



LIQUID HYDROGEN FUELLED AIRCRAFT SYSTEM ANALYSIS (CRYOPLANE)

34 partners from Austria, Belgium, France, Germany, Greece, Netherlands, Norway, Spain, Sweden, United Kingdom, representing industry, research institutes and universities. Coordination: EADS Airbus GmbH (D)

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Storing of large volume of liquid hydrogen in insulated containers causes changes in aircraft configuration.

The project evaluates major aspects of using liquid hydrogen as fuel for aircraft.

- Hydrogen can be produced by electrolysis of water using electrical power from any renewable energy source.
- The only primary combustion product is water - no CO₂, no CO, no sulphuric acid, no soot, no un-burnt hydrocarbons; only very small amounts of NO_x (as demonstrated in the EQHHPP program).
- Liquid hydrogen hence offers the prospect of long term growth of aviation in full agreement with the need to protect the environment.
- Hydrogen offers an energy content per weight which is 2.8 times higher than for kerosene, hence promises higher payload or lower take-off weight.
- The liquid state (-253°C) requires well insulated spherical or cylindrical tanks. The volume is 4 times greater than for a mass of kerosene containing the same amount of energy, causing significant configuration changes.
- Emission of water is greater by a factor of 2.5 than for kerosene, but no condensation nuclei are emitted. Hence, formation and characteristics of condensation trails require careful study. The need for flight tests is foreseen.
- At least the same overall safety level can be achieved as with kerosene. However, the specific characteristics of the new fuel need careful attention in choosing aircraft overall configuration as well as in detail design and in operation. Again, early tests are necessary.
- The CRYOPLANE project addresses aircraft configuration/performance, systems and components, propulsion, safety, environmental compatibility, infrastructure and operation, and scenarios for the transition from kerosene to hydrogen.

