



Clean Sky 2 - JOINT UNDERTAKING

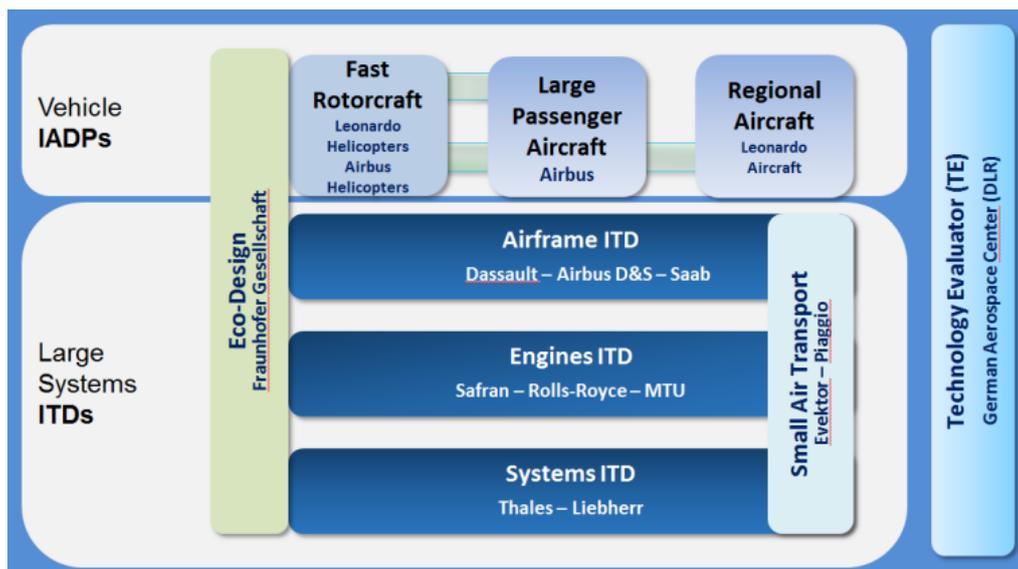


Clean Sky is a Joint Technology Initiative (JTI) that aims to develop and mature breakthrough 'clean technologies' for Air Transport. By accelerating their deployment, the JTI will contribute to Europe's strategic environmental and social priorities, and simultaneously promote competitiveness and sustainable economic growth.

The Clean Sky 2 programme is jointly funded by the European Commission and the major European aeronautics companies, and involves an EU contribution (financial) from the Horizon 2020 programme budget of €1.755 bn. This is complemented by the In-Kind contributions from the Private members leading to a total public and private investment of approximately €4 bn.

The Clean Sky 2 programme consists of four different elements:

- Three Innovative Aircraft Demonstrator Platforms (IADPs), for Large Passenger Aircraft, Regional Aircraft and Fast Rotorcraft, operating demonstrators at vehicle level;
- Three Integrated Technology Demonstrators (ITDs), looking at Airframe, Engines and Systems, using demonstrators at system level;
- Two Transverse Activities (Eco-Design, Small Air Transport), integrating the knowledge of different ITDs and IADPs for specific applications.
- The Technology Evaluator (TE), assessing the environmental and societal impact of the technologies developed in the IADPs and ITDs;



The partners' activities will be determined through topics defined in the work plan and launched as calls for proposals via the EU Participant Portal. The 2019 Call for Proposal deadline for applications is **September 3rd 2019**. The detailed topics descriptions are described in [this document](#).

