

# Euro Airship - rigid airships

Peter Lobner, updated 17 August 2023

## 1. Introduction

Euro Airship was founded in 2010 as a private company in Bayonne, France, by Marc Sénépart, who is now the Chief Technology Officer.



The firm has carried out more than 10 years of engineering analysis and design, as well as detailed application studies on

market requirements for modern airships. Their goal is to become the world leader in rigid airship design, construction and sales.

Euro Airship has prepared construction-ready designs for the following rigid airships that are intended for operating in all weather conditions:

- Euro Airship 10T (formerly Corsair)
- Euro Airship 50T (formerly DGPAtt 50)
- Euro Airship 400T (formerly DGPAtt 400)
- Solar Airship One

These airships are configurable for use in a wide range of applications, including cargo hauling with precise pickup and delivery, rescue and humanitarian missions on land or at sea, long-duration surveillance of land or sea areas, scientific missions, military missions, and tourism. Euro Airship holds international patents to key technologies incorporated in these airships.

On their website (<http://www.euroairship.eu>), Euro Airship explains: “With 10 years of self-financed research, major patented technical innovations, and 3 years of complementary engineering work by Capgemini Engineering, we are excited to announce that our team is now entering the industrialization phase.” To highlight this transition, Euro Airship and its industrial partners are developing their newest design, the Solar Airship One, to make the first non-stop, all-electric, solar-powered, around-the-world flight in 2026.

Special thanks to Euro Airship and Marie-Christine Bilbow for their thoughtful input for this article.

## **2. Euro Airship general features**

Euro Airship's designs are founded on Zeppelin designs from the interwar period (1920s – 1930s). From this starting point, years of research and development and the introduction of new materials and technologies have resulted in modern rigid airship designs with significantly improved performance, maneuverability, reliability, stability and safety.

Common features of Euro Airship designs include:

- Rigid framework with double polylobed gas envelopes
  - Outer fabric shell; inner low-leakage helium lifting gas cells
- Cigar shaped aerodynamic profile with low drag coefficient ( $C_x$ )
  - This reduces the airship's wind resistance and sensitivity to wind gusts.
- Patented variable buoyancy control system using air ballast:
  - Enables vertical takeoff and landing (VTOL) and hovering.
  - Manages airship buoyancy during load exchanges without the need for external ballast exchange.
- A water ballasting system is available for use if needed.
- Patented anticipatory piloting system manages the helium gas volumes, automates airship stabilization and anticipates variations to be corrected.
- Powerful engines, but quiet operation.
  - Solar-electric propulsion is available on some models
- Designed for high-availability, all-weather operation, 365 days a year:
  - Designed to operate in the same weather conditions as fixed-wing cargo airplanes.
  - Able to operate in weather conditions that might ground other airships.

- The rigid hull and the powerful engines enable the airships to withstand in-flight winds of up to 160 km/h (99 mph) without risk to their structures. Notwithstanding, the routes flown by the airships typically would seek more favorable wind conditions than flying directly into strong winds.
- Automatic de-icing of the entire hull through reuse of warm air.
- Long operating range of several thousand kilometers.
- Largely independent of ground infrastructure; can load & unload anywhere, including at sea:
  - Airship can land to permit rapid roll-on/roll-off (Ro-Ro) loading and unloading.
  - Airship can remain aloft, hovering over ships or other specific locations and conduct loading and unloading using airborne cranes.
  - Airship can land and pick up or deliver a detachable cargo pod.
  - Can operate from a fixed-base rotating platform that keeps the airship pointing into the wind after mooring.
- Capable of landing at unimproved sites; also capable of amphibious operations.
- Low operating cost, enabled by the expected high operational availability of the airship and its all-weather operating capability.
- Low environmental impact:
  - 6 to 10 times less carbon dioxide emissions than a fixed-wing airplane of comparable cargo capacity.
  - No carbon emissions from solar-electric powered models
- Transformable into a drone for unmanned operations: low radar cross-section and capable of very long autonomous missions (over 15 days) at medium altitude (up to 7,000 m / 23,000 ft).

### 3. Implementing variable buoyancy control on a Euro Airship

One of the key technologies is a ballasting system that uses compressed air as the variable ballast. The operation of this system is described as follows:

“Euro Airship’s patented airship ballasting system uses the powerful on-board engines to manage compressed air stored in special containers. Ballasting can achieve airship weighting in seven minutes to one hour, depending on the size of the load to be discharged (from 10 to 400 metric tons).”

The maximum pressure of the Euro Airship air ballast system is not known, but the following parametric analysis provides insight into the air ballasting requirements for the range of payloads carried by Euro Airship rigid airships.

<i>Mass of air ballast</i>	<i>Volume of air ballast at atmospheric pressure (14.7 psia)</i>	<i>Volume of air ballast at 50 psig (64.7 psia)</i>	<i>Volume of air ballast at 100 psig (114.7 psia)</i>	<i>Volume of air ballast at 200 psig (214.7 psig)</i>
<i>10 metric tons (10,000 kg)</i>	<i>7,841 m<sup>3</sup> (276,902 ft<sup>3</sup>)</i>	<i>1,781 m<sup>3</sup> (62,895 ft<sup>3</sup>)</i>	<i>1,005 m<sup>3</sup> (35,491 ft<sup>3</sup>)</i>	<i>537 m<sup>3</sup> (18,964 ft<sup>3</sup>)</i>
<i>50 metric tons (50,000 kg)</i>	<i>39,203 m<sup>3</sup> (1,384,440 ft<sup>3</sup>)</i>	<i>8,907 m<sup>3</sup> (314,548 ft<sup>3</sup>)</i>	<i>5,026 m<sup>3</sup> (177,492 ft<sup>3</sup>)</i>	<i>2,685 m<sup>3</sup> (94,820 ft<sup>3</sup>)</i>
<i>400 metric tons (400,000 kg)</i>	<i>313,627 m<sup>3</sup> (11,075,633 ft<sup>3</sup>)</i>	<i>71,256 m<sup>3</sup> (2,516,382 ft<sup>3</sup>)</i>	<i>40,207 m<sup>3</sup> (1,419,897 ft<sup>3</sup>)</i>	<i>21,483 m<sup>3</sup> (758,665 ft<sup>3</sup>)</i>

*Note: At IUPAC standard temperature and pressure (STP, 0 °C and 100 kPa / 1 atm / 14.7 psi), dry air has a mass of about 1.2754 kg/m<sup>3</sup>*

The volumes indicated in the above table are the on-board air storage container volumes (at four different maximum pressures) required for the air ballast system to compensate for a load exchange of the designated mass. Large capacity air pumps and vent systems aboard the airship accomplish the tasks of rapidly and precisely adding or discharging pressurized air ballast as needed to establish the desired buoyancy condition.

