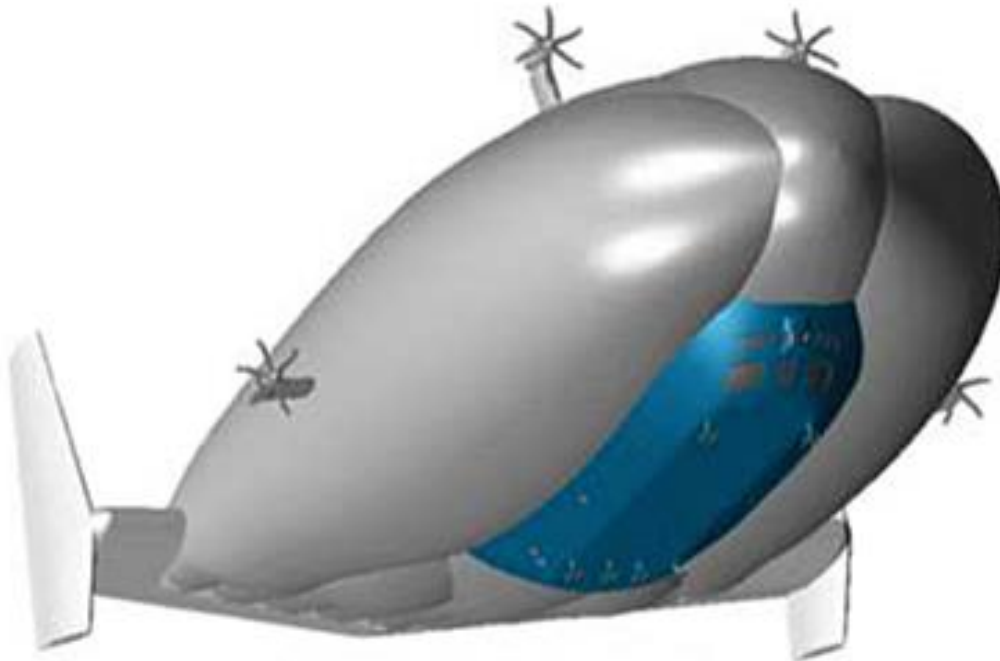


Lockheed Martin - Aerocraft hybrid airship

Peter Lobner, 24 August 2021

1. Introduction

Starting in the 1990s, Lockheed Martin's Advanced Development Programs (the Skunk Works) in Palmdale, CA, studied various concepts for large, cargo-carrying airships. One early hybrid airship design concept was trademarked in 1998 as the Aerocraft (not to be confused with the Aerocraft trademark held by Worldwide Aeros Corp.).



Source: Lockheed Martin

This semi-rigid hybrid airship design, with an internal framework to support the engines and propulsion loads, predates the Lockheed Martin P-791 and Sky Tug / LMH-1 hybrid airship designs, which are described in separate articles. Lockheed Martin did not build an Aerocraft hybrid airship.

2. Lockheed Martin's patents for hybrid airship technology

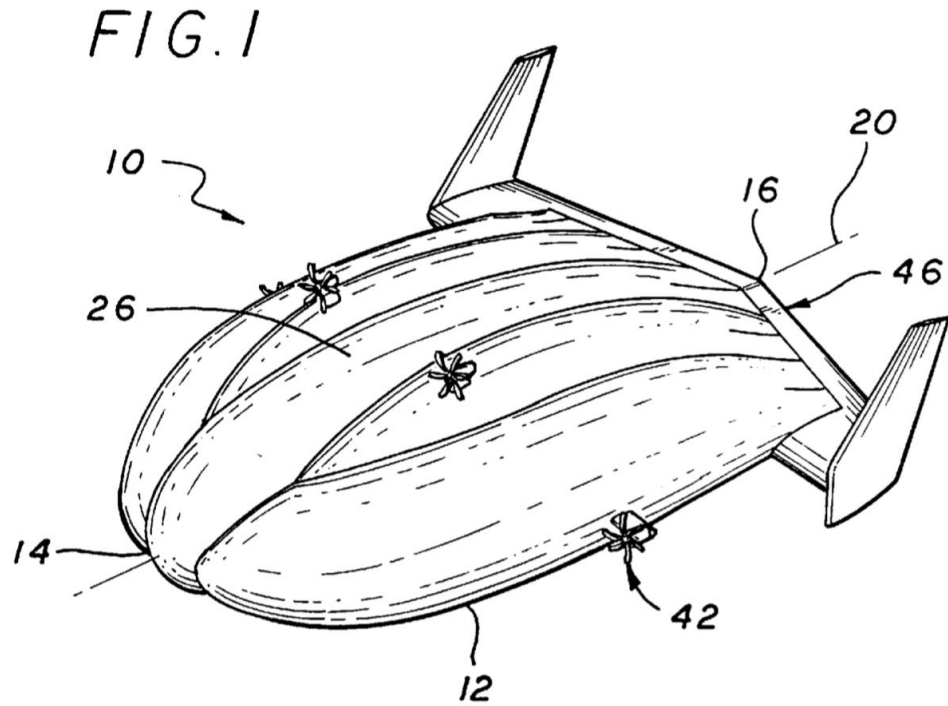
The following Lockheed-Martin's airship technology patents granted in the early 2000s describe features of the Aerocraft hybrid airship:

