Aero

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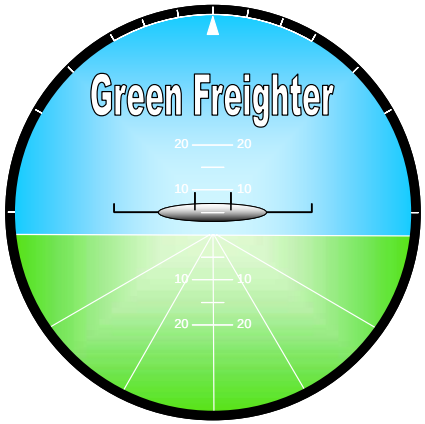

The Green Freighter Project

Kolja Seeckt
Hamburg University of Applied Sciences

Dieter Scholz
Hamburg University of Applied Sciences

SWAFEA – 1st Stakeholder Meeting

Sustainable Way for Alternative Fuels and Energy for Aviation

Brussels, Belgium, 23 – 24 April 2009

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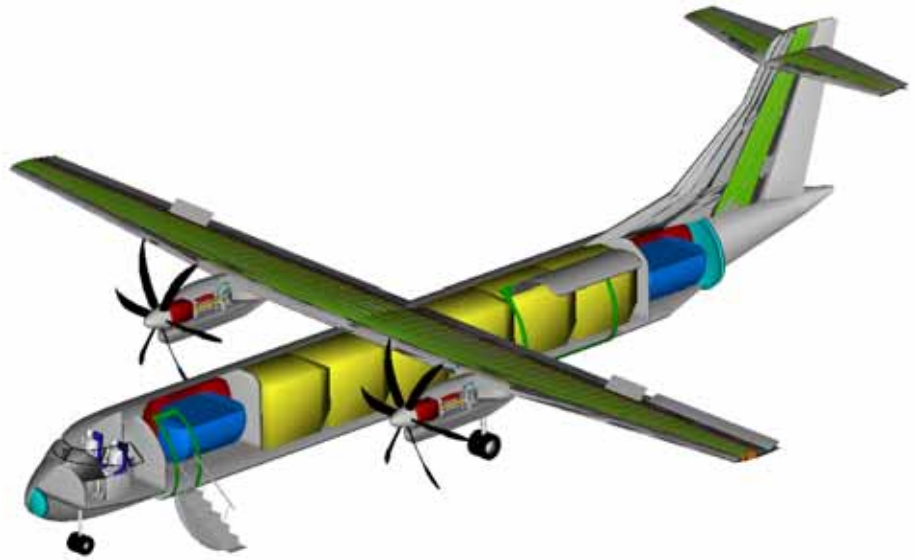
- The Green Freighter project
- Effects of the use of hydrogen
- Hydrogen in freighter aircraft



The Green Freighter project

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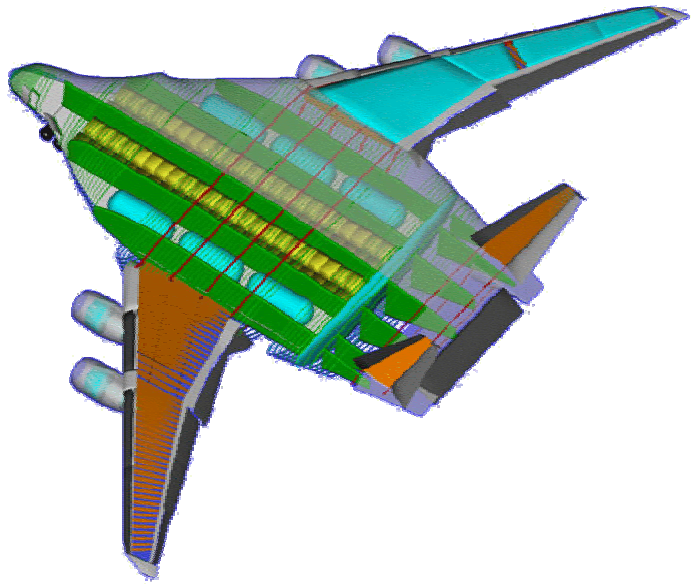
Full project title

Design investigations
of *environmentally friendly*
and *cost effective*
freighter aircraft
with *unconventional* configuration



The Green Freighter project

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Hamburg University of Applied Sciences (HAW)

