Lightspeed USA Inc. (LSI) airships

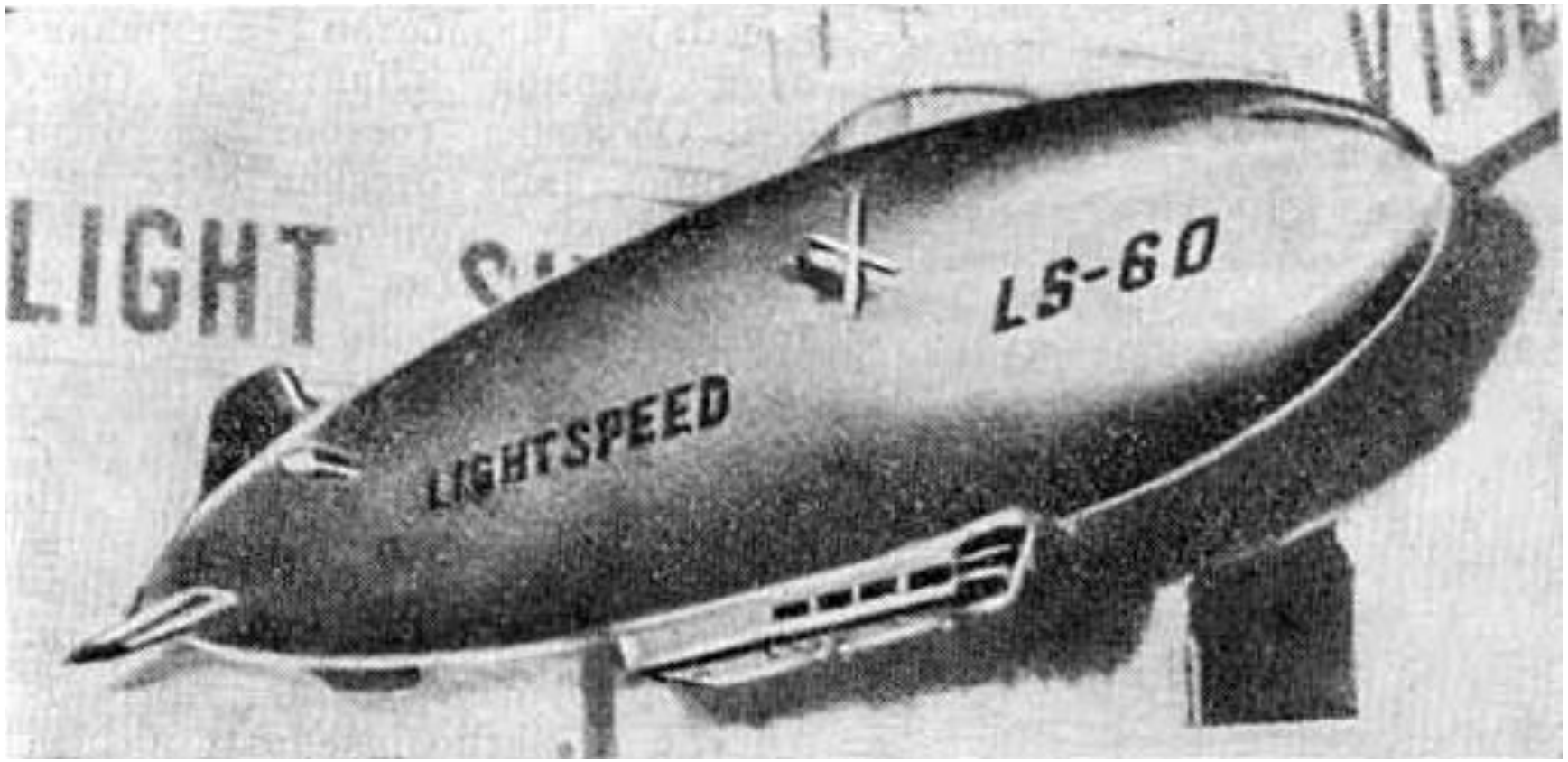
Peter Lobner, updated 11 February 2022

1. Introduction

The Lightspeed Collective was a European firm that planned to build a family of modern geodesic hull rigid airships known as “Lightships” that would provide a a safe, practical and economic alternative for air travel and cargo transport. Lightspeed favored the rigid airship over non-rigid blimps because the rigid airships provided better cargo carrying capabilities and offered better control in rough air. By mid-1975, Lightspeed had secured a commitment for about $2 million in funding for a prototype airship from the French government, but with conditions that the group found undesirable. After a visit to the US in mid-1975 seeking alternative funding sources, the Lightspeed Collective relocated to the US and established their headquarters in Melbourne, FL, as Lightspeed USA Inc. (LSI).