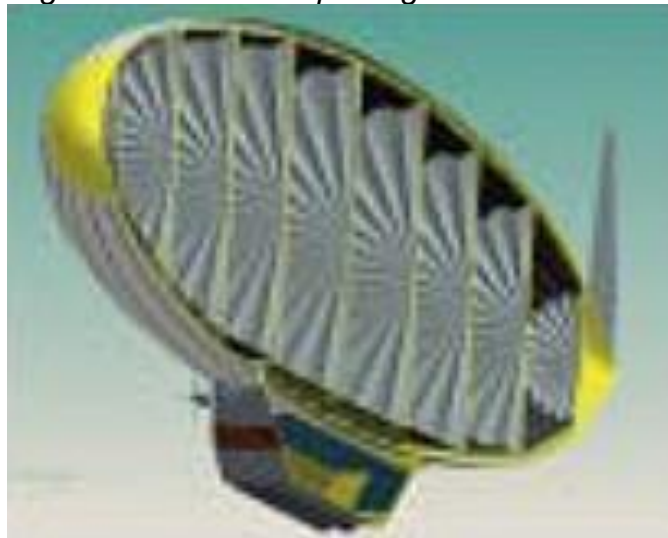
A conventional water ballast system is provided as a backup or supplement to the air ballast variable buoyancy control system.

#### 4. The Euro Airship 10T rigid airship and its predecessor, the Corsair

The Euro Airship 10T is an evolutionary development of the Corsair rigid airship, and is configurable for a variety of missions with payload requirements up to 10 metric tons (11 tons). For Corsair, such missions included tourism, cargo, military surveillance and civil security. The airship has a crew of two and can be configured to operate unmanned as an autonomous or remotely-piloted drone.



*Rendering of a Corsair airship in flight. Source: Euro Airship*



*Corsair internal lifting gas cell arrangement  
Source: Euro Airship*

Corsair was offered in three versions: Standard, Hybrid and Solar-powered. These versions are described in this section. Euro Airship 10T versions have not yet been announced.

## **Euro Airship 10T & Standard Corsair version**

### **General characteristics of the Euro Airship 10T & Corsair**

<b>Parameter</b>	<b>Euro Airship 10T</b>	<b>Corsair</b>
Length		139 meters (456 ft)
Diameter, max		23 meters (75.5 ft)
Propulsion		Two small turboshaft engines, each rated at 597 kW (800 shp), driving two propellers mounted amidships on the gondola
Variable buoyancy control system		Air ballasting system with two air pumps powered, each powered by a 100 kW (136 shp) microturbine
Crew	2 (pilot, co-pilot or engineer)	2 (pilot, co-pilot or engineer)
Payload, max	10 metric tons (11 short tons)	8 metric ton (8.8 short ton)
Speed, cruise		108 kph (67 mph)
Speed, max		130 kph (81 mph)
Altitude		<ul style="list-style-type: none"> <li>Up to 7,000 m (22,966 ft) with 1 metric ton payload</li> <li>2,000 m (6,561 ft) with max payload</li> </ul>
Range, operational		About 2,000 km (1,243 miles) with max payload

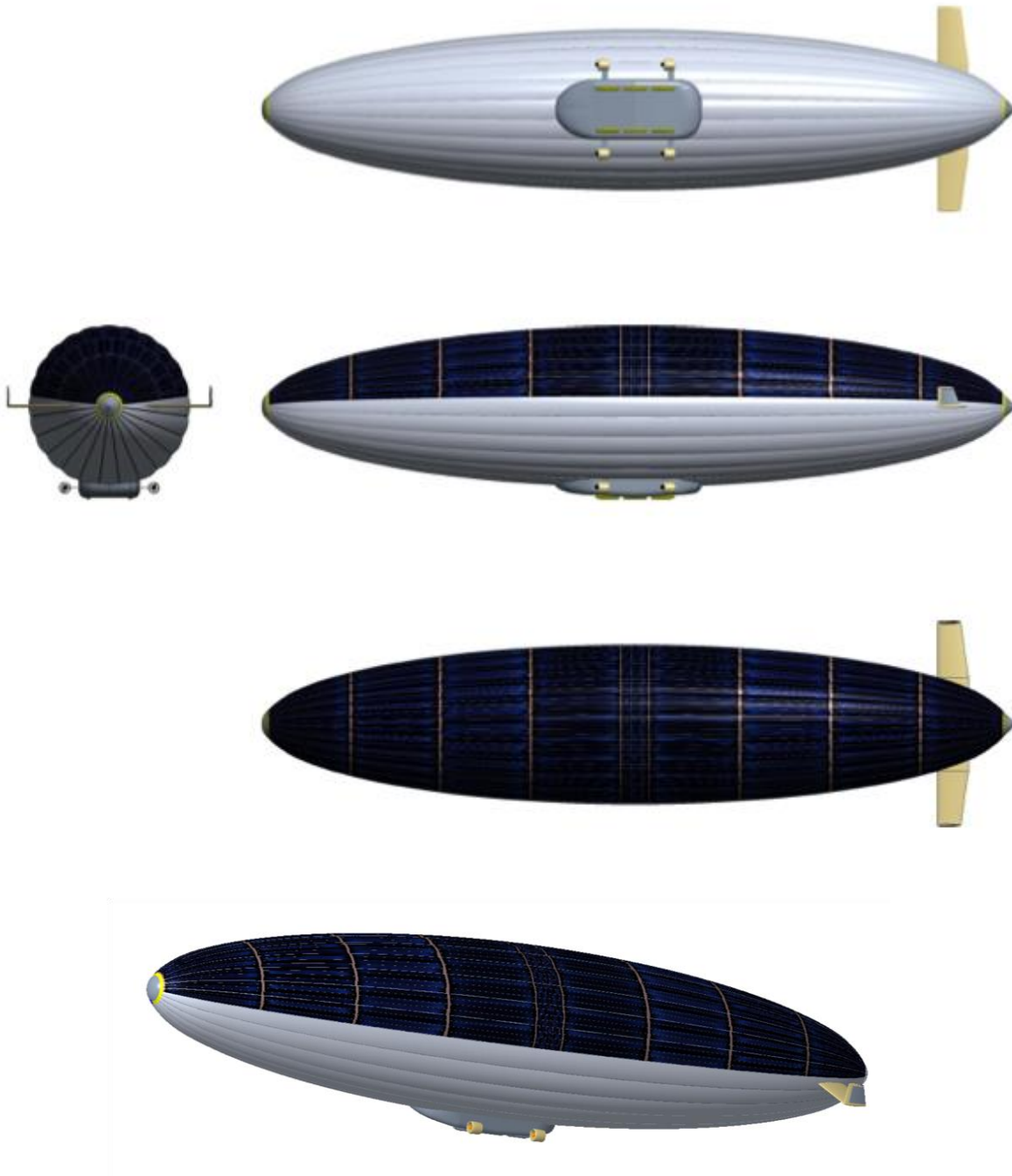
*Note: Details for the Euro Airship 10T have not yet been released.*