- US 6196498B1 - Semi-buoyant vehicle with aerodynamic lift capability
- US 6293493B1 - Pressure stabilized gasbag for a partially buoyant vehicle
- US 6315242B1 - Propulsion system for a semi-buoyant vehicle with an aerodynamic (hull)
- US 5449129A - Propulsion system for a lighter-than-air vehicle

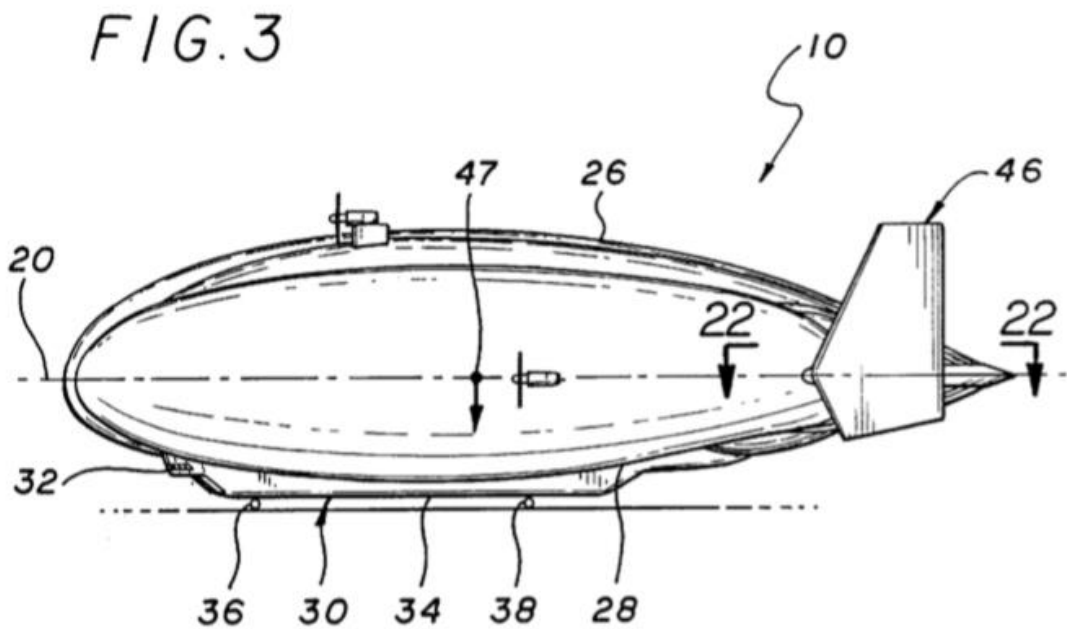
Patent US 6196498B1 - Semi-buoyant vehicle with aerodynamic lift capability

