HEAVEN

HIGH POWER DENSITY FC SYSTEM FOR AERIAL PASSENGER VEHICLE FUELED BY LIQUID HYDROGEN

Project ID:	826247
PRD 2023:	Panel 3 – H2 end uses – transport
Call topic:	FCH-01-4-2018: Fuel cell systems for the propulsion of aerial passenger vehicle
Project total costs:	EUR 6 953 835.06
Clean H_2 JU max. contribution:	EUR 3 995 305.00
Project period:	1.1.2019–30.9.2023
Coordinator:	H2FLY, Germany
Beneficiaries:	Air Liquide Advanced Technologies SA, Deutsches Zentrum für Luft- und Raumfahrt EV, Ekpo Fuel Cell Technologies GmbH, Fundación Ayesa, Air Liquide SA, Pipistrel Vertical Solutions Doo Podjetje Za Napredne Letalske Resitve

https://heaven-fch-project.eu/

PROJECT AND OBJECTIVES

The overall objective of this project is to address the gap between the research and product stages of a zero-emission fuel-cell-based propulsion technology to achieve emission- and noise-reduction scenarios, and meet the 2050 environmental goals for aviation. To that end, a high-efficiency, high-power-density, fuel-cell-based serial hybrid-electric propulsion architecture will be combined with the high energy density of cryogenic hydrogen storage. It will be advanced up to TRL6.

NON-QUANTITATIVE OBJECTIVES

- HEAVEN aims to increase the credibility of the solution for the propulsion of passenger aircraft and UAVs.
- The project aims to advance towards zero-emission hydrogen-powered regional commuter airliners.

PROGRESS AND MAIN ACHIEVEMENTS

- The cryogenic systems have been manufactured and the GSE has been developed.
- The cryogenic system was tested and verified.
- The powertrain was integrated into the aircraft.

FUTURE STEPS AND PLANS

- Fuel cell and hydrogen fuel system coupling and testing with liquid hydrogen (March 2023).
- Ground tests (June 2023).
- Flight test (September 2023).

QUANTITATIVE TARGETS AND STATUS

Target source	Parameter	Unit	Target	Achieved to date by the project	Target achieved?
Project's own objectives and AWP 2018	FC stack power density in weight	kW/kg	2	2.7 (stack including end plates)	✓
	FC power density in volume	kW/l	3.5	4.1 (stack including end plates)	
	Air subsystem	%	> 50	Preliminary results are in compliance with this value but have not been achieved yet	
	Power converter	kW/kg	8	Preliminary results are in compliance with this value but have not been achieved yet	
	System lifetime	hours	500 (stack)	N/A	
	Hydrogen system	wt%	> 5.5	11.50	✓

Clean Hydrogen Partnership
Co-funded by the European Union