EADS Tropospheric Airship

Peter Lobner, Updated 3 April 2021

1. Introduction

Designed by European Aeronautic Defense and Space Company (EADS) Innovation Works, this catamaran-style, twin hull airship is the product of a concept study for a multi-mission observation airship for all-weather operations in Arctic regions. Unveiled in June 2013 at the Paris Air Show, the Tropospheric Airship is designed for unmanned missions lasting up to 40 days. The large size of the Tropospheric Airship enables it to carry a broad range of sensors, cameras, communications and other equipment customized for the intended mission(s). The airship also can function in a secondary role as a cargo transport.

In its 2013 brochure on the Tropospheric Airship, EADS noted that it was seeking partners for follow-on work that could lead to flight tests of a first (manned) demonstrator in three years after program launch.

Front quarter view. Source: EADS

2. Characteristics of the tropospheric airship

The Tropospheric Airship is a rigid, hybrid, variable volume airship, with the following technical characteristics:

- Rigid airframe
- Dimensions: Length 90 meters, width 60 meters, height 8 meters. (295 x 197 x 26 feet)
- Speed: 60 to 150 kph (37 to 93 mph)
- Maximum altitude:
    - With a one ton load (1,000 kg; 2,205 lb), maximum altitude is 5,000 meters (16,404 feet) on aerostatic buoyancy alone. Aerodynamic lift from the fore and aft wings in forward flight enable the airship to reach an altitude of 7,000 meters (22,966 feet).
    - With a 7 ton load (7,000 kg; 15,432 lb), maximum altitude is 1,000 meters (3,280 feet)
- The twin-hull design creates a more streamlined profile than single-body dirigibles – reducing aerodynamic drag.
- The low height enables use of conventional hangers
- Can operate from established base locations as well as unprepared sites without ground support infrastructure.

View from below, multi-segmented buoyancy cells retracted.
Source: EADS

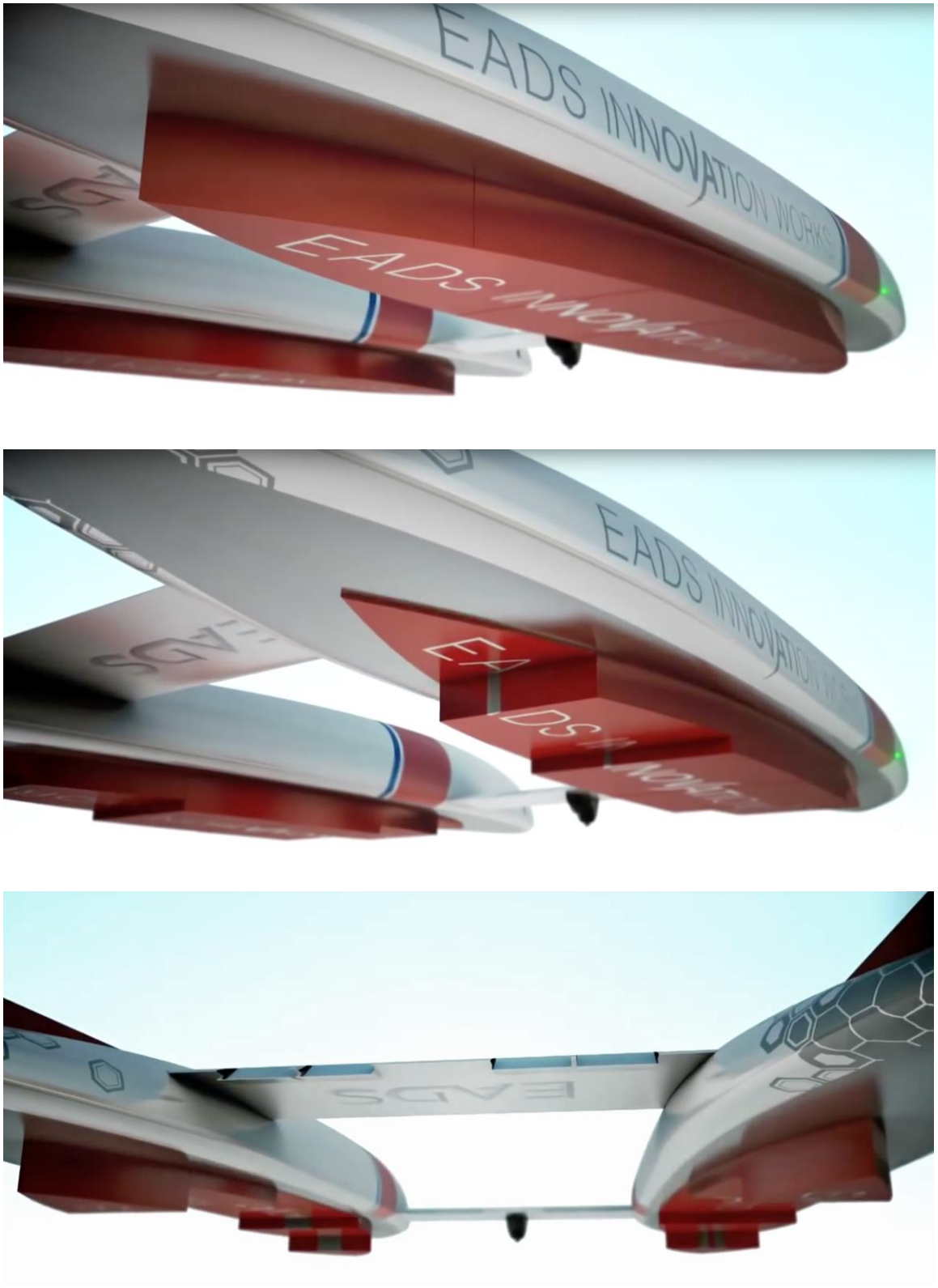
3. Operation of the variable buoyancy, variable volume airship

Propulsion is provided by aft-mounted pusher propellers in each hull, driven by diesel engines or electric motors in each hull. Yaw control is provided by sideward facing ducted fans in the nose and in the tail structure on each side of the twin hulls.

