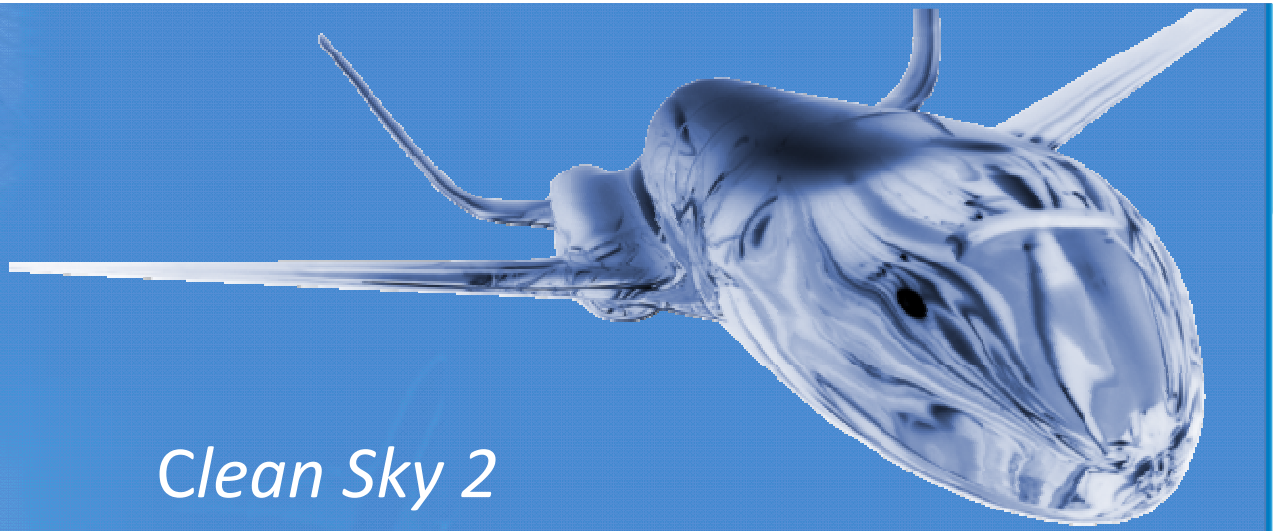

# *Clean Sky 2*
# Information Day dedicated to the 11th Call for Proposal Partners (CfP11)

**LPA – IADP**

Presented by

Jens Koenig ; Airbus

Brussels / Belgium, 28th January 2020

**Innovation Takes Off**

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Clean Sky 2

# From Clean Sky towards Clean Sky 2

## CS1 Smart Fixed Wing Aircraft -ITD (SFWA)

- Is a unique environment for high TRL integrated Research and Development
- Provides the frame for well aligned objective driven R&T covering development and maturation through numerical simulation, rig demonstrators, wind tunnel testing, large scale and flight testing under conditions relevant for operation



**SFWA key technologies**

- NLF – wing for large transport aircraft and bizjets
- CROR engine integration
- Innovative empennage for next generation bizjets
- Innovative control surfaces
- Buffet Control Technologies
- Advanced load control architectures and function
- Advanced Flight Test instrumentation

## CS2 Large Passenger Aircraft IADP (LPA)

- Will provide a platform for even more focussed large scale, highly integrated demonstrators with core partners and partners
- Build on down best candidate technologies emerging from CleanSky 1 other national and EU R&T programs and additional technologies developed in CS2 ITDs

Contribute to TRL - Scale

| 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|

Clean Sky

# LPA Setup and Implementation

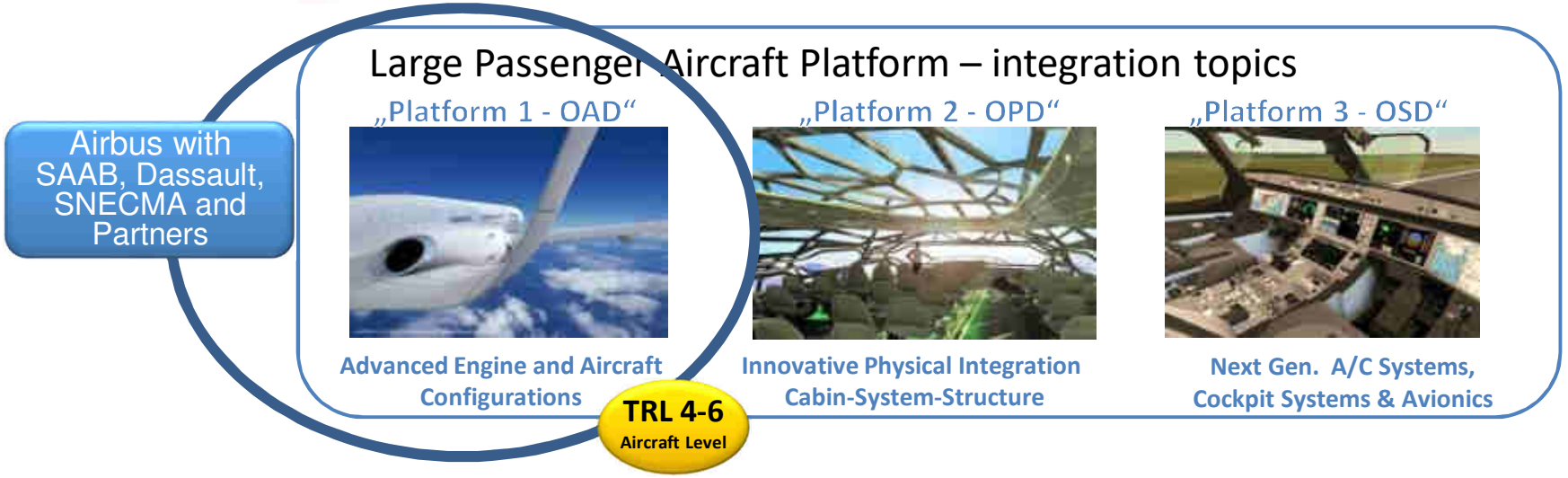
*„Mature and validate disruptive technologies for next generation Large Passenger Aircraft through large scale integrated demonstration“*

**Platform 1**
Advanced Engine and Aircraft Configuration

**Platform 2**
Innovative Physical Integration Cabin-System-Structure

**Platform 3**
Next Gen. A/C Systems, Cockpit Systems & Avionics

# LPA-IADP WBS – “Platform 1”




## **Platform 1** Advanced Engine and Aircraft Configurations

**WP 1.1** Advanced engine demonstrators (BLI, UHPE, Open Rotor)

**WP 1.2** Advanced engine integration driven rear fuselage

**WP 1.3** Validation of scaled flight testing

**WP 1.4** Hybrid laminar flow control large scale demonstration

- HLFC applied on fin in long-term flight operation
- HLFC wing pre-flight demonstrator

**WP 1.5** Applied technologies for enhanced aircraft performance

**WP 1.6** Demonstration of radical aircraft configurations

Estimated Volume of Activities ~560M€

# LPA-IADP WBS – “Platform 2”

Airbus with, Liebherr, Fraunhofer and Partners

Large Passenger Aircraft Platform – integration topics

„Platform 1 - OAD“

Advanced Engine and Aircraft Configurations

„Platform 2 - OPD“

Innovative Physical Integration Cabin-System-Structure

„Platform 3 - OSD“

Next Gen. A/C Systems, Cockpit Systems & Avionics

TRL 4-6
Aircraft Level

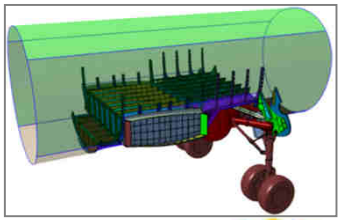
## **Platform 2** Innovative Physical Integration Cabin-System-Structure

**WP 2.1** Next generation fuselage, cabin and systems integration

**WP 2.2** Next generation cabin & cargo functions

**WP 2.3** Next generation lower centre fuselage

**WP 2.4** Non-specific cross function



Estimated Volume of Activities ~290M€



Clean Sky

# LPA-IADP WBS – "Platform 3"

TRL 4-6
Aircraft Level

Airbus with Thales, Liebherr, SAFRAN and Partners

## Large Passenger Aircraft Platform – integration topics

„Platform 1 - OAD"

**Advanced Engine and Aircraft Configurations**

„Platform 2 - OPD"

**Innovative Physical Integration Cabin-System-Structure**

„Platform 3 - OSD"

**Next Gen. A/C Systems, Cockpit Systems & Avionics**

**<u>Platform 3</u>** <u>Next Gen. Aircraft A/C Systems, Cockpits & Avionics</u>

**WP 3.1** Enhanced flight operations and functions

**WP 3.2** Innovative enabling Technologies

**WP 3.3** Next generation cockpit functions flight demonstration

**WP 3.4** Enhanced cockpit demonstration

**WP 3.5** Disruptive Cockpit demonstration

**WP 3.6** **ADVANCE** Maintenance

**Cockpit of the future (Fenics)**

Estimated Volume of Activities ~220M€

# CS2 Large Passenger Aircraft WBS

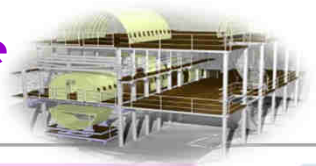
LPA (Airbus)

## Overall Aircraft Design

### Platform 1 – WP 0
Advanced Engine & Aircraft Configuration

- **WP1.1** Short/Medium Range Aircraft Power Plant System Integration
- **WP1.2** Advanced Rear-end
- **WP1.3** Validation of Scaled Flight Testing
- **WP1.4** Hybrid Laminar Flow Control Large Scale Demonstrator
- **WP1.5** Applied Technologies for Enhanced Aircraft Performance
- **WP1.6** Demonstration of Radical Aircraft Configurations

## Structure Design



### Platform 2 – WP 0
Innovative Physical Integration Cabin-System-Structure

- **WP 2.1** Next generation fuselage, cabin and systems integration
- **WP 2.2** Next generation cabin & cargo functions
- **WP 2.3** Next generation lower centre fuselage
- **WP 2.4** Non-specific cross functions

## System Design

### Platform 3 – WP 0
Next Generation Aircraft, Cockpits Systems & Avionics

- **WP 3.1** Enhanced flight operations & functions
- **WP 3.2** Innovative enabling technologies
- **WP 3.3** Next generation cockpit functions flight demonstration
- **WP 3.4** Enhanced cockpit demonstration
- **WP 3.5** Disruptive cockpit demonstration
- **WP 3.6** ADVANCE (Maintenance)

- **WP 0.1** Technology assessment
- **WP 0.2** EcoDesign
- **WP 0.3** ITD - Interfaces



Clean Sky

# Overview of the LPA-CfP11 topics

**Platform 1**

**10 topics / 12,45M€ ind. funding**

| Identification Code | Title | Type of Action | Value (Funding in M€) | Topic Leader |
|---|---|---|---|---|
| JTI-CS2-2020-CfP11-LPA-01-88 | Development of New digital Microphone-MEMS-Sensors for wind tunnels with open/closed test sections and flight tests | IA | 1.40 | Airbus |
| JTI-CS2-2020-CfP11-LPA-01-89 | Advanced characterization of friction and surface damage for gears running in loss of lubrication conditions | RIA | 1.10 | GE Avio |
| JTI-CS2-2020-CfP11-LPA-01-90 | Automated thermography for inspection of welded safety critical engine components | IA | 0.70 | GKN |
| JTI-CS2-2020-CfP11-LPA-01-91 | Development and validation of a method to predict non-linear aerodynamic characteristics of lifting surfaces with controls | RIA | 0.75 | Airbus |
| JTI-CS2-2020-CfP11-LPA-01-92 | Optimization of APU Exhaust Muffler Thermal Barrier and Air Intakes construction Technologies | IA | 0.90 | Airbus |
| JTI-CS2-2020-CfP11-LPA-01-93 | Engine bleed jet pumps continuous behaviour modelization | RIA | 0.70 | Liebherr |
| JTI-CS2-2020-CfP11-LPA-01-94 | Installed UHBR Nacelle Off-Design Performance Characteristics. | RIA | 3.00 | Rolls-Royce |
| JTI-CS2-2020-CfP11-LPA-01-95 | Passive Actuated Inlet for UHBR engine ventilation | IA | 0.70 | Airbus |
| JTI-CS2-2020-CfP11-LPA-01-96 | Analytical and experimental characterization of aerodynamic and aeroacoustic effects of closely operating propellers for distributed propulsion wing solutions. | RIA | 2.50 | Airbus Defence and Space |
| JTI-CS2-2020-CfP11-LPA-01-97 | Insulation Monitoring for IT Grounded (Isolation Terra) Aerospace Electrical Systems | IA | 0.70 | Rolls-Royce plc |

