



Making an impact on the clean energy transition

HYDROGEN TECHNOLOGY FOR CLEANER SKIES FROM 2035



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Green power in the air

Modern aircraft, powered by polluting kerosene, emit more than 900 million tonnes of CO₂ globally each year, putting the aviation industry under intense pressure to decarbonise. Hydrogen, which can be produced sustainably using renewable energy, is emerging as a game-changing clean, green and viable solution, not just as an alternative to kerosene but also to synthetic fuels and biofuels. A Fuel Cells and Hydrogen 2 Joint Undertaking and Clean Sky 2 Joint Undertaking study predicts short-range hydrogen-powered aircraft could enter into service by 2035.

Significant progress towards using hydrogen to power aircraft, is being achieved in a series of FCH JU-supported projects. HYCARUS developed a flight-ready fuel-cell system, including a high-pressure hydrogen tank for pressurised passenger aircraft, while FLHySAFE is developing an auxiliary power unit for flight controls, linked hydraulics and flight-critical instrumentation in case of emergency. The HEAVEN project is producing a modular high-power fuel-cell system for small aircraft in combination with an innovative cryogenic liquid hydrogen storage system.

Innovating toward the first test flights

In the near future, planned flight tests and validation of the technology by these projects underpin expectations that the first prototype fully-hydrogen-powered aircraft could be approved for take-off by 2028. This will mark a watershed moment in aviation's green transition and will raise awareness in the aeronautics sector globally of the potential of hydrogen. FCH JU's progressive approach to supporting innovation spans key applications from propulsion and auxiliary power to safe hydrogen storage that are set to play a significant role in accelerating decarbonisation of the industry.

Hydrogen-powered commercial aircraft could come into service in just 15 years. The FCH JU has started the ball rolling with three research projects that will help reach this milestone.



Source : Dassault Aviation



Generic Fuel Cell System

Power Range : 20-25 kW
H₂ Storage : 350 bars (1,5 kg)
Supplied Voltage : AC or DC

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FCH JU Success Stories



DECARBONISING AVIATION

The aviation industry needs commercially viable, green and clean alternatives to fossil fuel in order to decarbonise and reduce its environmental impact.

HYDROGEN-POWERED PLANES

To support the development and testing of hydrogen-powered aviation solutions, the FCH JU brought together research institutions and leading companies in aviation and hydrogen technology. **The goal?** To demonstrate the commercial viability of hydrogen-powered aircraft and raise awareness of hydrogen’s potential to help the aviation industry decarbonise. **Key results?** New propulsion systems, emergency power units and hydrogen storage solutions that are putting hydrogen-powered aircraft on track to commercial deployment.

KEY ACHIEVEMENTS

HYCARUS

20 - 25 kW

fuel-cell power range achieved

46 %

target efficiency under airborne operating conditions

10

partners from 5 European countries

FLHySAFE

15 kW

modular fuel-cell system architecture

100 W/kg

power density of emergency unit

7

partners from 3 European countries

HEAVEN

2 kW/kg

expected power density of fuel-cell stacks

90 kW

powertrain of two 45 kW fuel-cell stacks

10 %

weight efficiency of cryogenic hydrogen storage system

7

partners from 4 European countries

IMPACT

2030s

could see the introduction of commercial hydrogen-powered aircraft

50 - 90 %

reduction in global warming impact of flying

ZERO

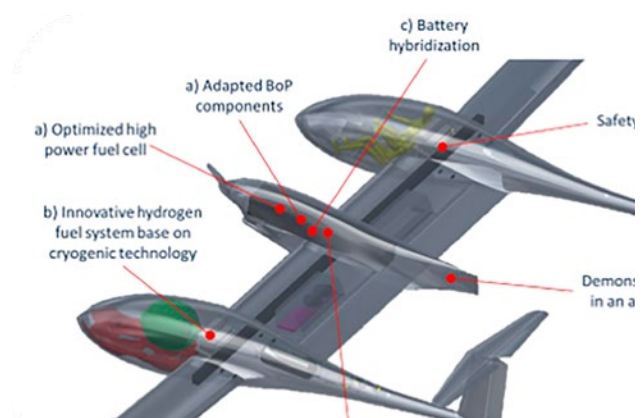
CO₂ emissions if hydrogen demand met by renewable sources

40 %

of aircraft globally could be powered by hydrogen by 2050

5 - 10 % CHEAPER

than using synthetic fuels for short-range and regional flights



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www.fch.europa.eu/page/fch-ju-projects
<http://hycarus.eu>
<https://www.flhysafe.eu>
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**FUEL CELLS AND HYDROGEN
JOINT UNDERTAKING**

A partnership dedicated to clean energy and transport in Europe