



Fuel Cell Europe

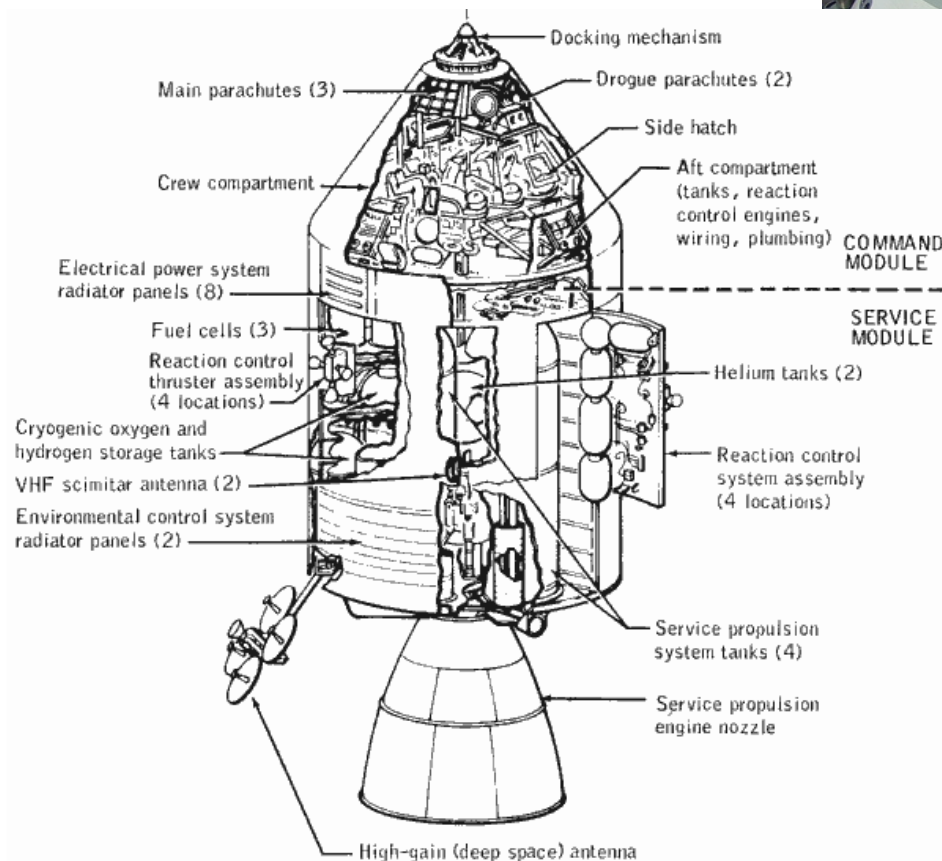
AN ACTIVITY OF THE WORLD FUEL CELL COUNCIL



**Fuel Cell Europe
Fuel Cell and Hydrogen Industry Workshops, Oct. 13, Brussels
Innovation Round Table**

**Johannes Stuhlberger
EADS, VP, Head of Global Innovation
Networks**

Fuel Cell Technology: reaching for the stars



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Motivation for Fuel Cell Application

Fuel cell technology offers a chance to approach these goals:

- enhanced energy efficiency
- emission free and low noise ground operation
- emission reduction during whole flight cycle
- additional synergy benefits through fuel cell by-products (inert gas, water)



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Low Emissions System : Fuel Cells



Fuel cell technology will initiate a step change in aircraft systems through enhanced integration architectures

Airbus Fuel Cell Emergency Power System

First time ever:

Hydrogen supplied fuel cell system operation on-board of commercial aircraft

Hydrogen supplied fuel cell system integrated into electric and hydraulic network

Successful flight tests performed 27 July 2007 in Hamburg

Toulouse, 15 February 2008: Flight controls powered by fuel cell in flight



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Anteres (DLR)

**Take-off and Landing
with fuel cell as unique
power source**



Fell Cell

H2 Storage



Regenerative Fuel Cell Technology

An electrolyser in conjunction with a fuel cell enables the production and storage of chemical-bound energy, oxygen (O₂) and hydrogen (H₂)

- **Power Supply for Stratospheric Platforms and Mars Rover**
- **Energy Storage and Supply for Robots, Satellites (GEO) and habitats**
- **Power supply for upper stage (only fuel cell)**



Advantages of Fixed-Alkaline Technology for Space Applications

High efficiency

- **No phase separation, suited for micro gravity**
- **Electrodes suited for pure O₂ operation**
- **Reversible electrodes based on nickel possible**



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Conclusion

Fuel cell technology will enable significant breakthroughs to deliver greener aircraft

First successful demonstration of the technology achieved!

The integration of fuel cell technology in A/C will bring more improvements

First A/C application will be largely driven by the next step in weight and durability expected by increasing industrial applications

I welcome your questions!



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