Adam Lisowski, Lightspeed Director of Finance, 1975. Source: LA Times

LSI’s business objective was to organize an airship consortium with US aerospace companies to build geodesic hull rigid airships, starting with the modest-sized LS-12 and then the larger LS-60.



Lightspeed LS-60 model showing the flank-mounted engines, inverted Y-tail, and the large passenger gondola. Source: Arie, "Dirigibles," (1986)

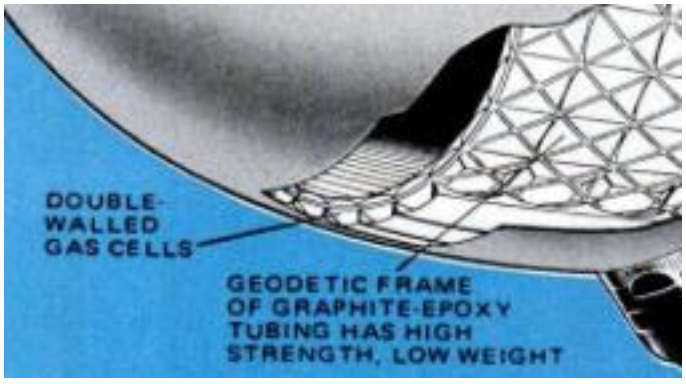
2. The geodesic airship patent

The basic design of the Lightship is described in German patent DE2659401A1, “Double skin airship construction - has skeletal support frame within gasbag to hold engine pods and cabins.”

- Inventors: Adam Lisowski, Jurgen Bothe, Joseph Fechner, Robert Witherow, Serge Amoos and Loren Rueter.
- Filed by Lightspeed USA Inc. on 29 December 1976
- Published on 4 August 1977

The patent abstract describes the invention as follows:

> “The hull of the airship is formed by a skeletal frame to control the shape and a double skinned airbag which is fastened to the frame, with one wall on the inside and one on the outside. The two skins are joined over the frame at set points to totally enclose the frame. This ensures that the shape of the hull is always retained no matter what the internal pressure. The skeletal frame also enables the engine pods, cabins, etc., to be securely fastened to the hull in any desired position, for improved control. The rigid shape enables it to be steered in high winds etc. The frame can be in prefabricated sections so that any length of hull can be assembled.”



Arrangement of the load-bearing tubular geodesic hull frame and the air-filled double wall gas cells that pressurize the external fabric cover. Source: Popular Mechanics, July 1977

A US patent application was filed as US75288176A on 20 December 1976, but apparently was not completed.

3. Structural technology assessment

In 1977, the US Naval Air Development Center in Warminster, PA published Technical Memorandum No. VT-TM-1891, “Structures Technology for Lighter-Than-Air Vehicles.” This document included an assessment of the structural technology of the Lightspeed airships and contained the following favorable assessment:

