



- **Innovation Takes Off**

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Outline

1. General info:
 - CS/CS2,
 - call related,
 - CPW04, Cfp05, CfP06
2. CfP05
3. CfP06 Preliminary Overview of AIR and REG topics – Jose-Garcia Navarro
4. CfP06 – AH topics
5. CPW04 – FRC topics
6. CfP06 – FRC topics
7. Q&A

Clean Sky JTI – response to challenges

Extended and Enhanced efforts in CS2 / H2020

EXAMPLE: ACARE SRA 50% CO₂ reduction targeted by 2020



2020



2035



2050



Clean Sky goal: >30% CO₂ reduction vs 2000 at high TRL, building on earlier research

Clean Sky 2 goal: 20-30% CO₂ reduction vs. 2014 SoA ready for next generation of aircraft 2025 - 2035

ACARE SRIA: 75% CO₂ reduction targeted by 2050



Clean Sky organization Integrated Technology Demonstrators



CO₂ emissions reduced by 50%
NO_x emissions reduced by 80%
Noise reduced by 50%

Smart Fixed Wing Aircraft
Airbus (F, D, UK, E)
SAAB (SE)
Green Regional Aircraft
Alenia Aeronautica (I)
EADS CASA (E)
Green Rotorcraft
AgustaWestland (I, UK)
Eurocopter (F, D)
Sustainable and Green Engines
Rolls-Royce (UK, D)
Safran (F)
Systems for Green Operation
Thales (F)
Liebherr (D)
Ecodesign
Dassault Aviation (F)
Fraunhofer Gesellschaft (D)
Technology Evaluator
Thales
DLR



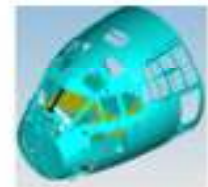
Addressing H2020 Transport Challenge Areas

Energy Efficiency & Environment

Enabling Safe & Seamless Mobility

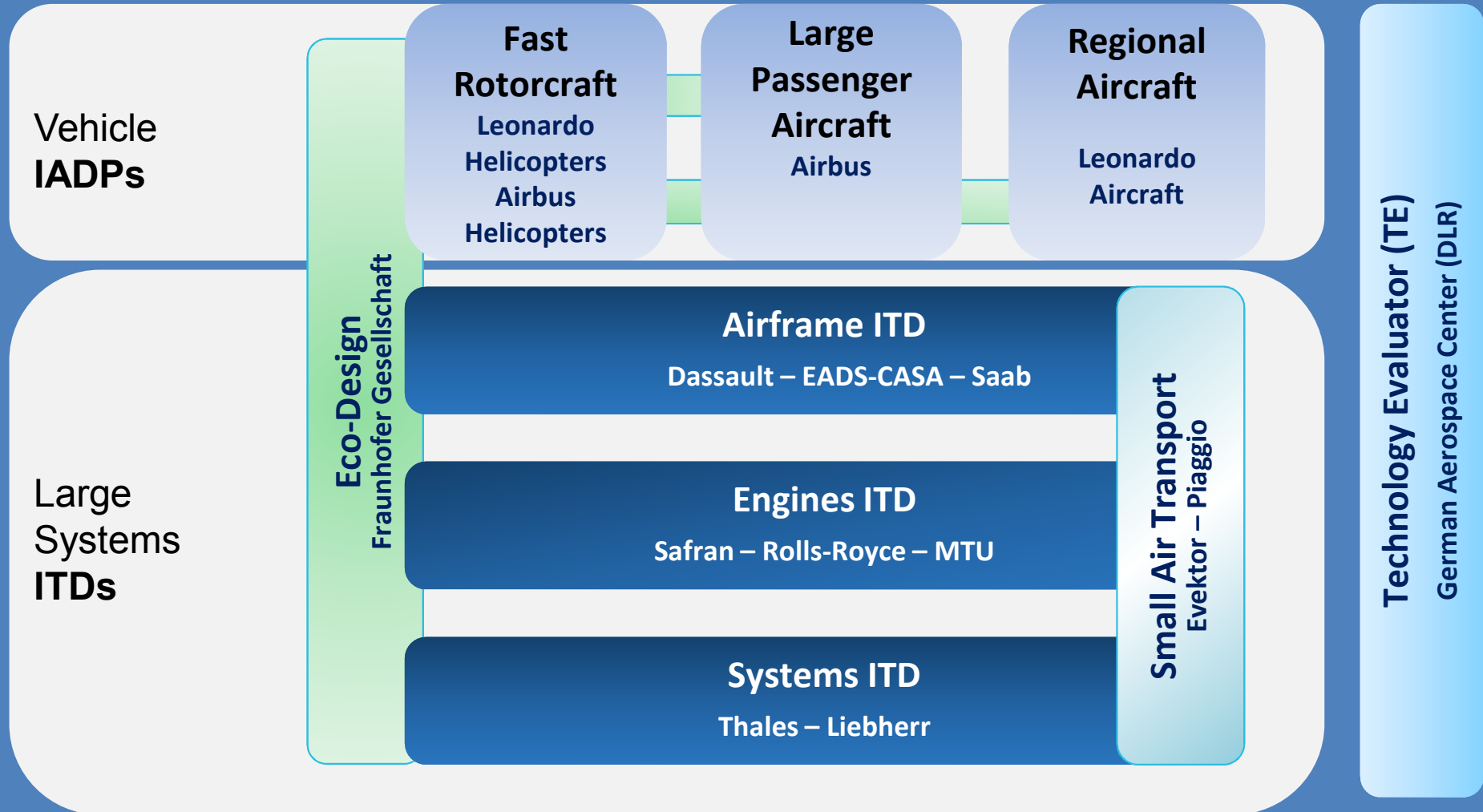


Building industrial leadership in Europe



Clean Sky 2 Programme

EU Funding: ~1.8bn€
Private Members: ~2.2bn€



*Building on Clean Sky, going further into integration at full aircraft level
And developing new technology streams for the next generations of aircraft*

Basic definitions

The RIA, IA and CSA grants:

- **research and innovation actions (RIA):** R&D **aiming to establish new knowledge** or explore the feasibility of a new technology, product, process, service or solution (including basic and applied research, technology development and integration, testing and validation on a small-scale prototype in a laboratory or simulated environment)
- **innovation actions (IA):** innovation activities directly **aiming at producing plans and arrangements or designs for new, altered or improved products, processes or services** (including prototyping, testing, demonstrating, piloting, large-scale product validation and market replication)
- **coordination and support actions (CSA):** **accompanying measures** (*such as standardisation, dissemination, awareness-raising and communication, networking, coordination or support services, policy dialogues and mutual learning exercises and studies*).