Airbus Future Projects Office

Institute of Aircraft Design and Lightweight Structures (IFL) of the Technical University of Braunschweig

Bishop GmbH

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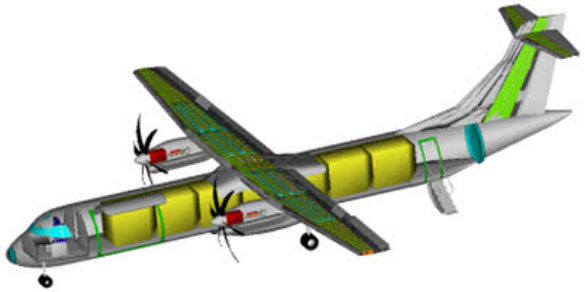
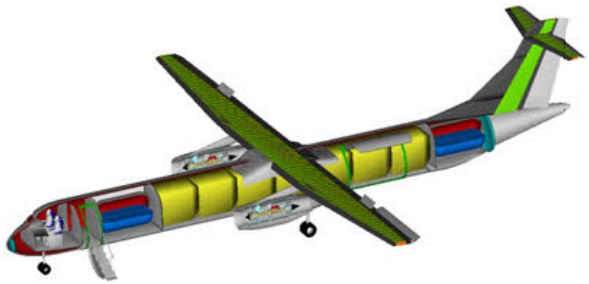
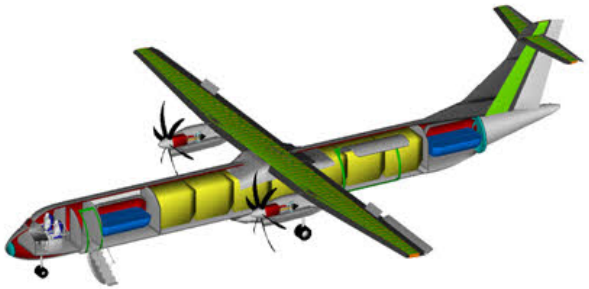
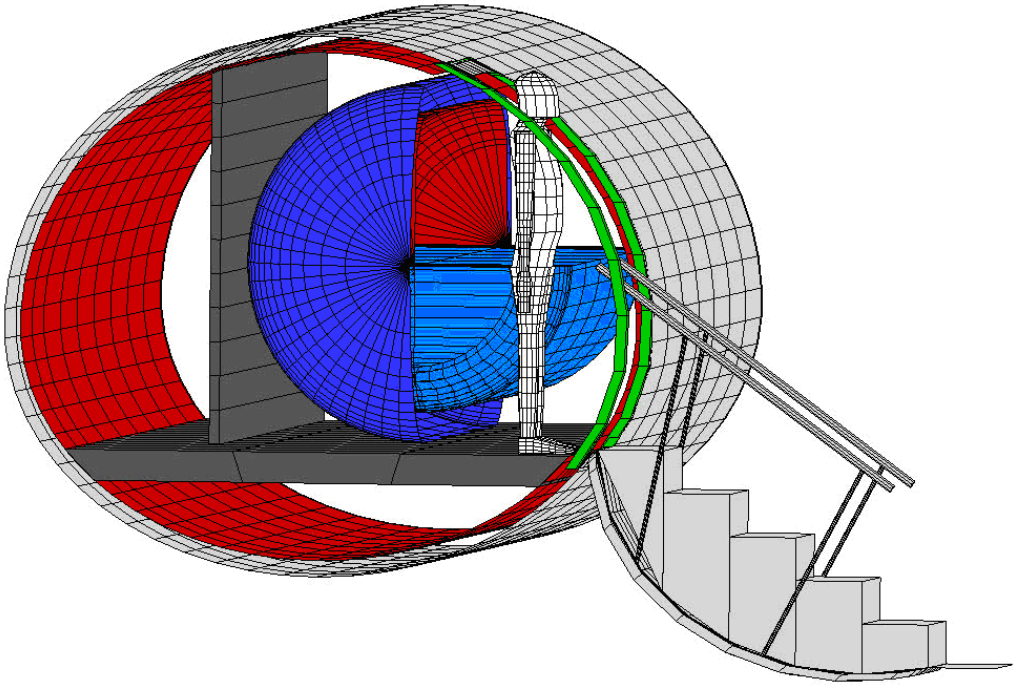
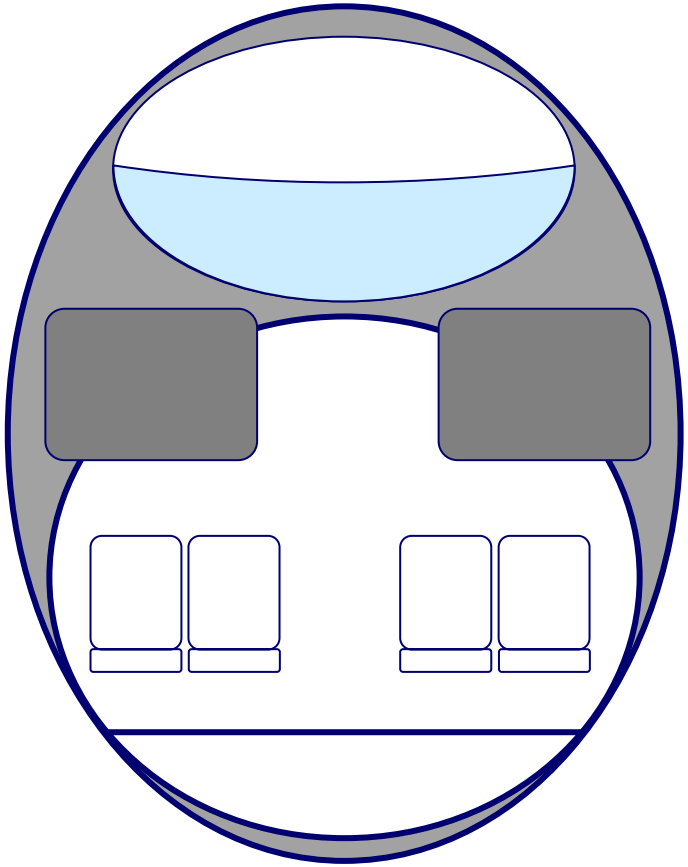
Short-range aircraft variants matrix

