CargoLifter AG

Peter Lobner, updated 2 August 2026

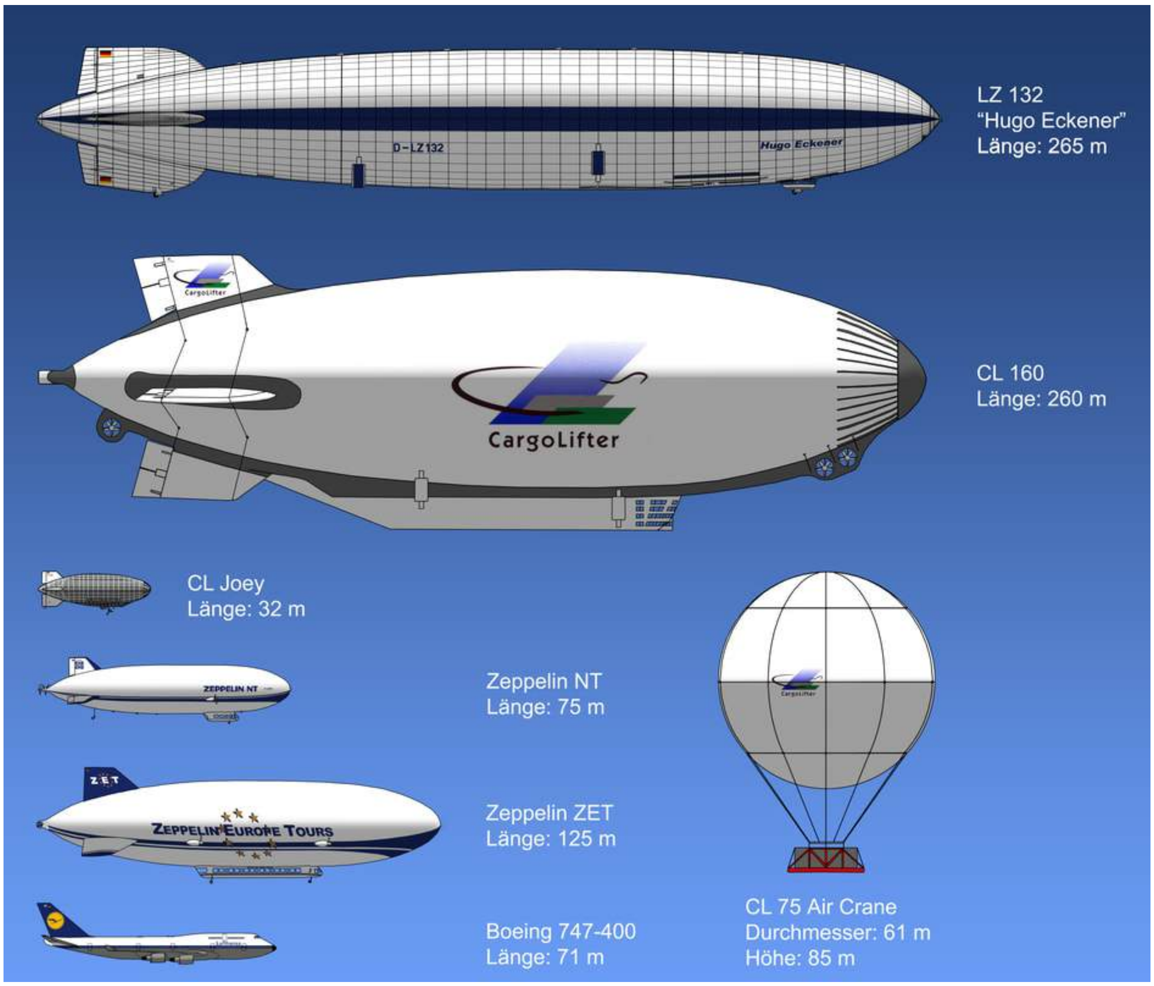
1. Introduction

Led by Carl-Heinrich Freiherr von Gablenz, CargoLifter AG was founded in September 1996 in Wiesbaden, Germany, with the objective of offering a logistics service based on the point-to point transportation of heavy and oversized loads using lighter-than-air (LTA) technology in airships of their own design. In 2000, Wired reported, "A CargoLifter study estimates that, in the US market alone, shipments heavier than 100 tons and longer than 75 feet are worth $1 billion a year." When CargoLifter went public on 30 May 2000 on the Frankfurt Stock Exchange, the company had a valuation of almost $180 million.

An abandoned former Soviet military airbase in Brand-Briesen, south of Berlin, was selected as the site to build their production and operation center, including a giant airship hangar that, in 2020, remains the largest freestanding building in the world.

CargoLifter hangar circa 2001. Source: Stefan Kühn via Wikipedia

Three different types of CargoLifter airships were planned: the 1:8 scale manned experimental airship “Joey,” the unmanned CL75 AC “AirCrane” transportation balloon and the CL160 semi-rigid, heavy-lift airship. The CL160 was much larger than the rigid LZ-129 *Hindenburg* zeppelin built in the 1930s and the similar LZ-132 concept from the 1950s.



Size comparison of CL160 CargoLifter, CL75 AC AirCrane transportation balloon, and CL “Joey” experimental airship with other air vehicles. Source: migenda.weebly.com

The CL160 was designed to conduct airborne load exchanges, which means that the airship could pick up or drop off up to 160 metric tons (176 tons) of cargo while hovering above a specific destination, such as a factory, warehouse, distribution center or end-user site.

First flight of the CL160 originally was planned to occur in 2003, with series production starting in 2004 / 2005. The first unit, known as P1, was intended to be certified as an experimental aircraft and used mainly for development risk reduction. The second unit, P2, would have been used to validate lift, control and maneuvering systems in a comprehensive development program leading to type certification.

