

Hydrogen for aerospace applications

Hydrogen, clean energy to help
preserve the environment



Air Liquide is strongly committed to developing technologies that offer solutions to the major problems facing society. One of these technologies is hydrogen energy, a fast-growing field for which the Group masters the entire industrial chain, from production and storage to distribution and applications.

Air Liquide is the world leader in gases, technologies and services for Industry and Health and is a specialist in the field of air gas separation technologies.

Air Liquide has developed a cutting-edge expertise in aerospace and, today, is a favoured partner in aviation. Our teams design systems that generate gases for use both on board aircraft and on the ground.

HYCARUS PROJECT



Air Liquide, a HYCARUS (Hydrogen Cells for AiRborne USage) project partner: hydrogen fuel cell system technologies used for aircraft applications.

HYCARUS addresses the global concern of European airlines and business jet operators to find **alternative sources to power non-propulsive aircraft systems** in order to positively impact the environment and address future emission regulations. Due to their multiple benefits, the use of PEM fuel cells to generate electrical power for non-essential aircraft applications is now being fully investigated. In connection with the HYCARUS project, **Air Liquide's role is to develop high-pressure storage systems and supply hydrogen gas on board for the fuel cell.**

The project has received funding from the European Union's Seventh Framework Programme (FP7/2007-2013) for the Fuel Cells and Hydrogen Joint Technology Initiative under grant agreement n° 325342.

Zodiac Aerospace: System integrator and tier one supplier

CEA: Energy research organisation

Dassault Aviation: Aircraft applications

Air Liquide: Gases, technologies and services for Industry and Health

INTA (Instituto Nacional de Técnica Aeroespacial) and JRC (Joint Research Centre – Directorate C Energy, Transport and Climate): Test facility organisations

ARTTIC: Collaborative R&D consultancy

FCH JU Project coordinated by Zodiac Aerospace



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Air Liquide is also innovating to offer, in the future, clean and renewable delivery systems based on hydrogen energy and fuel cells.

Onboard hydrogen-powered fuel cells can provide electricity on board for various uses, especially during airport ground phases. By the same token, it will be possible to convert airport ground logistics – warehouse forklift truck fleets, aerial platforms, and baggage handling vehicles – to hydrogen for a cleaner environment.

FUEL CELLS SYSTEMS



Fuel cell module "G1" by Axane* to provide electricity on board aircraft for various applications

** Axane, a subsidiary of the Air Liquide group, providing Hydrogen Fuel Cells engineering.*

HYDROGEN CHARGING STATIONS

Air Liquide provides a complete range of **hydrogen charging stations from 35 up to 70MPa** and offers comprehensive turnkey solutions to charge vehicle tanks with hydrogen, in under five minutes.

- Over 50 years of technical and industrial experience in hydrogen
- Over 15 years of experience in hydrogen charging stations
- Standardised products and tailor-made solutions to meet specific customer needs
- More than 75 hydrogen stations installed
- Turnkey solutions
- From mobile to advanced stationary stations
- Station integration: compact skid 10', 20', 40' or on-site accommodation



www.airliquide.com

The world leader in gases, technologies and services for Industry and Health, Air Liquide is present in 80 countries with approximately 66,000 employees and serves more than 3.6 million customers and patients.