14th EASN International Conference

October 8-11, 2024
Thessaloniki, Greece

Booklet of projects

CINEA Thematic Sessions

European Commission

The European Climate, Infrastructure and Environment Executive Agency (CINEA) was established by the European Commission to manage EU funding programmes that contribute to decarbonisation and green growth.

Find out more: **https://cinea.ec.europa.eu/index_en**

Index

ALRIGH2T

Airport-Level DemonstRatIon of Ground refuelling of Liquid Hydrogen for AviaTion

ALRIGH2T responds in full to the “expected outcomes” and “scope” of the HORIZON-CL5-2023-D5-01-07 topic, by developing and demonstrating two alternative technologies for LH2 aircraft refuelling:

- Direct LH2 refuelling, encompassing the definition of operational protocols for safe and rapid refuelling, the development and testing of a LH2 transfer pump and an instrumented tank, their integration in an iron bird laboratory for the execution of refuelling/defueling tests and the delivering of a digital twin model.
- LH2 tanks swap refuelling, encompassing end-to-end logistic and supply chain of tank modules, the design of the associated on- and off-site infrastructure and its demonstration.

Both concepts will achieve TRL 6 by the end of the project, undergoing a comprehensive technology evaluation informed by demonstration results in two major airports, i.e. Milan Malpensa and Paris (Orly or LeBourget) respectively.

The two technology lines are complemented by transversal activities for the definition of technical and techno-economic boundary conditions, the demonstration of the use of H2 for ground operations (i.e. H2 powered tow vehicle, demonstrated at the Malpensa site) as well as environmental, safety and regulatory cross-cutting aspects. ALRIGH2T has the ambition of demonstrating, for the first time, LH2 refuelling in a scale compatible with airport operations, synergizing with the Clean Aviation research and development efforts at the aircraft level.

The project is implemented by a consortium built on the competences of top European industrial players, positioned along entire hydrogen and aeronautic value chain, complemented by research and technology organisations and selected member of the Advisory Board, including the EASA. ALRIGH2T is expected to be a cornerstone in the path towards the deployment of LH2 as an aviation fuel, strengthening the European research and industry leadership and consolidating the role of green airports as hubs of the H2 economy.

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TECHNISCHE UNIVERSITAET MUENCHEN
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Linde Kryotechnik AG (AP)

Funding Authority: HORIZON EUROPE
Topic: HORIZON-CL5-2023-D5-01-07
Grant Agreement No: 101138105

Start Date: JANUARY 1, 2024
End Date: DECEMBER 31, 2027

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AVIATOR

Assessing aViation emission Impact on local Air quality at airports: TOwards Regulation

The aviation sector is the second biggest source of transport greenhouse gas emissions after road transport. In this context, addressing public health concerns about air quality in and around airports is a top priority. The EU-funded AVIATOR project will provide enhanced understanding of primary emitted particulate matter and gases and evolution of pollutants in the exhaust plume.

The project will develop and deploy at multiple airports a proof-of-concept low-cost sensor network for the monitoring of ultra-fine particle, and gaseous species such as NOx and SOx, across airport and surrounding communities. Working with the public health community, the project will improve guidance on measuring and modelling the impact of aircraft emissions.

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Funding Authority: HORIZON 2020
Topic: LC-MG-1-1-2018
Grant Agreement No: 814801

Start Date: JUNE 1, 2019
End Date: MAY 31, 2023

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CAELESTIS

Hyperconnected simulation ecosystem supporting probabilistic design and predictive manufacturing of next generation aircraft structures

The aviation industry has set an ambitious target: net zero emissions by 2050. A new generation of aircrafts is essential to ensure the transition to clean aviation technologies is a reality. In this context, the EU-funded CAELESTIS project will explore the technology of virtual prototyping.

It will develop a new interlinked system that can execute a huge number of calculations and predictions across the entire aviation value chain. The next step will be to create digital twins and model-based products and virtual prototyping. The aim is to reduce the costs and risks in developing new aircraft designs to reduce fuel consumption and the weight of aircraft.

Coordinated by:
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Funding Authority: HORIZON EUROPE
Topic: HORIZON-CL5-2021-D5-01-06
Grant Agreement No: 101056886

Start Date: MAY 1, 2022
End Date: OCTOBER 31, 2025

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CAVENDISH

Consortium for the AdVent of aero-Engine Demonstration and aircraft Integration Strategy with Hydrogen

The goal to minimise the impact of air travel on the environment is key to achieving carbon neutrality in the aviation industry. Along these lines, the EU-funded CAVENDISH project will develop breakthrough technologies related to direct combustion systems for liquid hydrogen. Specifically, it will prototype and integrate these technologies onto a modern donor aeroengine for ground testing, starting in late 2024. This will lead to the development of commercial hydrogen-fuelled aircraft by 2035. The project will also explore alternative technologies such as a dual fuel combustor system and a cryo-compressed tank system. CAVENDISH will bring together expertise-leading organisations and build on technology programmes from France, Germany, the Netherlands and the United Kingdom.

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SHORT BROTHERS PLC (AP)
ROLLS-ROYCE PLC (AP)
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Funding Authority: HORIZON EUROPE
Topic: HORIZON-JU-CLEAN-AVIATION-2022-01-HPA-01
Grant Agreement No: 101102000

Start Date: JANUARY 1, 2023
End Date: DECEMBER 31, 2026

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DEMOQUAS

DEsigning, Manufacturing and Operating Quantification of Uncertainties to increase Aviation Safety

The integration of novel propulsion technologies presents a formidable challenge in the field of aviation. Uncertainties pervade every phase of aircraft development, from initial design to operational deployment. These uncertainties cast shadows over safety and efficiency. Traditional approaches struggle to grapple with the complexity and unpredictability inherent in these technologies. With this in mind, the EU-funded DEMOQUAS project aims to revolutionise the field with its pioneering framework of uncertainty quantification (UQ) and holistic aircraft/engine design tools. By navigating uncertainties across design, manufacturing, and operations phases, the project will enhance efficiency and decision-making. With a focus on six industrially relevant test cases, the project aims to elevate UQ methods, mitigating simulation time constraints and enhancing accuracy.