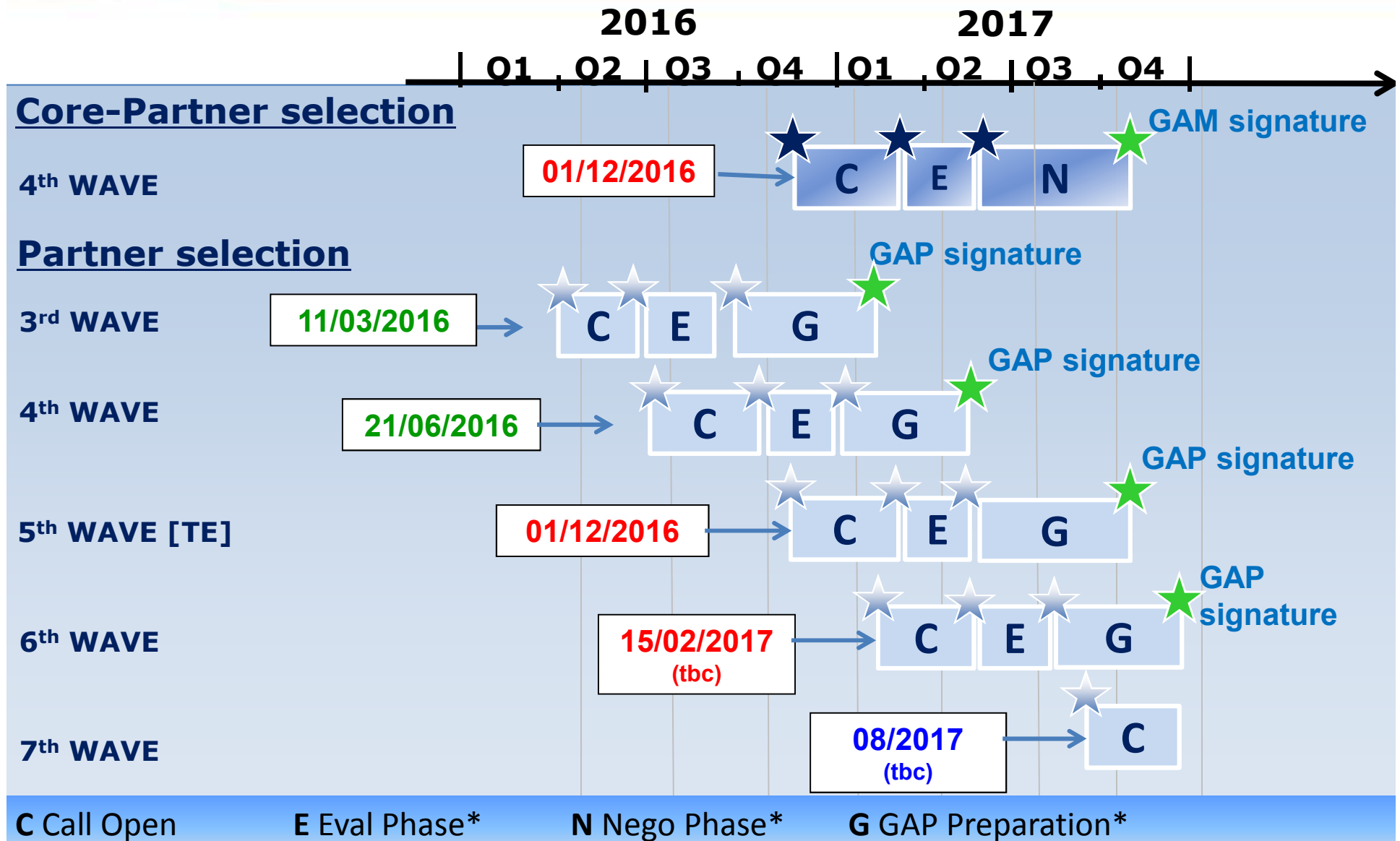
Funding Rates

The funding rates:

- H2020 **Innovation Action** category (IA):
 - Not-for-Profit organisations foreseen to be funded at **100%** of total eligible cost in accordance with the H2020 Regulation
 - For-Profit Participants (large and small) should be funded **70%** of total eligible cost
- H2020 **Research and Innovation Action** category (RIA):
 - Not-for-Profit organisations foreseen to be funded at **100%** of total eligible cost in accordance with the H2020 Regulation
 - For-Profit Participants (large and small) should be funded **100%** of total eligible cost

Type of actions	Non profit Organisations	Other type of organisations
RIA	100/25	100/25
IA	100/25	70/25

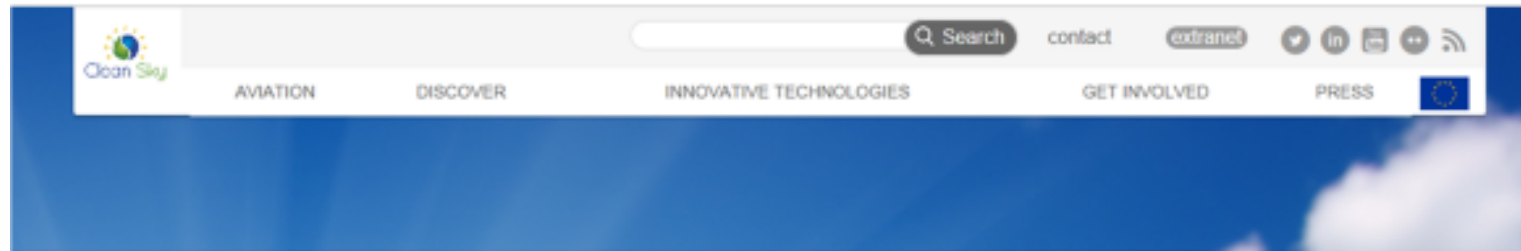
Overall High-level Call Planning for 2016-2017 (planned)



*These phases includes the GB Approval Period

Calls – where to find?