## **Hybrid Corsair version**

Two hybrid generators provide electric power for propulsion and airship systems, each consisting of a gas turbine driving an electric generator rated at 600 kWe. Propulsion is provided by four vectorable propellers mounted to the gondola, each driven by a 350 kW (469 shp) electric motor. One back-up lithium battery system can provide power for fans, two lateral thrusters (front and rear) or 100 kW of additional power for landing and takeoff assistance.

## **Solar Corsair version**

A solar-electric version of the Corsair incorporated thin-film solar panels on the upper half of the envelope. The general configuration of this airship is shown in the following graphics.



*Renderings of the solar-electric powered Corsair airship.  
Source: Euro Airship*



## 5. The Euro Airship 50T rigid airship and its predecessor, the DGPAtt 50

“DGPAtt” is the French acronym for “autonomous jumbo all-weather airship”. Propulsion is provided by four turboshaft engines driving four (or six) propellers mounted amidships, two (or three) on each side of the gondola. Directional control is provided by an all-moving rudder and, for low-speed maneuvering, by lateral thrusters located in the bow and stern.

The Euro Airship 50T is expected to have a similar design.



*Two views of the DGPAtt 50 airship. Source: Euro Airship*

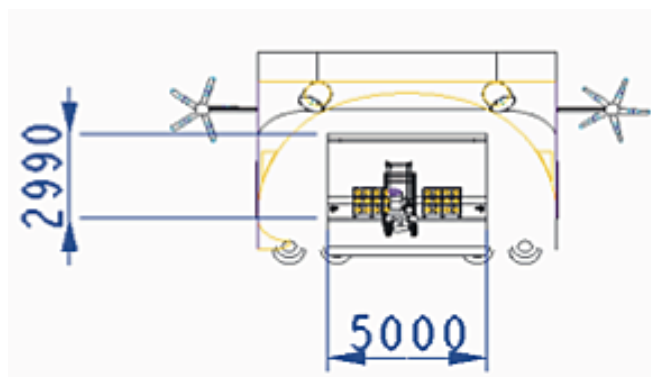
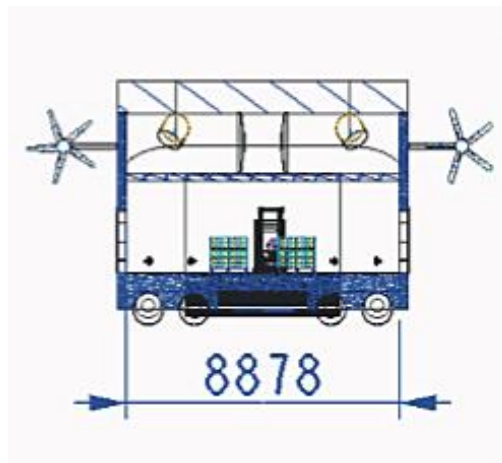
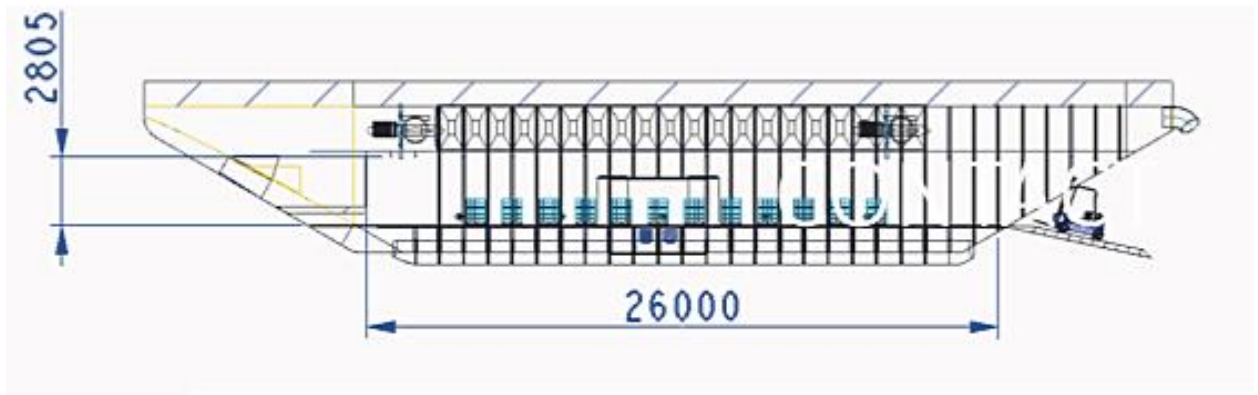


## General characteristics of the Euro Airship 50T & DGPAAtt 50

Parameter	Euro Airship 50T	DGPAAtt 50
Length		169 meters (554 ft)
Diameter, max		33 meters (108 ft)
Propulsion		Four turboshaft engines, each rated at 2,013 kW (2,700 shp), driving four (or six) propellers mounted amidships, two (or three) on each side of the gondola
Aerodynamic controls		All-moving inverted-Y rudder & elevons
Low-speed lateral dynamic control		Bow and stern lateral thrusters
Variable buoyancy control system		Air ballasting system details not specified
Crew	2 (pilot, co-pilot or engineer)	2 (pilot, co-pilot or engineer)
Payload, max	50 metric tons (55 short tons)	50 metric ton (55 short ton)
Cargo bay, standard		26 L x 8 W x 4 H meters (85 x 26 x 13 ft)
Speed, cruise		130 kph (81 mph)
Speed, max		180 kph (112 mph).
Altitude		3,000 meters (9,842 feet) with max payload
Range, operational		About 2,800 km (1,740 miles) with max payload
Range, ferry		More than 10,000 km (6,214 miles) with no cargo

*Note: Details for the Euro Airship 50T have not yet been released.*

A DGPAtt airship can be equipped with standard or specialized cargo bays. Standard bays are shown in the following figures.