CargoLifter AG planned to build up to 50 CL160 airships and 10 CL75 AC transportation balloons by 2015 and establish the global infrastructure that could support this fleet of airships. The expected price of the CL160 was about $60 million and the CL75 AC price was about $10 million.

In April 2002, Forbes reported, "…CargoLifter, a would-be manufacturer of heavy-lift dirigibles that so far has lifted $263 million from investors and done precious little else." With a rapidly deteriorating financial condition, in May 2002, CargoLifter attempted to negotiate a rescue plan with its British competitor Advanced Technologies Group (ATG).

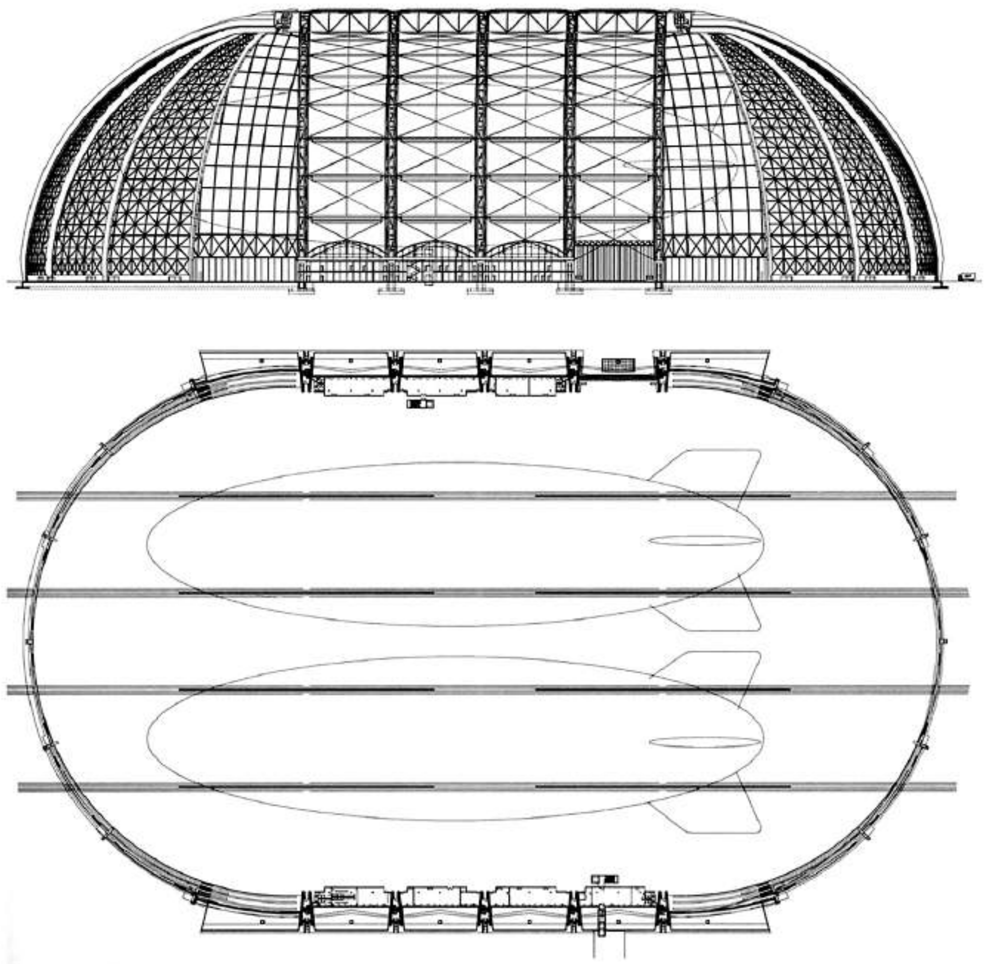
CargoLifter AG announced insolvency on 2 June 2002. This was after their giant hangar in Brand-Briesen had been completed, the Joey and CL75 AC had flown, and their purchased Skyship 600B training airship had been delivered and flown, but before the first CL160 heavy-lift airship was built. Liquidation proceedings started in July 2002.

Details on CargoLifter AG are presented in this article, which is organized in the following sections:

2. The CargoLifter hangar
3. The CargoLifter "Joey" (renamed Ziphius 900 in 2010)
4. The CargoLifter CL75 AC transport balloon (AirCrane)
5. Airship Industries SkyShip 600B training airship
6. The CargoLifter CL160 heavy-lift airship
7. CargoLifter AG epilogue
8. For more information

2. The CargoLifter hangar

The massive hangar at Brand-Briesen measures 360 m (1,180 ft) long x 220 m (720 ft) wide x 106 m (348 ft) high and was designed to handle two CL160 airships. It would have been the site for manufacturing the CL75 AC transport balloons and CL160 airships.



Elevation and plan views of the CargoLifter hangar.
Source: https://www.atlasofplaces.com/architecture/CargoLifter/

Most of the hangar construction work was completed by the end of 1999 at a cost of about $77 million, 50 percent or which was subsidized by the Brandenburg state government. CargoLifter also built an adjacent CargoLifter World theme park, which opened in the Spring of 2000. The park enabled the interested public to get a close-up view of the company's development activities.