<http://www.cleansky.eu/calls>



Home > Get Involved > Calls



Calls



Latest Call news

- The 5th Call for Proposals (CfP05) and the 4th Call for Core Partners are now open
- The Sixth Call for Proposals [CfP06] will be launched mid-February 2017 via the European Commission Participant Portal. The preliminary list of topics and topic descriptions is accessible [here](#).

What is a Clean Sky Call?

There are two types of calls under Clean Sky 2, published on this website.

Calls for Core Partners – selection of long-term partners expected to make a substantial commitment to Clean Sky 2 and its programme activities. Core Partners are officially **Members** of the Clean Sky Joint Undertaking.

4th Call for Core Partners

Overview of number of topics and total funding value per SPD

Area	No. of topics	Indicative topic Funding (M€)
IADP Large Passenger Aircraft	3	23.65
IADP Regional Aircraft	0	0
IADP Fast Rotorcraft	1	11
ITD Airframe	0	0
ITD Engines	0	0
ITD Systems	3	19
Small Air Transport (SAT) Transverse Area	0	0
ECO Transverse Area	0	0
Technology Evaluator 2	0	0
TOTAL	7	53.65

- **Call Open: 1st December 2016**
- **Call Closure: 9th March 2017**

5th Call for Partners

Overview of number of topics and total funding value per SPD

Topic Identification Code	Topic Title	Topic Ind. Value (Funding in M€)
JTI-CS2-2016-CFP05-TE2-01-01	Airport Level Assessment (Fixed-wing)	0,550
JTI-CS2-2016-CFP05-TE2-01-02	Airport and ATS Level Assessment (Rotorcraft)	0,550
JTI-CS2-2016-CFP05-TE2-01-03	ATS Level business jet 2035 forecast	0,120
JTI-CS2-2016-CFP05-TE2-01-04	ATS Level Rotorcraft 2035 forecast	0,150
JTI-CS2-2016-CFP05-TE2-01-05	ATS Level SAT 2035 forecast	0,150

- Call Open: 1st December 2016
- Call Closure: 3rd March 2017

CfP05 – 3 Forecast calls (1/3)

List of Topics for Calls for Partners (CFP05)

Identification Code	Title	Type of Action	Ind. Value (Funding in M€)	Topic Leader
JTI-CS2-2016-CFP05-TE2-01-03	ATS Level business jet 2035 forecast	CSA	0,120	DLR
JTI-CS2-2016-CFP05-TE2-01-04	ATS Level Rotorcraft 2035 forecast	CSA	0,150	DLR
JTI-CS2-2016-CFP05-TE2-01-05	ATS Level SAT 2035 forecast	CSA	0,150	DLR

Demand and movement forecasts up to 2035:

- Business Jets
- Small Air Transport (SAT)
- Rotorcraft (FRC)

CfP05 – 2 Assessment calls (2/3)

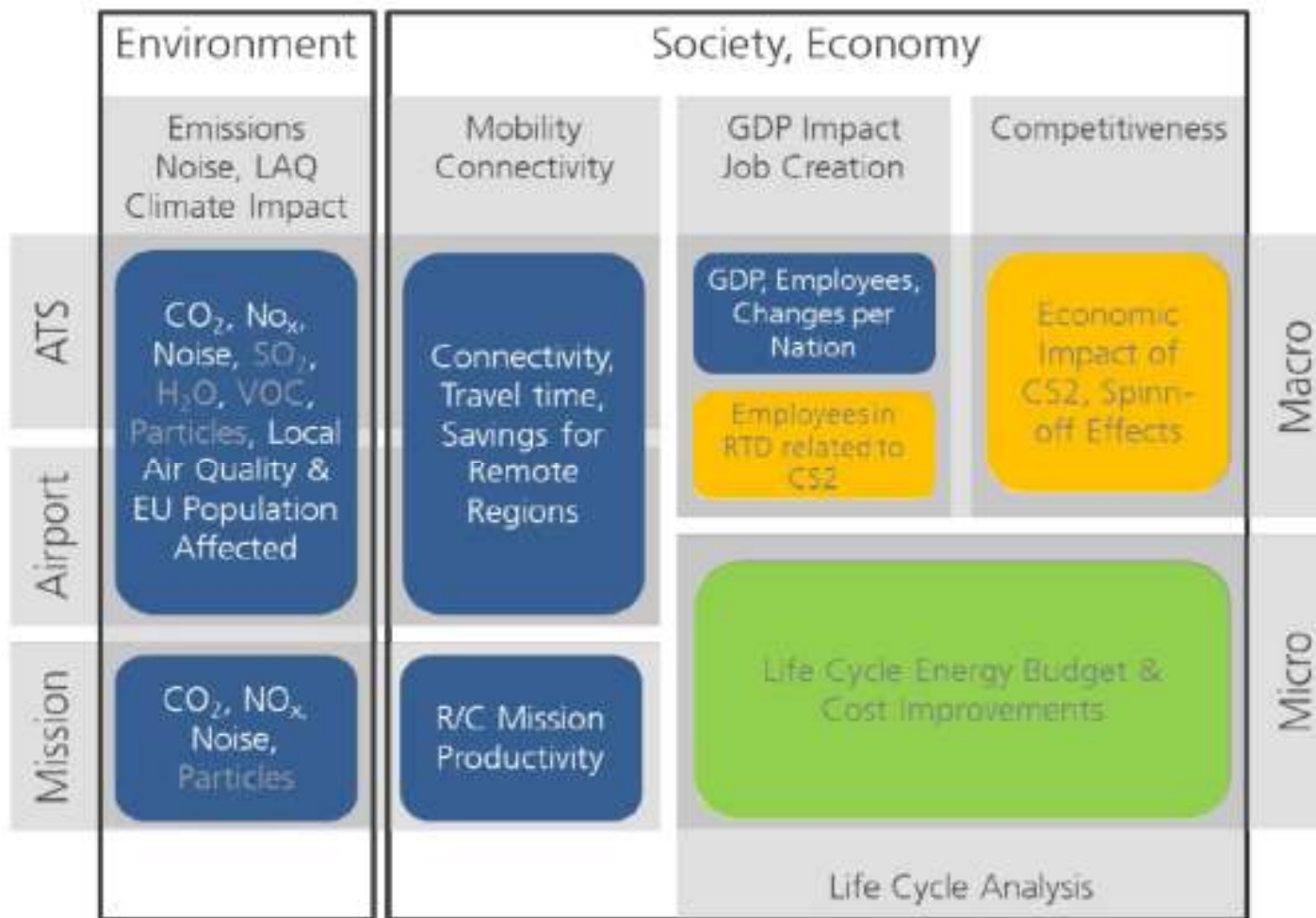
List of Topics for Calls for Partners (CFP05)

