Alpha & Alizé lenticular airships

Peter Lobner, updated 10 March 2022

1. Introduction

The Alpha and Alizé lenticular airships were designed by Pierre Balaskovic, who was a strong proponent of lenticular (lens-shaped) airships. Both airships were built and flown in France.

2. Alpha

Balaskovic's remotely piloted Alpha semi-rigid lenticular experimental airship was built in collaboration with Airstar and the support of John Goelet. Alpha flew in France between 1999 and 2002 and demonstrated the maneuverability of a lenticular hull. The design of the remote piloting system benefited from the academic work of d'Animatlab and de l'ENST.

Alpha stern view. Source: LTA Solutions (2015)

3. Alizé

Alizé was a two-seat, semi-rigid, lenticular ULM category experimental airship designed by Balaskovic as an evolutionary development of Alpha. Alizé was funded and built by LTA Corporation at Rochefort in 2005 and flight tested there through 2008.

Key patents

The Alizé design and controls are described in a series of patents filed by LTA Corporation. The earliest patent was US7866601B2, "Lenticular Airship," which was filed 18 October 2007 and granted on 11 January 2011. The following three diagrams are from that patent. The general arrangement of the airship is shown in patent Figure 1A. The lenticular hull (22) in this particular diagram has a set of propulsion units in three locations (31) set 120° apart, as shown in Figure 5A, and attached to the rigid equatorial frame (120, aka "keel hoop") of the airship. Other propulsor arrangements are possible.

Pitch, roll and yaw controls can be provided by the propulsion units (532, 533 & 534), which have thrust vectoring capabilities and can be coordinated in a variety of ways to maneuver the airship and also provide thrust for vertical and horizontal motion. The horizontal thrusters (541 & 541) propel the airship and may be installed on fixed or thrust vectoring mounts. The Alizé prototype had the following:

- A single vectorable propulsor is installed at the bow.
- Compound propulsors are installed on each flank, each consisting of a vectorable propulsor and a separate (lower) longitudinal thruster.

There also are aerodynamic control surfaces on the vertical and horizontal stabilizers.