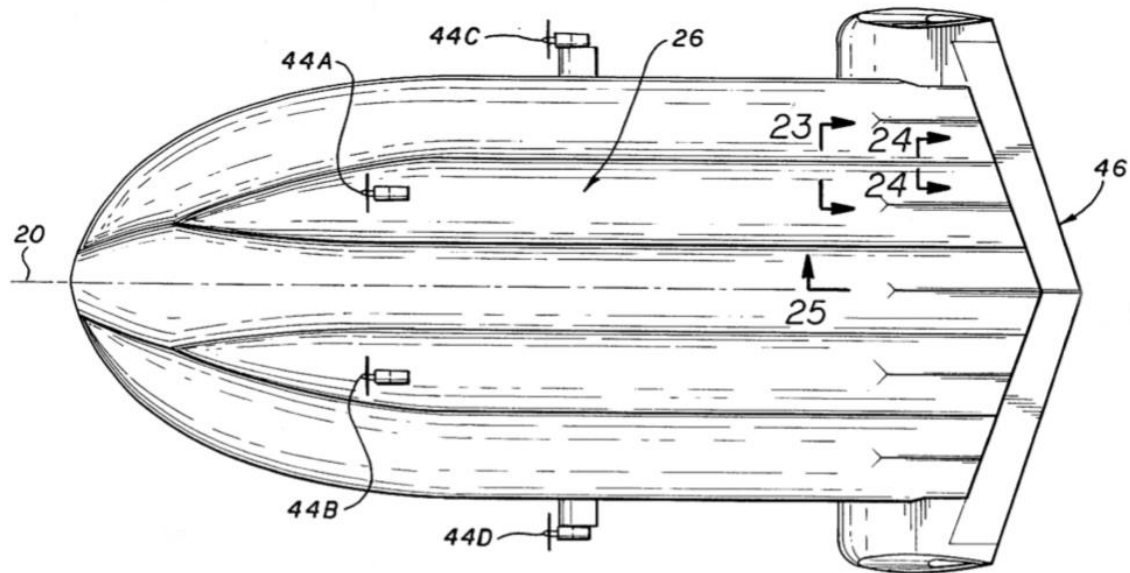
- Date of Patent: 6 March 2001
- Inventor: David B. Eichstedt, John P. Morehead, John B. Kalisz
- Current Assignee: Lockheed Martin Corp.
- Available from Google patents here:
<https://patents.google.com/patent/US6196498B1/en>

This patent describes a non-rigid, semi-buoyant, aerodynamic lift producing hybrid airship with improved lifting gas distribution such that center of buoyancy is closely aligned with the center of gravity of the vehicle. This hybrid airship takes off and lands like an aircraft, but at very low speed. This patent was the first to describe the general arrangement of the Aerocraft hybrid airship, its propulsion system and flight controls.



Hybrid airship (10) has a very similar overall layout to the Aerocraft, with a pressure stabilized envelope (gasbag, 12), propulsion system (42) and tail assembly (46). The gondola (30) under the envelope includes the flight deck (32), the cargo compartment (34), and the landing gear (36, 38). The center of gravity is at (47).





The propulsion system consists of four rotatable (vectored) propulsion units arranged in two pairs. Propulsion units 44A and 44B extend out of the top surface of the vehicle and are capable of left-right thrust vectoring for yaw control. Propulsion units 44C and 44D extend out of the sides of the vehicle near the center of gravity and are capable of up-down thrust vectoring for direct lift or differential roll control. Due to the proximity of the center of gravity, the impact of vectoring 44C and 44D on pitch should be minor. The set of four vectored propulsion units are intended to provide excellent directional control, particularly during takeoff and landing.

Patent US 6315242B1 - Propulsion system for a semi-buoyant vehicle with an aerodynamic (hull)

- Date of Patent: 13 November 2001
- Inventor: David B. Eichstedt, John P. Morehead, John B. Kalisz
- Current Assignee: Lockheed Martin Corp.
- Available from Google patents here:
<https://patents.google.com/patent/US6315242>

For an airship similar in overall layout to the Aerocraft, this patent describes a means to install propulsion engines on a rigid structure that transfers propulsion system loads to a rigid gondola or keel structure and into the envelope of a non-rigid, buoyant or semi-buoyant airship.