# Overview of the LPA-CfP11 topics

**Platform 2**

**5 topics / 6,35M€ ind. funding**

| Identification Code | Title | Type of Action | Value (Funding in M€) | Topic Leader |
|---|---|---|---|---|
| JTI-CS2-2020-CfP11-LPA-02-33 | Tooling, Equipment and Auxiliaries for the closure of a longitudinal Barrel Joint: Butt strap integration and Lightning Strike Protection continuity | IA | 1.60 | Airbus |
| JTI-CS2-2020-CfP11-LPA-02-34 | Tooling, Equipment and Auxiliaries for the closure of a longitudinal Barrel Joint: Overlap Joint and Frame Coupling integration | IA | 1.40 | Airbus |
| JTI-CS2-2020-CfP11-LPA-02-35 | Innovative disbond arrest features for long thermoplastic welded joints | IA | 0.75 | Fokker |
| JTI-CS2-2020-CfP11-LPA-02-36 | Large scale aircraft composite structures recycling [ECO] | IA | 1.80 | Airbus |
| JTI-CS2-2020-CfP11-LPA-02-37 | Thermoplastic fuselage repair process integrated on manufacturing line | IA | 0.80 | Airbus |

**Platform 3**

**1 topic / 0,8M€ ind. funding**

| Identification Code | Title | Type of Action | Value (Funding in M€) | Topic Leader |
|---|---|---|---|---|
| JTI-CS2-2020-CFP11-LPA-03-19 | Concept for Pilot State Monitoring system operation in commercial aviation | IA | 0.80 | Honeywell International |

**LPA total number of topics in CfP#11: 16**
**total indicative funding: 19,6M€**

# Overview of the LPA-CfP11 topics

**Platform 2**

5 topics / 6,35M€ ind. funding

**Platform 3**

1 topic / 0,8M€ ind. funding

| Identification Code | Title | Type of Action | Value (Funding in M€) | Topic Leader |
|---|---|---|---|---|
| JTI-CS2-2020-CfP11-LPA-02-33 | Tooling, Equipment and Auxiliaries for the closure of a longitudinal Barrel Joint: Butt strap integration and Lightning Strike Protection continuity | IA | 1.60 | Airbus |
| JTI-CS2-2020-CfP11-LPA-02-34 | Tooling, Equipment and Auxiliaries for the closure of a longitudinal Barrel Joint: Overlap joint and | IA | 1.40 | Airbus |
| JTI-CS2-2020-CFP11-LPA-03-19 | Concept for Pilot State Monitoring system operation in commercial aviation | IA | 0.80 | Honeywell International |

**Important for Partner-Applicants to note:**

Cooperation between the GAP Partners and LPA members acting in the „hosting“ work packages shall be done by means of an Implementation Agreement (IA) for all CfP#10 topics.

The IA shall be used as published with the CfP#10 Call documents.

LPA total number of topics in CfP#11: 16
total indicative funding: 19,6M€

# LPA-IADP WBS – “Platform 1”

Airbus with SAAB, Dassault, SNECMA and Partners

Large Passenger Aircraft Platform – integration topics

„Platform 1 - OAD“

Advanced Engine and Aircraft Configurations

„Platform 2 - OPD“

Innovative Physical Integration Cabin-System-Structure

„Platform 3 - OSD“

Next Gen. A/C Systems, Cockpit Systems & Avionics

**TRL 4-6**
Aircraft Level

## **Platform 1** Advanced Engine and Aircraft Configurations

**WP 1.1** Advanced engine demonstrators (BLI, UHPE, Open Rotor)

**WP 1.2** Advanced engine integration driven rear fuselage

**WP 1.3** Validation of scaled flight testing

**WP 1.4** Hybrid laminar flow control large scale demonstration

- HLFC applied on fin in long-term flight operation
- HLFC wing pre-flight demonstrator

**WP 1.5** Applied technologies for enhanced aircraft performance

**WP 1.6** Demonstration of radical aircraft configurations

Estimated Volume of Activities ~560M€

# CS2 Large Passenger Aircraft - WBS

## Overall Aircraft Design

**Platform 1 – WP 0**

Advanced Engine & Aircraft Configuration

- **WP1.1** Short/Medium Range Aircraft Powe Plant System Integration — LPA 01-88, LPA 01-89, LPA 01-90
- **WP1.2** Advanced Rear-end — LPA 01-91, LPA 01-92
- **WP1.3** Validation of Scaled Flight Testing
- **WP1.4** Hybrid Laminar Flow Control Large Scale Demonstrator
- **WP1.5** Applied Technologies for Enhanced Aircraft Performance — LPA 01-93, LPA 01-94, LPA 01-95
- **WP1.6** Demonstration of Radical Aircraft Configurations — LPA 01-96, LPA 01-97

LPA (Airbus)

Structure Design

Platform 2 – WP 0
Innovative Physical Integration Cabin-System-Structure

WP 2.2
ration cabin & cargo functions

WP 2.3
Next generation lower centre fuselage

WP 2.4
Non-specific cross functions

System Design

Platform 3 – WP 0
Next Generation Aircraft, Cockpits Systems & Avionics

WP 3.1
Enhanced flight operations & functions

WP 3.2
Innovative enabling technologies

WP 3.3
Next generation cockpit functions flight demonstration

WP 3.4
Enhanced cockpit demonstration

WP 3.5
Disruptive cockpit demonstration

WP 3.6
ADVANCE (Maintenance)

WP 0.1
Technology assessment

WP 0.2
EcoDesign

WP 0.3
ITD - Interfaces



Clean Sky

JTI-CS2-2020-CfP11-LPA-01-88

# Development of new digital microphone MEMS sensors for wind tunnels with open/closed test sections and fligh tests

**Innovation Takes Off**

http://www.cleansky.eu/content/homepage/about-clean-sky-2

Clean Sky 2

# JTI-CS2-2020-CfP11-LPA-01-88

- **JTI-CS2-2020-CfP11-LPA01-88**

- **Title:** *Development of new digital microphone MEMS sensors for wind tunnels with open/closed test sections and fligh tests.*
- **Objective:** The main objective is to develop a novel technology for surface unsteady pressure measurements for arbitrary model/aircraft position (including cockpit area) and with a high spatial resolution. This new sensor should overpass the current limitations (height, size and price).
- **Type of action**: IA
- **Volume:** 1.4 M€ funding


**Example of MEMS integration**

| Criterion | | Wind tunnel test application *Open test section* | Wind tunnel test application *Closed test section* | Fligh test application |
|---|---|---|---|---|
| Airframe noise application | Min | 0 | 30 | 45 |
| Dynamic Range [linear dB ref. 2 10⁻⁵ Pa] (integrated rms value) | Max | 140 | 150 | 145 |
| Rotor/Fan noise application | Min | 30 | 30 | 45 |
| Dynamic Range [linear dB ref. 2 10⁻⁵ Pa] (integrated rms value) | Max | 170 | 170 | 175 |
| Frequency Response [Hz] | +/- 3 dB | 100 – 35000 | 100 – 100000 | 40 - 10000 |
| (see footnote 3 and remarks) | 12dB/oct. [1] | 500 – 50000 | n/a | n/a |
| Signal to Noise ratio below 120 dB [dB] | | 90 | 90 | 70 |
| Temperature range [°C] | Min | -50 | -20 | -65 |
| | Max | 70 | 70 | 30 |
| Ambient pressure stability range [Pa][4] | Min | 99000 | 99000 | 22000 |
| | Max | 102000 | 102000 (not pressurized)<br>500000 (pressurized) | 102000 |
| Humidity stability range [%] | Max | 50 | 50 | Up to 100% |
| Pressure equilization vent | | Individual front vented | Individual front vented | |
| Environment statbility | | | | Water proof / ice |
| Thickness / Height | | 1 mm | 1 mm | 1 mm |

**Mic. specification**

# JTI-CS2-2020-CfP11-LPA-01-88

- **Schedule/Milestones**

| Deliverables | | | |
|---|---|---|---|
| **Ref. No.** | **Title - Description** | **Type** | **Due Date** |
| Step 1: Wind tunnel (WT) test application | | | |
| 01 | Partner contribution detailed description (content, deliverables, planning) | Report | T0 + 3 |
| 02 | Final specifications of the WT sensor | Report + Decision gate | T0 + 3 |
| 03 | Choice of the solution for WT and validation plan | Report + Decision gate | T0 + 6 |
| 04 | MEMS prototype for WT sensor | Specimens | T0 + 10 |
| 05 | Qualification and validation of the WT sensor in laboratory conditions | Test Report + compliance | T0 + 12 |
| 06 | Qualification and validation of the sensor in wind-tunnel conditions | Test Report + compliance | T0 + 18 |
| Step 2: Flight test (FT) application | | | |
| 07 | Final specifications of the FT sensor taking into account results from laboratory tests | Report + Decision gate | T0 + 18 |
| 08 | Choice of the solution (unique or several) and validation plan | Report + Decision gate | T0 + 20 |
| 09 | MEMS prototype for FT sensor | Specimens | T0 + 22 |
| 10 | Qualification and validation of the FT sensor in laboratory conditions | Test Report + compliance | T0 + 26 |
| 11 | Qualification and validation of the sensor in flight tests conditions | Test Report + compliance | T0 + 28 |
| Final deliverable | | | |
| 12 | Final MEMS sensor(s) design ready to industrialize | Report + specimen | T0 + 30 |

- **Targeted applicant/Required Skills:**

  The applicant(s) must have proven capabilities development experience in:
  - Electronics
  - MEMS sensors
  - Acoustic measurements

JTI-CS2-2020-CfP11-LPA-01-89

# Advanced characterization of friction and surface damage for gears running in loss of lubrication conditions

**Innovation Takes Off**

http://www.cleansky.eu/content/homepage/about-clean-sky-2

Clean Sky 2

# JTI-CS2-2020-CfP11-LPA-01-89

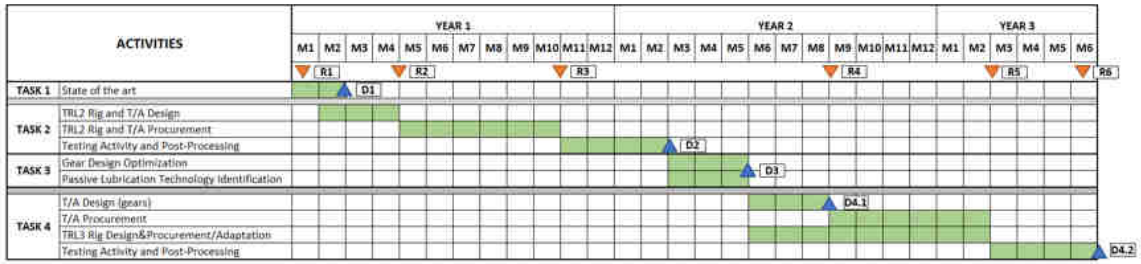
- **JTI-CS2-2020-CfP11-LPA01-89**
- **Title:** *Advanced characterization of friction and surface damage for gears running in loss of lubrication conditions.*


*Pictorial representation of solid material contact with full lubrication (a) and boundary/starved lubrication (b). Condition (b) may lead to material scoring/damage.*

- **Objective:** Understand the major drivers of frictional heating and surface damage on gears running in off-design conditions (loss of lubrication), deriving new correlations and modelling tools through TRL2 rig experimental activities. Develop solutions for gear surface damage minimization and demonstrate technology through TRL3 component test.
- **Type of action**: IA
- **Volume:** 1.1 M€ funding

# JTI-CS2-2020-CfP11-LPA-01-89

- **Schedule/Milestones**




2.5 years duration

| Milestones (when appropriate) | | | |
|---|---|---|---|
| ***Ref. No.*** | ***Title - Description*** | ***Type**** | ***Due Date*** |
| R1 | Kick Off - Agreement on detailed spec & Overall plan | Meeting | T0 + 1 |
| R2 | TRL2 rig and T/A design review | R, Meeting | T0 + 4 |
| R3 | TRL2 Rig Test Design Review – Review of proposed test, risks, instrumentation | R, Meeting | T0 + 10 |
| R4 | T/A Design Review (for TRL3 rig) | R, Meeting | T0 + 20 |
| R5 | TRL3 Rig Test Design Review – Review of proposed test, risks, instrumentation | R, Meeting | T0 + 26 |
| R6 | Closure Meeting – Final Results, Outcomes | Meeting | T0 + 30 |

- **Targeted applicant/Required Skills:**

The applicant(s) must have proven capabilities development experience in:

- Gear design
- Lubrication and fluid-dynamics
- Metal surface analysis
- Low TRL rig testing
- Gearbox rig testing and gear component testing
- Gears procurement

The applicant(s) must demonstrate to have access to TRL3 rig, or alternatively, to have proven capability of gearbox rig design (including instrumentation and dynamics) and procurement.