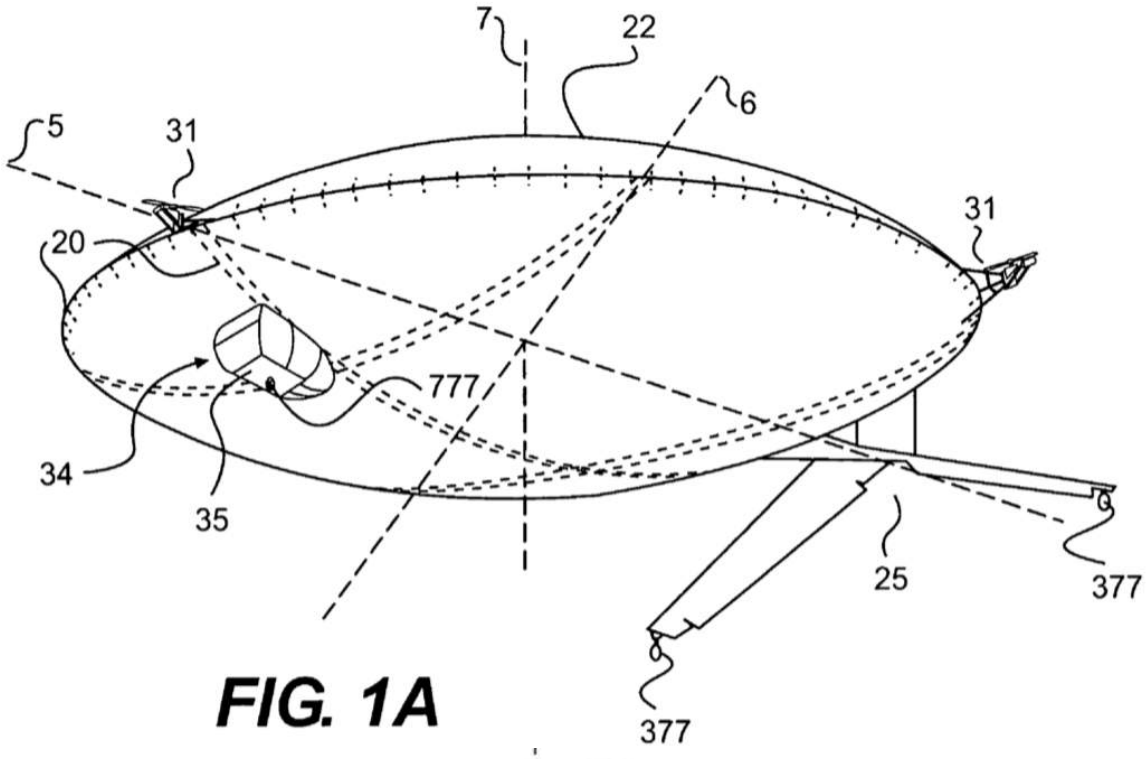
7
22
6
5
31
31
20
777
34
35
25
377
377

FIG. 1A

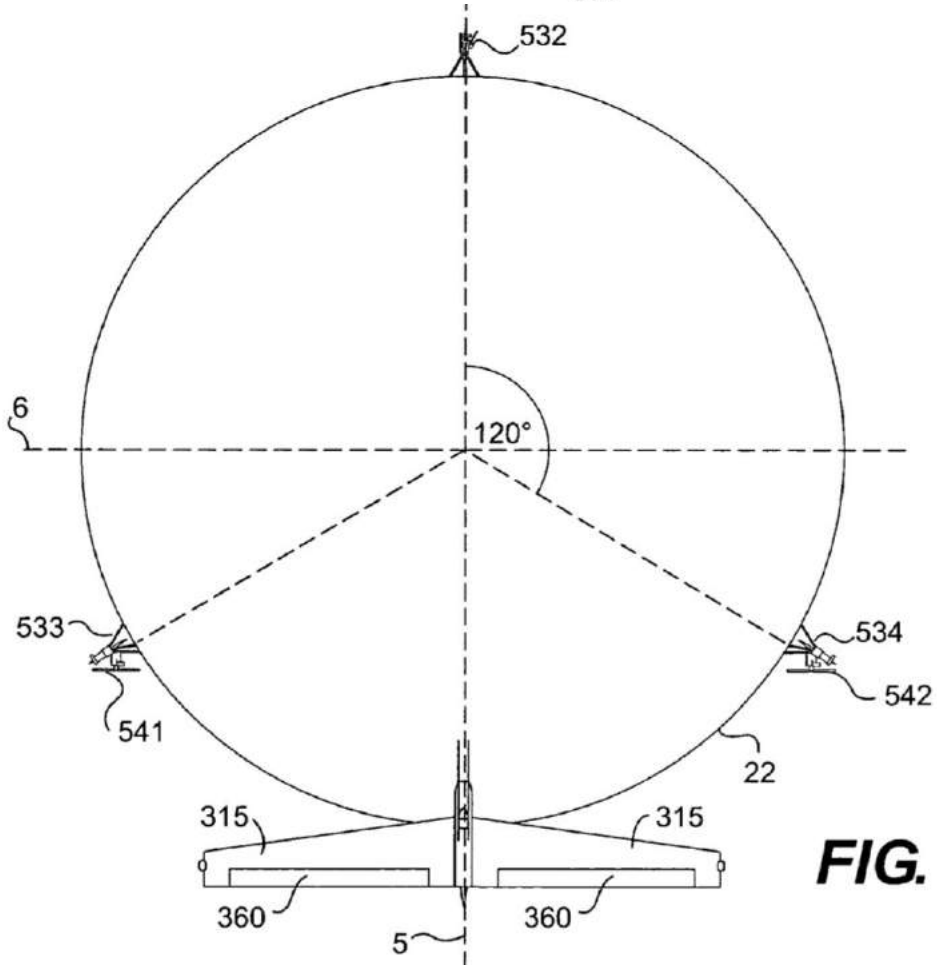
532
6
120°
533
534
542
541
22
315
315
360
360
5

FIG. 5A

The rigid frame of the airship is shown in patent Figure 1B consists of the circumferential equatorial keel hoop (120), which is connected across the lower hemisphere by two transverse frame members (122) and one longitudinal frame member (124). There are no rigid frame members installed across the upper hemisphere. A multi-layer flexible fabric envelope is installed over the rigid frame. The lenticular shape of the airship is established when the envelope is inflated.

