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PROJECT FACTS

Topic
HORIZON-CL5-2023-D5-01-08

Type of action
HORIZON Research and Innovation Actions

Starting date
1 January 2024

Duration
48 months

EU funding
€3.99M

CONSORTIUM

M2i materials innovation institute · TU Delft · Technische Universität Dresden · Ergon research · Sabancı Universitesi · Cryomotive · Lithoz Manufacture the future. · AMIRES

WWW.TRIATHLON-PROJECT.EU

TRIATHLON

THERMODYNAMICS-DRIVEN CONTROL MANAGEMENT OF HYDROGEN POWERED AND ELECTRIFIED PROPULSION FOR AVIATION.

TRIATHLON envisions to develop disruptive approaches to design more robust, low-maintenance, low-emission, highly responsive hydrogen-electric powertrains for megawatt class aircraft.

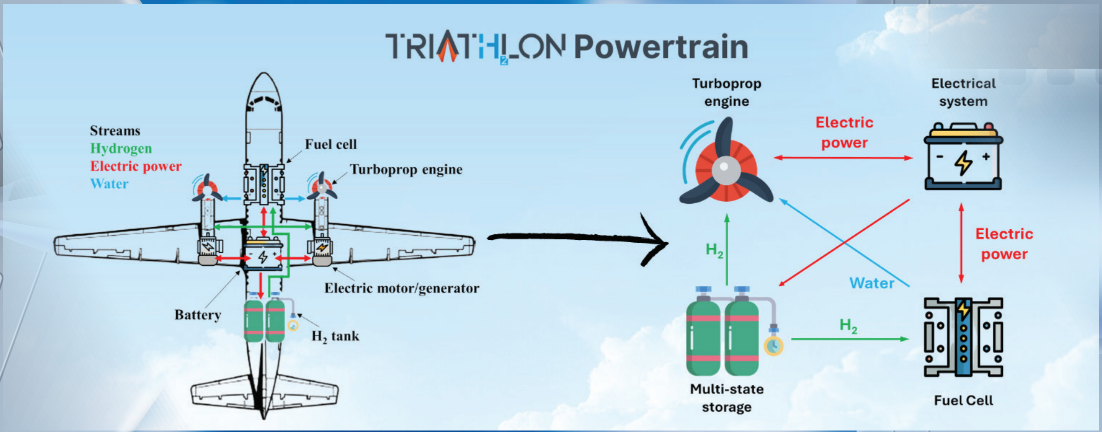
This project has received funding from the European Union's Horizon Europe research and innovation program under grant agreement No. 101138960

TRIATHLON IMPACT

- Emissions Reduction: Implementing NOx reduction strategies and harnessing excess hydrogen for recompression.
- Storage Solutions: Eliminating cryogenic pumps and enhancing fuel distribution with high-pressure storage buffers.
- Energy Efficiency: Leveraging excess heat for hydrogen conditioning through state-of-the-art 3D printed heat exchangers.
- Gravimetric Index Improvement: Enhancing powertrain efficiency and compactness through effective thermal management.

TRIATHLON OBJECTIVES

- Develop a hybrid power generation system that achieves high efficiency, power density and ultra-low NOx emissions.
- Develop and investigate the feasibility of target-oriented storage solutions for higher gravimetric density and lower loss to atmosphere, increasing safety and reducing cost.
- Characterize interfacial heat and mass transfer of hydrogen phase change flow and define thermal management (TM) solutions based on structured minichannels.
- Assess these technologies and draw a roadmap to further increase the TRL.



TRIATHLON EXPECTED RESULTS

- Combustion stability / emission mapping: the development of a comprehensive map utilizing high-fidelity CFD simulations to analyse various operational conditions and parameters crucial for direct hydrogen combustion.
- Python code for hydrogen mass estimation: the creation of Python code to provide reliable estimates of hydrogen mass per storage state, tailored to specific system configurations and flight missions.
- Insulation volume reduction: efforts directed towards minimizing the insulation volume required for a given storage volume, optimizing efficiency and space utilization.
- Feasibility study for multi-state storage: conducting feasibility studies to assess the energy densities of multi-state storage concepts for different aircraft configurations and flight missions.
- Thermal managementoptimization: identification of key geometrical and fluid-dynamic parameters to maximize heat transfer rates while minimizing pressure drops, ensuring optimal performance.
- Roadmap for commercialization: development of a detailed roadmap for the commercialization of hydrogen-powered aircraft, outlining key technical and regulatory milestones.