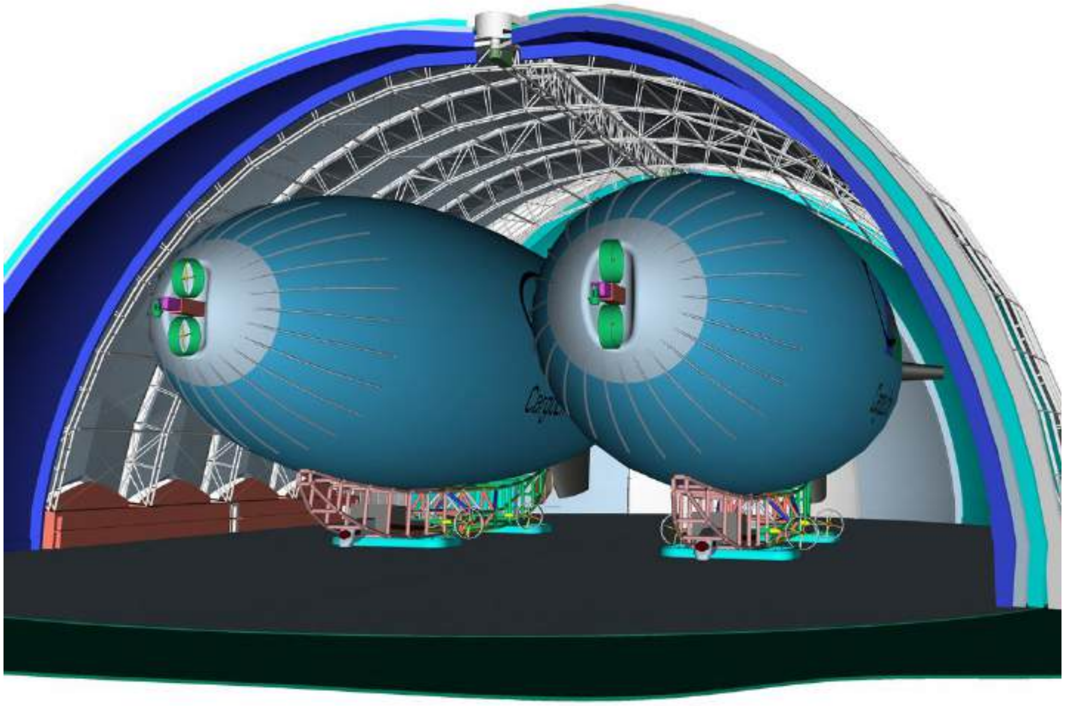
CargoLifter hanger under construction. Sources: (L) [Beyond Plan B](), (Below) Screenshot, Nils F time lapse video (May 2000 image).

(Below) Aerial view of the completed CargoLifter hangar built at the site of the abandoned former Soviet military airbase in Brand-Briesen. Source: [Beyond Plan B]()

You can appreciate the scale of the completed hangar in the following photos. Watch a short time-lapse video of the construction of the CargoLifter hangar from 1999 to 2000 here.

The completed CargoLifter hangar with Skyship 600B training airship inside. Source: CIDECT

The completed CargoLifter hangar with the CL75 AC transport balloon inside. Source: CargoLifter AG



CAD rendering showing two CL160 airships inside the hangar.
Source: cargolifter.com

The giant hangar was sold during liquidation of CargoLifter's assets in 2002 and is still in use today, not for aviation, but as the world's largest indoor tropical rainforest and water theme park named Tropical Islands Resort. Here's the link: https://www.tropical-islands.de/en

Panoramic view insider the former CargoLifter hangar today: Tropical Islands Resort. Source: Beyond Plan B

3. The CargoLifter "Joey" (renamed Ziphius 900 in 2010)

"Joey" is a small scale (1:8) experimental airship that is so named because it could fit inside a CL160's cargo bay like a kangaroo baby in its mother's pouch. It is a semi-rigid airship with a rigid, tubular carbon fiber keel attached under a non-rigid gas envelope. The keel supports the propulsion system and a small welded steel-frame gondola with side-by-side seating for a pilot and test engineer (or a pilot and more extensive measuring equipment).

General design parameters of the CargoLifter Joey airship

Parameter	CargoLifter Joey
Length	32 m (105 feet)
Diameter	7.9 m (26 feet)
Envelope volume	1,050 m³ (37,080 ft³) total, arranged in four helium cells: approx. 100 m³ in the bow, 100 m³ in the stern, & 400 m³ each in port & starboard mid-ship cells
Envelope pressure	No separate ballonet. Fans maintain 450 Pa (4.5 mbar) positive pressure inside the envelope.
Empty weight	827 kg (1,823 lb)
Cargo capacity	220 kg (485 lb)
Accommodations	Pilot + passenger or test equipment
Propulsion	2 x 17.6 kW (24 shp) engines attached by pylons to the rigid keel, each driving a fixed propeller
Aerodynamic controls	Cruciform tail fins with control surfaces are connected to one another via a rigid internal wire-braced frame structure inside the hull.

Development of Joey started in early 1997 at the University of Stuttgart. Joey made its maiden flight on 18 October 1999, about the time that construction started on the massive CargoLifter hangar. Development and construction of Joey helped CargoLifter AG obtain approval in Germany as an aviation development company.

CargoLifter AG used Joey to support the development and validation of the software being used to design and simulate CL160 flight characteristics, to test in-flight airship behavior (i.e., of the helium cells and air cells), and to support development of airship operating processes and procedures. In addition, Joey was used to inspect airship hangar construction from the outside.

Joey in flight as hangar construction starts. Source: CargoLifter

Joey on a mobile mooring with hangar construction in progress. Source: DPA


Joey in flight near the completed hangar. Source: CargoLifter AG

Joey tailplanes and control surfaces. Source: Zukunft-in-Brand e.V. (2006)

Joey on approach to landing. The black circle visible on the side of the envelope is one of two helium valves. Source: Screenshot, Joey-Testflug video (2008)

Joey two-seat cockpit & twin engine installation, with envelope air supply ducts in the propeller slipstreams. Source: Screenshot, Joey-Testflug video (2008)

Joey in its hangar, circa 2000. Source: CargoLifter

The insolvency administrator sold Joey for € 13,000 (about $15,860 at a 2002 exchange rate of 1.22). Today, it is in France, where it has been owned by Marvin Johnson since 2010 and renamed Ziphius 900.