Identification Code	Title	Type of Action	Ind. Value (Funding in M€)	Topic Leader
JTI-CS2-2016-CFP05-TE2-01-01	Airport Level Assessment (Fixed-wing)	RIA	0,550	DLR
JTI-CS2-2016-CFP05-TE2-01-02	Airport and ATS Level Assessment (Rotorcraft)	RIA	0,550	DLR

2 sorts of assessments:

- Airport level assessments for fixed wing aircraft fleets
- Airport and Air Transport level assessments for rotorcraft fleets

CfP05 – Assessment (3/3)



6th Call for Partners

Overview of number of topics and total indicative funding value per SPD

SPD Area	No. of topics	Total indicative funding value (in M€)
IADP Large Passenger Aircraft	17	15,48
IADP Regional Aircraft	2	2,00
IADP Fast Rotorcraft	11	11,05
ITD Airframe	17	14,15
ITD Engines	14	15,77
ITD Systems	14	11,35
Small Air Transport (SAT) Transverse Area*	[2]	[1,6]
ECO Design Transverse Area	0	0
Technology Evaluator	0	0
TOTAL	75	69,80

Note: Figures in brackets indicate that these activities are identified as having benefits for the Transverse Areas i.e. SAT and ECO Design but which launch and budget reside inside the concerned SPDs and not in the Transverse Areas as such.

- Pre-publication via JU website: 20 Jan 2017
- Indicative Call opening: >15 Feb 2017
- Indicative Call closure: **17 May 2017**

CfP06 Preliminary Overview of AIR and REG topics
Jose-Garcia Navarro

**FRC:
CPW04 & CfP06**

**Contributors:
Philippe CABRIT, Airbus Helicopters
Luigi Ricci MORETTI, LEONARDO HD**

WP1 NextGenCTR

Lead: Leonardo Hel.

Clean Sky 2 – Fast Rotorcraft IADP

- I. Low-speed Air Data Sensor for Tilt-rotor Control
- II. Contactless measurement system for real time monitoring of proprotor flapping angle
- III. Interactional aerodynamic assessment of advanced Tilt Rotor configuration

- IV. Lateral rotor noise prediction dedicated to low noise footprint optimisation of a compound helicopter
- V. Emergency Exits and Cabin Footstep for the Fast Rotorcraft
- VI. Lateral rotor declutching mechanism for a fast compound rotorcraft
- VII. Enhanced gear strength through cavitation peening technologies ([Avio Aero](#))
- VIII. Hybrid bearing technologies ([Avio Aero](#))
- IX. Fuel System Detail Development, Testing and Manufacturing
- X. Compound Rotorcraft Assembly tooling
- XI. Rotor's Flight Test Instrumentation on demonstrator Fast Rotorcraft Project

WP2 LifeRCraft

Lead: Airbus Hel.