JTI-CS2-2018-CfP11-LPA01-90

# Automated thermography for inspection of welded safety critical engine components

Clean Sky 2

# JTI-CS2-2020-CfP11-LPA-01-90

Thermography has a potential to increase probability of detection of defects as well as enhance accessibility for fast, automated non-destructive evaluation of aero engine components.
This project aims at developing full-scale thermography inspection of near surface defects very small defects on welded and machined engine frames.

1. Definition of process and inspection requirements
2. Identification of NDT system – Thermography, Automation, Secondary sensors, Data analysis and Defect classification software.
3. Development and verification of sub-systems on realistic industrial level.
4. Probability of Detection quantification on test samples.
5. Final demonstration on a relevant component

*The final demonstrator will probably consist of two super alloy sectors (as above) welded together. Size is ~25 cm in all*

JTI-CS2-2020-CfP11-LPA-01-91

# Development and validation of a method to predict non-linear aerodynamic characteristics of lifting surfaces with controls

http://www.cleansky.eu/content/homepage/about-clean-sky-2

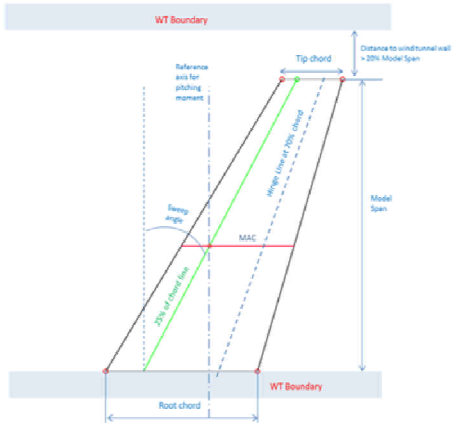
Clean Sky 2

# JTI-CS2-2020-CfP11-LPA-01-91

- **JTI-CS2-2020-CfP11-LPA-01-91**
- **Title:** Development and validation of a method to predict non-linear aerodynamic characteristics of lifting surfaces with controls.
- **Objective:** The purpose of this research proposal is to develop numerical methods for the prediction of the non-linear aerodynamic characteristics of lifting surfaces, of the type used in the tails of commercial aircraft. The maximum lift coefficient of the lifting surface, including deflected controls, is of interest for the design of efficient empennages and a rapid means to estimate this parameter is required. The methods to be developed will be calibrated and validated using a systematic series of wind tunnel tests of several models covering a wide range of planform parameters, with and without simulated ice shapes.
- **Volume:** 750 K€ funding

RANGE OF VARIATION OF PLANFORM PARAMETERS

| | |
|---|---|
| Sweep @25%chord: -40 deg to 40 deg | |
| Aspect Ratio: | 3.5 to 7 |
| Taper Ratio: | 0.2 to 1 |
| Dihedral: | 0 deg to 45 deg |



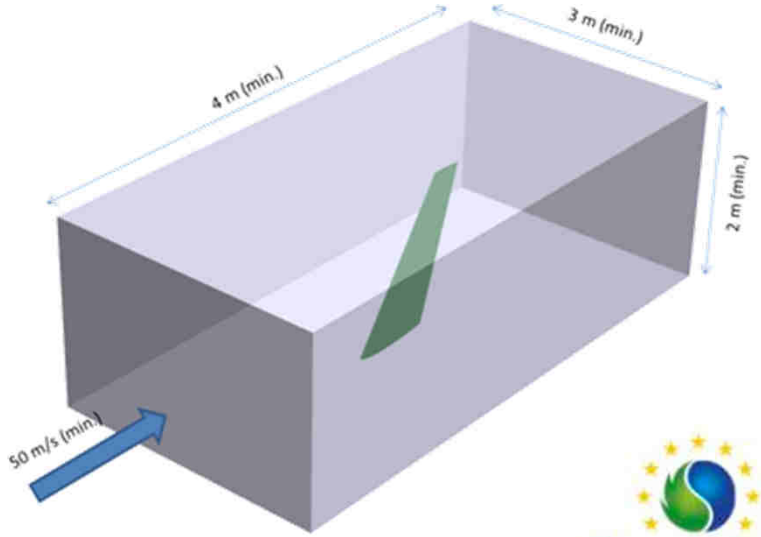




*Figure 1 Planform definition of a trapezoizal lifting surface and wind tunnel constraints*

# JTI-CS2-2020-CfP11-LPA-01-91

**Major deliverables/ Milestones and schedule (estimate)**

The main deliverables of this project are:

- Generation of a systematic series of geometries covering a wide design space of tail surfaces
- Manufacture and dynamic characterization of low cost modular wind tunnel models based on the above geometries (determination of the moment of inertia, friction and damping coefficients of the control surface)
- Aerodynamic testing of the modular models and data processing
- Development of a theoretical low order, physics based model for the prediction of non-linear characteristics of the tail surfaces spanned by the design space covered by the systematic series, including hinge moments
- Development of a calibration method to adjust high order CFD models to obtain non-linear aerodynamic characteristics of tail surfaces matching the WTT results of the systematic series and a method for Reynolds extrapolation
- Adjustment of the low order physics based model to match the results of the wind tunnel tests and development of an extension methodology for an arbitrary Reynolds number so that the proposed theoretical model can be used for the preliminary sizing of tail surfaces
- Overall conclusions and recommendations

# JTI-CS2-2020-CfP11-LPA-01-91

## Special skills, Capabilities, Certification expected from the Applicant(s)

- Advanced geometric modelling
- CFD analysis
- Low speed Wind Tunnel Testing
- Use of the following equipment for aerodynamic analysis and testing:
  - High Performance Computing (HPC) and state of the art CFD solvers, preferably open source.
  - Testing facilities for the dynamic characterization of the control surfaces (preferably in vacuum), e.g., damping and moment of inertia
  - Shape and roughness verification methods to guarantee that the models are manufactured within the stated specifications.
  - Low speed wind tunnel with the following characteristics:
    - test section dimensions : 2m (minimum) in the span direction by 3m (minimum) in the complementary direction, in order to reduce wind tunnel blockage when the lifting surface is at very large angles of attack (e.g. around 40 deg.).
    - minimum test speed 50 m/s,
    - Wind Tunnel model used by applicant shall have a turbulence level **<0.25%** and uniformity **> 99%**, to be clearly demonstrated in the proposal.
    - Measurement means, preferably optical, to verify that the model deformation under aerodynamic load is within the stated tolerances in 2.3.3
    - force balances to measure lift, drag and yawing and hinge moment (at least), even in dynamic (oscillatory) conditions of the control surface
    - surface flow visualisation
    - infra-red thermographic cameras with enough sensitivity to detect boundary layer transition in air (or equivalent, non-intrusive, means)

***Advantageous is the availability of:***

- Particle Image Velocimetry equipment
- Pressure Sensitive Paint

# JTI-CS2-2020-CfP11-LPA-01-92

# Advanced Rear End systems: Optimization of APU Exhaust Muffler Thermal Barrier and Air Intakes construction Technologies

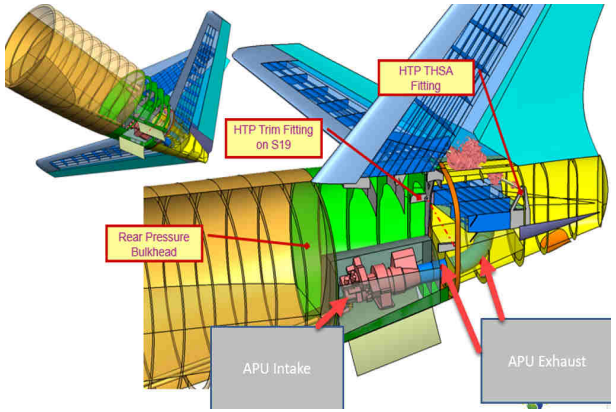
http://www.cleansky.eu/content/homepage/about-clean-sky-2

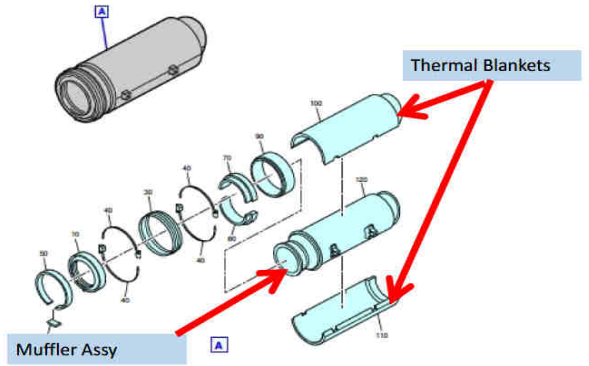
Clean Sky 2

# JTI-CS2-2020-CfP11-LPA-01-92

- **JTI-CS2-2020-CfP11-LPA-01-91**
- **Title:** Rear fuselage and empennage: APU Mufflers Exhaust/Air Intakes . Optimization of APU Exhaust Muffler Thermal Barrier and Air Intakes construction Technologies. .
- **Objective.** The purpose of this research proposal is to develop:
  - A new basic thermal barrier concept to be used in Exhaust Muffler that can be used in rear end fuselage or in other parts of the Aircraft where a power unit might be installed.
  - A new basic materials construction concept to be used in Air Intakes that can be used in rear end fuselage or in other parts of the aircraft.

Air Intakes and Exhaust Mufflers are parts of the system installation required for air breathing engines (such as an Auxiliary Power Unit) or other Aircraft systems. These parts provide a flow path for the external air needed, as well as the exhaust gas path. They provide other functions such as fire barrier (meet Fire Proof requirements according AC 20-135), noise attenuation and thermal insulation. Other requirements that are applicable to this parts include, drainage, fire toxicity, etc.



# JTI-CS2-2020-CfP11-LPA-01-92

**Major deliverables/ Milestones and schedule (estimate)**

The main deliverables of this project are:

- Report of Materials Build up construction Proposal. It includes the definition of the new material and how this solution provides a response to the functional requirements. A two-step approach to identify a candidate solution can be considered (i.e. PDR-CDR).
- Validation and Verification Plan (including modelling and test plan): definition of the plan to validate and verify the solution proposed.
- Validation Models of Test Specimens.
- Qualification test procedure that would be executed on the sample part.
- Qualification test results of the sample part
- Validation and Verification Summary
- Manufacturing dossier
- Final report: Overall conclusions and recommendations

- **Special skills, Capabilities, Certification expected from the Applicant(s)** The applicant(s) shall be able to demonstrate sound technical knowledge in the following areas:
  - Thermal barrier modelling, analysis and optimization.
  - Thermal design and manufacturing capabilities.
  - Acoustic modelling, analysis and optimization.
  - Acoustic design and manufacturing capabilities.
  - Fire thermal Testing: APU exhaust Muffler applications.
  - Acoustic Testing: APU exhaust Muffler applications.
  - Excellent mechanical design capability applied to aeronautical projects. Knowledge of design standards, materials and processes.
  - Demonstrated mechanical design capability to design a new APU exhaust Muffler concept.