Joey reincarnated as Ziphius 900. Source: Marvin Johnson

4. The CargoLifter CL75 AC transport balloon (AirCrane)

The CL75 AC, also known as the AirCrane, was an unpowered, unmanned, heavy-lift, spherical balloon designed to lift heavy, cumbersome items and be towed by ground vehicles, a ship or a large helicopter. The CL75 AC had a transport load capacity of up to 75 metric tons (75,000 kg, 165,347 lb). The basic design and operation of this type of transport balloon is described in CargoLifter AG patent application US2002/0109045 (published in 2002).

General design parameters of the CL75 AC

Parameter	CL75 AC
Diameter	61 m (200 ft)
Height, overall, incl. cargo load frame	85 m (279 ft)
Envelope volume	110,000 m^3 (3,884,600 ft^3)
Cargo capacity	75 metric tons (75,000 kg, 165,347 lb)
Load frame dimensions	13 x 6 x 6 m (42.6 x 19.7 x 19.7 ft)
Maximum altitude	762 m (2,500 ft) above sea level
Maximum transport speed (towed)	70 kph (43.5 mph)

The balloon envelope was developed by ILC Dover and TCOM and manufactured in the U.S. The load frame was developed and manufactured in the U.S. by AdvanTek International LLC. The complete CL75 AC was integrated in the CargoLifter AG hangar.

CL75 AC in the CargoLifter hangar. Source: CargoLifter AG

The CL75 AC would have been integrated with CL160 airship operations in CargoLifter AG's planned worldwide heavy-lift transportation infrastructure. In operation, the CL75 AC would have been towed by one or more ground vehicles to move heavy cargo from place to place, over ranges up to 250 km (155 miles).


CL75 AC with empty load frame under tow. Sources: (L) cargolifter.com, (R) screenshot from Project CargoLifter video (2013)

In 2001, CargoLifter AG received an order for one CL75 AC transportation balloon, priced at $10 million USD, from Heavy Lift Canada, Inc., which was headquartered in Calgary, Alberta. Under the agreement, CargoLifter was to deliver the CL75 AC by December 2002 and Heavy Lift Canada would deploy it in commercial operation for the transport of oilfield equipment over ice roads in Canada's Arctic and in Alaska. Heavy Lift Canada also secured an option to purchase 25 additional CL75 AC balloons for $10 million USD each. Heavy Lift Canada commented, "With its capabilities, the CL75 AC enables drilling companies to extend the current season for oil and natural gas exploration in remote Northern areas,"

The CL75 AC made its first flight on 12 October 2001. On 7 May 2002, it was used to validate the tethered, in-flight, load exchange process to be employed by the CL160. Shortly thereafter, the balloon was severely damaged by high winds in a storm on 10 July 2002. A month later, in August 2002, all work on the CL75 AC was halted after CargoLifter AG declared insolvency. None of the transport balloons were ever delivered.

Load exchange experiments with CL75 AC transport balloon

The load exchange ballasting process for the CL160 was tested from 2000 – 2002 and demonstrated successfully using the CL75 AC and a specially designed load frame that also could carry water ballast. In one outdoor test on 7 May 2002, a 55 metric ton (60.5 ton) German mine-clearing tank was loaded, lifted and discharged from the carriage as water ballast was unloaded and later reloaded in approximately the same time it took to secure the tank in the carriage (several minutes). In this test, the 55 metric tons cargo was exchanged with about 55 cubic meters (1,766 cubic feet, 14,530 US gallons) of water ballast.

German mine-clearing tank inside the CL75 AC load frame. Source: cargolifter.com

CL75 AC aloft on tethers during May 2002 load test with the mine-clearing tank. Source: CargoLifter AGPics from cargolifter.com

The load exchange test was conducted as follows:

Cargo has been loaded. The AC75 is held on the ground by the combined weight of the cargo and ballast water (blue) in the tanks of the load frame.

Pumping the ballast water from the load frame to the tanker trucks makes the balloon system lighter-than-air and it lifts off with the cargo, controlled by its tether.

At the destination, the CL75 AC is hauled down. Ballast water is pumped back into the load frame upon landing, stabilizing the balloon system safely on the ground. The cargo now can be removed from the load frame. The balloon system remains held on the ground by the weight of the ballast water.

You can watch a short video of this load exchange test and a simple animation of the water ballast transfer process at the following link:
https://www.youtube.com/watch?v=lralh-LwcJQ
The three graphics above are screenshots from this video.

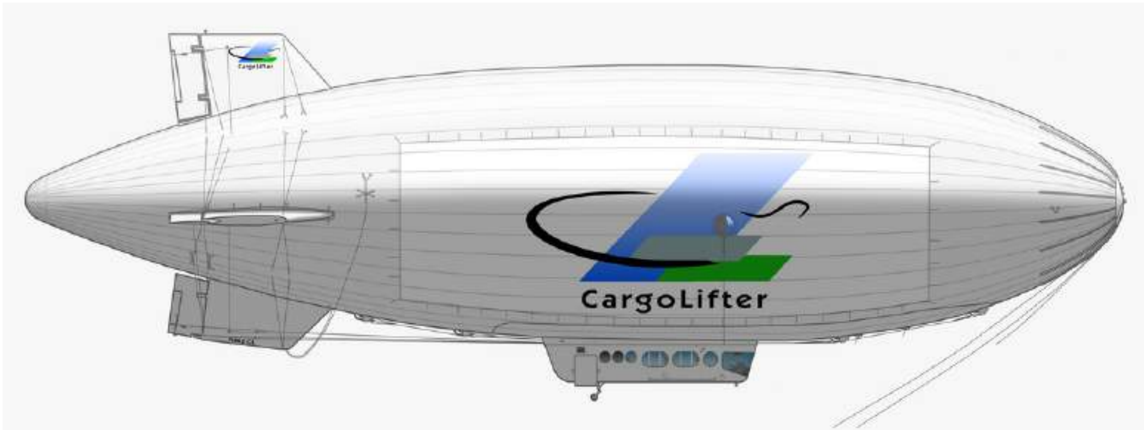
5. Airship Industries SkyShip 600B training airship