*The DGPAtt cargo hold layout and dimensions  
Source: Euro Airship*

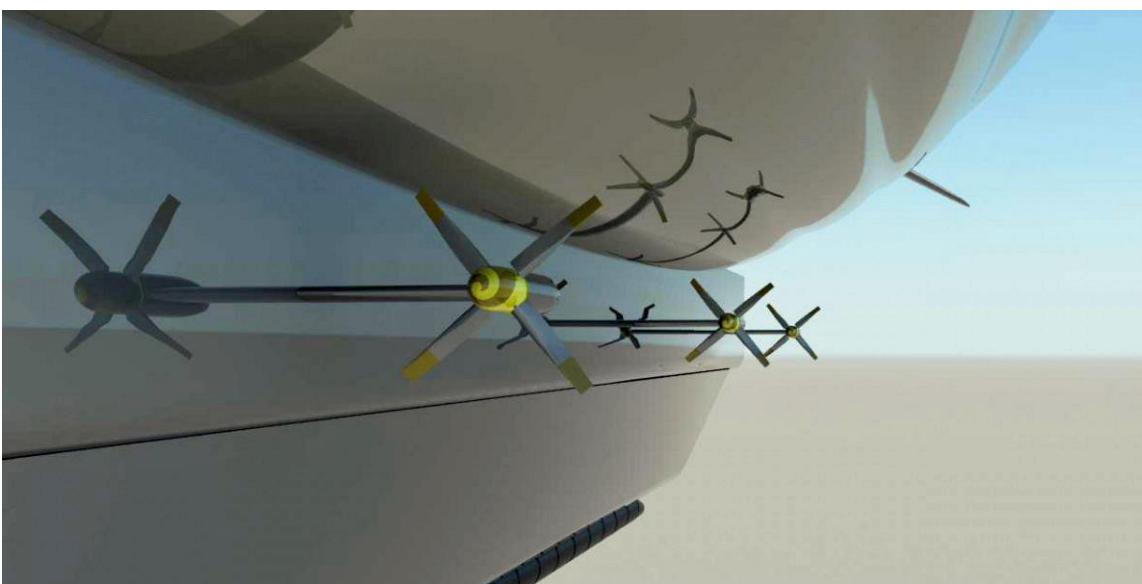


*Two rendering of a DGPatt airship in flight.  
Source: Euro Airship*

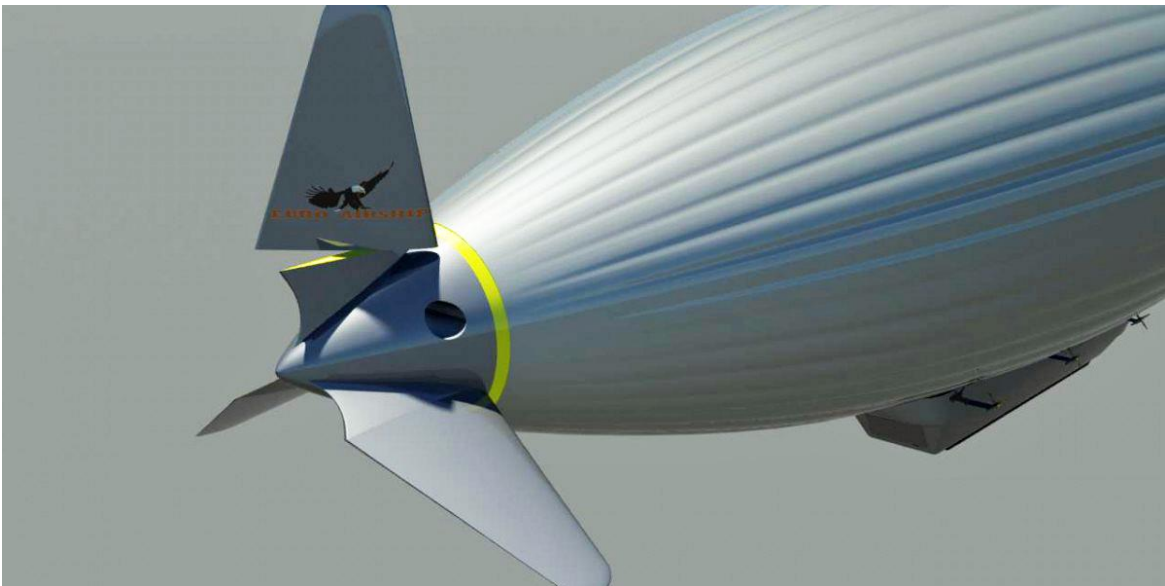
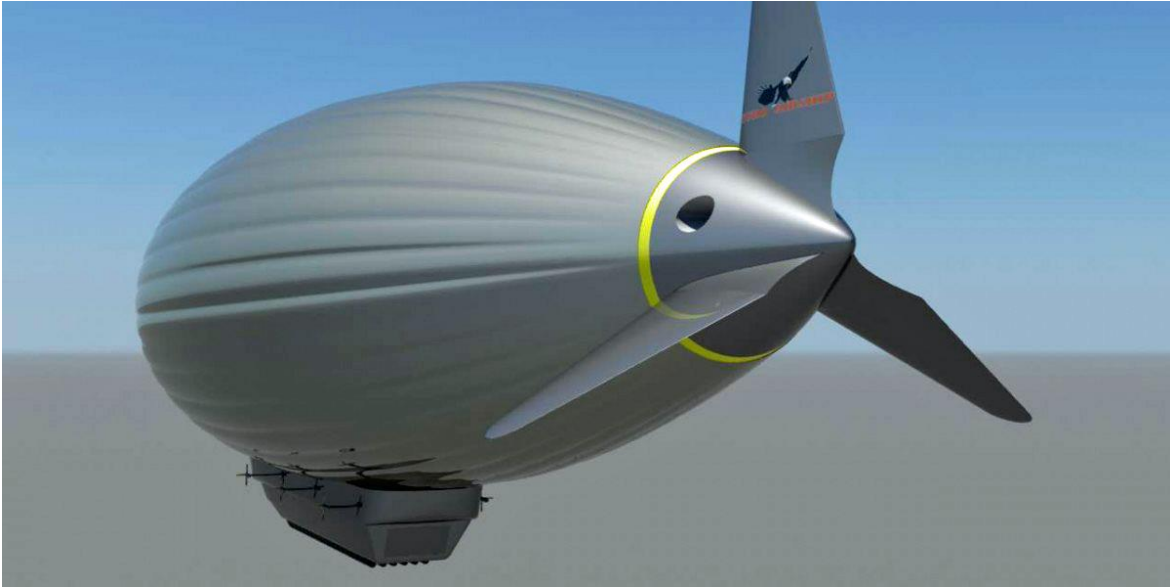




*Front quarter view of a DGPatt airship. Note the placement of the bow lateral thruster on the nose cone and the propulsion propellers along the side of the gondola.*  
Source: Euro Airship



*Close-up of three sets of propellers along the side of the gondola.*  
Source: Euro Airship



*Two stern views of the DGPatt concept. Note the all-moving rudder design and placement of the stern lateral thruster in the tail cone.  
Source: Euro Airship*

In 2014, The European Union's Heli4Rescue (H4R) Project evaluated the future needs of a proposed trans-European emergency response infrastructure. Part of that infrastructure would be an airborne response service that could perform a wide range of important functions, including delivery of bulk supplies and evacuation of large numbers of people in heavy-lift airships. The Euro Airship DGPatt was the heavy-lift airship included in the H4R evaluation.