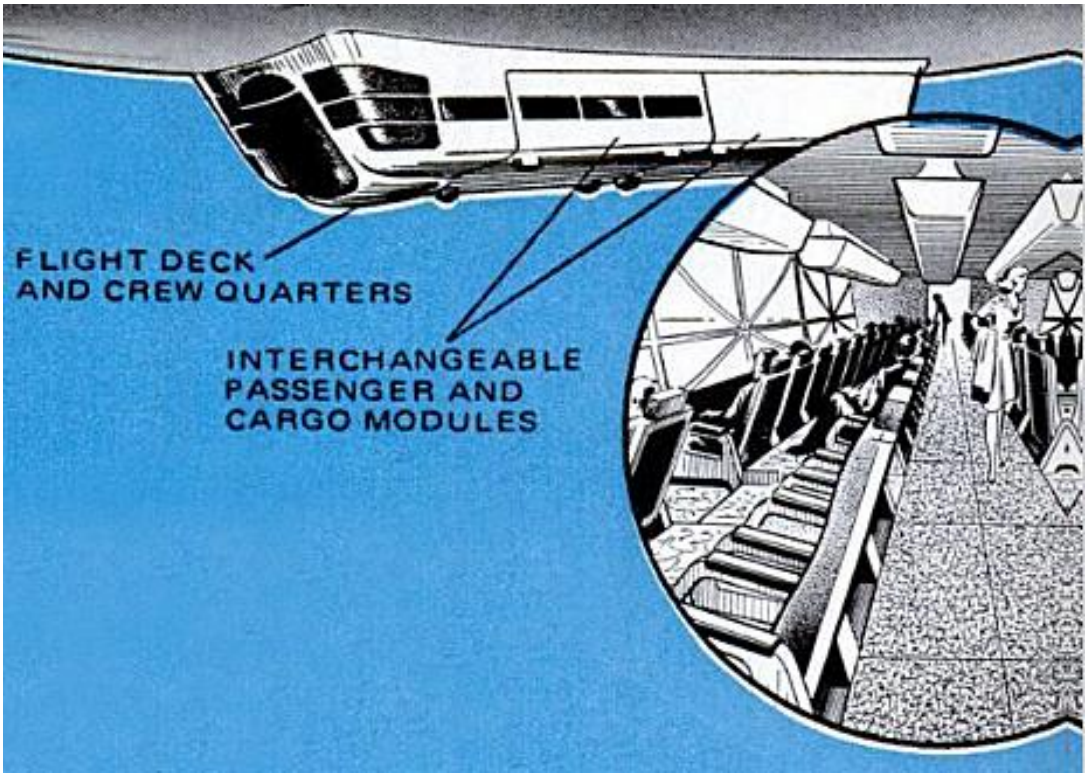
> “The Lightspeed design…….incorporates several interesting and innovative features, including the tubular geodetic structure, scalloped frames, multiple gas and air cells and a scalloped type outer envelope which reduces local membrane stress. The nature of the construction provides for fail safeness, redundancy, and damage tolerance. Although at first glance it appears to be complex and to have many parts, it is relatively simple in its fabrication concept. Present designs use developed aerostat materials and future plans allow for use of highly efficient composites, specifically Kevlar covers and graphite-epoxy geodetic structure, which will further reduce the structural weight on the order of 30 to 40%. Considering everything, the Lightship designs may be the best new entry into modern airship structural design, a design which is imaginative but at the same time one which is engineered as a practical product.”

4. Lightship design features

Two Lightship models were planned, the modest-sized LS-12 and the larger LS-60, both based on the tubular geodesic hull, double wall gas cell and pressurized external fabric cover design described in the patent.

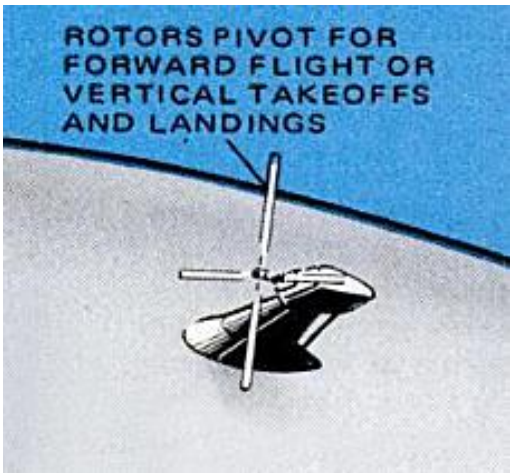
The two Lightship models shared the following design features:

- The large gondola had interchangeable modules installed behind the flight deck and crew quarters for passengers, cargo, heavy lift and other missions.
- In the passenger module, seating was arranged sideways to give all passengers a good view through the large windows.



Modular gondola and passenger cabin arrangement.
Source: Popular Mechanics, July 1977

- The propulsion system consisted of five engines. The stern pusher propeller provided propulsion. The four flank-mounted tractor propellers provided propulsion and the two forward engines could be vectored vertically to provided dynamic thrust for takeoff, landing, hover and for ballast compensation.



A forward flank rotor in the cruise position.
Source: Popular Mechanics, July 1977