	Jet	Propeller
Kerosene		
Hydrogen		

Effects of the use of hydrogen

Internal tank position alternatives





Effects of the use of hydrogen

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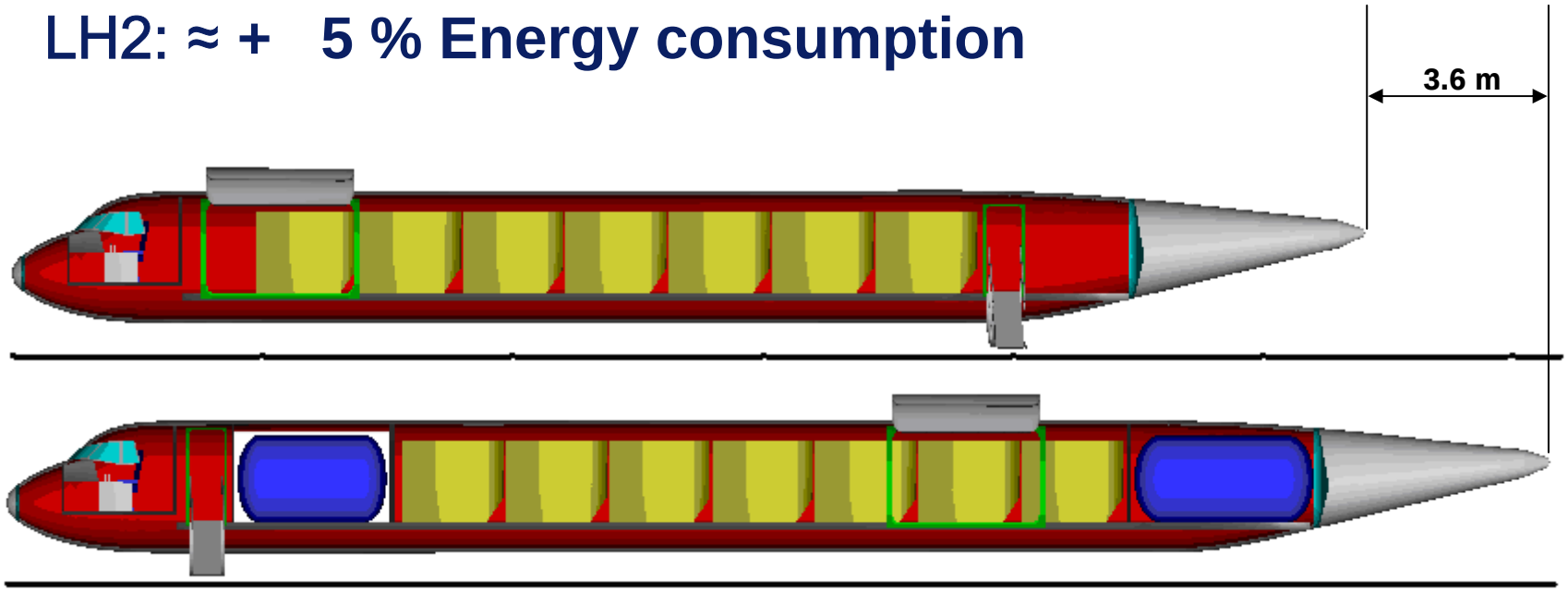
Size, mass, energy consumption