*Elements of a proposed EU airborne response service includes a DGPatt heavy-lift airship. Source: screenshot from EU H4R video*

The H4R Final Report states:

“As reference for Large Sized Airship (LSA) the rigid airship from the Euroairship project has been considered. This project is under funding phase with patent technology for automatic ballasting system. Thanks to new technology applications in structure, membrane and to its natural aerostatic lift and automatic ballasting system, LSA is very efficient for autonomous heavy lift transport and firefighting and Civil Security missions. LSA is also very cost efficient and environmentally friendly with regards to other aerial or terrestrial means.”

You can view the EU’s Heli4Rescue (H4R) “dissemination video” at the following link. This video illustrates how a heavy lift airship could be integrated into an airborne response service that includes other aircraft types (helicopters and drones) that have unique roles in the response.

<https://www.youtube.com/watch?v=ZEmcr-mYgZM>

You can read the H4R report here:

<https://cordis.europa.eu/docs/results/284/284658/final1-d1-5-public-report-final.pdf>

The DGPAtt can transport and dump tons of water at a rate faster than current fire-fighting tanker aircraft. Euro Airship estimates that it would take four to five fire-fighting planes to match the airdrop capacity of one 30-T (30 metric ton) DGPAtt, about 90 metric tons/hour. With its VTOL and variable buoyancy capabilities, a fire-fighting DGPAtt can hover and fill its cargo hold with water from any nearby water body (lake, large or small rivers, etc.) and then return to continue fighting the fire.



*DGPAtt dropping water on a forest fire. Source: Euro Airship*

## **6. The Euro Airship 400T rigid airship and its predecessor, the DGPAtt 400**

The very large Euro Airship 400T is planned to be a scale-up of the Euro Airship 50T design, both of which are based on the earlier designs of the DGPAtt 50 and DGPAtt 400 airships. The Euro Airship 400T is designed to handle payloads up to 400 metric ton (440 short tons) in a large internal cargo bay. This airship also could operate in a passenger configuration.



## 7. Luxury versions of the Euro Airship 50 and its predecessor, the DGPAtt 50

As they did with their earlier DGPAtt 50 design, Euro Airship is expected to offer customized passenger-carrying versions of their latest 50T airship, taking advantage of the large internal volume of the gondola to create luxurious, multi-level passenger spaces that are tailored to the particular application and customer's preferences. Such passenger airships also take advantage of the operational capabilities of the airship to takeoff and land vertically, cruise noiselessly, hover indefinitely, and operate during day or night in all weather conditions. For example, potential luxury passenger applications could include:

- A touring airship offering short-duration (i.e., hours) scenic / adventure flights during the day or at night for a relatively large number of passengers.
- A flying luxury “cruise ship” or small hotel providing overnight accommodations for a modest number of passengers on longer duration (i.e., days, weeks) trips, with routes selected to offer spectacular, panoramic views from the air, unique experiences from this airborne platform, and access to very remote or rugged locations with minimal environmental impact.
- A corporate or private “flying yacht” configured as required by the customer.



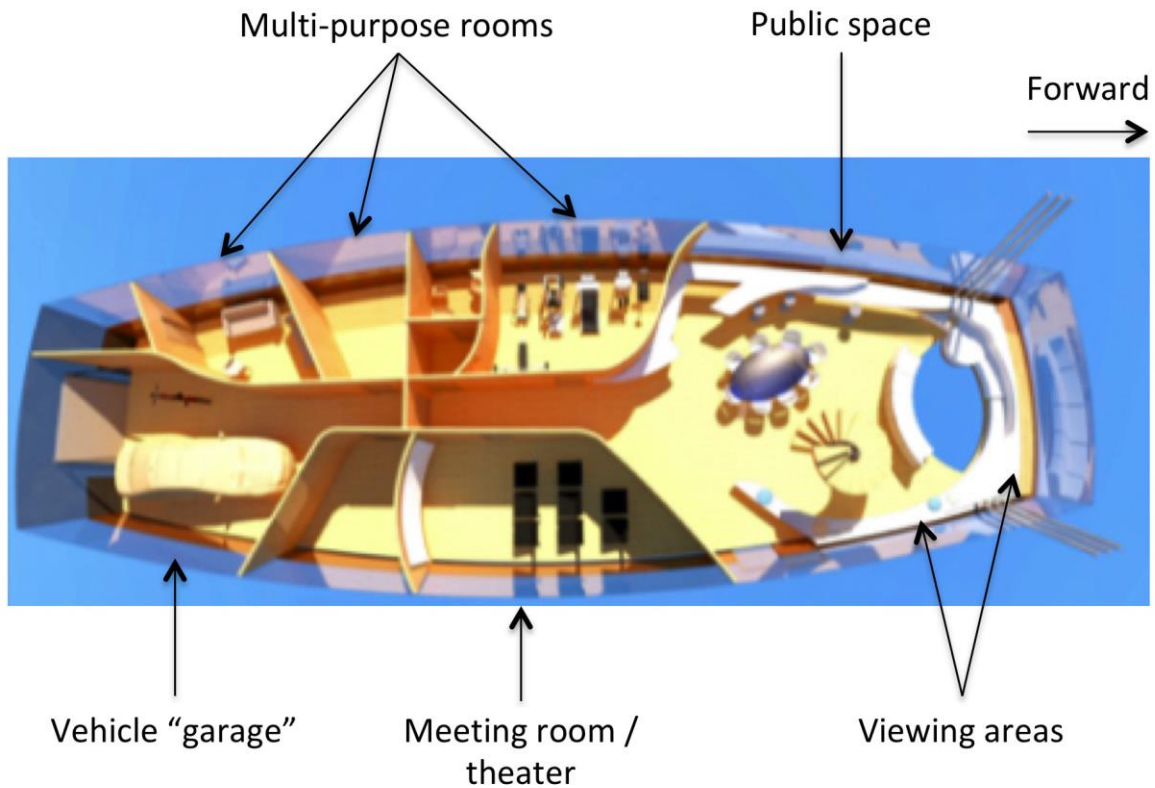
*DGPAtt visiting scenic destinations. Source: Euro Airship*