In April 2000, FlightGlobal reported: “CargoLifter has ordered a Skyship 600B airship with which to begin preparations for its planned CL-160 large cargo airship operations. The contract is worth $6.4 million to Orlando, Florida-based Airship Operations and UK sister company Global Skyship Industries. The Skyship will be assembled and flight tested by Airship Operations next April (2001), and delivered to CargoLifter's Brand, Germany base. Airship Operations will also help the company gain its German air operator's certificate after which CargoLifter will use the Skyship to train CL-160 flight test and line operating crews. Operation of the cargo lifters are to begin in 2002.”

General design parameters of the Skyship 600B airship

Parameter	Skyship 600
Length	59 m (193.6 ft)
Diameter, max	15.2 m (49.4 ft)
Height, overall	20.3 m (66.6 ft)
Envelope volume	7,200 m³ (254,265.6 cu ft); larger than Skyship 600 original envelope.
Ballonet volume	26% of envelope gross volume, in two ballonets
Max gross lift	5,900 kg (13,007 lb)
Maximum takeoff weight	6,650 kg (14,661 lb)
Empty weight	3,650 kg (8,047 lb)
Payload	3,000 kg (6,614 lb)
Propulsion	2 x turbocharged 6-cylinder Porsche 930/67/AI/3 engines rated @ 190 kW (255 hp) each, with ducted propeller configuration similar to Skybus 500, vectorable 85° up to 110° down
Gondola dimensions	11.7 L x 2.56 W metres (38.3 L x 8.4 W feet)
Accommodations	2 crew + 13 passengers
Speed, max	92.5 kph (57.5 mph)
Speed, cruise	55.5 kph (34.5 mph)
Range	1,020 km (630 mi) @ 74 kph (46 mph)
Ceiling, max	3,050 m (10,010 ft)
Endurance	14 hours

Source: Modern Airships, Airship Industries Ltd.



Skyship 600B airship (D-LCLAL) used by CargoLifter AG.
Source: Source: migenda.weebly.com

After CargoLifter's insolvency in 2002, Skycruise Switzerland Ltd. acquired the Skyship 600B after its operating license had expired. The airship made no further passenger flights in Germany. However, it was used in other roles, including as a surveillance airship at the 2004 Olympic Games in Athens.

The Airship Industries Skyship 600B, nicknamed "Charly," in CargoLifter livery, sharing the hangar with the CL75 AC.
Source: dpa

The Airship Industries Skyship 600B, nicknamed "Charly," sharing the hangar with the CL75 AC. Source: (above) dpa, (below) cargolifter.com

CargoLifter's Skyship 600B "Charly" flying outside the massive CargoLifter hangar. Source: Frankfurter Allgemein FAZ.NET (2015)

CargoLifter's Skyship 600B "Charly".
Source: Zukunft-in-Brand e.V. (2006)

CargoLifter's Skyship 600B "Charly".
Source: Zukunft-in-Brand e.V. (2006)

6. The CargoLifter CL160 heavy-lift airship

The CL160 was a design for a 260 m (853 ft) long, conventional, semi-rigid airship with a rigid structural keel coupled to a 550,000 m³ (19,423,067 ft³) pressure-stabilized gas envelope that supported the full weight of the airship. The neutrally-buoyant airship was designed to hover above a destination and conduct an airborne load exchange. It also could perform a vertical takeoff and landing (VTOL).

While CargoLifter AG reported that the conceptual design was frozen in November 1998, the airship has evolved through three (or more) configurations between late-1998 and mid-2002, as shown in the following CargoLifter AG graphic.

(L to R) CargoLifter CL160 airship design evolution: early, mid and final generations. Source: CargoLifter AG via Zukunft-in-Brand e.V. (2006)

(Bottom to top) CargoLifter CL160 airship design evolution: early, mid and final generations. Source: CargoLifter AG

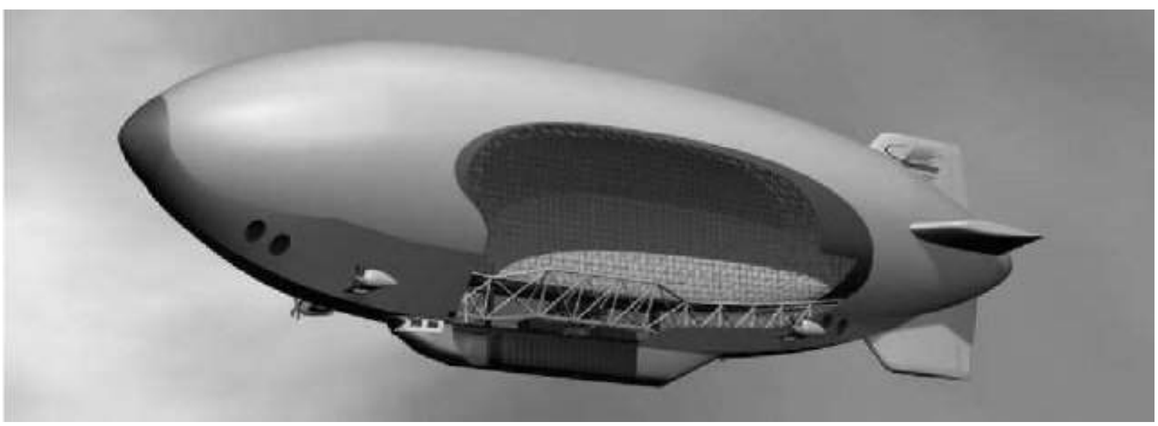
For the sake of discussion in this article, I’ll refer these three variants as the early generation (L), the mid-generation (M) and the final generation (R).