CfP06 – Airbus Helicopters

FRC – Filling the Mobility Gap

MISSIONS

EMS, SAR,
Coast guard
Disaster relief
Oil & Gas offshore

Corporate Transport
Air Taxi

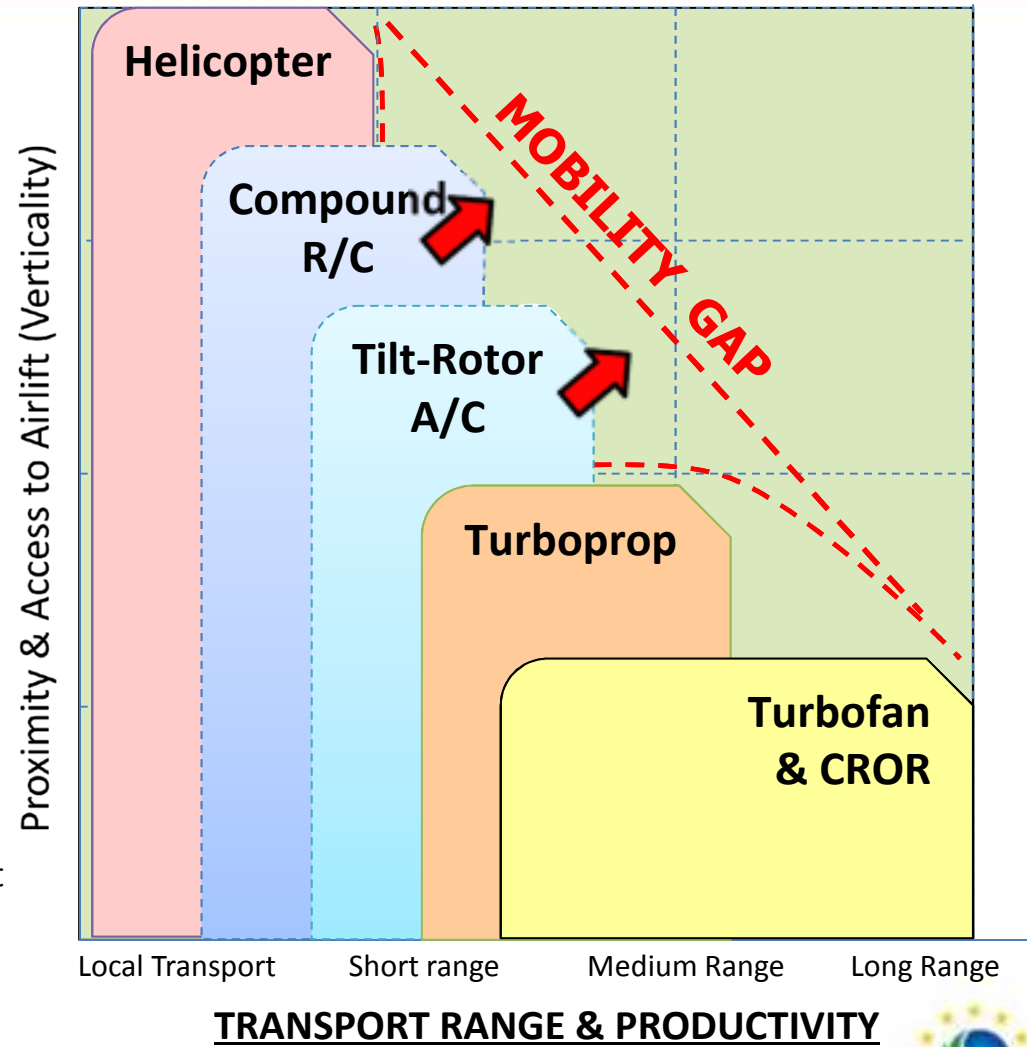
AIRFIELD

Unprepared Area
Helideck
Door-to-Door

Heliport
Local airfield

Regional
Airport

Large
Airport



LifeRCraft ⁽¹⁾ - The Compound Rotorcraft

A new game-changing rotorcraft

Not an airplane, better than a helicopter:
a compound VTOL* architecture that retains
the best of both aircraft types

Unique capabilities:

- ✓ Hover/Vertical flight: as good as helicopter
- ✓ Cruise speed exceeding 220 kt (410 km/h)

Enabling to meet expectations for door-to-door mobility, environment protection, citizens' health & safety:

- ✓ Shorter time for Rescue & Emergency, Air Taxi
- ✓ Acoustic footprint & CO2 emission lower than helicopter
- ✓ Eco-friendly materials, greener life cycle

Thanks to a comprehensive demonstration that will:

- ✓ De-risk the integration of this new configuration thru the supply chain
- ✓ Pave the way for development & marketing prior non-EU competitors to secure market share of European rotorcraft industry.



Continue with LifeRCraft
To prepare a competitive product



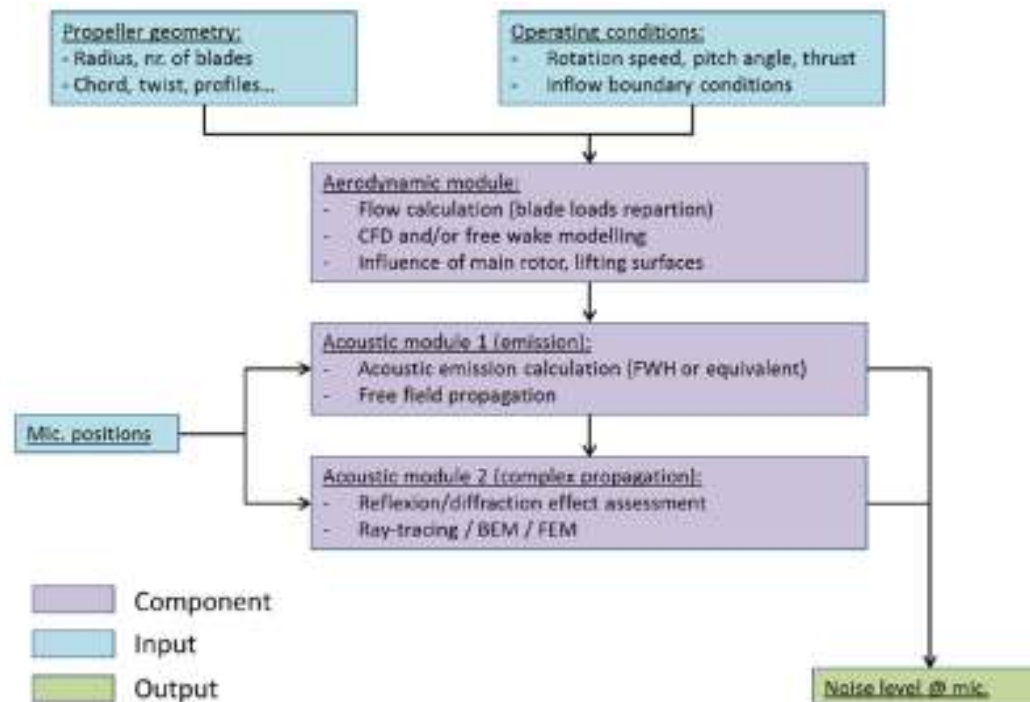
⁽¹⁾ LifeRCraft= Low Impact, Fast & Efficient RotorCraft. CS2 Info Day CfP06, Lisbon 03.02.2017

NB: images may not reflect CS2 demonstrator sizing & components (for illustration purpose only)

(*) VTOL: Vertical Take-Off & Landing

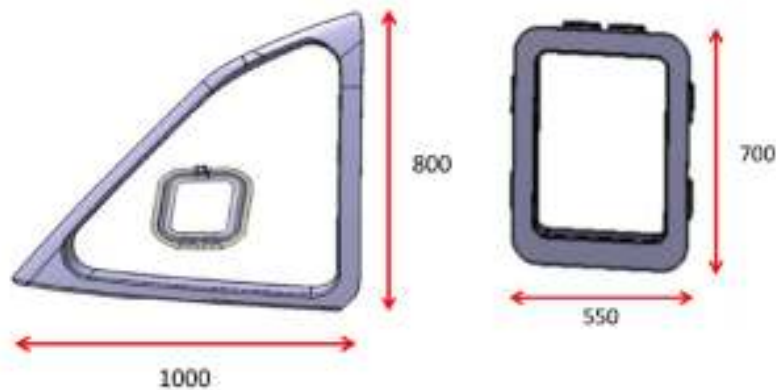
FRC-02-17: Lateral rotor noise prediction dedicated to low noise footprint optimisation of a compound helicopter