Large Passenger Aircraft - LPA

The Large Passenger Aircraft IADP is focussing on **large-scale demonstration of technologies** integrated at aircraft level in 3 distinct 'Platforms' and as follows:

- Platform 1: **"Advanced Engine and Aircraft Configurations"**: The major objective of Platform 1 is to provide the development environment for the integration of the most fuel efficient propulsion concepts into compatible airframe configurations and concepts targeting next generation aircraft.
- Platform 2: **"Innovative Physical Integration Cabin – System – Structure"**: Platform 2 aims to develop, mature, and demonstrate an entirely new, advanced fuselage structural concept developed in full alignment towards next-generation cabin & cargo architectures, including all relevant aircraft systems.
- Platform 3: **"Next Generation Aircraft Systems, Cockpit and Avionics"** including advanced systems maintenance activities: In 2018 and 2019, the IADP LPA platform 3 activities will focus upon continuing the development and starting the integration and tests of the functions and technologies developed by the several Core partners in Platform 3 and in the ITD systems, within the Large aircraft Disruptive Cockpit, Regional aircraft Active cockpit and business jet ground demonstrators.

Action	Topic	Topic Leader
IA	Development of a distributed CFD platform for collaborative design	Airbus
IA	Innovative Thrust Reverser Actuator System (ITRAS)	Airbus
IA	UHBR Engine Studies for Aircraft Operations and Economics	Airbus
IA	Advanced solutions for 2030+ UHBR Core Noise reduction	Safran Aircraft Engines
IA	Supporting implementation of 2030+ UHBR low noise fan technology solutions through enhanced modeling capabilities	Safran Aircraft Engines
IA	Advanced Pitch Control Mechanism TRL4 Demonstration	Safran Aircraft Engines
RIA	Innovative turbine cavity swirl control systems through Additive Manufacturing	GE Avio
IA	Development of multidisciplinary design tools for rapid concept design for aero engine components	GKN
RIA	Rear fuselage and empennage shape optimization including anti-icing technologies	Airbus
IA	Fiber reinforced thermoplastics manufacturing for stiffened, complex, double curved structures	German Aerospace Center, DLR
IA	Development of Thermoplastic press forming Tool for Advanced Rear End Closing Frame Prototype and Tooling 4.0 for Assembly and transportation of the Advanced Rear End Prototype	Aernnova
IA	Development and simulation of a forming process for LE HLFC wing outer skins	Aernnova
IA	Development of a manufacturing process and a manufacturing unit for production of a laser treated titanium panel with a 3D printed substructure	Fraunhofer
IA	Design and manufacturing of multi-functional Ice Protection System power feed/monitoring lines and Shielding/High-lift electrical actuation system for a HLFC Wing demonstrator	SONACA
IA	Develop and test Power Efficient Actuation Concepts for Separation Flow Control at large aerodynamic areas requiring very low actuation energy	Airbus
IA	Loop Heat Pipe development for severe environment	Liebherr
IA	Development of innovative welding systems for structural joints of Thermoplastic matrix based Composites	Aernnova Composites Illescas
IA	Development of short fibre reinforced thermoplastic airframe clips and brackets using factory waste	Fokker
RIA	Innovative miniaturized sensing device for large wave length spectrum reception capability as a tool for quality control and aircraft maintenance	Airbus operations

The deadline for applications is September 3rd 2019.

Regional Aircraft - REG

The REG IADP objective is to bring the integration of technologies for Regional Aircraft to a further level of complexity with respect to the achievements of Clean Sky Green Regional Aircraft (GRA). Retaining GRA outcomes, **advanced technologies for regional aircraft** are being further developed and will be **integrated and validated at aircraft level**, so as to drastically de-risk their integration on future regional aircraft products.

During 2018-2019, technical activities will be seamless continued from 2017 to cover further development of technologies, detailed definition of technologies integration into each demonstrator, design of demonstrators, laboratory testing and activities related to Wing Tunnel Tests (WTTs). For several demonstrators, the manufacturing phase will also start in this period. Core partners (CPs) will provide key contributions towards the maturation of relevant technologies as well as for the design and manufacturing of the full scale integrated demonstrators.

Action	Topic	Topic Leader
RIA	Theoretical and experimental evaluations of strain field modification induced by flaws in loaded composite structures	Leonardo SpA - Aircraft
IA	Innovative Noise Generation System for testing of Regional Cabin Interior Noise reduction	Leonardo SpA - Aircraft
RIA	SHMS and Dynamic fields sensors development	Airbus Defence & Space

The deadline for applications is September 3rd 2019.