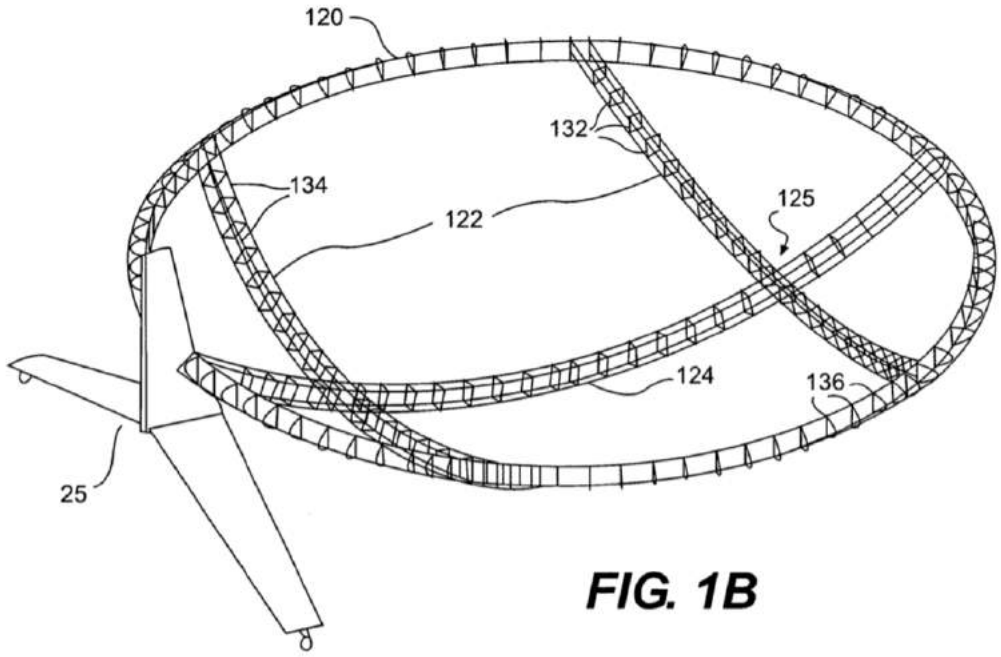

FIG. 1B

Alizé with its lower skin removed showing the internal rigid structures. Source: Association Moulin Rouge 2006

Flight testing

Early flight testing was done by remote control to validate basic handling characteristics. Initially, the gondola was not installed.

Alizé stern view. Source: LTA Solutions (2015)

Alizé first flew by remote control, without the cockpit gondola installed. Source: LTA Solutions (2015)

Alizé with a basic open cockpit installed. Source: Pasternak (2009)

Alizé demonstrated its ability to take off and land vertically. The airship had an attitude stabilization system that made it possible to perform hovering flights in ground effect.

You can watch a short video, “Airship Alizé” (6:07 minutes), that shows low altitude tests with two different stern propulsors here: https://www.youtube.com/watch?v=QxHO8OMgi5c

The following photos are screenshots from that video.

Profile view showing the placement of the bow and flank compound thrusters. Note the short duct surrounding the propeller on the flank longitudinal thruster.

Stern view showing the tail aerodynamic surfaces and the placement of the flank compound thrusters

Profile view showing the placement of the bow and flank compound thrusters. Note the short duct surrounding the propeller on the flank longitudinal thruster.

Alizé with enclosed cockpit. Note that the cockpit's support struts connect directly to the rigid framework of the hull.

Bow vertical thruster unit

Flank compound thrusters

On 7 September 2006, Alizé was donated to the Museum of Naval Aviation in Rochefort, where it currently is in storage in a disassembled state.

Alizé in storage. Source: Pyperpote 2010

4. For more information

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- “Dirigible Pierre Balaskovic ‘Alizé’ W17OD,” (presentation to the Museum of Naval Aviation in Rochefort), 2010: http://www.pyperpote.tonsite.biz/listinmae/index.php/les-appareils-en-reserve/les-reserves-du-musee-de-l-air/229-dirigeable-pierre-balaskovic-alize-w17od
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Patents

- US7866601B2, “Lenticular Airship,” Inventor Pierre Balaskovic, Assigned to LTA Corp., application filed 18 October 2007, patent granted 11 January 2011: https://patents.google.com/patent/US7866601B2/en?oq=7866601
- US2008/0179454A1, “Lenticular Airship,” Inventor Pierre Balaskovic, Assigned to LTA Corp., application filed 18 October 2007, patent granted 11 January 2011: https://patents.google.com/patent/US20080179454A1/en?oq=20080179454
- US8297550B2, “Lenticular Airship and associated controls,” Inventor Pierre Balaskovic, Assigned to LTA Corp., application filed 7 August 2008, patent granted 30 October 2012: https://patents.google.com/patent/US8297550B2/en?oq=•US8297550

- US2010/0320314A1, “Lenticular Airship and associated controls,” Inventor Pierre Balaskovic, Assigned to LTA Corp., application filed 7 August 2008, patent granted 23 December 2010: https://patents.google.com/patent/US20100320314A1/en?oq=20100320314
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    - Airstar – small airships & drones
    - LTA Aerostructures
- *Modern Airships - Part 3*: https://lynceans.org/all-posts/modern-airships-part-3/