Coordinated by:
ARISTOTELIO PANEPISTIMIO THESSALONIKIS

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Funding Authority: HORIZON EUROPE
Topic: HORIZON-CL5-2023-D6-01-11
Grant Agreement No: 101147454

Start Date: MAY 1, 2024
End Date: APRIL 30, 2027

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DIDEAROT

Digital Design strategies to certify and mAnufacture Robust cOmposite sTructures

New certified designs for structures are critical for the new upcoming changes in conception of aircraft architectures. A variety of breakthrough designs and new strategies for a better use of material and integration of functions in aircrafts are required. They range from regional electrical mobility solutions to increased aspect ratio wings that will bring higher flexibility in structures. Digital conception and simulation need to play an ever-bigger role to reach a certified design that includes production scenarii before full manufacturing.

High-end simulation is a spearhead research activity present in many fundamental and applied research activities. The level of complexity of phenomena being solved through dedicated modeling techniques is constantly evolving and faces many challenges in validation and exploitation. For better use of these methods, the consortium will pursue the objective of scalability and representativity of results in the design process through appropriate Machine Learning surrogates, benefiting from High Performance Computing.

The DIDEAROT project aims at bringing a digital centrepiece approach that could integrate the move to more digital designs in the aircraft industry. It will cover the robust optimization of composite structures focused on digital predictions of two key aspects in its lifetime:

- Manufacturing: predicting distortions, stress build-up and assembly challenges for ever-more integrated industrial scale composite parts
- Dynamic loads and impact: predicting damage and effects from loads occurring at high speed or repeated loads over time that can lead to critical certification conditions.

While both aspects have been partially addressed by the research community, the challenge we tackle here is to integrate them together in the testing pyramid (up to an industrial scale) for certification of structures and increase the reliance on digital technologies (data or simulation driven) to ensure optimized design approaches.

Funding Authority: HORIZON EUROPE
Topic: HORIZON-CL5-2023-D6-01-11
Grant Agreement No: 101056682

Start Date: SEPTEMBER 1, 2022
End Date: AUGUST 31, 2026

Coordinated by:
CENTRE DE RECHERCHE EN AERONAUTIQUE ASBL - CENAERO

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ENODISE

Enabling optimized disruptive airframe-propulsion integration concepts

The noise and greenhouse gas emissions generated by aircraft have a negative impact on human health and the environment. To reduce noise and gaseous emissions, the EU-funded ENODISE project aims at improving the integration of novel aircraft's propulsion systems with the airframe. To achieve this, it will study the key propulsion-airframe integration issues and build a solid basis of knowledge and methods. The project will investigate integration optima using a novel experimental methodology combined with high-fidelity simulations and low-order modelling approaches. It will also implement shape modifications and innovative flow/acoustic control technologies to maximise aero-propulsive efficiency while reducing adverse installation effects. The proposed research plan should lead to better integration designs with minimal detrimental installation effects.

Coordinated by:
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STICHTING KONINKLIJK NEDERLANDS LUCHT - EN RUIMTEVAARTCENTRUM

Funding Authority: HORIZON 2020
Topic: LC-MG-1-5-2019
Grant Agreement No: 860103

Start Date: JUNE 1, 2020
End Date: NOVEMBER 30, 2024

https://www.vki.ac.be/index.php/about-enodise
https://cordis.europa.eu/project/id/860103
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exFan

Novel recuperation system to maximize exergy from anergy for fuel cell powered geared electric aircraft propulsion system

To achieve climate neutrality in aviation by 2050, hydrogen powered aircraft propulsion can be key. For this, several challenges need to be tackled such as thermal management and heat rejection of fuel cells in the aircraft. For each watt of electricity produced by a fuel cell, one watt of waste heat is generated. Recuperating it to further use would be indeed an asset. The exFan project will target such innovation by including a ducted heat exchanger in the nacelle of the propulsion system. It will use the ram jet effect, called also “Meredith effect” (ME) to generate thrust from waste heat. The design of a lightweight heat exchanger and the recovery of waste heat using the ME are promising topics further investigated in detail here. The exFan system will be included in a geared electric fan propulsion system of mega-watt class powered by hydrogen fuel cell technology. The heat exchanger will be a bionic design duly surface finished to hinder particle accumulation, corrosion, and erosion. Additionally, novel thermal management system will be designed, to optimize the heat quality of the waste heat and control the heat flux of the propulsion system. Optimal operation conditions will also be investigated. A simulation model will be set up for operation parameter optimization. First functional lab scale tests of exFan will serve to verify such model. The breakthrough innovations proposed in exFan will i) allow European aircraft producers to offer savings in cost operation ii) enable European aeronautics industry to maintain global competitiveness and leadership, and iii) create significant contribution in the path towards CO_2 and NOx emission free aircrafts.

exFan brings together multidisciplinary experts from academia, aeronautical associations and industry, supported by a selected technical advisory board. exFan will be in close contact with Clean Aviation and Clean Hydrogen to create synergies and speed up the development.