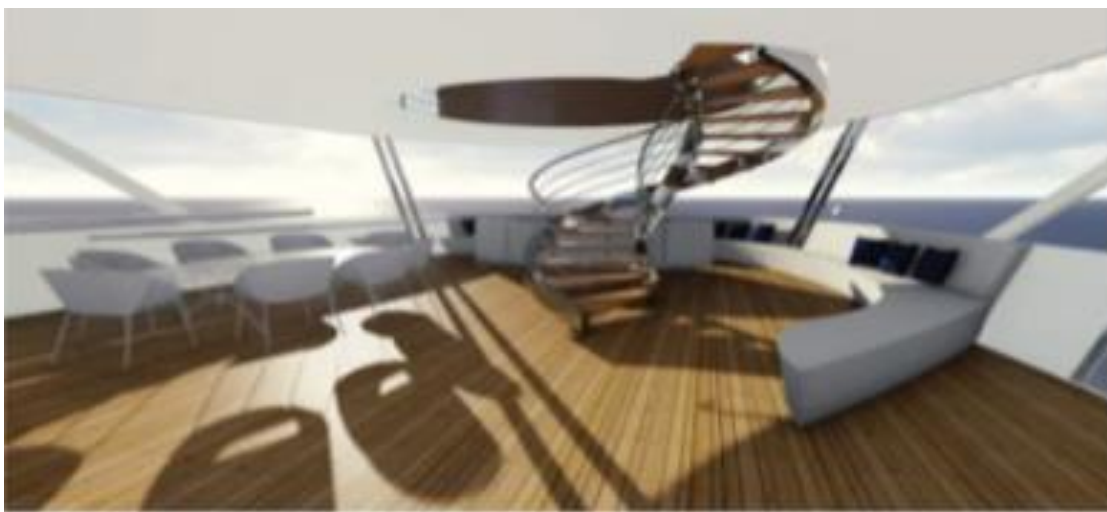
*DGPatt visiting a scenic destination. Source: Euro Airship*

Euro Airship developed the following set of floor plans, interior concept drawings, and in-flight renderings to provide examples of how its DGPatt airship could be configured for luxury passenger service. Similar interior designs are expected for the Euro Airship 50T.

**First (lower) level:** This level is configured with an expansive public area forward, a meeting room and several multi-purpose rooms. A vehicle for use when the airship lands is carried in the aft garage.



*Example floor plan for the lower level. Source: adapted from Euro Airship*



*Large windows in the lower level public area provide panoramic views.  
Source: Euro Airship*



*A transparent floor section provides a view straight down.*



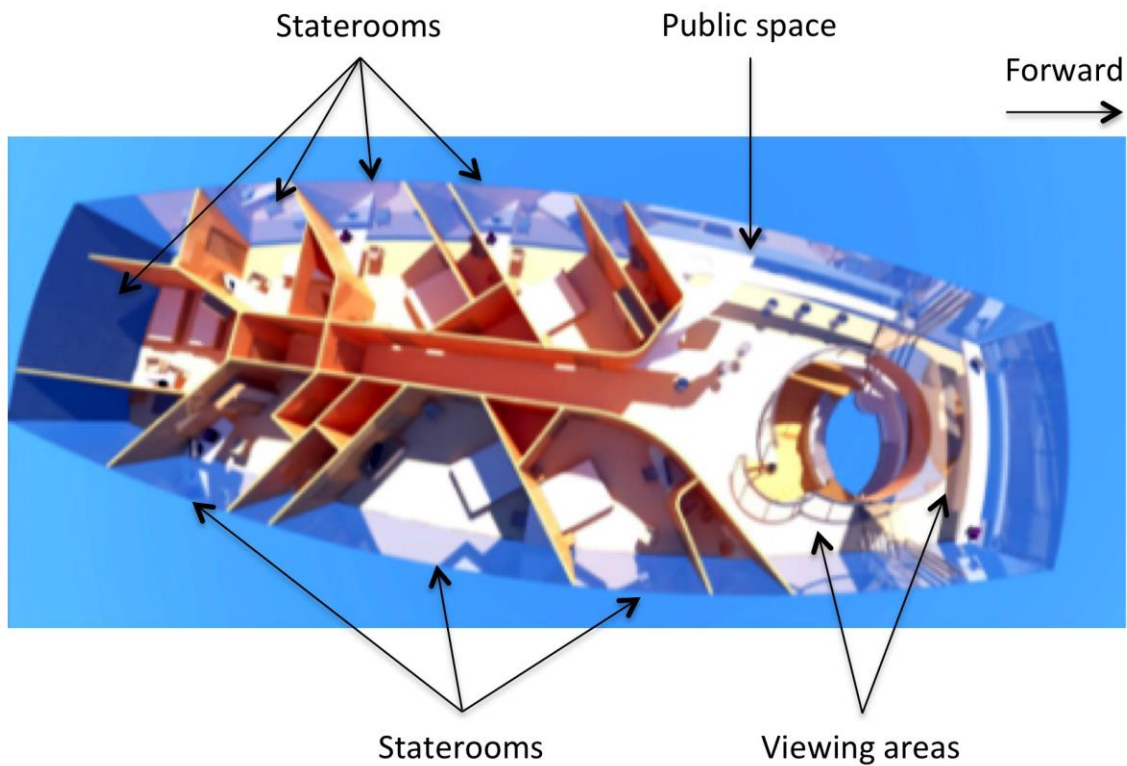
*Panoramic view from the forward seating area.*