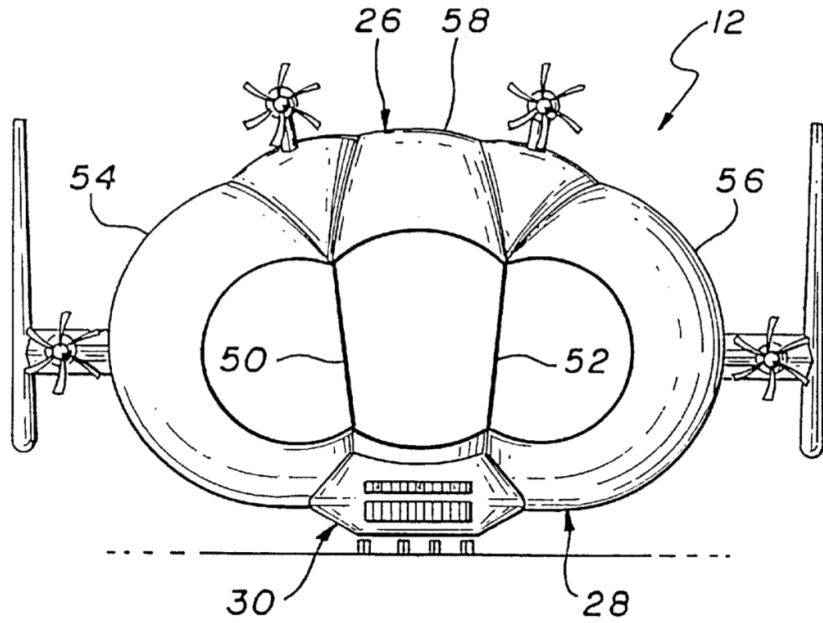
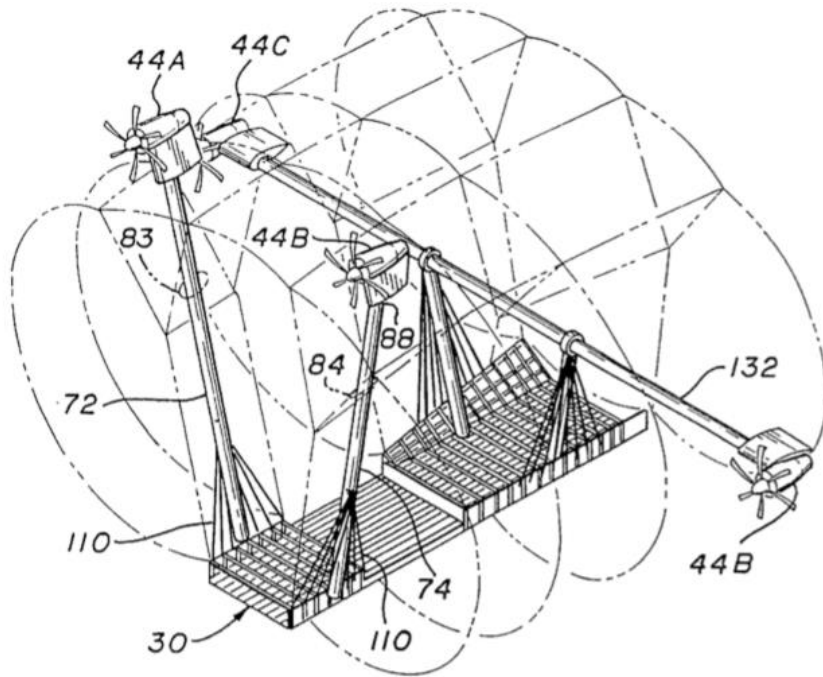


FIG. 6

Bow view of a hybrid airship with propulsors on pylons that extend through the pressure stabilized hull

FIG. 8



The propulsors (44) are supported by rigid frameworks (72, 74, 132) within the pressure stabilized hull. These frameworks transfer propulsion loads to a rigid keel (30) and thence into the envelope.

Patent US6293493B1 - Pressure stabilized gasbag for a partially buoyant vehicle

- Date of Patent: 25 September 2001
- Inventor: David B. Eichstedt, John P. Morehead, John B. Kalisz
- Current Assignee: Lockheed Martin Corp.
- Available from Google patents here:
<https://patents.google.com/patent/US6293493B1/en>

This patent applies to the design of a pressure stabilized gasbag having an aerodynamic shape for a semi-buoyant airship. The pressure stabilized gasbag is designed to provide close alignment of the center of buoyancy and the center of gravity of the airship, thereby minimizing bending of the non-rigid gasbag. The design also provides for the efficient distribution of tail assembly loads into the non-rigid gasbag structure.