Multi-segmented buoyancy cells in the lower part of the two hulls can be extended or retracted to change the total volume of the helium gas envelope and thereby manage the overall buoyancy of the airship and its cargo. Extending a cell increases its volume, reducing the internal helium gas pressure and increasing the cell's buoyancy. Conversely, retracting a cell reduces its volume, compressing the helium gas and decreasing the cell's buoyancy. Extending and retracting the cells in unison changes the overall buoyancy of the airship and controls the airship's rate of climb and descent. When moving the cells differentially by segment, the changes in buoyancy can control the vehicle's pitch and roll attitude without changing the overall buoyancy of the airship.

Multi-segmented buoyancy cells extended.
Source: EADS

You can view an EADS video depicting the operation of the Tropospheric Airship here:
https://www.youtube.com/watch?v=GLsiaIwmWOA



Three views of the multi-segmented buoyancy cells in various stages of extension. Source: EADS

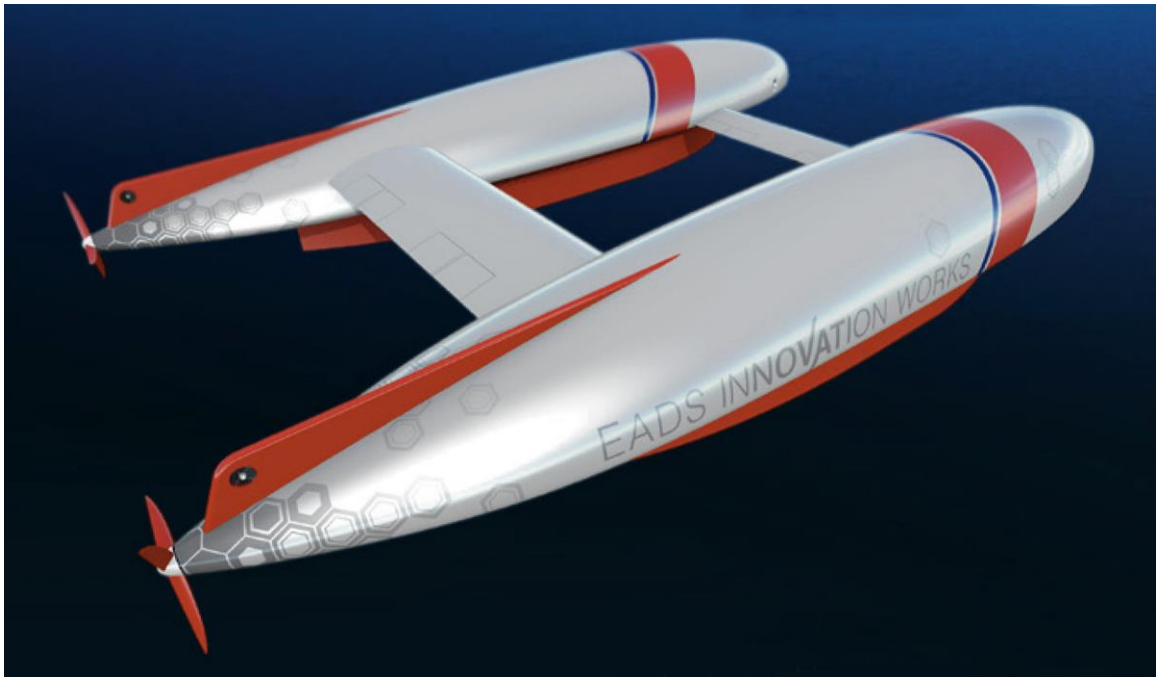
4. Managing load exchanges

The Tropospheric Airship's variable volume design feature enables it to precisely adjust buoyancy as needed to take on or deliver heavy loads without having to discharge or take on compensating ballast. This results in a very simple load exchange process.

Starting with the airship in a neutrally-buoyant hover, a load on the ground is connected to a sling from the airship. To lift the load, the airship's multi-segmented buoyancy cells are extended in unison to increase buoyancy until the full weight of the load is carried by the airship and the desired rate of climb is achieved.

To deliver the load, the airship uses the multi-segmented buoyancy cells to control its descent to the delivery site. From a neutrally-buoyant hover above the delivery site, the airship descends enough to place the load on the ground and the multi-segmented buoyancy cells are slowly retracted to reduce buoyancy enough to transfer the full weight of the load to the ground. At load release, the airship is neutrally-buoyant and the sling is not carrying a load. Then, the airship extends its multi-segmented buoyancy cells and flies away.

Airship carrying an external load. Source: EADS



Source: EADS

5. For more information

- "TROPOSPHERIC AIRSHIP - Concept study of an observation airship for arctic operations." EADS Innovation Works, 2013: http://www.blimpinfo.com/wp-content/uploads/2013/06/AirShip_EN_V04_-a.pdf