Coordinated by:
FUNDACION CIDETEC

Partners:
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Funding Authority: HORIZON EUROPE
Topic: HORIZON-CL5-2023-D5-01-08
Grant Agreement No: 101138184

Start Date: DECEMBER 1, 2023
End Date: NOVEMBER 30, 2027

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fLHYing Tank

Flight demonstration of a Liquid HYdrogen load-bearing tank in an unmanned cargo platform

The use of liquid hydrogen (LH2) is growing, particularly in the aviation sector. This necessitates lightweight hydrogen storage systems. The EU-funded fLHYing tank project will flight-test a 1000-litre flight load-bearing vacuum-insulated composite LH2 tank in the Pipistrel Nuuva V300 cargo UAV. The project includes the disruptive maturation of lightweight LH2 storage systems through accelerated acquisition of knowledge on flight operation of LH2 tanks, as required by the demonstrator strategy of the Clean Aviation Strategic Research and Innovation Agenda. The pioneering fast-track flight testing of a relevant-scale composite LH2 storage system using an UAV will reduce the risk, cost and time to market of revolutionary technologies in the aeronautical industry.

Funding Authority: CLEAN AVIATION
Topic: HORIZON-JU-CLEAN-AVIATION-2022-01-HPA-04
Grant Agreement No: 101101946

Start Date: JANUARY 1, 2023
End Date: DECEMBER 31, 2025

Coordinated by:
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Partners:
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FlyECO

Future enabLing technologies for hYdrogen-powered Electrified aero engine for Clean aviatiOn

FlyECO will deliver transformative technologies to support Integrated Power and Propulsion Systems (IPPS) that contributes to zero-emission and sustainable growth of aviation and has the potential to enable aviation climate neutrality by 2050. The utilization of hydrogen as sole energy source offers the opportunity to eliminate aviation CO_2 emissions entirely. Furthermore, a reduction in NOx emissions of at least 50% is enabled by ingesting steam produced by a solid oxide fuel cell (SOFC) into the hydrogen-fuelled gas turbine (GT). FlyECO will develop a simulation and evaluation framework in which the optimal architecture definition of the IPPS, the key enabling integration technologies and necessary controls concepts can be explored, investigated closely and advanced towards TRL3 through Proof-of-Concept (PoC) demonstrators. A Commuter/Regional aircraft application was chosen as a use case to develop the propulsion system with more than one megawatt power. In particular, the energy management and distribution strategies will be developed for both quasi-steady-state and transient operation. In addition, PoC for the IPPS and the reduction in NOx emissions will be provided via two demonstrators: (1) a sub-structured test-rig emulating the cycle-integrated hybrid-electric propulsion system and (2) a high-pressure combustor with steam ingestion.

The outcome of FlyECO will be comprise of:

- an advanced simulation platform to analyse the impact of the SOFC integration on a hydrogen GT,
- a validation methodology for novel energy and power management strategies for the IPPS architecture,
- a controls' approach for the IPPS, including specialised local control for components and subsystems as well as global control,
- a set of key coupling technologies developed to enable the integration of the SOFC with a GT under consideration safe design process in aviation based on ARP 4754A,
- an open-access database on hydrogen combustion with steam injection.

Funding Authority: HORIZON EUROPE
Topic: HORIZON-CL5-2023-D5-01-08
Grant Agreement No: 101138488

Start Date: JANUARY 1, 2024
End Date: DECEMBER 31, 2026

Coordinated by:
DEUTSCHES ZENTRUM FUR LUFT - UND RAUMFAHRT EV

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GENEX

New end-to-end digital framework for optimized manufacturing and maintenance of next generation aircraft composite structures

Composite materials are flying high and are dropping weight – in the aviation industry, that is. They provide structural strength but are light in weight. The EU-funded GENEX project will develop a novel end-to-end digital twin-driven framework based on enhanced computational models. These models incorporate the interdisciplinary knowledge of aircraft components and manufacturing/repair processes to support its optimization. Furthermore, they enable the development of health and usage monitoring and management system during continuous operation of aircraft to ensure aircraft safety and airworthiness. The digital twin-driven framework will be implemented into a common industrial internet of things (IIoT) platform to integrate the developed models.

Coordinated by:
INSTITUTO TECNOLOGICO DE ARAGON

Partners:
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Funding Authority: HORIZON EUROPE
Topic: HORIZON-CL5-2021-D5-01-06
Grant Agreement No: 101056822

Start Date: SEPTEMBER 1, 2022
End Date: FEBRUARY 28, 2026

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GOLIAT

Ground Operations of LIquid hydrogen AircrafT

In the near future, hydrogen will be a solution to decarbonise short- and medium-haul aviation.

The EU-funded GOLIAT project brings together aircraft manufacturers (Airbus, H2FLY), a technology provider (Chart Industries), research institutions (TU Delft, Leibniz University Hannover), and airport operators (Vinci Airports, Schiphol Airport, Rotterdam Airport, Stuttgart Airport, Budapest Airport) to enable widespread use of hydrogen at airports by:

- Developing and demonstrating liquid hydrogen (LH2) refuelling technologies scaled-up for future large commercial aircraft.
- Demonstrating small-scale liquid hydrogen aircraft ground operations at airports.
- Developing the standardisation and certification framework of future liquid hydrogen operations.
- Assessing the sizing and economics of hydrogen value chains for airports.

Coordinated by:
AIRBUS

Partners:
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Funding Authority: HORIZON EUROPE
Topic: HORIZON-CL5-2023-D5-01-07
Grant Agreement No: 101138379

Start Date: MAY 1, 2024
End Date: APRIL 30, 2028

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H2ELIOS

HydrogEn Lightweight & Innovative tank for zerO-emisSion aircraft

To enable a technologically and economically feasible H2-powered aviation, new integral LH2 tank solutions are required that could serve as part of the airframe main structure and capable of withstanding its respective loads.