6.1 Common features

All variants of the CL160 were conventional, semi-rigid airships with similar basic dimensions: 260 m (853 ft) long, 550,000 m^3 (19,423,067 ft^3) envelope volume.

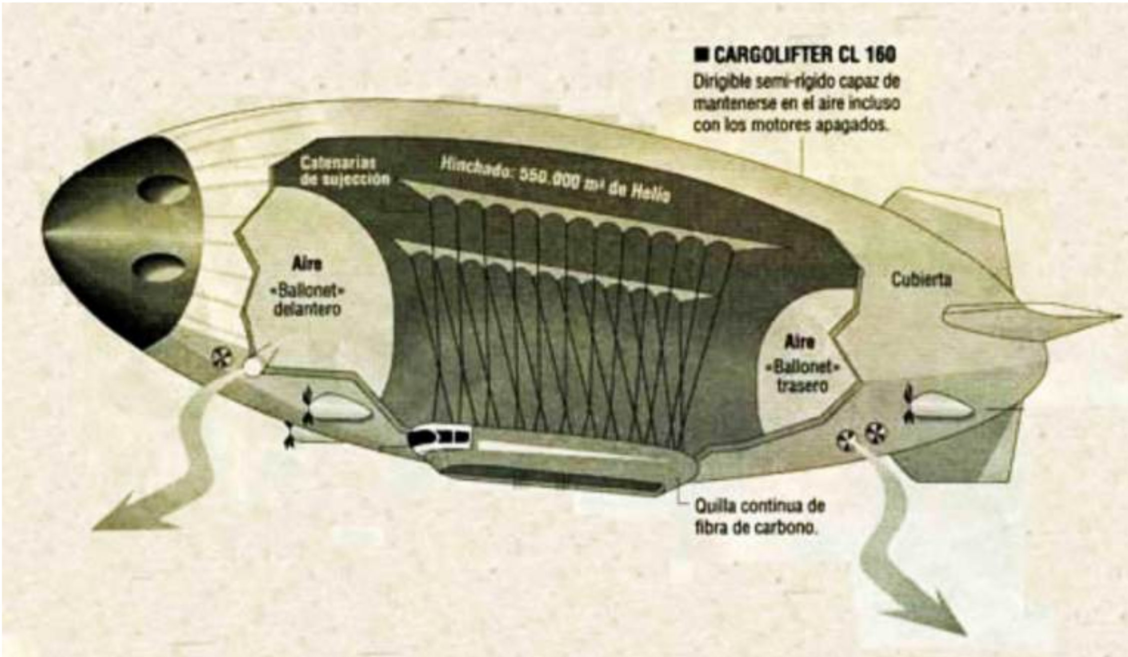
Envelope: The lifting gas (helium) is contained within a pressure-stabilized, multi-layer fabric envelope, which forms a single, low-leakage gas cell, like a blimp envelope. The use of multiple lifting gas cells was rejected due to the added complexity without a corresponding increase in safety. Two large ballonets are installed inside the envelope, one near the nose and one near the tail.

Rigid keel: A long, rigid keel is installed under the envelope to carry the structural weight of engines, fuel, crew, airship systems and up to 160 metric tons (352,000 lb) of cargo. Originally, the keel was designed to be constructed of tubular aluminum. A later report addressing the CL160 mid-generation design (NASA Ames, June 2016) indicates that a carbon fiber keel was planned.



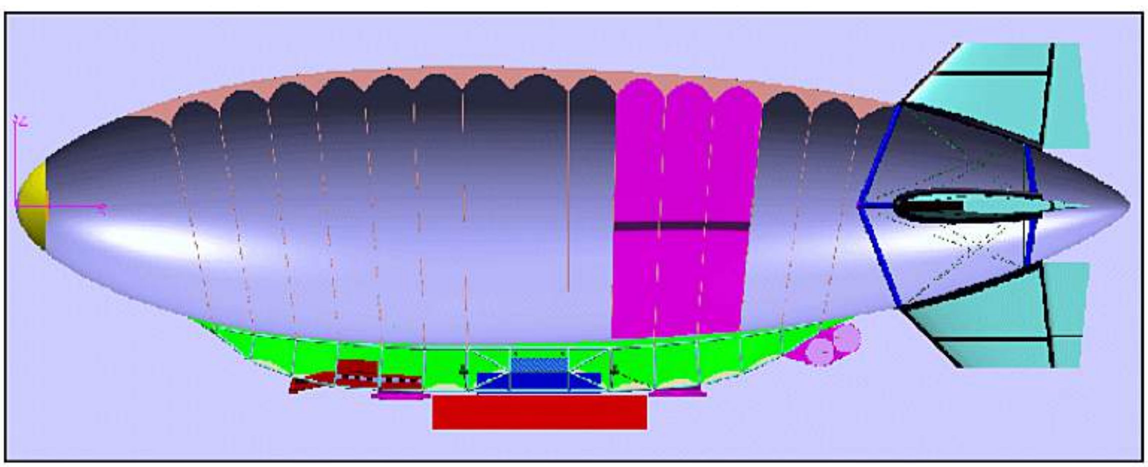
Early generation CL160 cutaway drawing showing the keel structure extending along the bottom of the envelope. The cargo bay is the dark area in the center of the long gondola. Source: Carl Schweizerhof / Wilhelm Rust, "Finite element load limit analysis of thin-walled structures….." July 2002

Internal suspension system: The total weight of the keel is supported by two conventional catenary curtains, similar to a blimp's internal rigging, which transfer the load into the upper surface of the fabric envelope. Redondo (2008) reported that each curtain was comprised of 12 cables that distributed the load. A later report (NASA Ames, June 2016) shows 15 suspension cables.