Fast Rotorcraft - FRC

The Fast Rotorcraft IADP of Clean Sky 2 consists of two separate demonstrators, the **Next Generation Civil TiltRotor (NGCTR)** [leader: Leonardo Helicopters] and the **RACER compound helicopter** [leader: Airbus Helicopters]. These two fast rotorcraft concepts aim to deliver superior vehicle productivity and performance, and through this economic advantage to users.

In 2019, topics will focus on NGCTR. NGCTR aims to design, build and fly an innovative next generation civil tiltrotor technology demonstrator. The configuration will go beyond current architectures of this type of aircraft and will involve tilting proprotors mounted in fixed nacelles at the tips of the wing.

Action	Topic	Topic Leader
RIA	Innovative kinematic analysis to incorporate multiple functions within a movable surface	Leonardo SpA Helicopter
IA	Smart Active Inceptors System development for Tilt Rotor application	Leonardo SpA Helicopter
IA	Multipurpose bench for Tiltrotor equipment functional test	Leonardo SpA Helicopter

The deadline for applications is September 3rd 2019.

Airframe - AIR

Due to the large scope of technologies undertaken by the Airframe ITD, addressing the full range of aircraft types, the ITD is structured around 3 major Activity Lines split into Technology Streams:

- Activity Line 1: **High Performance & Energy Efficiency (HPE)**: the high-level objectives for the period 2018-2019 are: **Innovative Aircraft Architecture; Advanced Laminarity; High Speed Aircraft; Novel Control; Novel Travel Experience.**
- Activity Line 2: **High Versatility and Cost Efficiency (HVC)**: the main objectives for the 4 major Technology Streams are: **Next Generation Optimized Wing Boxes; Optimized High Lift Configurations; Advanced Integrated Structures; Advanced Fuselage.**
- Activity Line 3: **Eco-Design**: the most promising technology will be developed to TRL 4 and large demonstrators design will start for a maturation of technologies to TRL 5-6.

Action	Topic	Topic Leader
IA	Low speed handling quality and innovative engine integration of a new configuration aircraft	Dassault Aviation
RIA	Development of a methodology (test, measurement, analysis) to characterize the behaviour of composite structures under dynamic loading	Dassault Aviation
RIA	Verification of advanced simplified HLFC concept with variable porosity	German Aerospace Center DLR
RIA	Development of a methodology to optimize a wing composite panel with respect to tyre damage certification requirement	Dassault Aviation
IA	Coupon and element testing and manufacturing of test article for morphing technologies	Fokker Aerostructures
RIA	Increasing the efficiency of pulsed jet actuators for flow separation control	Airbus
IA	Application of graphene based materials in aeronautical structures for de-icing, lightning strike protection, fire barrier and water absorption prevention purposes	Leonardo SpA Aircraft
IA	Development of FEM fastener parametric/adaptable sizing tool including EMC impact, and manufacturing and EMC/LSP testing of demonstrators	Evektor
IA	Innovative flight data measurements to support the aerodynamic analysis of a compound helicopter demonstrator	Airbus Helicopters
RIA	Active Flow control on Tilt Rotor lifting surfaces	Leonardo SpA Helicopter
RIA	Innovative approaches for interior Noise Control for Next Generation Civil Tilt Rotor	Leonardo SpA Helicopter
IA	Innovative weight measurement system for Tilt Rotor application	Leonardo SpA Helicopter
IA	Modular platform development for Tilt Rotor final assembly	Leonardo SpA Helicopter
IA	Development of a multifunctional system for complex aerostructures assembly, assisted by neural network softwares	Leonardo SpA Aircraft
IA	Development of equipment for composite recycling process of uncured material	Leonardo SpA Aircraft
RIA	End of Life (EoL) for biomaterials	INVENT GmbH
RIA	Disassembly and recycling of innovative structures made of different Al-Li alloys	Aero-Magnesium
RIA	Scrapping of carbon reinforced thermoplastic materials	Netherlands Aerospace Centre

The deadline for applications is September 3rd 2019.