JTI-CS2-2020-CfP11-LPA-01-93

# Engine bleed jet pumps continuous behavior modelling

**Innovation Takes Off**

http://www.cleansky.eu/content/homepage/about-clean-sky-2

Clean Sky 2

# JTI-CS2-2020-CfP11-LPA-01-93

| | | | |
|---|---|---|---|
| **Type of action (RIA/IA/CSA)** | RIA | | |
| **Program Area** | LPA | | |
| **(CS2 JTP 2015) WP Ref.** | WP1.5.2 | | |
| **Indicative Funding Topic Value (in k€)** | 700 k€ | | |
| **Topic Leader** | Liebherr | **Type of Agreement** | Implementation Agreement |
| **Duration of the action (in Months)** | 24 | **Indicative Start Date** | Q4 2020 |

| **Identification** | **Title** |
|---|---|
| **JTI-CS2-2020-CfP11-LPA-01-93** | **Engine bleed jet pumps continuous behavior modelling** |
| **Short description** | |
| The objective of this topic is to gain knowledge on physics involved inside jet pumps, and in particular to develop representative dynamic continuous behavior 1D models. Partners will have to develop such 1D models with a high level of representativeness in transition phases between the different operating modes. In order to feed and tune these 1D models, the partners will have to perform CFD and physical testing. | |

# JTI-CS2-2020-CfP11-LPA-01-93

## Scope of work

| Tasks | | |
|---|---|---|
| ***Ref. No.*** | ***Title - Description*** | ***Due Date*** |
| **WP1** | **Jet Pumps behavior static analysis** | |
| WP1.1 | CFD static analysis for each operating, off-design modes and transitions | T0+6 |
| WP1.2 | DoE testing on instrumented prototypes - Static | T0+8 |
| WP1.3 | OD-1D Modelling | T0+10 |
| WP1.4 | OD-1D Validation | T0+12 |
| **WP2** | **Jet Pumps behavior dynamic analysis** | |
| WP2.1 | CFD analysis for transition phases (between two modes) | T0+12 |
| WP2.2 | DoE testing on instrumented prototypes - Dynamic | T0+16 |
| WP2.3 | OD-1D Modelling | T0+20 |
| WP2.4 | OD-1D Validation | T0+24 |

# JTI-CS2-2020-CfP11-LPA-01-93

## Major Deliverables & Milestones

| **Deliverables** | | | |
|---|---|---|---|
| ***Ref. No.*** | ***Title - Description*** | ***Type**** | ***Due Date*** |
| D1.1 | Jet pump model design description and static behavior simulation report | R | T0+10 |
| D1.2 | Static library (Dymola models) and validation report | D+R | T0+12 |
| D2.1 | Jet pump model design description and dynamic behavior simulation report | R | T0+20 |
| D2.2 | Dynamic library (Dymola models) and validation report | D+R | T0+24 |

*Type: R=Report, D=Data, HW=Hardware

# JTI-CS2-2020-CfP11-LPA-01-93

**Special skills, Capabilities, Certification expected from the Applicant(s)**

*Skills:*

- Fluid mechanics (steady and unsteady, compressible flow, …)
- OD-1D modelling (Dymola/Modelica) for library and models

*Capabilities:*

- Dymola/Modelica tool
- Data analytics framework / environment
- Testing facilities featuring high pressure (up to 5 bars) air supply at a temperature up to 200°C; enabling rapid pressure variation (e. g. going from 2 to 4 bars ≤ 1 s)

# JTI-CS2-2020-CfP11-LPA-01-94

## Installed UHBR Nacelle Off-Design Performance Characteristics.

**Innovation Takes Off**

**http://www.cleansky.eu/content/homepage/about-clean-sky-2**

# JTI-CS2-2020-CfP11-LPA-01-94

| | | | |
|---|---|---|---|
| **Type of action (RIA/IA/CSA)** | RIA | | |
| **Programme Area** | LPA | | |
| **(CS2 JTP 2015) WP Ref.** | WP 1.5.2 | | |
| **Indicative Funding Topic Value (in k€)** | 3000k€ | | |
| **Topic Leader*** **full name, no abbreviation* | Rolls-Royce | **Type of Agreement** | Implementation Agreement |
| **Duration of the action (in Months)** | 30 | **Indicative Start Date**[1] | Q4 2020 |

| **Topic Identification Code** | **Title** |
|---|---|
| **JTI-CS2-2020-CfP11-LPA-01-94** | Installed UHBR Nacelle Off-Design Performance Characteristics. |

**Short description**

UHBR engines require novel advanced low drag nacelles, and close coupled wing installations, outside current design experience. The Project objective is investigate how novel UHBR Nacelles perform under off design conditions, (take off high lift, at windmill and idle), and provide a detail understanding of the complex flow separation physics to assist in interpreting FTB results. A detailed understanding of the factors influencing external flow separation mechanism will enable improved design rules, prediction methodologies and geometric enhancements to be developed. This requires utilising a range of CFD techniques to predict external cowl separation mechanisms and Wind Tunnel Component testing with high fidelity instrumentation to measure the detail flow physics of the external cowl under off design windmill high incidence conditions; and installed nozzle suppression under take off windmill and idle conditions to provide CFD validation data. Jet flap interaction Noise understanding also needs to be enhanced to aid interpretation of FTB results. Acoustic measurements should be undertaken during the same test series; with an aligned CAA (computational aero acoustics) study to extrapolate the test results to the free flight environment.

# JTI-CS2-2020-CfP11-LPA-01-94

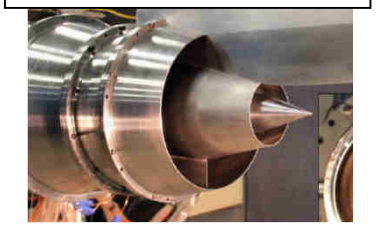
**Objective** – Detailed understanding of Novel UHBR installed advanced nacelle aerodynamics and acoustics under 'off design' take off and cruise Operation

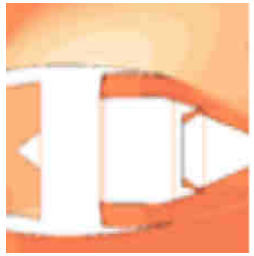
- Providing:-
- Detailed understanding of installed UHBR nacelle off design performance.
- Validate aerodynamic design rules for external cowl separation - low speed high lift conditions.
- Demonstrating exhaust suppression UHBR nacelle under low speed high lift operation.
- Demonstration of design constraints imposed by noise at Take-Off and in cruise.

## Timeplan -milestones

| Milestones (when appropriate) | | | |
|---|---|---|---|
| ***Ref. No.*** | ***Title - Description*** | ***Type**** | ***Due Date*** |
| **M1** | Work Plan agreed | Report | T0 + 3 months |
| **M2** | Nacelle and Exhaust rig test concept review | Review | T0 + 6 months |
| **M3** | Nacelle configurations for test down select | Review | T0 + 12 months |
| **M4** | Model and instrumentation definition for manufacture. | Review | T0 + 12 months |
| **M5** | Wind tunnel test model manufacture complete | Hardware | T0 + 18 months |
| **M6** | Wind tunnel test complete | Data | T0 + 24 months |
| **M7** | Post test CFD validation and design rules complete | Report | T0 + 30 months |

AIAA DSFR Nozzle. Mikkelsen et al





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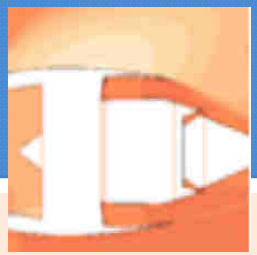
# JTI-CS2-2020-CfP11-LPA-01-94

**Objective** – Detailed understanding of Novel UHBR installed advanced nacelle aerodynamics and acoustics under off design take off and cruise Operation

## This CfP requests significant innovation in five key areas :-

- CFD assessment of novel UHBR nacelle profiles under 'off design‘ conditions, requiring parametric geometric modelling & optimisation, and validated RANS CFD analysis tools to create the candidate designs.
- A highly instrumented nacelle section test rig to take detail measurements of the key flow physics, for CFD validation.
- High accuracy test measurement of installed fan and core exhaust Cd suppression at low flows on representative separate jet exhaust geometry under Take-Off and cruise conditions.
- High order CFD calculations to predict complex external nacelle separation under 'off design‘ conditions.
- Measurement and CAA prediction of installed jet flap interaction on a separate jet nozzle test rig, and extrapolation of results to flight.

# JTI-CS2-2020-CfP11-LPA-01-94



**Targeted Applicant:**

- Academic partners with proven track record of civil UHBR nacelle installation design, shock boundary interactions, RANS & High fidelity CFD for aerodynamics and acoustics.
- Research partner with proven capability for nacelle wind tunnel testing to industry standards using and advanced instrumentation.

**Required Skills:**

- Detailed knowledge of UHBR nacelle design and analysis using parametric optimisation.
- Understand UHBR installed nacelle 'off design' aerodynamic and acoustic challenges.
- Proven validated ability to conduct UHBR nacelle RANS and High Fidelity CFD analysis.
- Expertise in Hi Fidelity CFD for Aerodynamic and Acoustic.
- Expertise in complex shock boundary layer interaction on complex geometry.
- Demonstrated ability to use mid TRL3 rigs for high fidelity shock boundary layer measurements.
- Proven test capability to conduct and analyse separate jet aero and acoustic exhaust testing with a high lift wing.
- Proven experience to novel flow measurements techniques.
- Cycle modelling capability for prediction of turbofan idle/windmill performance.

JTI-CS2-2020-CfP11-LPA-01-95

# Passive Actuated Inlet for UHBR engine ventilation

**Innovation Takes Off**

http://www.cleansky.eu/content/homepage/about-clean-sky-2

Clean Sky 2

# JTI-CS2-2020-CfP11-LPA-01-95

- **JTI-CS2-2020-CfP11-LPA01-95**
- **WP1.5.2**
- **Topic Leader : Airbus**

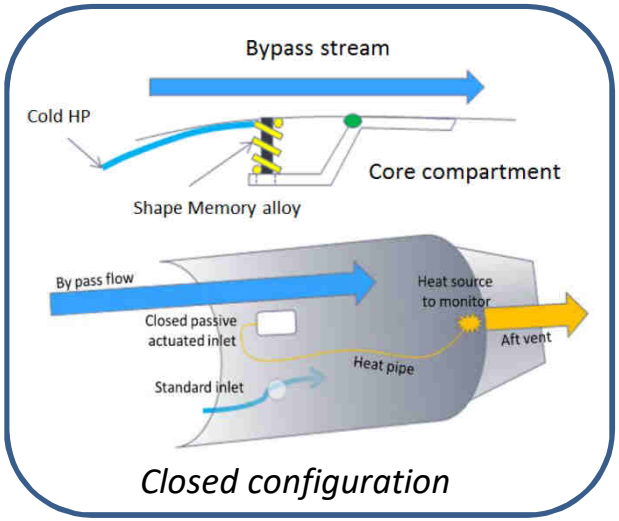
- **Title:** Passive Actuated Inlet for UHBR engine ventilation

- **Objective:** this topic aims at developing a new actuation system based on both following passive devices : Passive 2 phase system like heat pipe and shape memory alloys.

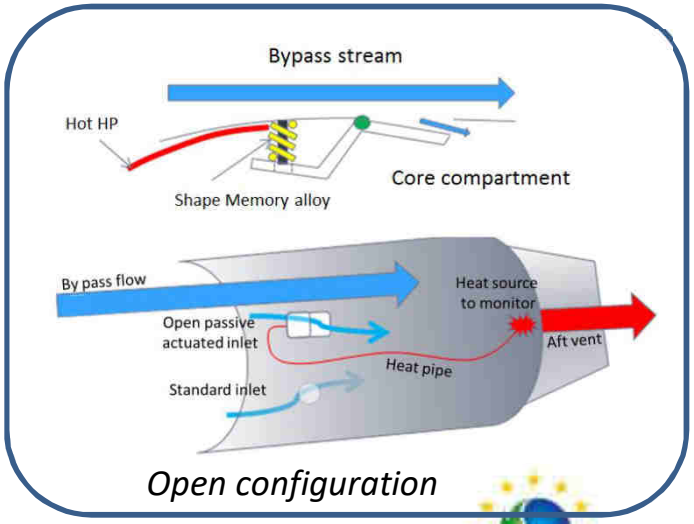
  That technology targets engine compartment ventilation modulation in order to reduce fuel consumption.