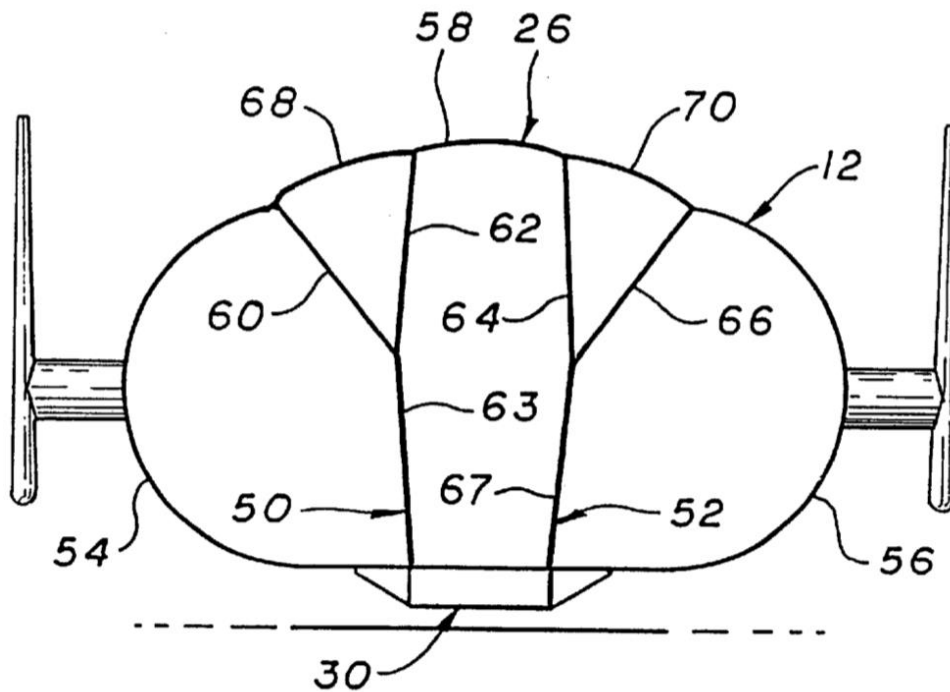
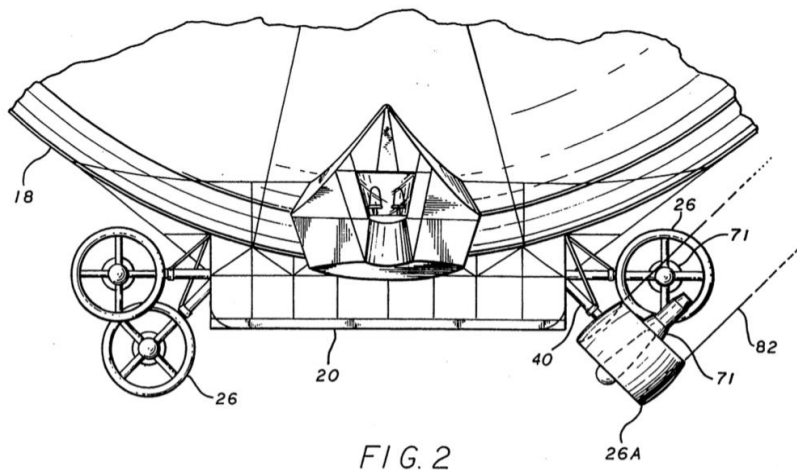


FIG. 17

Bow view of the envelope showing side lobes (54, 56), top lobes (68, 70), Y-arms & leg (60, 62, 63), gondola (30)

Patent US 5449129A - Propulsion system for a lighter-than-air vehicle

- Date of Patent: 12 September 1995
- Inventor: David E. Carlile, Mark H. Wexler
- Current Assignee: Lockheed Martin Corp.
- Available from Google patents here:
<https://patents.google.com/patent/US5449129A/en>



Note propulsor 26A rotated 90° relative to the orientation of the other three propulsors.

This patent describes a propulsion system that provides maneuvering and thrust vectoring control. This general concept of thrust vector control has been applied by Lockheed Martin in their designs of the Aerocraft and P-791 hybrid airships.

3. For more information

- “AEROCRAFT European Union Trademark Information,” filed 28 July 1998, registration expired 31 May 2009:
<https://www.trademarkelite.com/europe/trademark/trademark-detail/000889972/AEROCRAFT>

Related Modern Airship articles

- Lockheed Martin P-791 hybrid airship