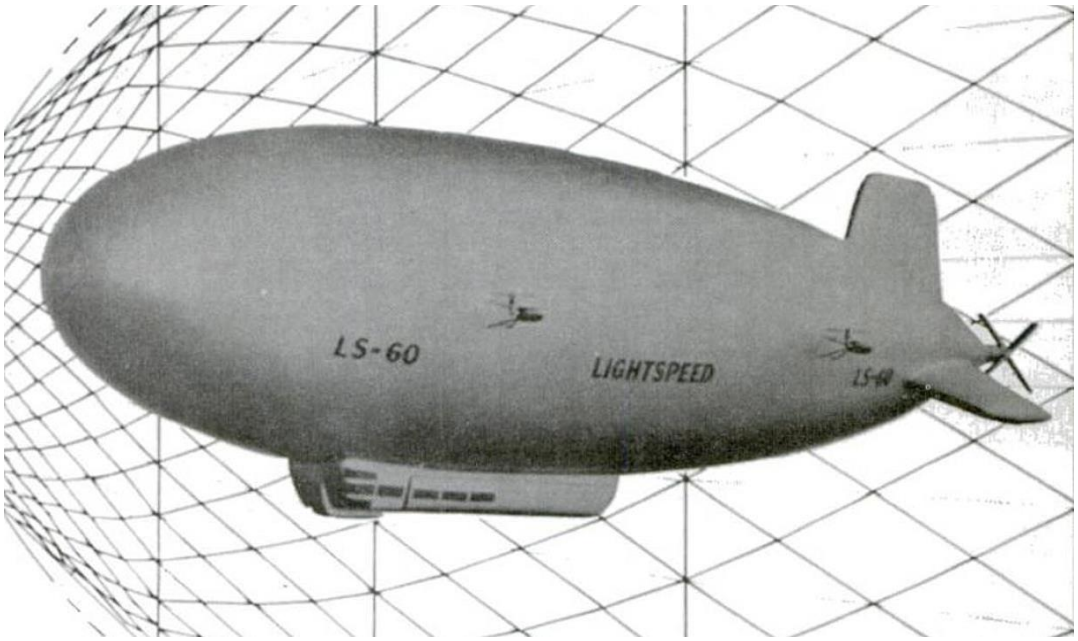
- A system of thrusters working on compressed air was installed close to the engines. The thrusters provided rapid control of the airship close to the ground.
- The Lightship was designed to operate independently of ground handling facilities.

General characteristics of the LS-12 & LS-60 airships

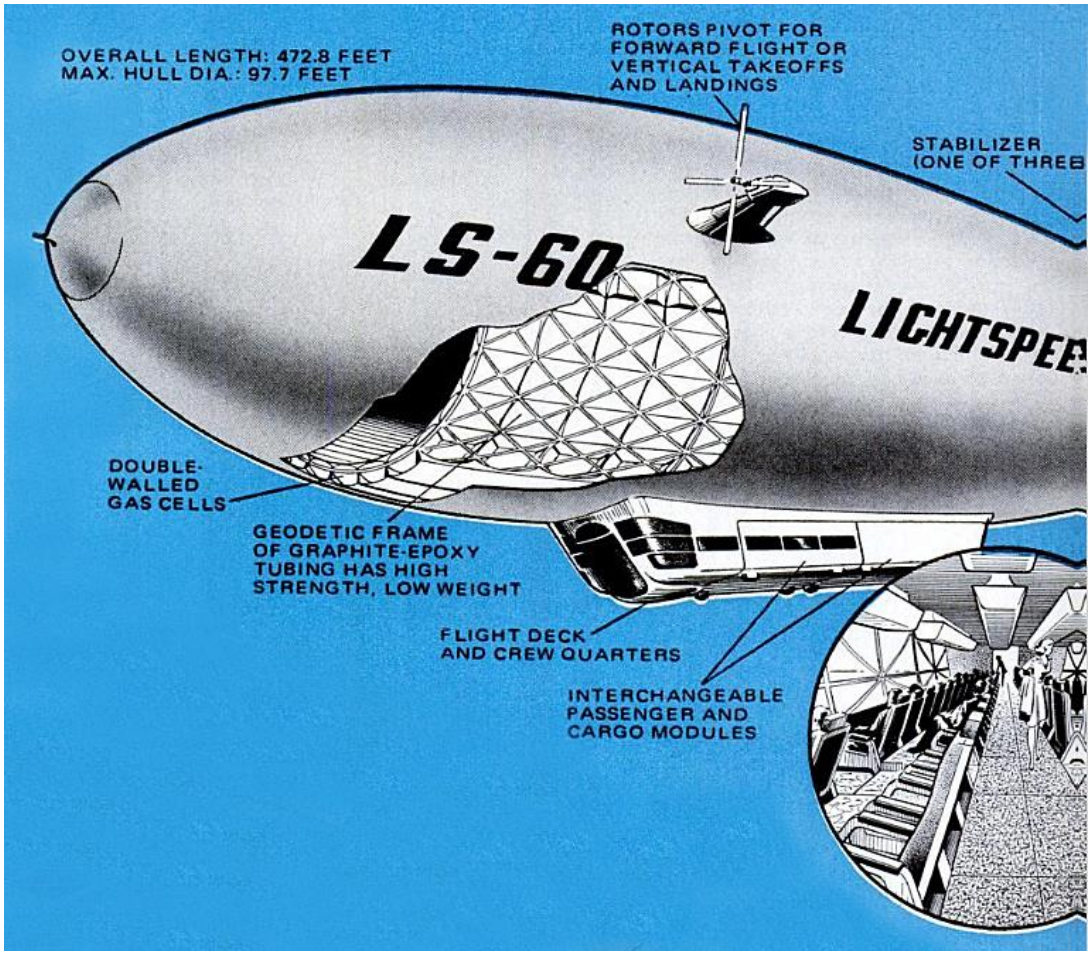
Parameter	**LS-12**	**LS-60**
Length	238 ft (72.5 m)	473 ft (144 m)
Diameter		97.7 ft (29.8 m)
Envelope volume	450,000 ft^3 (12,743 m^3)	2,094,160 to 2,213,878 ft^3 (59,300 to 62,690 m^3) *
Envelope surface area	38,262 ft^2 (3,555 m^2)	110,679 ft^2 (10,282 m^2)
Independent helium cells		8
Gross lift @ 5,000 ft	23,576 lb (10,694 kg)	115,506 lb (52,393 kg)
Structure weight	10,200 lb (4,626 kg)	29,000 lb (13,154 kg)
Takeoff weight, max		148,800 to 164,024 lb (67,495 to 74,400 kg) *
Propulsion	• 5 x engines • 1 x stern-mounted pusher propeller • 4 x flank-mounted tractor propellers, the forward two with thrust vectoring capability	• 5 x engines rated @ 2,719 shp (2,000 kW) • 1 x stern-mounted, 10.7 m (35.1 ft) diameter pusher propeller • 4 x flank-mounted, 7.6 m (24.9 ft) diameter tractor propellers, the forward two with thrust vectoring capability
Payload		30 tons / 60,000 lb (27.2 MT / 27,216 kg)
Gondola volume (reconfigurable)		780 m^3 (27,545 ft^3).
Passenger accommodations		Up to 200 passengers
Design speed	90 knots (167 kph)	110 knots (204 kph)
Range		3,440 km (2,138 miles)
Endurance		25 hours