Early-generation CL160, showing the ballonet locations and the internal suspension supporting the rigid keel. Source: Redondo (2008), Fig. 18.

Aerodynamic control surfaces: The tail-mounted cruciform fins have conventional rudder and elevator aerodynamic control surfaces. The fins are supported internally by a rigid cruciform structure and external guy wires. Each fin had a cord of 42 m (137.8 ft) and a span of 21 m (68.9 ft).



CAD rendering showing a cross-sectional view of a mid-generation CL160.
The rigid keel is the light green area under the envelope.
The internal suspension system in this rendering has 15 support cables.
The rigid cruciform support structure for the tail fins is shown in dark blue.
The outlines of external bracing wires for the tail fins also are visible.
Source: NASA Ames Research Center, June 2016

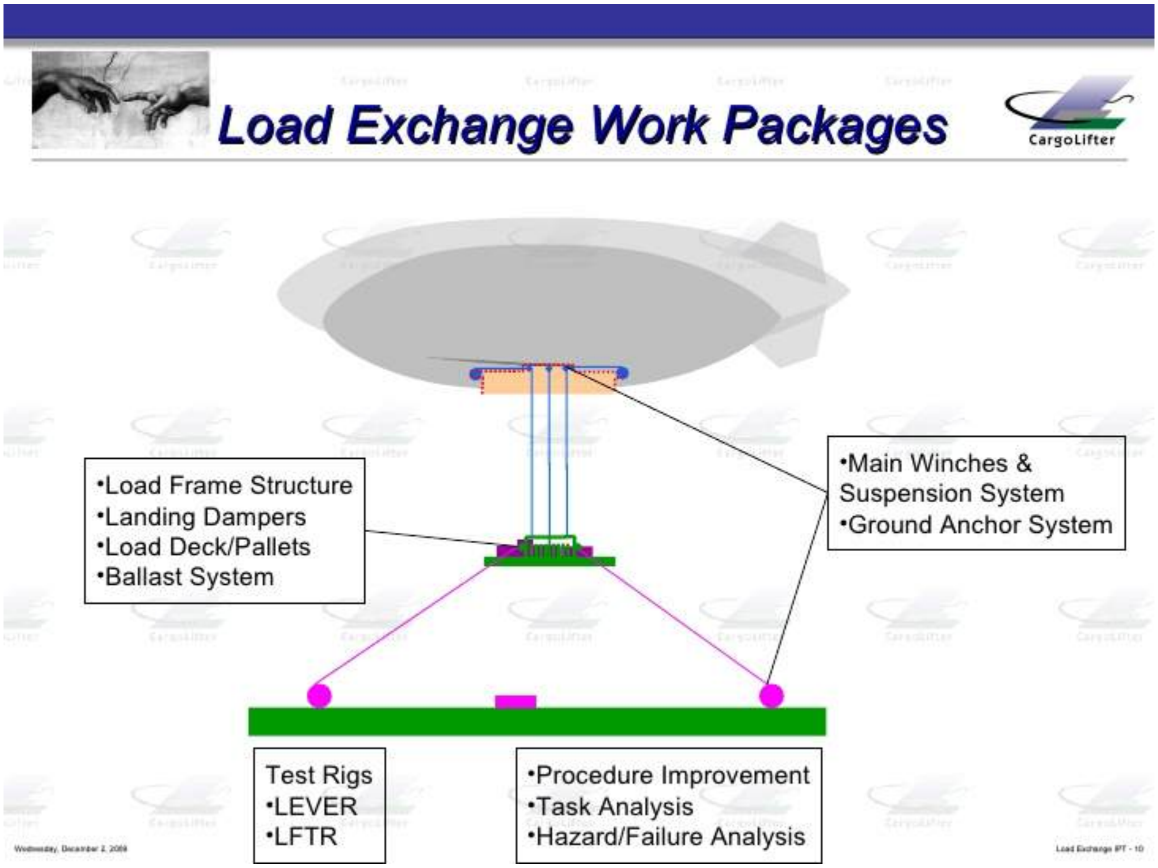
6.2 Executing a load exchange from a hovering CL160 airship

Among the challenges in making an in-flight load exchange from a hovering airship are station keeping over the destination, and managing the balance between lift and mass while massive cargo items are being added to, or removed from, the airship. CargoLifter AG's patent US6231007B1, which was granted in May 2001, describes a process for accomplishing these tasks by anchoring the hovering airship to the ground and transferring ballast water to or from the load frame as needed during a load transfer. All variants of the CL160 were designed to perform airborne load exchanges in this manner.