The H2ELIOS project will develop an innovative and effective lightweight LH2 storage system for aircraft. It will be implemented as demonstrators in two fuselage-like cylinder section with approximately 1.9 m of external diameter and approximately 2.3 m of external length. These demonstrators would be duly supported by component and subsystem ground tests at appropriate scale at project completion (TRL5 at storage level). The aim is that the concept is ready to be embedded and integrated in a specified aircraft architecture for flight demonstration in later stages.

H2ELIOS will provide a feasible and novel low-pressure, double-layer composite tank-based system, enabling the tank shape to be either conformal or non-conformal to the profile of the aircraft. Its general effectiveness will be assessed in terms of high GI performance and easiness of integration within the aircraft structure.

This concept will be supported by latest evolutions of innovative methods and technologies in terms of multidisciplinary design development, manufacturing processes and means of compliance and shall be demonstrated in operational conditions: first on ground up to TRL5 and then in flight by the end of Clean Aviation Phase 2 clearing a TRL6 maturation gate. Finally, delivery to the market is expected in the 2030-2035 period. In this way this project shall contribute to accomplish the objectives of the European Green Deal regarding decarbonization of the aviation industry.

The activities of H2ELIOS will be supported by explicit agreed support of EASA and an External Advisory Board comprising commercial aircraft OEMs, H2 management and cryogenics experts, MRO services, airlines, aircraft system integrators, materials developers and suppliers and airports operation.

Coordinated by:
ACITURRI ENGINEERING SL

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ACITURRI AERONAUTICA SL
ALESTIS AEROSPACE SL
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PANEPISTIMIO PATRON
UNIVERSITAT POLITECNICA DE CATALUNYA
EASN TECHNOLOGY INNOVATION SERVICES BVBA

Funding Authority: CLEAN AVIATION
Topic: HORIZON-JU-CLEAN-AVIATION-2022-01-HPA-03
Grant Agreement No: 101102003

Start Date: JANUARY 1, 2023
End Date: DECEMBER 31, 2025

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HASTA

Hydrogen Aircraft Sloshing Tank Advancement

Environmental concerns motivate a transition to liquid hydrogen aviation fuel in coming decades, and for this technology the size, placement and connections of the hydrogen tank on an aircraft are key decisions. The Hydrogen Aircraft Sloshing Tank Advancement project (HASTA) aims to experimentally and computationally investigate the storage of liquid hydrogen (LH2) for airborne use as fuel in civil aircraft applications. Size and position of a LH2 tank inside an aircraft are limiting factors for range, payload and aircraft size, and consequently play a crucial role in the environmental impact. The goal of facilitating tank design will be achieved through creation of design criteria for LH2 aircraft tanks; these design guidelines will be based on the different tools and models derived during the project, in particular those aimed at complex cryogenic sloshing.

The experimentally validated design tools developed during HASTA are to be used for both conceptual and detailed design in the aircraft industry, and therefore span a range of fidelities from reduced order models to full computational methods. The primary focus of this project will be the development of LH2 capabilities, and particularly the extension of mature capabilities already available for sloshing of standard civil aircraft fuel (kerosene) to the cryogenic temperatures associated with LH2. These capabilities are well reflected in the composition of the consortium, which includes partners with both experimental and modelling experience of fuel slosh, as well as cryogenics for space applications. The ultimate goal of the project is the development of experimentally validated numerical and analytical simulation tools to model the complex thermo-fluid-dynamics of cryogenic LH2 coupled to the thermo–mechanical behavior of a tank and its operational environment.

Coordinated by:
UNIVERSIDAD POLITECNICA DE MADRID

Partners:
AIRBUS OPERATIONS SL
AIRBUS OPERATIONS GMBH
ARIANEGROUP GMBH
ACADEMIA TEHNICA MILITARA "FERDINAND I"
CONSIGLIO NAZIONALE DELLE RICERCHE
SORBONNE UNIVERSITE
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VON KARMAN INSTITUTE FOR FLUID DYNAMICS
DEUTSCHES ZENTRUM FUR LUFT - UND RAUMFAHRT EV
UNIVERSITA DEGLI STUDI NICCOLO CUSANO TELEMATICA ROMA
UNIVERSITY OF CAPE TOWN
AGENZIA NAZIONALE PER LE NUOVE TECNOLOGIE, L'ENERGIA E LO SVILUPPO ECONOMICO SOSTENIBILE
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UNIVERSITY OF BRISTOL (AP)
UNITED KINGDOM RESEARCH AND INNOVATION (AP)

Funding Authority: HORIZON EUROPE
Topic: HORIZON-CL5-2023-D5-01-08
Grant Agreement No: 101138003

Start Date: SEPTEMBER 1, 2024
End Date: AUGUST 31, 2027

https://cordis.europa.eu/project/id/101138003
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HESTIA

HydrogEn combuSTion In Aero engines

Flying accounts for around 2.5 % of global carbon dioxide emissions. Current combustion chambers are burning hydrocarbon fuels, such as kerosene and sustainable aviation fuel. To mitigate the carbon footprint of the aviation sector, engineers are turning their focus on hydrogen – a promising zero-carbon fuel or energy carrier. The EU-funded HESTIA project aims to study the physical phenomena related to hydrogen-air combustion of future hydrogen-powered aero engines. Experimental activities will be complemented by theoretical work focused on adapting or developing new models and will progressively increase their maturity so that they can be integrated into industrial computational fluid dynamics code.