  Main activities of this topic are selection and characterization of appropriate materials, perform prototype modelling, design and manufacturing, followed by full demonstrator integration and tests.

- **Type of action**: IA
- **Volume:** 0.8 M€ funding
- **Indicative Start Date: > Q4/2020**
- **Duration: 27 months**



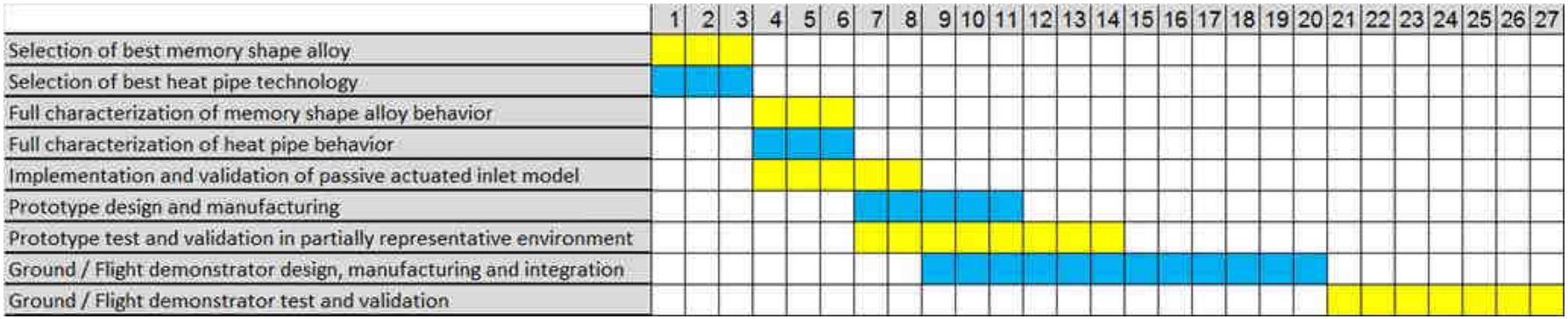
*Closed configuration*



*Open configuration*

# JTI-CS2-2020-CfP11-LPA-01-95

- **Schedule/Milestones**




2.25 years duration

- **Targeted applicant/Required Skills**

The applicant(s) must have proven capabilities development experience in:

- **Shape Memory Alloy** knowledge, modeling and manufacturing
- **Heat Pipes** knowledge, modeling and manufacturing
- Mechanical design and **integration**

The applicant(s) will be able to **understand and challenge the specifications** to develop thetechnology in a **aeronautical** environment and must demonstrate to have **access to Lab test** rigs.
**Creativity and innovation are expected.**

JTI-CS2-2020-CfP11-LPA-01-96

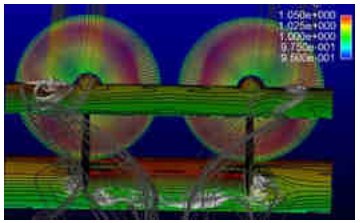
# Analytical and experimental characterization of aerodynamic and aeroacoustic effects of closely operating propellers for distributed propulsion wing solutions

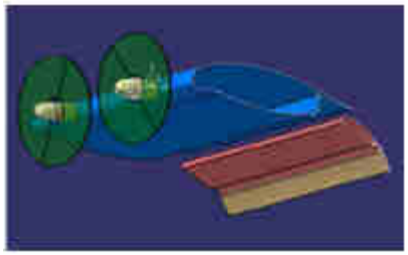
**Innovation Takes Off**

http://www.cleansky.eu/content/homepage/about-clean-sky-2

Clean Sky 2

# JTI-CS2-2020-CfP11-LPA-01-96





- **JTI-CS2-2020-CfP11-LPA-01-96**
- **WP1.6**
  - **Topic leader : Airbus Defence and Space - CASA**
- **Title:** Analytical and experimental characterization of aerodynamic and aeroacoustic effects of closely operating propellers for distributed propulsion wing solutions
- **Objective:** The main objective is to develop analytical and experimental evidence to foster computational capabilities and know-how in the field of aerodynamic and aeroacoustic design of distributed propulsion solutions and propeller arrays. In particular the objective is to be able to predict and validate with the highest possible fidelity the effect of closely operating propellers on the overall wing aerodynamics (such as puller or pusher leading edge or over-wing propeller array configurations) analyzing the effects of the different geometric parameters of interest, like propeller size, relative position among them and with respect to the wing, etc… The study should also address the experimental characterization of the impact on noise of the different geometric solutions, in order to allow generating design know-how in the field of aeroacoustics and vibrations (unsteady pressures in general) of disruptive configurations.
- **Volume:** 2500 k€ funding
- **Type of action**: RIA

# JTI-CS2-2020-CfP11-LPA-01-96

- **Scope of work and schedule :** Project scope is spread over 30 months and is rather ambitious in its initial planning, although the WP1.6 group is collaborating to rationalize the scope to secure success.

| | List of Milestones | | |
|---|---|---|---|
| | ***Ref. No.*** | ***Title – Description*** | ***Due Date*** |
| Ramp-up | M1 | Models definition and geometry / conditions exchange with TM | *M1* |
| | M2 | Models design: Identification of most relevant parameters & parametrization | *M2* |
| | M3 | Test strategy for phase 1 established | *M2* |
| Model design, characterization & manufacturing | M4 | Propeller selected / designed for all configurations | *M5* |
| | M5 | Models and test means design & manufacturing plan – phase 1 | *M5* |
| | M6 | Models-Phase 1 Aerodynamic CFD characterization | *M9* |
| | M7 | Models manufactured and verified | *M9* |
| First testing and benchmarking | M8 | Test completion – phase 1 | *M15* |
| | M9 | Benchmarking WTT & CFD - Assessment on CFD Down-selection of configurations for Phase 2. | *M18* |
| Model refinement & manufacturing | M10 | Test strategy for phase 2 established | *M19* |
| | M11 | Models and test means design & manufacturing plan – phase 2 | *M19* |
| | M12 | Models - Phase2 Aerodynamic & Aeroacoustic CFD characterization | *M22* |
| | M13 | Models manufactured and verified | *M22* |
| Advanced experimental measurements & analysis | M14 | Test completion – phase 2 | *M27* |
| | M15 | Benchmarking WTT & CFD / Aeroacoustics | *M30* |
| | M16 | Final assessment and lessons learned | *M30* |

→ First output to WP1.6

→ Final results & LL

# JTI-CS2-2020-CfP11-LPA-01-96

- **Targeted applicant**: Applicant will have consolidated experience in high fidelity aerodynamic and aeroacoustic characterization of propeller driven wings. This includes experience in the field of CFD and CAA, but also in Wind Tunnel Testing, including model design, manufacturing and test set-up / data acquisition. As this is a rather wide physical multidisciplinary problem, Airbus DS welcomes teams with multidisciplinary orientation, open minded and well organized to perform an agile and dynamic work.
- **Full required skills**
  - CFD and CAA analysis experience and capabilities, to setup initial databases.
  - Model design experience and capabilities, including CFD and CAA design and power-plant sizing and tuning, including propeller preliminary design.
  - Model manufacturing experience and capabilities, including power-plant control.
  - Demonstrated wind tunnel test experience
  - Demonstrated experience in Aero-Acoustic wind tunnel testing
  - Access to top level wind tunnel facilities in Europe, although testing capability at proprietary research/education facilities for model development is an add-on.

JTI-CS2-2020-CfP11-LPA-01-97

# Insulation Monitoring for IT Grounded (Isolation Terra) Aerospace Electrical Systems

**Innovation Takes Off**

**http://www.cleansky.eu/content/homepage/about-clean-sky-2**

# JTI-CS2-2020-CfP11-LPA-01-97

| | | | |
|---|---|---|---|
| **Type of action (RIA/IA/CSA)** | IA | | |
| **Programme Area** | LPA | | |
| **(CS2 JTP 2015) WP Ref.** | WP 1.6.1 | | |
| **Indicative Funding Topic Value (in k€)** | 700 | | |
| **Topic Leader*** **full name, no abbreviation* | Rolls-Royce plc | **Type of Agreement** | Implementation Agreement |
| **Duration of the action (in Months)** | 24 | **Indicative Start Date[1]** | Q1 2021 |

| **Topic Identification Code** | **Title** |
|---|---|
| **JTI-CS2-2020-CfP11-LPA-01-97** | Insulation Monitoring for IT Grounded (Isolation Terra) Aerospace Electrical Systems |

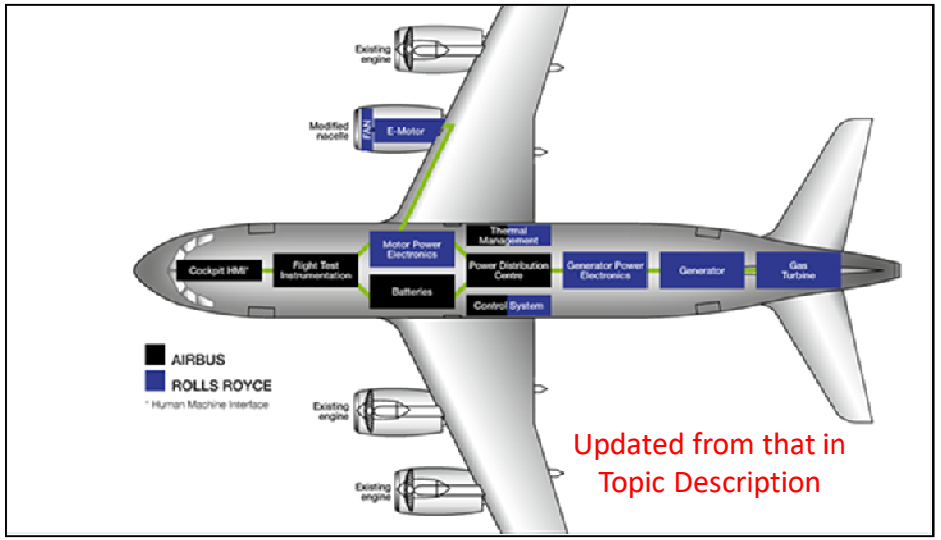
**Short description**

With an increase in the predicted demand for high voltage electrical power in large passenger aircraft and other more electric aircraft concepts, new electrical distribution systems will be required to enable safe, light, highly efficient electrical propulsion systems. Insulation monitoring technology is a crucial safety system on high integrity power distribution in land and marine systems, however they have not been tested, proven, optimised and made commercially available for aerospace. A functionally representative insulation monitoring demonstration for aerospace is required, incorporating applicable lessons and experience of established markets, but addressing some of the specialised aerospace environment and its safety processes.