- Topic Manager: **Airbus Helicopters** ; collab.= Implementation Agreement
- Indicative Funding Value, duration: **0,800 M€ ; 36 Months**
- Type of Action: **RIA**
- Overview: The aim of this topic is to develop a computation tool for prediction of noise of the lateral rotors installed on a compound helicopter. This tool is to be used afterwards to optimise flight path in order to obtain low noise footprint.

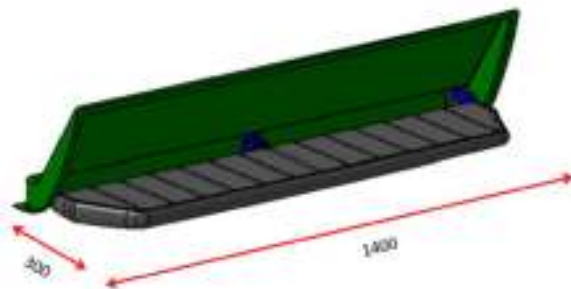


FRC-02-21: Emergency Exits and Cabin Footstep for the Fast Rotorcraft

- Topic Manager: **Airbus Helicopters** ; collab.= Implementation Agreement
- Indicative Funding Value, duration: **0,700 M€ ; 60 Months** (including support to flight tests)
- Type of Action: **IA**



Emergency exit for cockpit and cabin



Foldable foot step

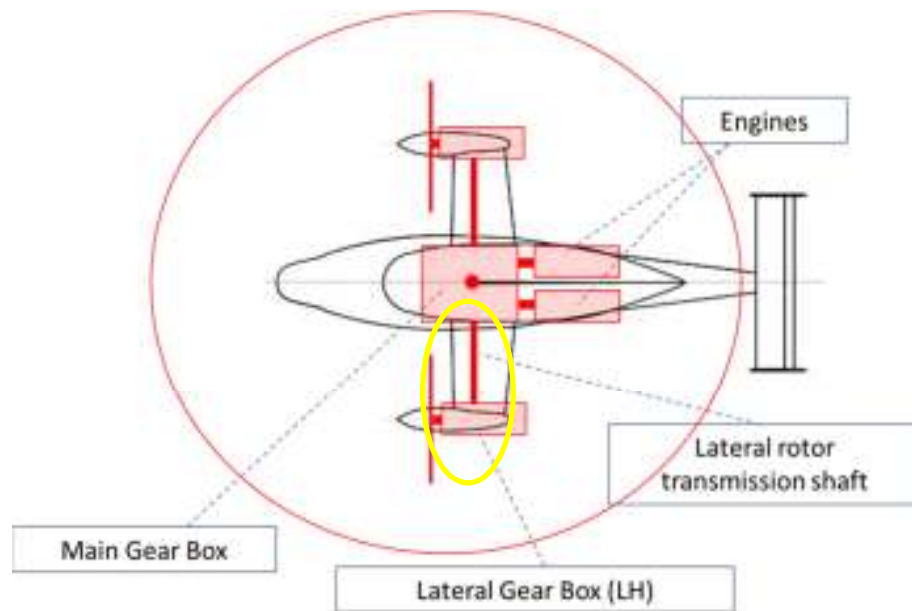
Overview: This project consists of the design, manufacturing, assembly and documentation of the Emergency Exits and Cabin Footstep for Search and Rescue missions.

The support during final assembly line and flight test phase is also included in this work package.

The Emergency Exits must ensure the evacuation of the aircraft according to CS29 and the latest recommendations provided by the airworthiness authorities.

FRC-02-22: Lateral rotor declutching mechanism for a fast compound rotorcraft

- Topic Manager: **Airbus Helicopters** ; collab.= Implementation Agreement
- Indicative Funding Value, duration: **0,900 M€ ; 36 Months**
- Type of Action: **IA**



Architecture of transmission: clutch to be installed in Lateral rotor drive chain

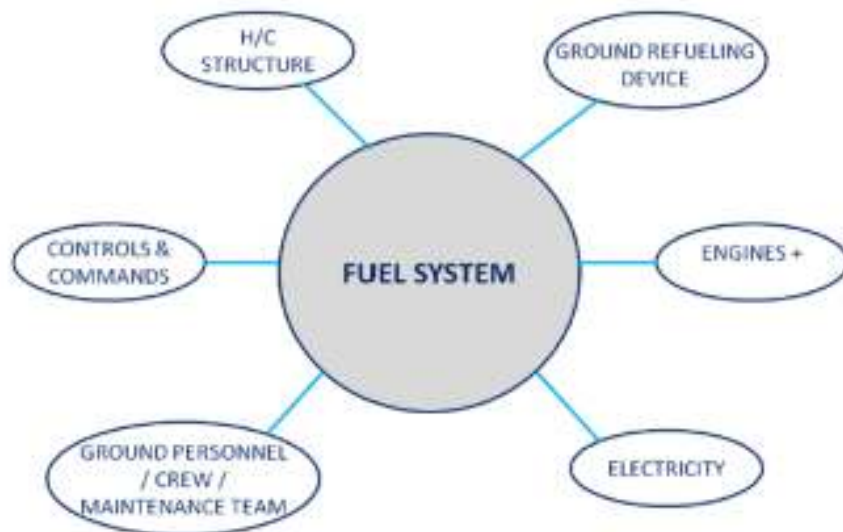
Overview: The aim of this topic is to study, design, manufacture and test a demonstrator of a declutching device that could be integrated in the drive system of the LifeRCraft to allow stopping one lateral rotor without stopping the whole dynamic system.