Coordinated by:
SAFRAN SA

Partners:
ROLLS-ROYCE DEUTSCHLAND LTD & CO KG
GE AVIO SRL
GENERAL ELECTRIC DEUTSCHLAND HOLDING GMBH
MTU AERO ENGINES AG
CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE CNRS
CENTRALESUPELEC
UNIVERSITE D'AIX MARSEILLE
CENTRE EUROPEEN DE RECHERCHE ET DEFORMATION AVANCEE EN CALCUL SCIENTIFIQUE
ECOLE NATIONALE SUPERIEURE DE MECANIQUE ET D'AEROTECHNIQUE
UNIVERSITE DE POITIERS
INSTITUT NATIONAL DES SCIENCES APPLIQUEES DE ROUEN
TECHNISCHE UNIVERSITAT DARMSTADT
DEUTSCHES ZENTRUM FUR LUFT - UND RAUMFAHRT EV
UNIVERSITA DEGLI STUDI DI FIRENZE
TECHNISCHE UNIVERSITAET MUENCHEN
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ROLLS-ROYCE PLC (AP)
THE CHANCELLOR MASTERS AND SCHOLARS OF THE UNIVERSITY OF CAMBRIDGE (AP)
LOUGHBOROUGH UNIVERSITY (AP)

Funding Authority: HORIZON EUROPE
Topic: HORIZON-CL5-2021-D5-01-05
Grant Agreement No: 101056865

Start Date: SEPTEMBER 1, 2022
End Date: AUGUST 31, 2026

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HOPE

Hydrogen Optimized multi-fuel Propulsion system for clean and silEnt aircraft

Increases in air traffic will increase fuel combustion and acoustic emissions, worsening aviation's environmental impact. The EU-funded HOPE project will deliver an integrated aircraft propulsion system comprising two multi-fuel ultra-high bypass ratio (UHBR) turbofan engines and a fuel cell based auxiliary propulsion and power unit (FC-APPU) driving an aft boundary layer ingestion (BLI) propulsor based on the tube-and-wing aircraft configuration. This system will minimise the combustion and noise emissions during landing and take-off, overhaul the existing aircraft configuration and de-risk hydrogen use solely in existing tube-and-wing aircraft configurations. HOPE will allow a smooth energy transition of the sector through several green propulsion technologies at different maturity levels.

Funding Authority: HORIZON EUROPE
Topic: HORIZON-CL5-2022-D5-01-12
Grant Agreement No: 101096275

Start Date: FEBRUARY 1, 2023
End Date: JANUARY 31, 2027

Coordinated by:
TECHNISCHE UNIVERSITEIT DELFT

Partners:
CHALMERS TEKNISKA HOGSKOLA AB
BAUHAUS LUFTFAHRT EV
ERGON RESEARCH SRL
HIT09 SRL
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HYLENA

HYdrogen eLectrical Engine Novel Architecture

HYLENA will investigate, develop and optimize an innovative, highly efficient, hydrogen powered electrical aircraft propulsion concept. This is based on the integration and combination of Solid Oxide Fuel Cells (SOFC) with turbomachinery in order to use both the electric and thermal energy for maximisation of propulsive efficiency. This game-changing engine will exploit the synergistic use of:

a) an electrical motor: the main driver for propulsion,

b) hydrogen fueled SOFC stacks: geometrically optimized for nacelle integration,

c) a gas turbine: to thermodynamically integrate the SOFC.

This concept will achieve significant climate impact reduction by being completely carbon neutral with radical increase of overall efficiency for short and medium range aircrafts. The HYLENA methodology covers on:

- SOFC cell level: experimental investigations on new high-power density cell technologies
- SOFC stack level: studies and tests to determine the most light-weight and manufacturable way of stack integration
- Thermodynamic level: engine cycle simulations of novel HYLENA concept architectures
- Engine design level: exploration, through resilient calculation and simulation, of the best engine design, sizing and overall components integration
- Overall engine efficiency level: demonstration that HYLENA concept can reach an efficiency increase of more than 50% compared to state-of-the-art turbofan engines
- Demonstration level: a decision dossier for a potential ground test demonstrator to prove that the concept works in practice during a second phase of the project

The HYLENA consortium consists of one aircraft manufacturer (Airbus), 3 universities and 2 research institutes covering the expertise in aircraft design, propulsion system design, SOFC technology, hydrogen combustion and climate impact assessment. This project is fully complementary to Clean Aviation to investigate a low level TRL concept and bring it to TRL3 in 42 months prior to a demonstrator in Phase 2.

Funding Authority: HORIZON EUROPE
Topic: HORIZON-CL5-2023-D5-01-08
Grant Agreement No: 101137583

Start Date: JANUARY 1, 2024
End Date: JUNE 30, 2027

Coordinated by:
AIRBUS

Partners:
AIRBUS OPERATIONS SAS
AIRBUS OPERATIONS GMBH
TECHNISCHE UNIVERSITEIT DELFT
GOTTFRIED WILHELM LEIBNIZ UNIVERSITAET HANNOVER
BAUHAUS LUFTFAHRT EV
DEUTSCHES ZENTRUM FUR LUFT - UND RAUMFAHRT EV
INSTITUT POLYTECHNIQUE DE GRENOBLE
UNIVERSITE GRENOBLE ALPES
CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE CNRS

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INDIGO

Integration and Digital Demonstration of Low-emission Aircraft Technologies and Airport Operations

Aviation is a significant contributor to high emissions of pollutants and noise in the vicinity of local airports. To address this issue, a new roadmap for the development of disruptive technologies and concepts of operations is needed. This will require a combination of interventions on both the aircraft and the airport itself. The EU-funded INDIGO project will unite academia, research centres and airports to identify to improve local air quality and noise reduction resulting from a new nonconventional mid-range aircraft. It has distributed propulsion based on hybrid electric/sustainable and conventional fuel powertrain and large aspect-ratio wings that allow for quiet flight with zero-to-low emissions at low altitudes near airports. Conventional fuel is only used when necessary.