# JTI-CS2-2020-CfP11-LPA-01-97

## Planned milestones

| *Ref. No.* | *Title - Description* | *Type ** | *Due Date* |
|---|---|---|---|
| M1.3 | Research requirements and gap analysis completed. | D | T0 + 5 |
| M2.1 | Summary of technology developments and future roadmap. | R | T0 + 17 |
| M3.3 | Verification of proposed product with the Topic Manager. | R | T0 + 23 |




## Required skills and expertise:

- Experience and understanding of state of the art in insulation monitoring systems
- Ability to produce insulation monitoring hardware - this project aims to get working hardware at TRL 4, to do this prototyping facilities are necessary
- Aerospace production route – investment and capability growth or future development partnerships may be required

## High level requirements for hardware:

- System to be suitable for use on systems with representative capacitance to earth
- System demonstration is not required to operate in representative environmental conditions, but should show a development route to representative environment testing
- Suitable for MW scale systems, high voltage distribution systems over 1000Vac rms and 1500V dc, development to TRL4

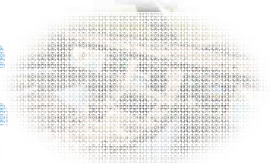
# CS2 Large Passenger Aircraft - WBS

LPA (Airbus)

Overall Aircraft Design

Structure Design

System Design



Platform 1 – WP 0
Advanced Engine & Aircraft Configuration

WP1.1
Short/Medium Range Aircraft Power Plant System Integration

WP1.2
Advanced Rear-end

WP1.3
Validation of Scaled Flight Testing

WP1.4
Hybrid Laminar Flow Control Large Scale Demonstrator

WP1.5
Applied Technologies for Enhanced Aircraft Performance

WP1.6
Demonstration of Radical Aircraft Configurations

**Platform 2 – WP 0**
Innovative Physical Integration Cabin-System-Structure

**WP 2.1**
Next generation fuselage, cabin and systems integration

**WP 2.2**
Next generation cabin & cargo functions

**WP 2.3**
Next generation lower centre fuselage

**WP 2.4**
Non-specific cross functions

LPA 02-33 | LPA 02-34 | LPA 02-35 | LPA 02-36 | LPA 02-37

Platform 3 – WP 0
Next Generation Aircraft, Cockpits Systems & Avionics

WP 3.2
Innovative enabling technologies

WP 3.3
Next generation cockpit functions flight demonstration

WP 3.4
Enhanced cockpit demonstration

WP 3.5
Disruptive cockpit demonstration

WP 3.6
ADVANCE (Maintenance)

WP 0.1
Technology assessment

WP 0.2
EcoDesign

WP 0.3
ITD - Interfaces

JTI-CS2-2020-CfP11-LPA-02-33

# Tooling, Equipment and Auxiliaries for the closure of a longitudinal Barrel Joint: **Overlap joint** and **Frame Coupling** integration

**Innovation Takes Off**

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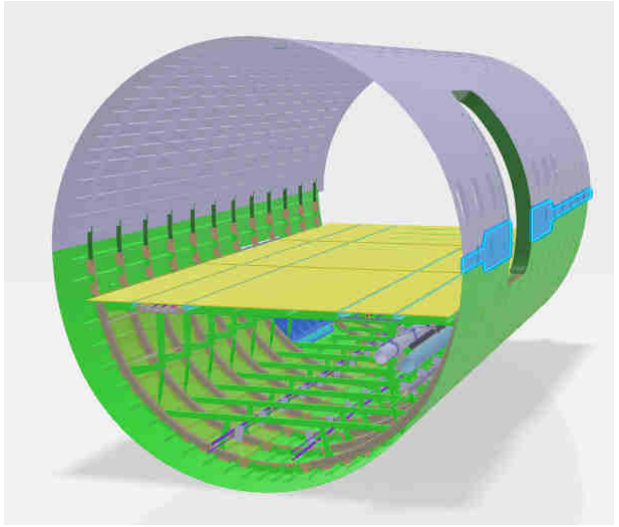
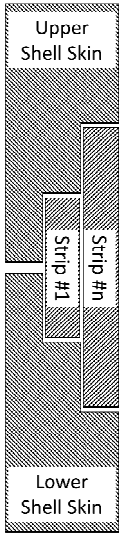
# JTI-CS2-2020-CfP11-LPA-02-33

| | | | |
|---|---|---|---|
| Type of action (RIA/IA/CSA) | IA – Innovation Action | | |
| Programme Area (LPA/REG/FRC/AIR/ENG/SYS/SAT/ECO/TE) | LPA – Large Passenger Aircraft | | |
| (CS2 JTP 2015) WP Ref. | WP 2.1 Next Generation Fuselage, Cabin and Systems Integration | | |
| Indicative Funding Topic Value (in k€) | 1600 | | |
| Topic Leader* *full name of the organisation, no abbreviation | Airbus Operations GmbH | Type of Agreement | Implementation Agreement |
| Duration of the Action (in Months) | 30 | Indicative Start Date (at the earliest)[1] | Q4 2020 |

| Topic Identification Code | Topic Title |
|---|---|
| JTI-CS2-2020-CFP11-LPA-02-33 | Tooling, Equipment and Auxiliaries for the closure of a longitudinal Barrel Joint: Butt strap integration and Lightning Strike Protection continuity |
| Short description | |
| One or more conduction welding heads, auxiliary equipment and consumables for the closure of an 8m typical fuselage barrel utilizing a butt strap need to be designed, manufactured, supplied and serviced on-site for this topic. Furthermore, following barrel closure, results need to be analysed and additional functionalities regarding improved in-situ monitoring and control integrated into the welding head or heads. | |



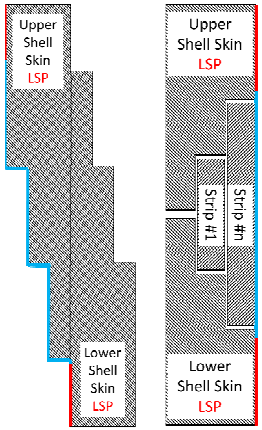



*Integration of the butt strap may occur in a layered progression and be conducted either in a continuous or stepwise processes. Due to the varying shell thickness, the number of butt strap strips changes along the length of the barrel.*

# JTI-CS2-2020-CfP11-LPA-02-33

- **Tasks & Schedule**

| Tasks | | |
|---|---|---|
| **Ref. No.** | **Title - Description** | **Due Date** |
| T1 | Requirements analysis and Functional Breakdown | T+1M |
| T2 | Tooling Specific Design | T+6M |
| T3 | Test pieces for Main Component Assembly integration | T+11M |
| T3 | Tooling manufacturing and delivery | T+11M |
| T4 | On-site support | T+17M |
| T5 | Process performance verification and analysis | T+18M |
| T6 | Improved functionality implementation and verification on welding equipment | T+27M |
| T7 | Documentation and Dissemination | T+28M |
| T8 | Technological de-risking trials and simulation | T+30M |




*Enabling electrical continuity across the longitudinal joints, a strip of lightning strike protection material shall be applied across both longitudinal joint.*

- **Targeted applicant**: Partner(s) with proven experience in the supply of welding heads for thermoplastic welding.

- **Special skills, Capabilities, Certification expected from the Applicant(s)**:
- *(M) – Mandatory; (A) – Appreciated.*
  - In-depth project management in time, cost and quality together with evidence of past experience in large project participation (M)
  - Specific machine tool design, manufacture and support to industry (M)
  - Proven expertise in the provision of conduction welding equipment for thermoplastics (M)
  - In-depth understanding of thermoplastic materials and welding thereof (M)
  - Online process monitoring and control for Quality Assurance (M)
  - In-house equipment for the chosen welding technologies (M)
  - Implementation of 3D Experience for the conduct of this project (M).
  - Experience with PAEK material family, preferably regarding welding (A)
  - Manufacturing and Processing validation for large passenger aircraft, in particular for composites (A)

JTI-CS2-2020-CfP11-LPA-02-34

# Tooling, Equipment and Auxiliaries for the closure of a longitudinal Barrel Joint: **Butt strap integration** and **Lightning Strike Protection continuity**

**Innovation Takes Off**

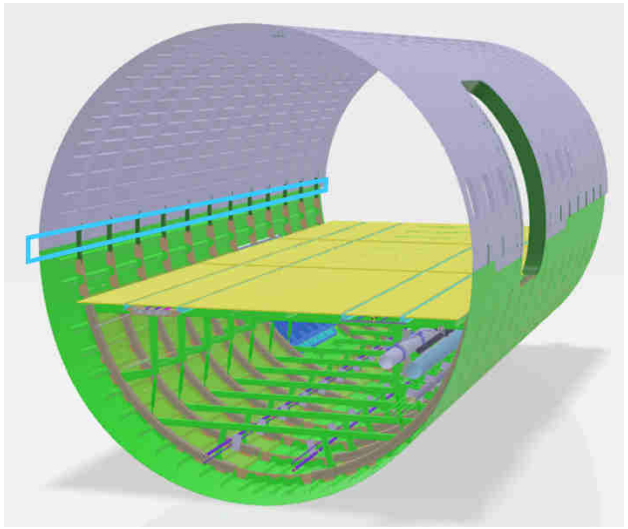
http://www.cleansky.eu/content/homepage/about-clean-sky-2

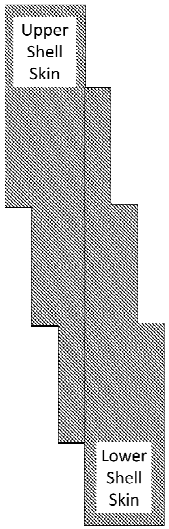
Clean Sky 2

# JTI-CS2-2020-CfP11-LPA-02-34

| | | | |
|---|---|---|---|
| Type of action (RIA/IA/CSA) | IA – Innovation Action | | |
| Programme Area (LPA/REG/FRC/AIR/ENG/SYS/SAT/ECO/TE) | LPA – Large Passenger Aircraft | | |
| (CS2 JTP 2015) WP Ref. | WP 2.1 Next Generation Fuselage, Cabin and Systems Integration | | |
| Indicative Funding Topic Value (in k€) | 1400 | | |
| Topic Leader* *full name of the organisation, no abbreviation | Airbus Operations GmbH | Type of Agreement | Implementation Agreement |
| Duration of the Action (in Months) | 30 | Indicative Start Date (at the earliest)[1] | Q4 2020 |

| Topic Identification Code | Topic Title |
|---|---|
| JTI-CS2-2020-CFP11-LPA-02-34 | Tooling, Equipment and Auxiliaries for the closure of a longitudinal Barrel Joint: Overlap joint and Frame Coupling integration |
| Short description | |
| Ultrasonic and resistance welding heads, auxiliary equipment and consumables for the closure of an 8m typical fuselage barrel need to be designed, manufactured, supplied and serviced on-site for this topic. Furthermore, following barrel closure, results need to be analysed and additional functionalities regarding improved in-situ monitoring and control integrated into the welding heads. | |



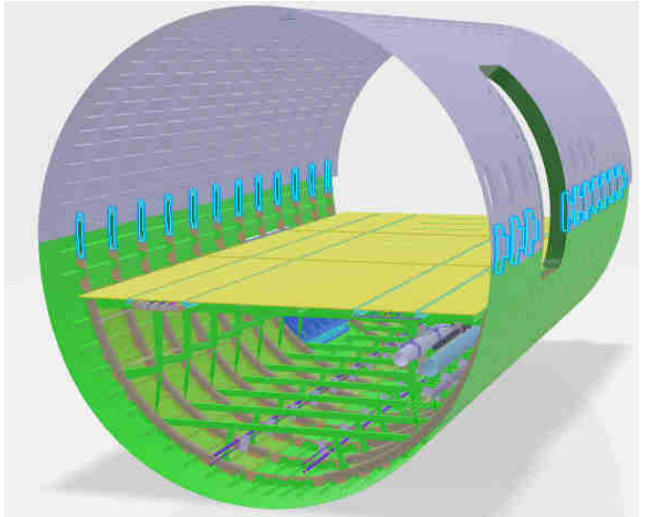



*Although unusual, the overlap joint design facilitates manufacturing and allows for significant compensation.*

# JTI-CS2-2020-CfP11-LPA-02-34

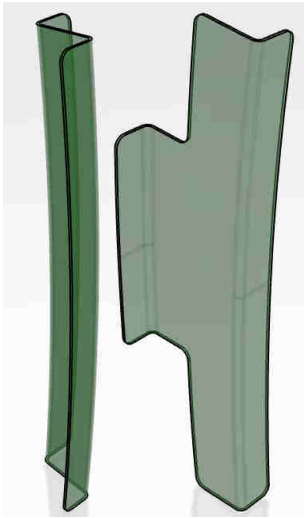
- **Tasks & Schedule**

| Tasks | | |
|---|---|---|
| **Ref. No.** | **Title - Description** | **Due Date** |
| T1 | Requirements analysis and Functional Breakdown | T+1M |
| T2 | Tooling Specific Design | T+6M |
| T3 | Tooling manufacturing and delivery | T+11M |
| T4 | On-site support | T+17M |
| T5 | Process performance verification and analysis | T+18M |
| T6 | Improved functionality implementation and verification on welding equipment | T+27M |
| T7 | Documentation and Dissemination | T+28M |
| T8 | Technological de-risking trials and simulation | T+30M |



- **Targeted applicant**: Partner(s) with proven experience in the supply of welding heads for thermoplastic welding.