* Sources vary on the value of this parameter.

The LS-60 preliminary design was completed in May 1976. However, no prototypes of the LS-12 or LS-60 were ever built.



LS-60 airship. Source: Development Digest, Jan 1979



LS-60 airship. Source: Popular Mechanics, July 1977

5. For more information

- Harold Watkins, “European Raises a Trial Balloon – New Dirigibles,” The Los Angeles Times, p. 41, 31 July 1975: https://www.newspapers.com/clip/32267835/the-los-angeles-times/
- Adam Lisowski, “The Development of a VTOL 30 Ton Payload Transport Airship,” (abstract only) Proceedings, Ninth AFGL Scientific Balloon Symposium, 20 October to 22 October 1976, p. 553: https://books.google.com/books?id=MLfl6DOn_XEC&pg=PA553&lpg=PA553&dq=lightspeed+USA+airship+LS-60&source=bl&ots=4vlTot6F1t&sig=ACfU3U0r3emF5n8tWybJDZubsPqY4cXVfQ&hl=en&sa=X&ved=2ahUKEwjY6_fbgZXvAhUSs54KHaKhC1QQ6AEwA3oECAYQAw#v=onepage&q=lightspeed%20USA%20airship%20LS-60&f=false
- “Structures Technology for Lighter-Than-Air Vehicles,” Naval Air Development Center, Technical Memo VT-TM-18912, pp. 20 – 26, March 1977: https://apps.dtic.mil/sti/pdfs/ADA081353.pdf
- Bill Allen, “Big Boom in Gas Bags,” Popular Mechanics, July 1977: https://books.google.com/books?id=tOIDAAAAMBAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false
- M. Ya. Arie, “Dirigibles” (in Russian), Publishing House "Naukova Dumka", Kiev, Ukraine, 1986

Additional patent

- German patent DE2659401A1, “Double skin airship construction - has skeletal support frame within gasbag to hold engine pods and cabins,” Published on 4 August 1977, abstract in English is available here: https://patents.google.com/patent/DE2659401A1/en?oq=DE2659401A1

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