Coordinated by:
UNIVERSIDAD CARLOS III DE MADRID

Partners:
C.I.R.A. CENTRO ITALIANO RICERCHE AEROSPAZIALI SCPA
RUHR-UNIVERSITAET BOCHUM
TECHNISCHE UNIVERSITAET BRAUNSCHWEIG
BARCELONA SUPERCOMPUTING CENTER CENTRO NACIONAL DE SUPERCOMPUTACION
DEUTSCHES ZENTRUM FUR LUFT - UND RAUMFAHRT EV
CENTRO DE REFERENCIA INVESTIGACION DESARROLLO E INNOVACION ATM, A.I.E.
STARPTAUTISKA LIDOSTA RIGA
UNIVERSITY OF BRISTOL (AP)
UNIVERSITY OF STRATHCLYDE (AP)

Funding Authority: HORIZON EUROPE
Topic: HORIZON-CL5-2022-D5-01-12
Grant Agreement No: 101096055

Start Date: FEBRUARY 1, 2023
End Date: JANUARY 31, 2026

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INVENTOR

INnoVative dEsign of iNstalled airframe componenTs for aircraft nOise Reduction

Aircrafts are noisy, especially during approach; landing gears and high-lift devices are the chief noise sources. Reducing noise levels is a challenging priority, since noise pollution poses a high risk to human health. The EU-funded INVENTOR project will study the physics of noise generated by landing gears and high-lift devices at landing/approach. Bringing together 16 partners (research and technology organisations (RTOs), large industries, and small and medium-sized enterprises (SMEs)) from 7 EU countries, the project will significantly contribute to Europe's leadership in aircraft noise reduction and solutions. INVENTOR's main goal is to develop innovative low-noise installed landing gear, high-lift device components and noise reduction technologies, in order to lower external noise from business jet and short-to-medium-range transport aircraft.

Coordinated by:
OFFICE NATIONAL D'ETUDES ET DE RECHERCHES AEROSPATIALES

Partners:
AIRBUS OPERATIONS SAS
AIRBUS OPERATIONS LIMITED
AIRBUS OPERATIONS GMBH
DASSAULT AVIATION
SAFRAN LANDING SYSTEMS
DEUTSCHES ZENTRUM FUR LUFT - UND RAUMFAHRT EV
CENTRE EUROPEEN DE RECHERCHE ET DEFORMATION AVANCEE EN CALCUL SCIENTIFIQUE
UNIVERSITY OF SOUTHAMPTON
THE PROVOST, FELLOWS, FOUNDATION SCHOLARS & THE OTHER MEMBERS OF BOARD, OF THE COLLEGE OF THE HOLY & UNDIVIDED TRINITY OF QUEEN ELIZABETH NEAR DUBLIN
STICHTING KONINKLIJK NEDERLANDS LUCHT - EN RUIMTEVAARTCENTRUM
RHEINISCH-WESTFAELISCHE TECHNISCHE HOCHSCHULE AACHEN
CHALMERS TEKNISKA HOGSKOLA AB
VON KARMAN INSTITUTE FOR FLUID DYNAMICS
UNIVERSITY OF BRISTOL
TECHNISCHE UNIVERSITEIT DELFT
UPSTREAM CFD GMBH
ERDYN CONSULTANTS SARL

Funding Authority: HORIZON 2020
Topic: LC-MG-1-5-2019
Grant Agreement No: 860538

Start Date: MAY 1, 2020
End Date: OCTOBER 31, 2024

https://w3.onera.fr/inventor/en
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MYTHOS

Medium-range hybrid low-pollution flexi-fuel/hydrogen sustainable engine

The EU-funded MYTHOS project aims to develop aircraft engines that can make flexible use of various sustainably produced fuels, including pure hydrogen. Researchers will demonstrate a breakthrough design methodology for future short- and medium-range civil-aircraft engines using a wide range of liquid and gaseous fuels. Machine learning methods will be used to develop a multidisciplinary modelling approach to characterising the related engine components. A unique aspect of the project is the realistic experimental validation of the numerical approaches. With this approach, the MYTHOS consortium will help shorten the time-to-market for engines suitable for various environmentally friendly fuels.

Funding Authority: HORIZON EUROPE
Topic: HORIZON-CL5-2022-D5-01-12
Grant Agreement No: 101096286

Start Date: JANUARY 1, 2023
End Date: DECEMBER 31, 2026

Coordinated by:
RUHR-UNIVERSITAET BOCHUM

Partners:
C.I.R.A. CENTRO ITALIANO RICERCHE AEROSPAZIALI SCPA
DREAM INNOVATION SRL
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NEXTAIR

NEXTAIR - multi-disciplinary digital - enablers for NEXT-generation AIRcraft design and operations

Mitigating aviation's impact on climate change requires major changes in aircraft configurations and operations. Digital methodologies that optimise aircraft performance will play a key role in this transformation. Through eight industrial test cases, the EU-funded NEXTAIR project will build and validate novel design methodologies, data-fusion procedures and smart health assessment tools. Together, these solutions will lead to the digital transformation of aircraft design, manufacturing, and maintenance.
The project will improve methods to better tackle the uncertainty in manufacturing and the inconsistency in operations for the industrial, multi-disciplinary design of aircraft and engine components.