*Illustration of a declutching device
(only for information - not to be considered as the expected solution)*

FRC-02-25: Fuel System Detail Development, Testing and Manufacturing

- Topic Manager: **Airbus Helicopters** ; collab.= Implementation Agreement
- Indicative Funding Value, duration: **1,500 M€ ; 60 Months** (including support to flight tests)
- Type of Action: **IA**



Overview: Development, testing and manufacturing of LifeRCraft fuel system:

- comprising engine feeder subsystem, fuel transfer system and ventilation system,
- comprising optimization of the ventilation outlets, integration of capacity gauging system and development of an innovative optical Fuel Level sensor.

Furthermore Fuel Test rig Design, Manufacturing and Installation on the existing Universal Test Rig Platform at the leader premises.

FRC-02-26: Compound Rotorcraft Assembly tooling

- Topic Manager: **Airbus Helicopters** ; collab.= Implementation Agreement
- Indicative Funding Value, duration: **0,700 M€ ; 48 Months**

(including support to assembly and first tests)

- Type of Action: **IA**

Picture for example:



© Airbus Helicopters

Example of cradle platform for assembly



© Airbus Helicopters

Overview: Develop and manufacture innovative tooling's to support the assembly and the operation of a fast compound rotorcraft and adapted to its specific architecture:

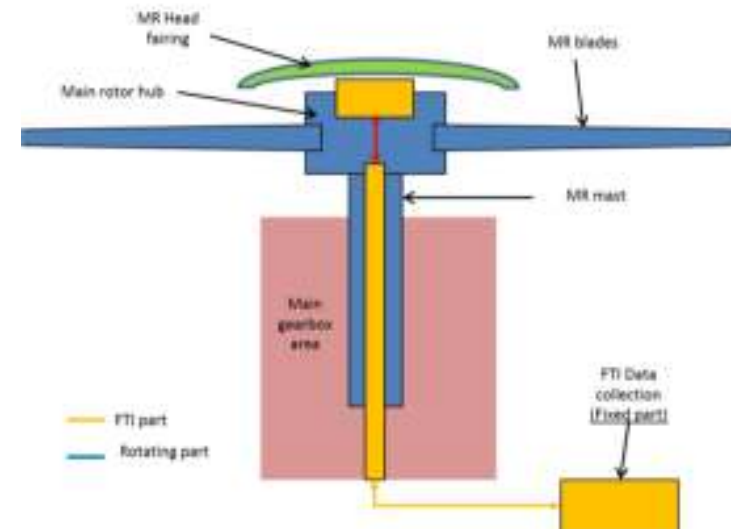
- Adjustable Jacks
- Wing installation tool
- Towing device
- Cradle platforms for assembly and maintenance
- Dummy landing gear



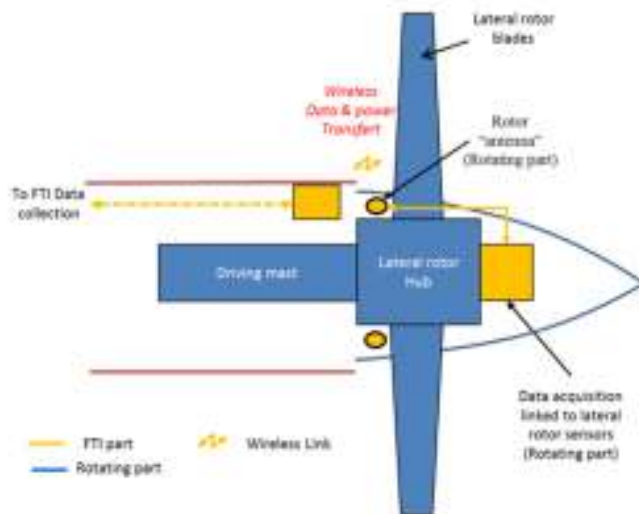
FRC-02-27: Rotor's Flight Test Instrumentation on demonstrator Fast Rotorcraft Project

- Topic Manager: **Airbus Helicopters** ; collab.= Implementation Agreement
- Indicative Funding Value, duration: **1,500 M€ ; 60 Months** (including support to flight tests)
- Type of Action: **IA**

Overview: The LifeRCraft Demonstrator will be fully instrumented with a Flight Test Instrumentation in order to acquire data on the systems on board.