- **Special skills, Capabilities, Certification expected from the Applicant(s)**:
- *(M) – Mandatory; (A) – Appreciated.*
  - In-depth project management in time, cost and quality together with evidence of past experience in large project participation (M)
  - Specific machine tool design, manufacture and support to industry (M)
  - Proven expertise in the provision of ultrasonic welding equipment (M)
  - Proven expertise in the development of resistance welding equipment (M)
  - Integration of electrically active and controlled members into CFRP material (M)
  - In-depth understanding of thermoplastic materials and welding thereof (M)
  - Online process monitoring and control for Quality Assurance (M)
  - In-house equipment for the chosen welding technologies (M)
  - Implementation of 3D Experience for the conduct of this project (M).
  - Experience with PAEK material family, preferably regarding welding (A)



*Two different types of Frame Couplings require integration by 2 and 3 welding zones respectively.*

JTI-CS2-2020-CfP11-LPA-02-35

# Innovative disbond arrest features for long thermoplastic welded joints

**Innovation Takes Off**

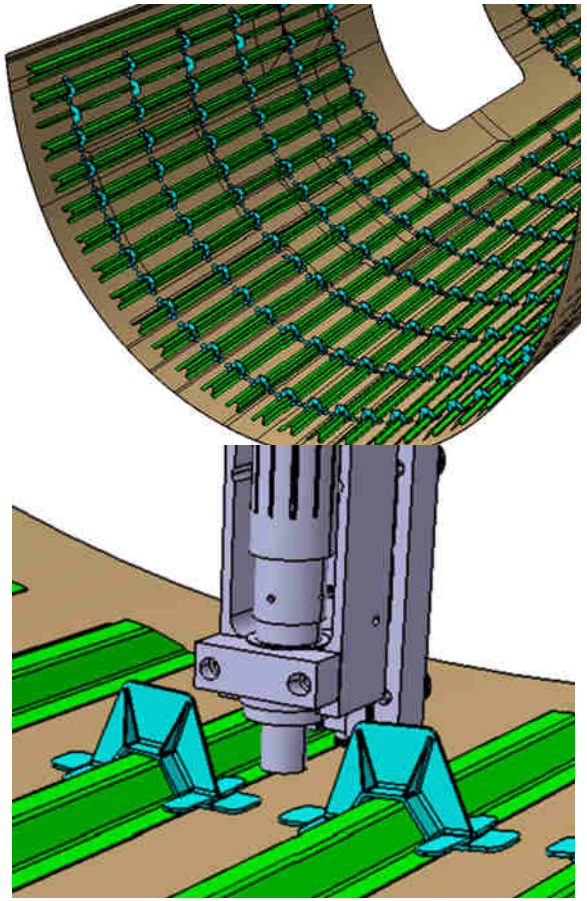
http://www.cleansky.eu/content/homepage/about-clean-sky-2

Clean Sky 2

# JTI-CS2-2020-CfP11-LPA-02-35

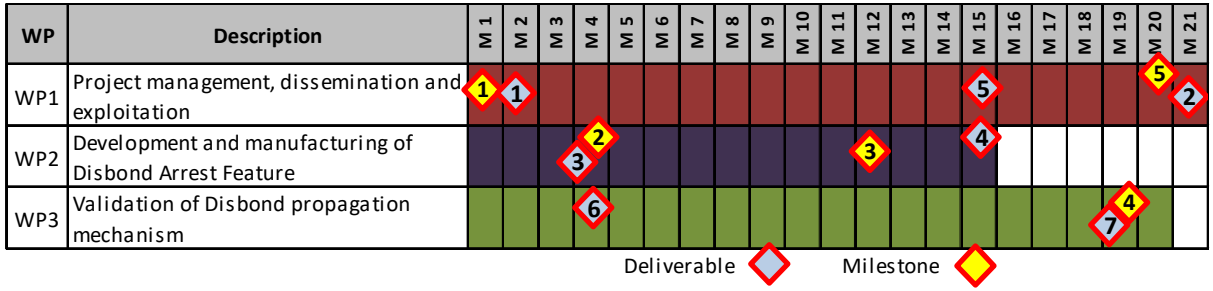
- **JTI-CS2-2020-CfP11-LPA-02-35**

- **Title:** *Innovative disbond arrest features for long thermoplastic welded Joints*
- **Objective:** In relation to the certification guidelines, the aim of this topic is to advance towards a certifiable joint with two main objectives:
  1. Exploration of novel disbond arrest features with particular emphasis on automated manufacturing process
  2. Physical validation of the influence of specific parameters i.e. material, DAF pitch and loading conditions on the disbond propagation mechanism resulting in some initial design guidelines.
- **Type of action**: IA
- **Volume:** 0.75 M€ funding



# JTI-CS2-2020-CfP11-LPA-02-35

## Schedule/Milestones:




| Deliverables | | | |
|---|---|---|---|
| ***Ref. No.*** | ***Title - Description*** | ***Type**** | ***Due Date*** |
| D1 | Project management, dissemination and exploitation plan | R | M2 |
| D2 | 2 peer reviewed journal articles | R, D | M21 |
| D3 | Manufacturing development plan for DAF installation | R | M4 |
| D4 | Evaluation report on demonstration of DAF installation | R,D | M19 |
| D5 | Industrialisation plan | R | M19 |
| D6 | Structural test plan | R | M4 |
| D7 | Test evaluation report inc. data | R, D | M19 |

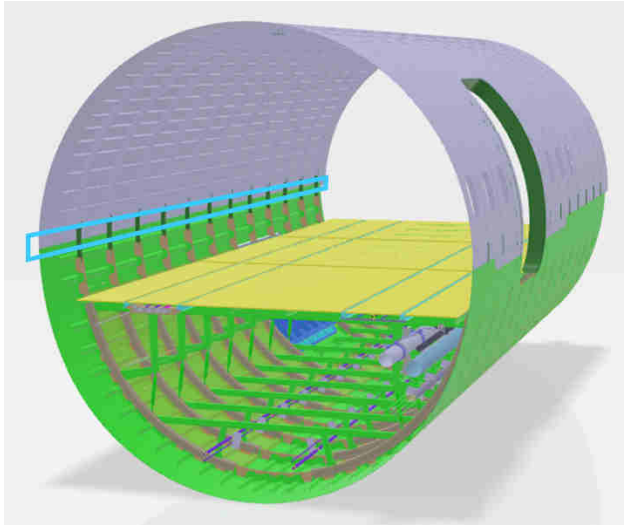
## Extract of Special skills / Capabilities:

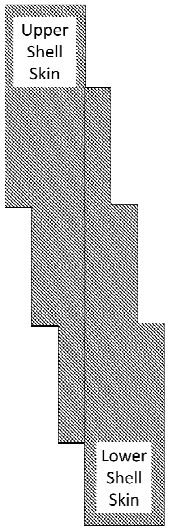
- The applicant should have a sound knowledge in structural testing of these structures as well as the capability to manufacturing test articles.
- Automated equipment for installation
- Functional structural tests, static and fatigue Familiar with Aerospace requirements TP processing capabilities, to produce test articles Experience in writing journal articles in the related field

# JTI-CS2-2020-CfP11-LPA-02-34

| | | | |
|---|---|---|---|
| Type of action (RIA/IA/CSA) | IA – Innovation Action | | |
| Programme Area (LPA/REG/FRC/AIR/ENG/SYS/SAT/ECO/TE) | LPA – Large Passenger Aircraft | | |
| (CS2 JTP 2015) WP Ref. | WP 2.1 Next Generation Fuselage, Cabin and Systems Integration | | |
| Indicative Funding Topic Value (in k€) | 1400 | | |
| Topic Leader* *full name of the organisation, no abbreviation | Airbus Operations GmbH | Type of Agreement | Implementation Agreement |
| Duration of the Action (in Months) | 30 | Indicative Start Date (at the earliest)[1] | Q4 2020 |

| Topic Identification Code | Topic Title |
|---|---|
| JTI-CS2-2020-CFP11-LPA-02-34 | Tooling, Equipment and Auxiliaries for the closure of a longitudinal Barrel Joint: Overlap joint and Frame Coupling integration |
| Short description | |
| Ultrasonic and resistance welding heads, auxiliary equipment and consumables for the closure of an 8m typical fuselage barrel need to be designed, manufactured, supplied and serviced on-site for this topic. Furthermore, following barrel closure, results need to be analysed and additional functionalities regarding improved in-situ monitoring and control integrated into the welding heads. | |






*Although unusual, the overlap joint design facilitates manufacturing and allows for significant compensation.*

# JTI-CS2-2020-CfP11-LPA-02-34

- **Tasks & Schedule**

| Tasks | | |
|---|---|---|
| **Ref. No.** | **Title - Description** | **Due Date** |
| T1 | Requirements analysis and Functional Breakdown | T+1M |
| T2 | Tooling Specific Design | T+6M |
| T3 | Tooling manufacturing and delivery | T+11M |
| T4 | On-site support | T+17M |
| T5 | Process performance verification and analysis | T+18M |
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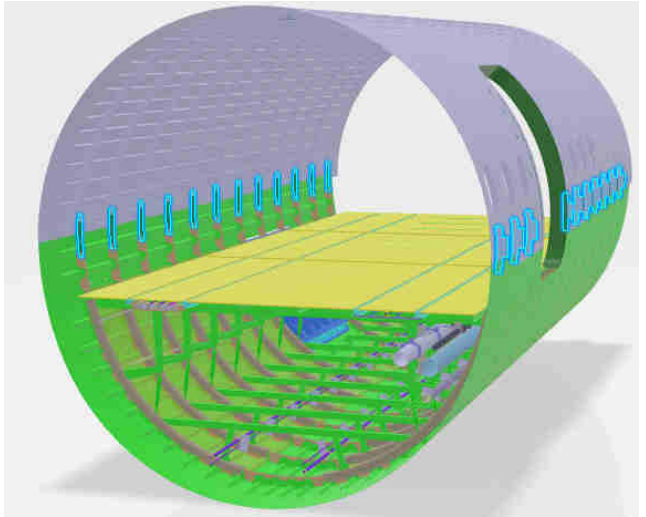
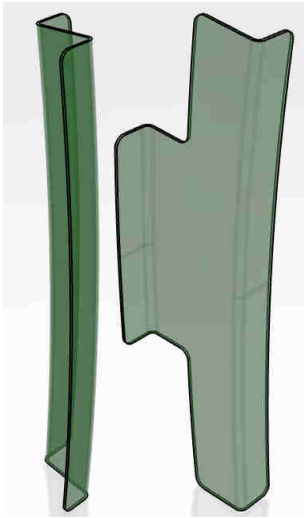
| T7 | Documentation and Dissemination | T+28M |
| T8 | Technological de-risking trials and simulation | T+30M |



- **Targeted applicant**: Partner(s) with proven experience in the supply of welding heads for thermoplastic welding.

- **Special skills, Capabilities, Certification expected from the Applicant(s)**:
- *(M) – Mandatory; (A) – Appreciated.*
  - In-depth project management in time, cost and quality together with evidence of past experience in large project participation (M)
  - Specific machine tool design, manufacture and support to industry (M)
  - Proven expertise in the provision of ultrasonic welding equipment (M)
  - Proven expertise in the development of resistance welding equipment (M)
  - Integration of electrically active and controlled members into CFRP material (M)
  - In-depth understanding of thermoplastic materials and welding thereof (M)
  - Online process monitoring and control for Quality Assurance (M)
  - In-house equipment for the chosen welding technologies (M)
  - Implementation of 3D Experience for the conduct of this project (M).
  - Experience with PAEK material family, preferably regarding welding (A)



*Two different types of Frame Couplings require integration by 2 and 3 welding zones respectively.*

JTI-CS2-2020-CfP11-LPA-02-36

# Large Scale Aircraft Composite Structures Recycling

**Innovation Takes Off**

http://www.cleansky.eu/content/homepage/about-clean-sky-2

Clean Sky 2

# JTI-CS2-2019-CfP11-LPA-02-36

| | | | |
|---|---|---|---|
| **Type of action (RIA/IA/CSA)** | IA | | |
| **Program Area** | LPA | | |
| **(CS2 JTP 2015) WP Ref.** | WP2.4 - Cabin and fuselage | | |
| **Indicative Funding Topic Value (in k€)** | 1800 | | |
| **Topic Leader** | Airbus | **Type of Agreement** | Implementation Agreement |
| **Duration of the action (in Months)** | 36 | **Indicative Start Date**[1] | Q4 2020 |

**Objective**: Within this project, methods for the salvaging, dismantling and recycling of a large transport aircraft with large, complex CFRP composite structures shall be investigated and demonstrated.

A special focus will be put on the areas of health and environment, with the physical means to protect environment and men during the dismantling process.