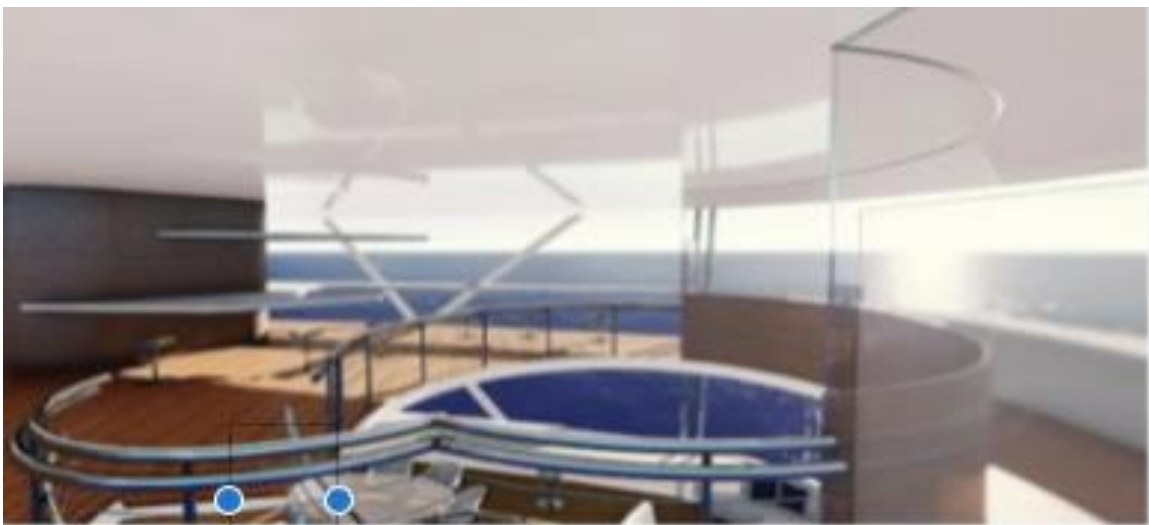
*Side view of the lower & upper level public areas.  
Source, three graphics: Euro Airship*



**Second (upper) level:** This level is configured with private staterooms aft and a public area with viewing areas and a bar forward.



*Example floor plan for the upper level. Source: adapted from Euro Airship*



*The upper level public area offers panoramic views and also shares the view straight down. Source: Euro Airship*



*The panoramic view forward from the upper level.*

*Source: Euro Airship*

## 8. Solar Airship One

Announced in January 2023, Solar Airship One is an ambitious project to build an all-electric rigid airship and fly it around the world



non-stop in 2026. Euro Airship leads the Solar Airship One project team, with support from many

industrial partner firms, including Capgemini, La Poste Groupe and Orange. The Solar Airship One project website is [here](#).



*Rendering of Solar Airship One, bow quarter view. Source: Euro Airship*

The general shape of Solar Airship One bears a family resemblance to Euro Airship's earlier rigid airship designs, Corsair and DGPAtt. Like the earlier designs, Solar Airship One incorporates systems for thrust vectoring propulsion, variable buoyancy control, anticipatory steering and automatic de-icing. These features enable all-weather operation and eliminate the need for heavy support infrastructure on the ground. Solar Airship One is sized and optimized for the primary mission of flying around the world with a small crew, on a 40,000 km (24,855 miles) West-to-East, equatorial route, in 20 days at an average altitude of 6,000 meters (19,685 ft), while generating zero CO<sub>2</sub> emissions.

The crew for the globe circling Solar Airship One flight is expected to include Swiss explorer Bertrand Piccard, French acrobatic pilot Dorine Bourneton and former French astronaut Michael Tognini. Piccard already has flown twice around the globe, first on the 1999 non-stop flight of the *Breitling Orbiter 3* balloon (a Rozière helium / hot air balloon), and second on the 2015 – 2016 flight of the solar-powered, fixed-wing *Solar Impulse*.

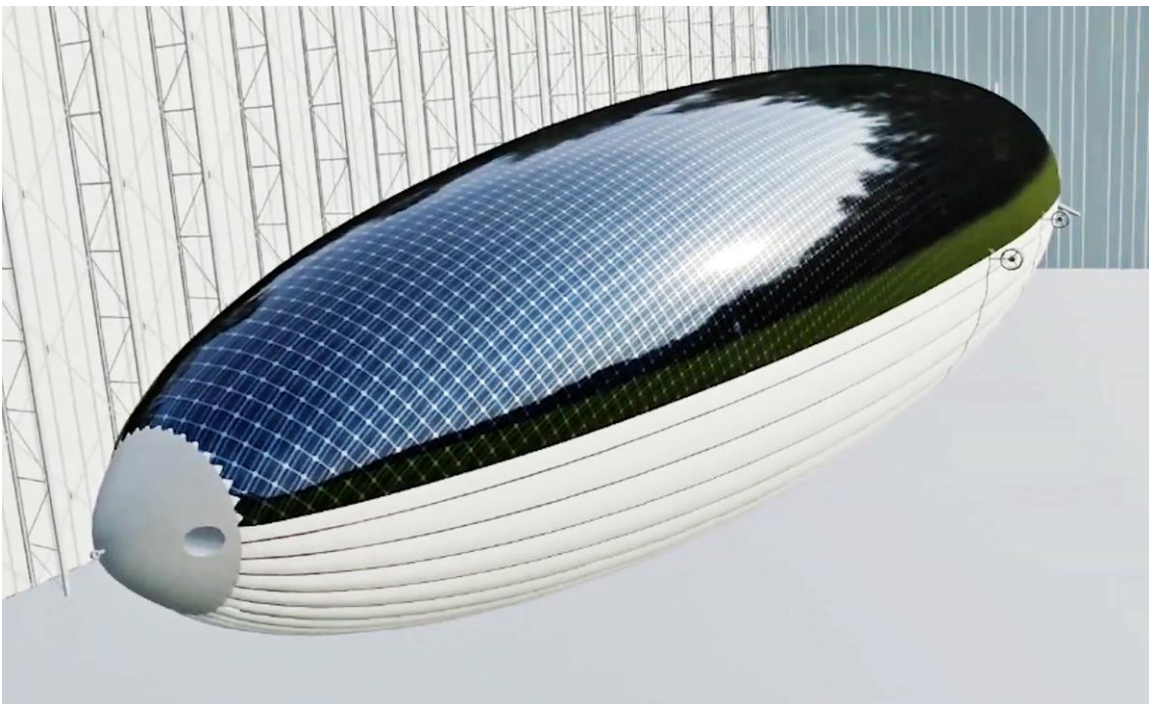
### General characteristics of the Solar Airship One