LH2: ≈ + 15 % MOEW; + 5 % MTOW

LH2: ≈ + 5 % Energy consumption



Effects of the use of hydrogen

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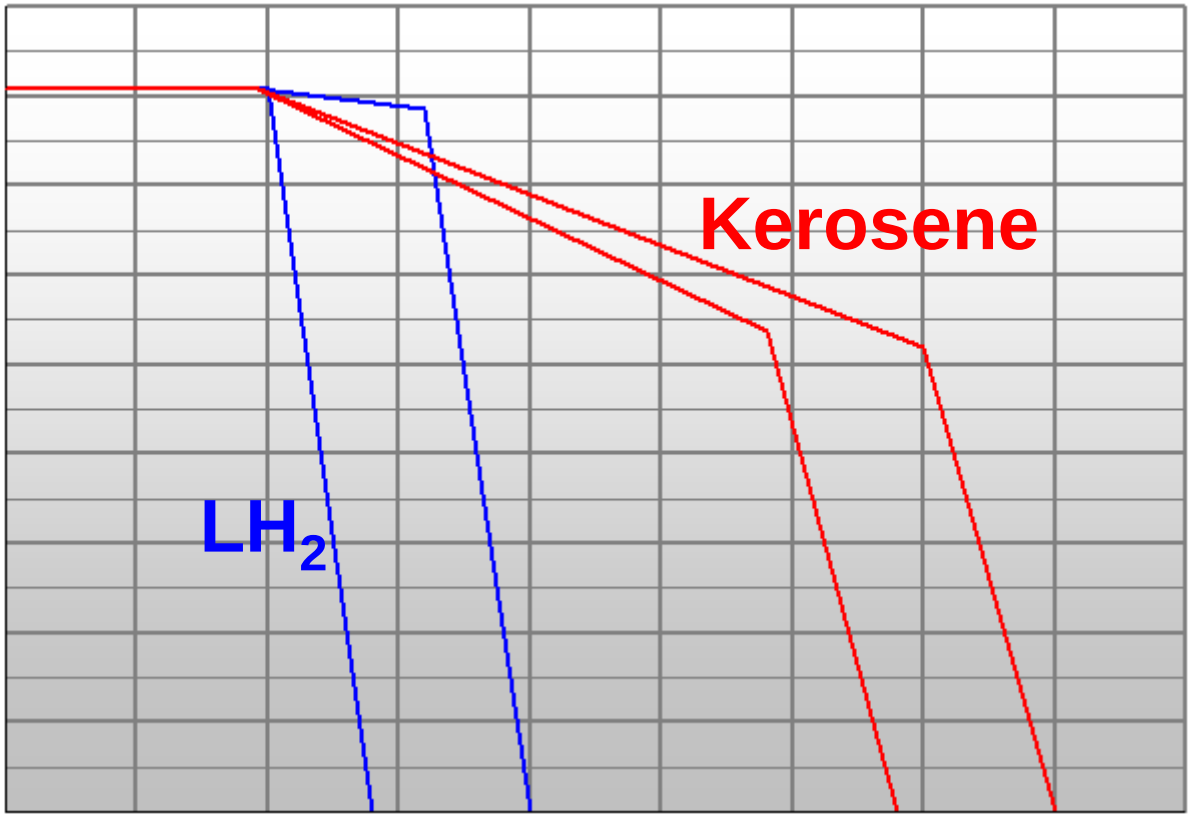
Performance



