

Bauhaus Luftfahrt e.V.

Peter Lobner, 8 February 2022

1. Introduction

Bauhaus Luftfahrt e.V. is a non-profit association that was founded in Munich, Germany in November 2005 by aerospace firms EADS



(today, Airbus Group), Liebherr-Aerospace Lindenberg, and MTU Aero Engines, as well as the Bavarian State Ministry for

Economic Affairs, Infrastructure, Transport and Technology. With a staff of about 50 people working on Interdisciplinary research teams, Bauhaus Luftfahrt focuses on the development of advanced civil aircraft design concepts that help define long-term development options for the aviation industry. Their website is here:

<https://www.bauhaus-luftfahrt.net/en/>

In 2008, Bauhaus Luftfahrt developed design concepts for two advanced airships: a luxury cruising hybrid airship and a vertical take-off and landing (VTOL), semi-buoyant, hybrid winged aircraft.

2. Luxury cruising airship

In their 2008 paper presented at the International Congress of the Aeronautical Sciences (ICAS 2008), the Bauhaus Luftfahrt authors explained their concept for a luxury cruising airship:

“Bauhaus Luftfahrt is pursuing the application of airships for luxury cruises. This particular market has not been looked into quite deeply and could provide a future niche market for Lighter-Than-Air technology. The required aircraft needs to operate very quietly, with almost no vibration, and it needs to provide a very high level of comfort. It also should be able to hover above a particular point of interest. Furthermore, it should offer enough room for the passengers on board to feel at ease any time.”

“The idea here is to offer a cruise for a maximum of 20 passengers; providing a journey with wellness character.”

“The idea of luxury in that particular concept should be defined in a completely new way. That means that in an actual interior design, luxury could be re-discovered through entirely new solutions, e.g. an exclusive foam bath rather than a heavy swimming pool. Additional equipment like casino, bar or sauna required to be designed for minimum weight. Comfort here means using exclusive offers only available on board that luxury cruise vehicle. This specialized airship could fly to any destination and perform various missions, e.g. city sightseeing, safari flights or rainforest cruises.”



Luxury cruising airship concept. Source: Bauhaus Luftfahrt (2008)

Basic design parameters for the luxury cruiser

| Parameter | Bauhaus Luftfahrt luxury cruiser |
|-------------------|---|
| Airship type | Hybrid, semi-rigid |
| Length | 85 m (279.9 ft) |
| Width | 45 m (147.6 ft) |
| Height | 22 m (72.2 ft) |
| Lift gas | Helium |
| Volume | 45,000 m ³ (1,590,000 ft ³) |
| Accommodations | 8 crew + 18 passengers |
| Propulsion system | Hybrid solar electric power system with fuel cells for energy storage, driving electric motor-driven propulsors |

Interior concepts for the luxury cruising airship



Bow observation deck. Source: Bauhaus Luftfahrt (Yearbook 2008)



Bow observation deck at twilight (top), dining room and bar (bottom). Source: Bauhaus Luftfahrt (2008)



*Rendering of the luxury cruising airship boarding thru a bow door.
Note that a mobile mooring mast is connected.
Source: Bauhaus Luftfahrt (Yearbook 2008)*

3. VTOL semi-buoyant hybrid aircraft

The VTOL, semi-buoyant, hybrid winged aircraft concepts were designed to operate at substantially higher cruise speeds than other LTA design options. The Bauhaus Luftfahrt authors explained:

“....in order to reach those speeds, the airship must have a low drag profile as well as a proper propulsion system. Because fast cruise speeds require greater engine power it also can be used efficiently for hovering, take-off and landing maneuvers as well as for attitude stabilization.”

“But being able to operate independently without any ground crew, those airships need to be heavier than air. The static lift must not be higher than the operating weight empty of that aircraft.”

At the time of ICAS 2008, first rough sketches had been prepared and preliminary calculations had been performed for a hybrid airship with the broad delta wing planform shown in the following Bauhaus sketches.