# JTI-CS2-2019-CfP11-LPA-02-36

- **Schedule/Milestones**

| Milestones (when appropriate) | | | |
|---|---|---|---|
| Ref. No. | Title - Description | Type* | Due Date |
| M1 | Legal, safety and environmental framework report and commercial assessment | R | T0+12 |
| M2 | Dismantling technologies and logistics concept | HW; R | T0+18 |
| M3 | Physical trials performed | HW; R | T0+24 |
| M4 | LCA assessment | R; D | T0+30 |
| M5 | Full supply chain concept proposal | R | T0+32 |
| M6 | Final presentation of results | R | T0+36 |

*Type: R=Report, D=Data, HW=Hardware

- **Targeted applicant & Required skills**:

- Targeted applicants: Dismantling experts, environmental legislation of dismantling, composite experienced recyclers
- Proven experience in the **dismantling of carbon fiber composite parts and handling of large scale structures.**
- D**edicated organisation for environmental safety or access to such**.
- **Detailed knowledge about the state of the art in carbon fiber materials, their recycling and processing technologies as well as existing markets and legal barriers**.
- One of the applicants has to have a dedicated R&D department for material and process research to cover the development of novel de-bonding methods.
- Capability to measure and collect economic process data for industrial processes.
- Applicant requires details knowledge about legal requirements in an airport surrounding or access to such

JTI-CS2-2019-CFP11-LPA-02-37

# Thermoplastic repair process integrated on manufacturing line for all fuselage configuration (TpRep)

**Innovation Takes Off**

http://www.cleansky.eu/content/homepage/about-clean-sky-2

Clean Sky 2

# JTI-CS2-2019-CFP11-LPA-02-37

| | | | |
|---|---|---|---|
| **Type of action (RIA/IA/CSA)** | **IA** | | |
| **Programme Area (LPA/REG/FRC/AIR/ENG/SYS/SAT/ECO/TE)** | LPA | | |
| **(CS2 JTP 2015) WP Ref.** | WP 2.4 | | |
| **Indicative Funding Topic Value (in k€)** | 800k€ | | |
| **Topic Leader** | AIRBUS | **Type of Agreement** | Implementation Agreement |
| **Duration of the Action (in Months)** | 30 | **Indicative Start Date** | Q4 2020 |

**Objective:**

Development of Repair / Rework capabilities (structural and non-Structural) for Thermoplastic Fuselage Structures within Platform 2 to be applicable for WP 2.1 and WP2.3.
The development is targeting the integration process, the industrialization on demonstrator level and the validation of the mechanical properties incl. state of the art NDI inspections of the final repair

## Stream 1: Welded Hard Patch

- pre-manufactured hard thermoplastic patches of the parent material
- integrated into the parent structure by means of welding

## Stream 2: In-Situ Patch creation

- layer-by-layer approach for structural repair
- 3D printing or shortfiber approach for non-structural repair
- solutions with one-side accessibility are preferred

Targeted Maturity for both streams at End of Project: TRL3

# JTI-CS2-2019-CFP11-LPA-02-37

| Tasks | | |
|---|---|---|
| | Title - Description | Due Date |
| T1 | Definition of Requirements | T0+2 |
| T2 | Screening and qualitative comparison of possible welding technologies for hard patch repair for Single Part, MCA and FAL application | T0+6 |
| T3 | Screening and qualitative comparison of possible technologies for In-Situ Repair Patch creation for Single Part, MCA and FAL application | T0+6 |
| T4 | Development and validation of Hard Patch Welding solution on coupon and element level (TRL3) | T0+24 |
| T5 | Development and validation of In-Situ-Repair-Patch Solution on coupon and element level (TRL3) | T0+30 |
| T6 | Demonstration of transfer on structural detail level (FAL/MCA) and demonstrator applicability | T0+35 |
| T7 | Technology comparison, applicability mapping and Roadmap to TRL6 | T0+36 |

| Milestones | | |
|---|---|---|
| | Title - Description | Due Date |
| Mil 1 | Down selection on welding technology for hard patch repair to be investigated in Task 4 with Topic Manager | T0+6 |
| Mil 2 | Down selection on technology for In-Situ Repair Patch creation to be investigated in Task 5 with Topic Manager | T0+6 |
| Mil 3 | TRL 3 for of Hard Patch Welding solution | T0+18 |
| Mil 4 | TRL 3 for In-Situ-Repair-Patch solution | T0+24 |
| Mil 5 | Final Review for Demonstrator application readiness | T0+29 |

| Deliverables | | |
|---|---|---|
| Ref. | Title - Description | Due Date |
| Del 1 | Requirement Summary | T0+2 |
| Del 2 | Comparison of possible welding technologies for Hard Patch Integration | T0+6 |
| Del 3 | comparison of possible technologies for In-Situ Repair Patch creation (Structural & Non-Structural) | T0+6 |
| Del 4 | TRL 3 for of Hard Patch Welding solution | T0+18 |
| Del 5 | TRL 3 for In-Situ-Repair-Patch solution | T0+24 |
| Del 6 | Report on demonstration on structural detail level (FAL/MCA) and demonstrator applicability | T0+29 |
| Del 7 | Technology comparison, applicability mapping and Roadmap to TRL6 | T0+30 |

**Required skills**

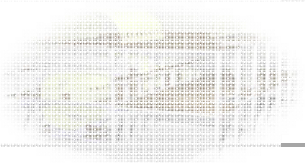
- Deep knowledge on thermoplastic composite materials and chemical processes associated to thermoplastics
- Knowledge in design of primary aircraft components made of composites
- Knowledge on composite patch repair
- Design tool for composite components
- Laboratory for physical, chemical, mechanical and optical/microscopy examination of composite materials
- Laboratory for thermoplastic component prototype manufacturing for preliminary developments and repair realization

# CS2 Large Passenger Aircraft - WBS

Overall Aircraft Design

LPA (Airbus)

Structure Design



System Design

Platform 1 – WP 0
Advanced Engine & Aircraft Configuration

- WP1.1 Short/Medium Range Aircraft Power Plant System Integration
- WP1.2 Advanced Rear-end
- WP1.3 Validation of Scaled Flight Testing
- WP1.4 Hybrid Laminar Flow Control Large Scale Demonstrator
- WP1.5 Applied Technologies for Enhanced Aircraft Performance
- WP1.6 Demonstration of Radical Aircraft Configurations

Platform 2 – WP 0
Innovative Physical Integration Cabin-System-Structure

- WP 2.1 Next generation fuselage, cabin and systems integration
- WP 2.2 Next generation cabin & cargo functions
- WP 2.3 Next generation lower centre fuselage
- WP 2.4 Non-specific cross functions

**Platform 3 – WP 0**
Next Generation Aircraft, Cockpits Systems & Avionics

- **WP 3.1** Enhanced flight operations & functions — **LPA 03-19**
- **WP 3.2** Innovative enabling technologies
- **WP 3.3** Next generation cockpit functions flight demonstration
- **WP 3.4** Enhanced cockpit demonstration
- **WP 3.5** Disruptive cockpit demonstration
- **WP 3.6** ADVANCE (Maintenance)

- WP 0.1 Technology assessment
- WP 0.2 EcoDesign
- WP 0.3 ITD - Interfaces

JTI-CS2-2019-CFP11-LPA-03-19

# Concept for Pilot State Monitoring system operation in commercial aviation

**Innovation Takes Off**

http://www.cleansky.eu/content/homepage/about-clean-sky-2

Clean Sky 2

# JTI-CS2-2020-CFP11-LPA-03-19

| | | | |
|---|---|---|---|
| **Type of action (RIA/IA/CSA):** | | IA | |
| **Programme Area:** | | LPA | |
| **(CS2 JTP 2015) WP Ref.:** | | WP 3.1 | |
| **Indicative Funding Topic Value (in k€):** | | 800 | |
| **Topic Leader:** | Honeywell International | **Type of Agreement:** | Implementation Agreement |
| **Duration of the action (in Months):** | 24 | **Indicative Start Date (at the earliest)[38]:** | > Q4 2020 |

| **Topic Identification Code** | **Title** |
|---|---|
| JTI-CS2-2020-CFP11-LPA-03-19 | Concept for Pilot State Monitoring system operation in commercial aviation |
| **Short description** | |
| The topic aims to develop Pilot State Monitoring system in the cockpit providing crucial feedback of the pilot state to yield faster decision making, reduce the probability of pilot errors and enhance the fatigue risk management. The project foresee collection of operational data, experience during nominal operations for both short and long-haul flights and the development of associate concept of operations. The concept should address envisioned use cases, identify benefits, operational constraints, risks and mitigation strategies and evaluate possible future use of the system from end users such as airlines, aircraft operators and training centres. | |

# JTI-CS2-2020-CFP11-LPA-03-19

- **Objective:** This task will cover the installation of a Pilot State Monitoring system onboard a commercial aircraft (either a large commercial aircraft and/or a Business Jet) and gathering pilot's feedback and various operational data in a real operational environment. The foreseen requirements for the feedback and data collection are:
  - The installation and setup of the PSM system in the aircraft cockpit.
  - Feedback from the installation/setup.
  - Concept of operations of the system and the assessment of its benefits for both flight safety and operation efficiency of crews and airlines.
- **Tasks and schedule**
  - Expected start date: Q4/2020

| **Tasks** | | |
|---|---|---|
| ***Ref. No.*** | ***Title – Description*** | ***Due Date*** |
| Task 1 | Definition of high-level specifications and requirements for system installation and setup | T0 + 3m |
| Task 2 | Specification of methodologies for feedback and data collection | T0 + 4m |
| Task 3 | Installation of Pilot Monitoring system into the A/C (phase 1) | T0 + 7m |
| Task 4 | Data and feedback collection, definition of PSM concept of operations (phase 1) | T0 + 13m |
| Task 5 | PSM usability feedback 1 | T0 + 14m |
| Task 6 | Redefinition of high-level specifications and requirements for system installation and setup for phase 2 | T0 + 16m |
| Task 7 | Installation of Pilot Monitoring system into the A/C (phase 2) | T0 + 17m |
| Task 8 | Acceptance analysis | TO + 18m |
| Task 9 | Data and feedback collection, definition of PSM concept of operations (phase 2) | T0 + 22m |
| Task 10 | Pilot Monitoring sensors and usability feedback 2 | T0 + 23m |
| Task 11 | Final evaluation / Acceptance analysis update | T0 + 24m |

# JTI-CS2-2020-CFP11-LPA-03-19

- **Targeted applicant:** partner operating a mix of short-haul and long-haul aircraft (either a large commercial aircraft and/or a Business Jet) with possibility to collect pilot‘s feedback and data from provided sensors.

- **Desired skills:**
  - Airline operating both short-haul and long-haul flights
  - Airline willing to purchase the aviation grade vision system specified by topic manager
  - Other A/C operators (business aviation, flight test aircraft, etc.) operating short-haul and long-haul flights

- **Advantageous skills:**
  - Operator with diversified pilot population (gender, origin, age, …)

# Questions?

Any questions on the 11th Call for Proposals can be addressed to the following mailbox:

Info-Call-CFP-2020-01@cleansky.eu

Last deadline to submit questions – check CS2 website

Thank you !

# Thank You

Clean Sky 2

AIRBUS
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AIRBUS HELICOPTERS

AgustaWestland
A Finmeccanica Company

Alenia Aermacchi
A Finmeccanica Company

DASSAULT AVIATION

DLR

EADS CASA

evektor

Fraunhofer

LIEBHERR

MTU Aero Engines

PIAGGIO AERO

Rolls-Royce

SAFRAN

SAAB

THALES

**Disclaimer**

- The content of this presentation is **not legally binding and subject to modifications and evolution over the info days on Clean Sky 2** until the adoption of the Regulation on *Clean Sky 2 JU*. **Any updated version will be regularly advertised on the website of the Clean Sky JU.**
- The selection of Partners will be based on Horizon 2020 Rules for Participation **(already in force)**, the rules for submission of proposals, evaluation and selection of Partners as adopted by the Governing Board of Clean Sky 2 JU .
- The proposed content/approach is based on the consultation with the "National States Representative Group" and the "Task Force " of the *Clean Sky 2* Programme
- A dedicated functional mailbox is available to any interested applicants for any further questions related to this Call: XXXX to be inserted.