Effects of the use of hydrogen

Emissions

LH2: No CO_2

LH2: ≈ 90 % less NO_x

Freighter aircraft enabling hydrogen

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Increasingly interesting market segment

- **Cargo volume forecasts: plus ≈ 6% p.a.**
  - ⇒ **World annual air cargo volume is expected to triple by 2025**
  - ⇒ **World freighter aircraft fleet is expected to almost double by 2025**
- **Need and market for new and dedicated freighter aircraft**

Hydrogen in freighter aircraft

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Greater freedom in design

- Greater psychological acceptance of unmanned operation and the use of hydrogen as fuel
- Largely reduced environmental control system (ECS)
- Infrastructure: More than 50 % of world air cargo is transported between less than 20 hubs

Hydrogen in freighter aircraft

Greater freedom in design

– Less problems in case of blended wing body configurations

- cabin pressurization,
- accelerations during roll maneuvers,
- no outside-view,
- evacuation,
- ...

Hydrogen in freighter aircraft

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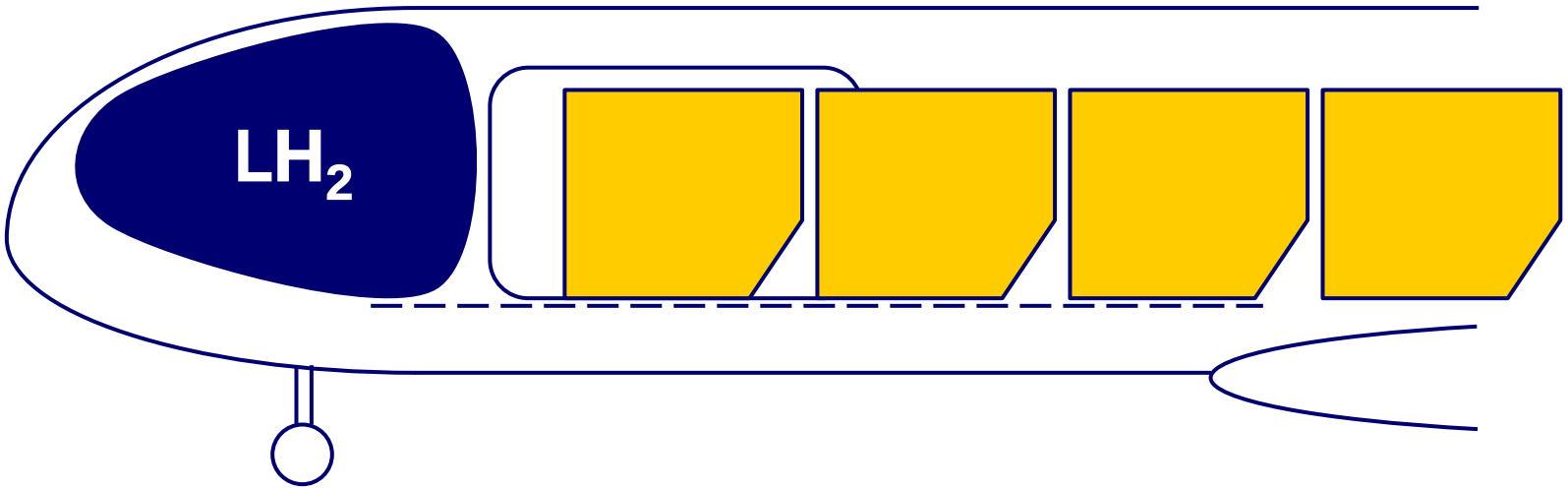
Unmanned operation