Coordinated by:
OFFICE NATIONAL D'ETUDES ET DE RECHERCHES AEROSPATIALES

Partners:
AIRBUS OPERATIONS SAS
DASSAULT AVIATION
DEUTSCHES ZENTRUM FUR LUFT - UND RAUMFAHRT EV
INSTITUT NATIONAL DE RECHERCHE EN INFORMATIQUE ET AUTOMATIQUE
IRT ANTOINE DE SAINT EXUPERY
ETHNICON METSOVION POLYTECHNION
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UNIVERSITA DEGLI STUDI DI CAGLIARI
FUNDACION CENTRO DE TECNOLOGIAS DE INTERACCION VISUAL Y COMUNICACIONES VICOMTECH
ERDYN CONSULTANTS SARL
ASOUTI V & SIA OE
IMPERIAL COLLEGE OF SCIENCE TECHNOLOGY AND MEDICINE (AP)
ROLLS-ROYCE PLC (AP)
THE UNIVERSITY OF SHEFFIELD (AP)

Funding Authority: HORIZON EUROPE
Topic: HORIZON-CL5-2021-D5-01-06
Grant Agreement No: 101056732

Start Date: SEPTEMBER 1, 2022
End Date: AUGUST 31, 2025

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OVERLEAF

nOVel low-prEssure cRyogenic Liquid hydrogEn storAge

The future of green, more sustainable flying will depend on hydrogen-powered aviation. At the moment, this technology is limited by the hydrogen storage aboard aircraft, whose energy-to-mass ratio is too low to be practical. The EU-funded OVERLEAF project will solve this by employing a design that utilises innovative materials to develop an innovative liquid hydrogen storage tank. This tank will seamlessly integrate with an aircraft's fuselage and structure, while simultaneously achieving a gravimetric index of approximately 50 % for 500 kilograms of hydrogen. This high energy-to-mass ratio will make the transition to hydrogen-powered flight viable for the first time and help achieve the European Green Deal by lowering the environmental burden of air travel.

Coordinated by:
ACITURRI ENGINEERING SL

Partners:
ACITURRI AERONAUTICA SL
ALESTIS AEROSPACE SL
ACITURRI AEROENGINE SL
ASOCIACION DE INVESTIGACION METALURGICA DEL NOROESTE
CENTRE TECHNOLOGIQUE NOUVELLE-AQUITAINE COMPOSITES & MATERIAUX AVANCES
UNIVERSITAT DE GIRONA
TECHNISCHE UNIVERSITEIT DELFT
FONDAZIONE ICONS
ARKEMA FRANCE SA
NATIONAL RESEARCH AND DEVELOPMENT INSTITUTE FOR CRYOGENICS AND ISOTOPIC TECHNOLOGIES ICSI RM VALCEA
NORGES TEKNISK-NATURVITENSKAPELIGE UNIVERSITET NTNU
AIMPLAS - ASOCIACION DE INVESTIGACION DE MATERIALES PLASTICOS Y CONEXAS

Funding Authority: HORIZON EUROPE
Topic: HORIZON-CL5-2021-D5-01-05
Grant Agreement No: 101056818

Start Date: MAY 1, 2022
End Date: APRIL 30, 2025

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https://cordis.europa.eu/project/id/101056818

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PANDORA

Open Fan Validation for Carbon-free Aircrafts

Expanding urbanisation and increasing air travel mean more people are living in the vicinity of busy airports and noise is an important concern. Open fan engine concepts could reduce weight and emissions relative to conventional ducted fans, but they may be noisier. Further, the experimental data and modelling tools available to evaluate and refine open fan designs and reduce noise generation are limited. The EU-funded PANDORA project will address this gap with experimental data and advanced models. The team will collect experimental noise and performance data from an unducted single fan for short/medium-range aircraft. The data will also help validate and expand the scope of numerical tools to improve further analysis.

Funding Authority: HORIZON EUROPE
Topic: HORIZON-CL5-2022-D5-01-12
Grant Agreement No: 101096156

Start Date: FEBRUARY 1, 2023
End Date: JANUARY 31, 2027

Coordinated by:
UNIVERSIDAD POLITECNICA DE MADRID

Partners:
DEUTSCHES ZENTRUM FUR LUFT - UND RAUMFAHRT EV
SAFRAN AIRCRAFT ENGINES
ECOLE CENTRALE DE LYON
CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE CNRS
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SENECA

(LTO) noiSe and EmissioNs of supErsoniC Aircraft

In SENECA, eleven academic and industrial aerospace entities from all over Europe have teamed up to address the challenges raised in the call LC-MG-1-15-2020 “Towards global environmental regulation of supersonic aviation”. The consortium is considering the forthcoming market entry of a new generation of supersonic aircraft. However, it is assumed that the first new generation of supersonic aircraft will not be able to fly over land with supersonic speed, i.e. will not have completely solved the problem of the supersonic boom. Therefore, the missions under consideration for this project will be supersonic over water and subsonic over land. As a consequence, SENECA will mainly focus on noise and emissions in the vicinity of airports and the global climate impact of supersonic aircraft. SENECA aims at developing deepened understanding and detailed modelling for the emissions, the LTO noise, and the global environmental impact of supersonic aircraft. Building on this, the development of beyond state-of-the-art technologies to further reduce the environmental impact of supersonic aviation will be enabled. SENECA will contribute its project results to the ICAO level discussions, in order to scientifically accompany and strengthen the European perspective on the necessary regulations for novel supersonic aircraft. Key milestones of the project dissemination and exploitation plan are aligned to the CAEP work program and agenda, and the whole project plan is designed to work towards these milestones.