Engines - ENG

As defined in Clean Sky 1, the objective of the **Sustainable and Green Engines (SAGE)** was to build and test **five engine ground demonstrators covering all the civil market**. In Clean Sky 2, the **ENGINES ITD** will build on the success of SAGE to validate more radical engine architectures to a position where their market acceptability is not determined by technology readiness. The platforms or demonstrators of these engines architectures can be listed with the following: **Ultra-High Propulsive Efficiency (UHPE) demonstrator; Business aviation/short-range regional Turboprop Demonstrator; Advanced Geared Engine Configuration; Very High Bypass Ratio (VHBR) Middle of Market Turbofan technology; VHBR Large Turbofan demonstrator; Small Aero-Engine Demonstration; Eco Design.**

Action	Topic	Topic Leader
RIA	Low NOx / Low soot injection system design for spinning combustion technology	Safran Helicopter Engines
IA	Revalorisation of Recycled Carbon Fibers and CFRP preparation through Eco design	Fraunhofer

The deadline for applications is September 3rd 2019.

Systems - SYS

Systems play a central role in aircraft operation, flight optimisation, and air transport safety at different levels as they enable optimised trajectories, new aircraft configurations and improved performance-weight-ratios. The 2018-2019 period will see the maturation of many topics while some others will be ramped-up.

Systems ITD's scope include virtually all major aircraft systems, ranging from cockpit and avionics to landing gears. It includes as well environmental control systems, wing ice protection and electrical power generation, distribution and conversion. Furthermore, flight control systems and actuation is addressed for small, regional and large aircraft alike. A joint focus of all activities is set on the increasing electrification of the systems to enable the future more-electric or full-electric aircraft. Additional work is done to create environmentally friendly technologies in particular in the area of material and processes.

Action	Topic	Topic Leader
IA	Enhanced digital georeferenced data models for cockpit use	Thales
IA	Innovative processing for flight practices improvement	Thales
IA	New Efficient production methods for 94 GHz (W-band) waveguide antennas	SAAB
IA	Low-profile/drag electronically steerable antennas for In-Flight Connectivity	Thales
IA	VOC filtration device for Inerting System	Zodiac Aerospace
IA	Innovative high flow rate constant pressure valve for inert gas discharge from pressurized vessels	Diehl Aviation
IA	Grey Water Container with Reduced Biofilm Growth	Diehl Aviation
IA	Automatic Haptic System Test Bench for Active Inceptors	Safran
IA	Innovative DC/DC converter for HVDC power sources hybridization	Airbus
IA	Toward a Digital Twin ECS and thermal management architecture models: Improvement of MODELICA libraries and usage of Deep Learning technics	Liebherr
RIA	Vapor Cycle System - Heat Exchanger performance 3D modelization with different new low GWP refrigerants	Liebherr
IA	Electro-Mechanical Landing Gear system integration for Small Aircraft [SAT]	Piaggio Aero
IA	Power Semiconductor Device module using Silicon Carbide devices for a relatively high-frequency, circa 100kW aircraft motor drive applications	University of Nottingham

The deadline for applications is September 3rd 2019.

Thematic Topics - THT

To integrate, demonstrate and validate the **most promising technologies** capable of contributing to the CS2 high-level and programme specific objectives, the CS2 technology and demonstration activity is structured in key (technology) themes, further subdivided in a number of demonstration areas. A demonstration area may contribute to one or more objectives and also may involve more than one ITD/IADP.

Action	Topic
RIA	Ultra-High Aspect ratio wings
RIA	Experimental and numerical noise assessment of distributed propulsion configurations
RIA	Disruptive Active Flow Control for aircraft engine applications
RIA	Non-intrusive, seedless measurement system: design, development, and testing

The deadline for applications is September 3rd 2019.