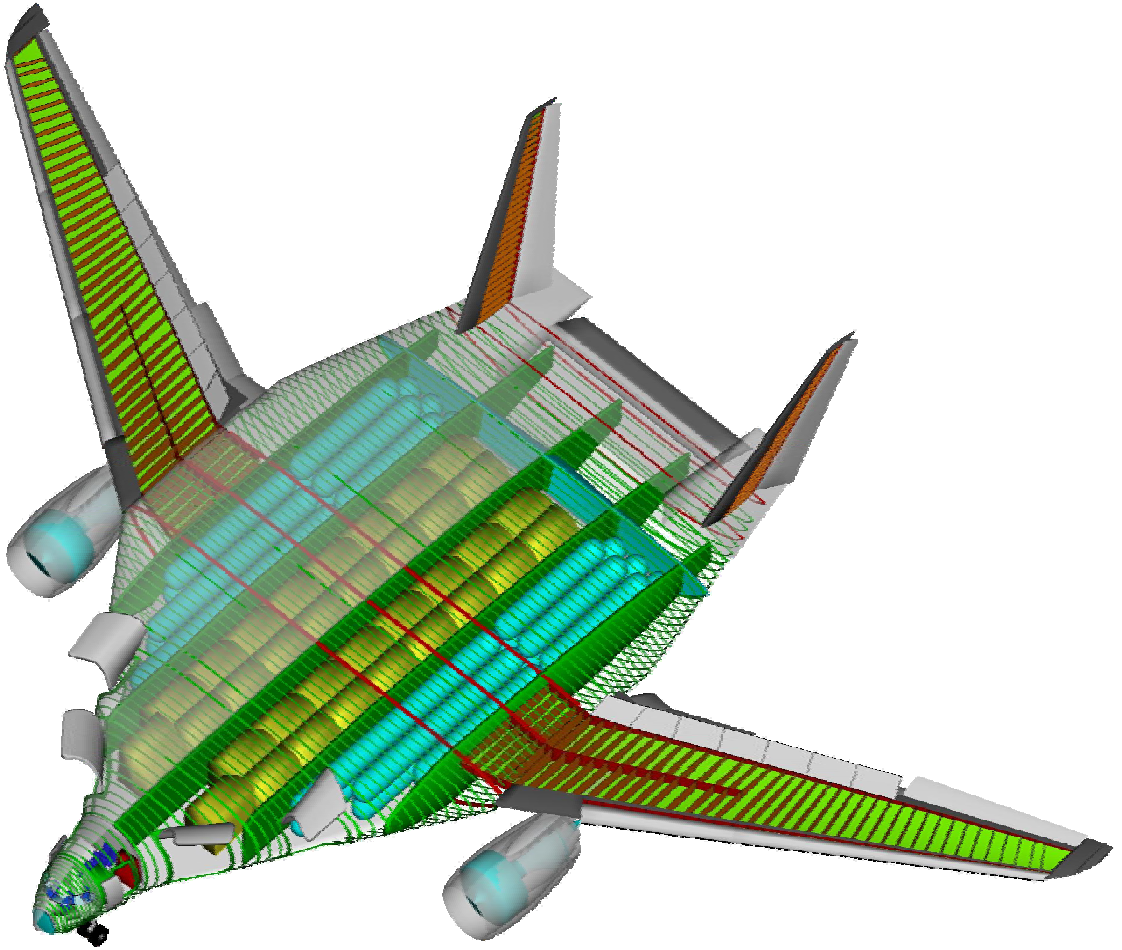


⇒ **New potential fuel storage volume**

⇒ **Smaller/no fuselage stretch**

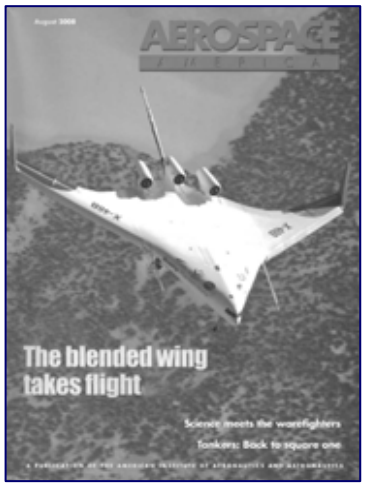
⇒ **Less mass and performance penalty**

Unconventional configurations

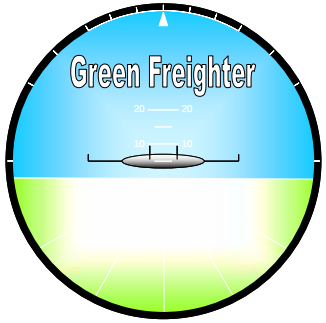


Hydrogen in freighter aircraft

- **“Safe handling of hydrogen is no longer a problem in the industrial and commercial area”**
- **Enough maturity to get (back) into demonstration**
- **Create confidence for investors**



Thank you for your attention



For further information see

http://GF.ProfScholz.de