Coordinated by:
DEUTSCHES ZENTRUM FUR LUFT - UND RAUMFAHRT EV

Partners:
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ROLLS-ROYCE PLC
OFFICE NATIONAL D'ETUDES ET DE RECHERCHES AEROSPATIALES
CRANFIELD UNIVERSITY
THE MANCHESTER METROPOLITAN UNIVERSITY
UNIVERSITY OF SOUTHAMPTON
MTU AERO ENGINES AG
NATIONAL AVIATION UNIVERSITY
AEDS SARL
STICHTING KONINKLIJK NEDERLANDS LUCHT - EN RUIMTEVAARTCENTRUM
C.I.R.A. CENTRO ITALIANO RICERCHE AEROSPAZIALI SCPA

Funding Authority: HORIZON 2020
Topic: LC-MG-1-15-2020
Grant Agreement No: 101006742

Start Date: JANUARY 1, 2021
End Date: DECEMBER 31, 2024

https://seneca-project.eu/
https://cordis.europa.eu/project/id/101006742
https://seneca-project.eu/contact-us

STARGATE

SusTainable AiRports, the Green heArT of Europe

The aim of the EU-funded STARGATE project is to develop, test and implement innovative solutions that make the airport ecosystem more sustainable. It will offer specific short- and medium-term green solutions for European airports at the level of day-to-day operations. Such solutions include developing digital twin technology to map operational processes by generating 3D models of airports and building a biofuel blending facility to increase the use of biofuels and decrease reliance on fossil fuels. Moreover, STARGATE will optimise terminal operations, for example with the deployment of a Terminal Command Centre, and it will cover other cross-cutting aspects like the minimisation of noise and emissions.

Stargate within EU Green Deal

Coordinated by:
BRUSSELS AIRPORT COMPANY

Partners:
TO70 BV
TO70 BELGIUM
ATHENS INTERNATIONAL AIRPORT S.A.
BUDAPEST AIRPORT BUDAPEST LISZT FERENC NEMZETKOZI REPULOTER UZEMELTETO ZARTKORUEN MUKODO RESZVENYTARSASAG
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ERASMUS CENTRE FOR URBAN,PORT AND TRANSPORT ECONOMICS BV
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SKYTANKING
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TUI AIRLINES BELGIUM NV
SOCIETE NATIONALE DES CHEMINS DE FER BELGES
YPTO
VLAAMS INSTITUUT VOOR DE LOGISTIEK VZW
SKEYES

Funding Authority: HORIZON 2020
Topic: LC-GD-5-1-2020
Grant Agreement No: 101037053

Start Date: NOVEMBER 1, 2021
End Date: OCTOBER 31, 2026

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TRIATHLON

Thermodynamics-driven control management of hydrogen powered and electrified propulsion for aviation

In order to mitigate the negative impact of human activity on the environment, significant efforts to lower carbon emissions are being pursued at both the global and European levels. Globally, the aviation industry aims for a 50% reduction of its carbon emissions by 2050, relative to 2005. In this transition towards net zero carbon emissions, novel powertrain technologies exploiting fuel cells and/or combustion systems that rely on hydrogen will play a significant role.

TRIATHLON will use the synergy between powertrain components to overcome the challenges associated with scaling up hydrogen powertrain technology to MW class. The ambition of TRIATHLON is the development of disruptive approaches to design more robust, low-maintenance, low-emmision, highly responsive hydrogen-electric powertrains for megawatt class aircraft. When the distruptive technologies developed by TRIATHLON are adopted by the industry beyond TRIATHLON, it will lead to:

1. Reduction of emissions by implementation of NOx reduction strategies like injection of exhaust water of the FC into the CC and by capturing vented and permeated hydrogen and recompressing it;
2. Elimination of the need for a cryogenic pump by using a high-pressure storage buffer for pressurisation of the fuel distribution system (making the fuel distribution more robust for turbulence as well);
3. Reduction of the power required for hydrogen conditioning using excess heat from FC and CC by means of 3D printed heat exchangers using innovative materials like ceramics, and smart thermal management;
4. Improvement of the gravimetric index of the entire powertrain by providing an effective heatsink to powertrain components, reducing the need for coolant, allowing design of a more compact and lightweight CC, as well as the need for insulation of the hydrogen storage whilst enabling a longer dormancy time.

Funding Authority: HORIZON EUROPE
Topic: HORIZON-CL5-2023-D5-01-08
Grant Agreement No: 101138960

Start Date: JANUARY 1, 2024
End Date: DECEMBER 31, 2027

Coordinated by:
STICHTING MATERIALS INNOVATION INSTITUTE (M2I)

Partners:
TECHNISCHE UNIVERSITEIT DELFT
TECHNISCHE UNIVERSITAET DRESDEN
ERGON RESEARCH SRL
SABANCI UNIVERSITESI
CRYOMOTIVE GMBH
LITHOZ GMBH
AMIRES SRO

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TULIPS

DemonsTrating lower pollUting soLutions for sustaInable airPorts acrosS Europe

One commitment of the European Green Deal is for transport to become drastically less polluting. Moving towards climate-neutral aviation, the EU-funded TULIPS project will accelerate the implementation of innovative and sustainable technologies targeting reduced greenhouse gas emissions at airports. The project will roll out 17 demonstrations of green airport technological, non-technological and social innovations at Amsterdam Airport Schiphol and at the Oslo, Turin and Larnaca airports. TULIPS will measure and quantify the benefits of these technologies and concepts and forecast their impact on EU climate goals. The project will consider economic, geographical and political scenarios to deliver a robust roadmap presenting the way of implementation from international hubs to the regional level.

Coordinated by:
SCHIPHOL NEDERLAND BV

Partners:
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EINDHOVEN AIRPORT NV
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Funding Authority: HORIZON 2020
Topic: LC-GD-5-1-2020
Grant Agreement No: 101036996

Start Date: JANUARY 1, 2022
End Date: DECEMBER 31, 2025

https://tulips-greenairports.eu/
https://cordis.europa.eu/project/id/101036996
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