Main rotor instrumentation



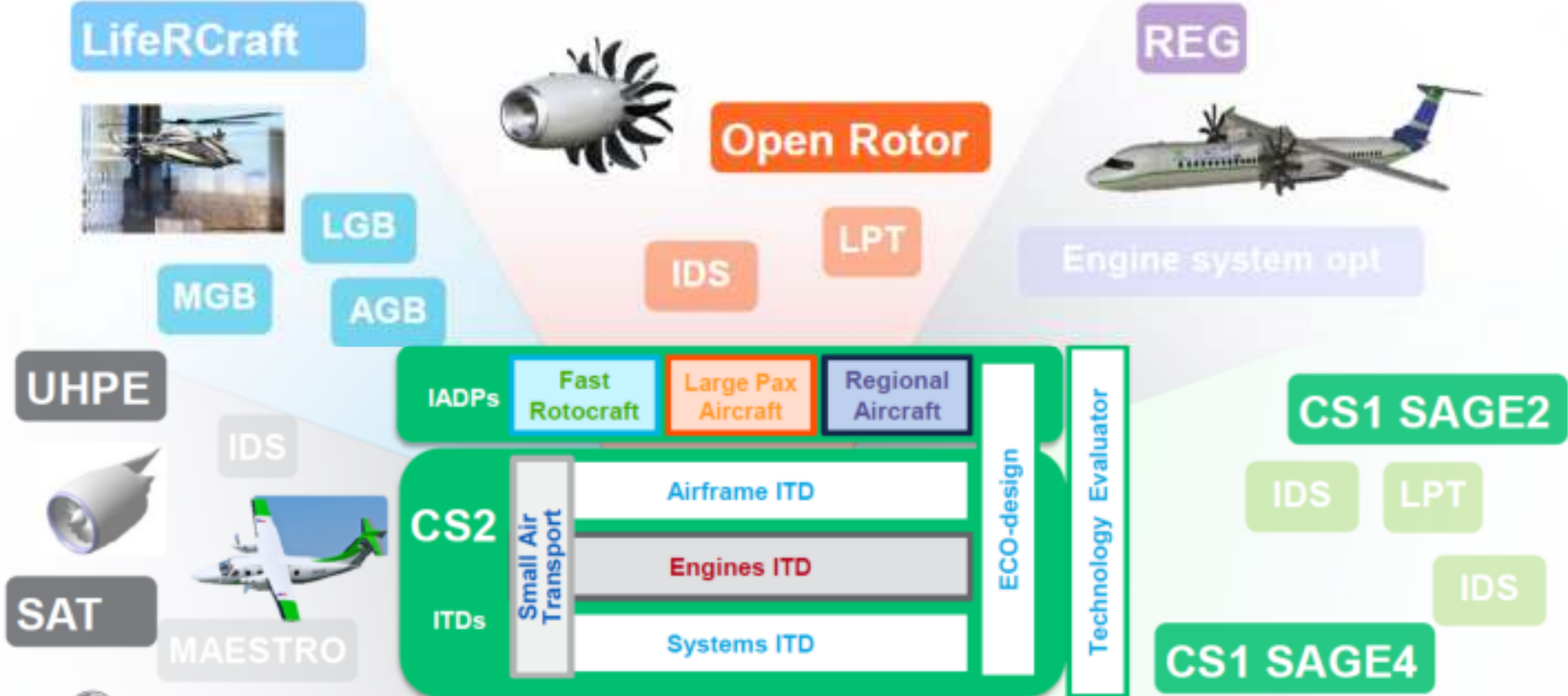
Lateral rotor instrumentation

Due to the “novelty” of configuration of this rotorcraft, a large amount of data coming from rotating parts (main rotor, lateral rotor, drive shaft systems) have to be acquired and transferred to the central acquisition system.



CfP06 GE AVIO core-partner of AH

Avio Aero Involvement in clean Sky





Focus on Portuguese collaboration (1/3)

CS1 SAGE CfP - RTM GEAR

Completed

Target

Develop innovative instrumentation for rotating gauges in harsh environment

Duration

25 months

Participants



Major Achievements

- Telemetric system developed and tested on dedicated test bench at High Temperature
- Surface Acoustic Wave (SAW) tested on bench to measure temperature and torque on rotating parts
- Test completed (TRL 4 achieved)

CS2 FRC CfP – iGear

NEGOTIATIONS ONGOING

Target

Develop an on-the-fly Structural Health Monitoring (SHM) system for the LiferCRaft Transmission system

Duration

26 months

Participants



Major Objectives

- Assessment of the technologies suitable to characterize health monitoring condition of gearboxes
- Innovative approach to the use of ceramic ball bearings for the high speed shaft definition
- SHM system validation



Focus on Portuguese collaboration (2/3)

CfP06 / FRC

Fast RotorCraft - LifeRCraft

Topic Title

Enhanced gear strength through cavitation peening tech.

Duration

24 months

Indicative funding

400 k€

Topic Content:

Development of technologies for enhancing the gear strength, specifically through cavitation peening, on high loaded applications. The applicant shall:

- define the optimal parameters for the cavitation peening process.
- process appropriate T/As through an optimized cavitation peening system
- test the T/A for confirming higher achieved mechanical properties
- determine an appropriate method to identify the cavitation parameters

Topic Title

Hybrid bearing technologies

Duration

36 months

Indicative funding

600 k€

Topic Content:

Development of hybrid tapered bearings (Si3N4 tapered rollers having steel inner and outer races) for aerospace application.

The main areas of analyses will be:

- the comparison of all steel vs. ceramic bearings in clean and contaminated conditions (through subscale and full scale testing)
- the investigation on allowable contact limits
- the investigation on the critical defects
- the optimization of the heat to oil characteristics
- the investigation on oil off behavior

FRC-02-23

FRC-02-24



Focus on Portuguese collaboration (3/3)

CfP06 /ENG

Topic Title

Advanced investigation of ultra compact RQL reverse flow combustor

Duration

18 months

Indicative funding

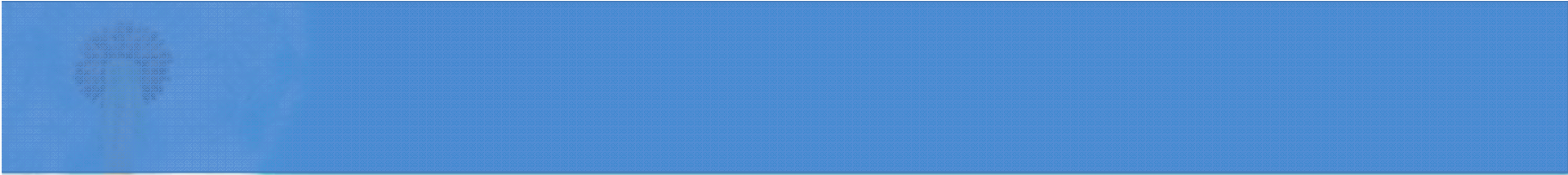
600 k€

Topic Content

Extremely compact reverse flow combustor architectures are required for future turboprop engines development, where geometry and space saving are strictly linked to fuel burn and emission reduction. The target of the CfP is to adapt the available Quick-Design-Rapid-Validation methodology to this family of combustors. Design-for-additive, Virtual combustor simulation and advanced diagnostic testing, addressed to innovative architectures and cooling concepts, quick quench modules design and low soot production, shall be developed to support in a period of 18 months the achievement of the objective. Strong collaboration among the possible partners and focus on available rigs is a strong requirement of the project.

ENG-04-07





LEONARDO Helicopter Division:
CPW04 – Wing
CfP06

Q&A

- **Innovation Takes Off**

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Disclaimer

CS2 Info Day CfP04, Brussels

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