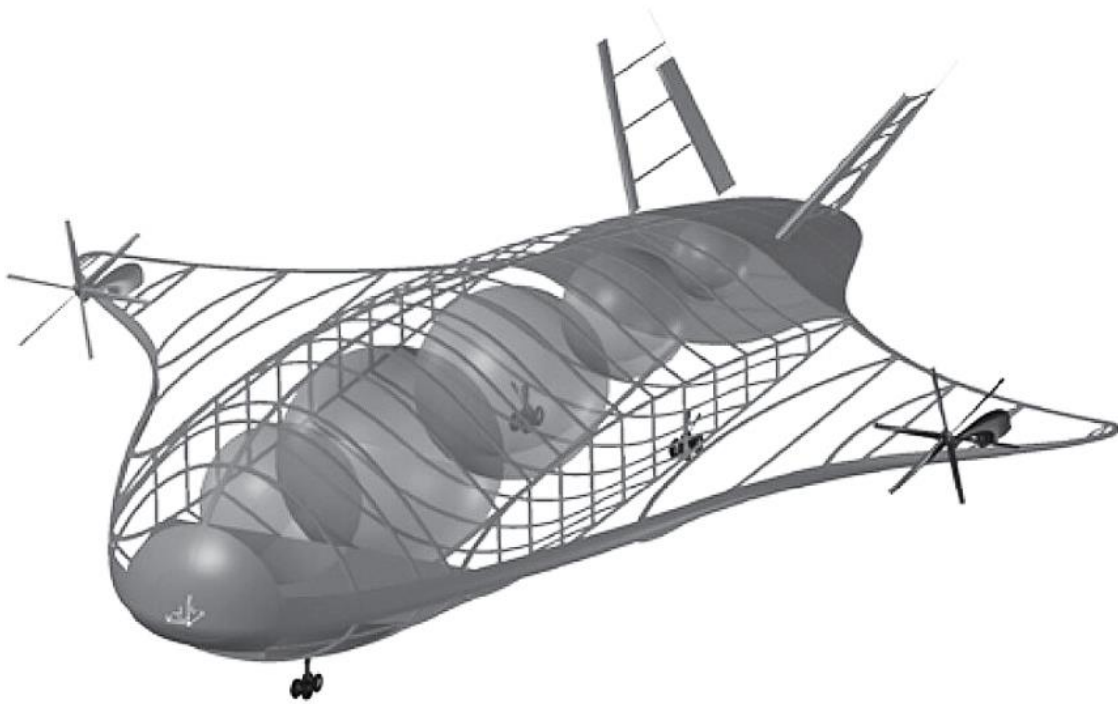


Source: Bauhaus Luftfahrt (2008)

These preliminary concepts evolved into the large semi-buoyant delta wing aircraft concept shown below.



Rendering of VTOL airship in flight. Source: Bauhaus Luftfahrt (2008)



VTOL airship structural details. Note the spherical lift gas cells along the centerline. Source: Bauhaus Luftfahrt (Yearbook 2008)

In operation, the large, thrust vectoring propulsors at the wingtips pivot vertically to provide the dynamic lift needed for vertical take-off, with enough power for transitioning to forward flight. As airspeed increases, the aerodynamic lift from the aerobody fuselage and wings replaces the dynamic lift, allowing the propulsors to pivot horizontally for high-speed forward flight.

It is likely that this airship can carry heavier loads when making short takeoffs and landings (STOL), much like the semi-buoyant Aereon Dynairships from the 1970s and 1980s.

4. For more information

- Raffael György, Klaus Broichhausen, Jost Seifert, "Potential for Lighter-Than-Air Technology in Future Markets – An Evaluation," Bauhaus Luftfahrt e.V., paper presented at ICAS 2008, 26th International Congress of the Aeronautical Sciences, Anchorage, Alaska, USA, 14 - 19 September 2008:

http://www.icas.org/ICAS_ARCHIVE/ICAS2008/PAPERS/507.PDF

- Bauhaus Luftfahrt – Yearbook 2008: <https://www.bauhaus-luftfahrt.net/epdf/Bauhaus-Luftfahrt-E-Jahrbuch-2008/#1>

Other *Modern Airships* articles

- *Modern Airships - Part 1*: <https://lynceans.org/all-posts/modern-airships-part-1/>
- *Modern Airships - Part 2*: <https://lynceans.org/all-posts/modern-airships-part-2/>
- *Modern Airships - Part 3*: <https://lynceans.org/all-posts/modern-airships-part-3/>