Parameter	Solar Airship One
Type	Rigid, variable buoyancy
Length	151 m (495.4 ft)
Diameter, max	About 30 m (98 ft)
Envelope	Double envelope, with 15 helium gas cells that are individually managed, automatic de-icing
Volume	53,000 m <sup>3</sup> (1,871,677 ft <sup>3</sup> )
Variable buoyancy control systems	<ul style="list-style-type: none"> <li>• Compressed air ballast system</li> <li>• Water ballast system</li> </ul>
Power source	<ul style="list-style-type: none"> <li>• 4,800 m<sup>2</sup> (51,667 ft<sup>2</sup>) photovoltaic array covers the entire upper surface of the hull</li> <li>• Hydrogen-oxygen fuel cells store energy during the day &amp; support airship operation through the night</li> </ul>
Propulsion	4 x flank-mounted, electric motor-driven, shrouded, thrust vectoring propellers
Altitude, cruise	6,000 m (19,685 ft)
Range	Around the world non-stop, about 40,000 km (24,855 miles)
Endurance	About 20 days
Speed, avg. cruise	About 83 kph (51.8 mph)



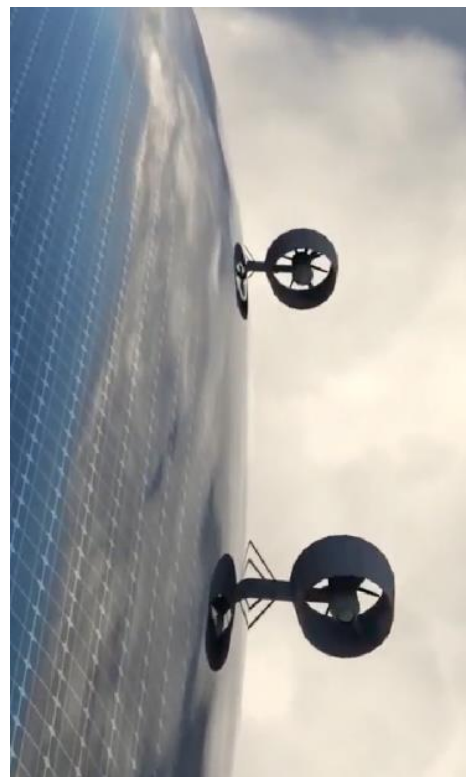


*Rendering of Solar Airship One showing the helium gas cells (brown) inside the rigid airframe, which has two reinforced transverse hull frames that support the flank-mounted propellers & propulsion system loads.*



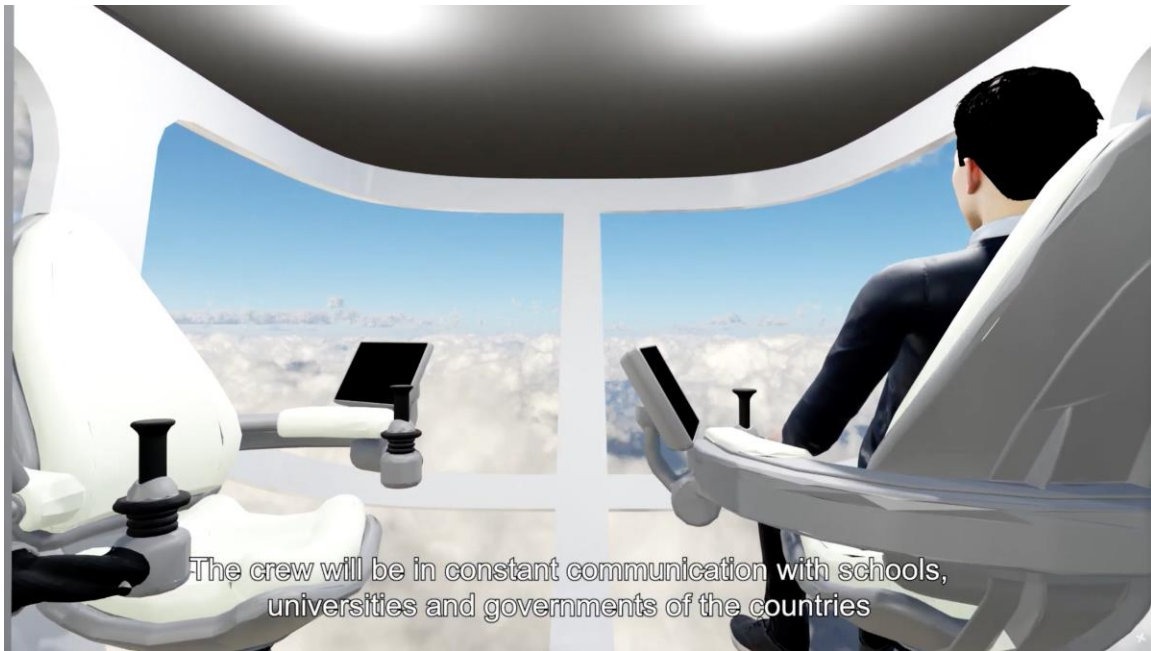
*Rendering of the completed Solar Airship One, showing the solar array installed on the top half of the hull, over the light-colored outer fabric skin, a reinforced nose cap, and flank-mounted shrouded propellers.*

*Source, both graphics: Screenshots from Euro Airship video (15 June 2023)*



*Renderings of Solar Airship One in flight, with propeller details.  
Source, three graphics: Screenshots from Euro Airship video (15 June 2023)*





*View from the crew cockpit. Source: Screenshot from Euro Airship video (15 June 2023)*



*Rendering of Solar Airship One flying over Paris. Source: Euro Airship*



*Solar Airship One. Source: Screenshot from Euro Airship video (15 June 2023)*

## 9. For additional information

- “World preview: Euro Airship reveals Solar Airship One mission A non-stop world tour flight without fossil fuels!,” Euro Airship press release via Orange Newsroom, 16 January 2023: <https://newsroom.orange.com/world-preview-euro-airship-reveals-solar-airship-one-mission-a-non-stop-world-tour-flight-without-fossil-fuels/?lang=en>

## Videos

- “Solar Airship One – Teaser Film,” (4:48 min): posted by Euro Airship, 15 June 2023: <https://www.youtube.com/watch?v=UACsK67DZag>
- “A non-stop, fossil fuel-free and CO<sub>2</sub>-free dirigible world tour with Euro Airship,” (in French, “Un tour du monde en dirigeable sans escale, sans carburant fossile et sans émission de CO<sub>2</sub> avec Euro Airship”), an interview with Euro Airship President Marie-Christine Bilbow, (1:52 min), posted by BFM Business, 15 June 2023: [https://www.bfmtv.com/amp/tech/viva-tech-un-tour-du-monde-en-dirigeable-sans-escale-sans-carburant-fossile-et-sans-emission-de-co2-avec-euro-airship\\_VN-202306150895.html](https://www.bfmtv.com/amp/tech/viva-tech-un-tour-du-monde-en-dirigeable-sans-escale-sans-carburant-fossile-et-sans-emission-de-co2-avec-euro-airship_VN-202306150895.html)

### **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/>