As described on the Aviation Technology website (https://www.aerospace-technology.com/projects/CargoLifter/) the CL160 would perform an in-flight delivery of cargo as follows

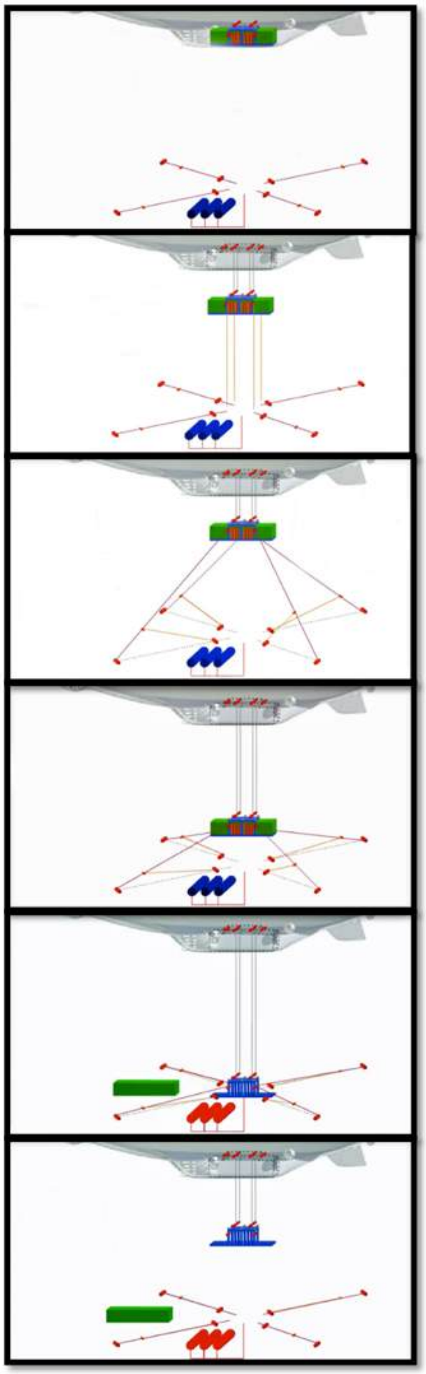
> "The airship's load exchange procedure makes use of a new, specially developed technology, allowing it to load and unload without landing. The airship hovers at about 100 m above the ground and a special loading frame, which is fixed during flight to the keel of the airship, is then rigged with four cable winches to the ground, a procedure which is to assure that the airship's lifting gear stays exactly above the desired position. Ballast water is then pumped into tanks on the frame and the payload can be unloaded. The anchor lines are released and the frame is pulled back into the payload bay of the airship."

When the CL160 receives new cargo during a load exchange transaction, the weight of water ballast on the load frame needs to be reduced by the same amount as the weight of the new cargo. CargoLifter claimed that a load exchange could be conducted in steady wind up to 10 m/s (22.3 mph) or +/- 5 m/s (11 mph) gusts, comparable to operating limits for a modern construction crane.



Load exchange in progress from a CL160 (final generation) hovering at about 100m (328 ft). Source, both graphics: CargoLifter AG

An in-flight load exchange is illustrated in the following graphics. The sequence-of-events graphic was created with screenshots from the above video. A 160 metric tons cargo requires the exchange of 160 cubic meters (5,138 cubic feet, 42,269 US gallons) of water ballast.



The CL160 arrives above the delivery site with cargo . The ground anchor system and ballast water on the ground are ready.

The CL160 lowers its load frame with the cargo and empty ballast tanks. Haul-down cables are dropped to the ground.

The CL160 haul-down cables are secured to the ground anchor system. The CL160 is now tethered to the ground via the load frame.

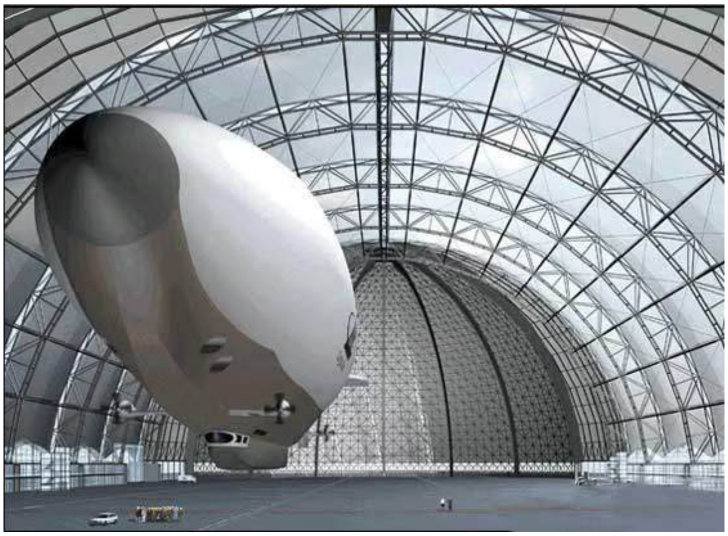
The load frame is hauled down to the ground while the tethered CL160 hovers above.

The load frame is ballasted from the ground storage tanks with water equivalent in weight to the cargo. Then the cargo is removed.

The ballasted load frame is released from the ground anchor system and is lifted back up into the CL160. The airship can depart the site.

Airborne load exchange sequence of events.
Screenshot from CargoLifter AG video (posted 2006)

6.3 CL-160 early generation

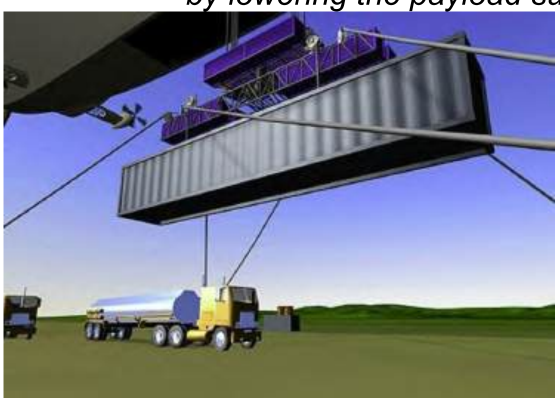


The early generation CL160s had four podded main engines, each driving a large propeller, installed along the lower flanks of the airship, where they are attached via pylons to the rigid keel structure.

Low on the hull, fore and aft of the main engines, are pairs of circular ports for bow & stern maneuvering thrusters that provide positioning stability during load exchanges and mooring.

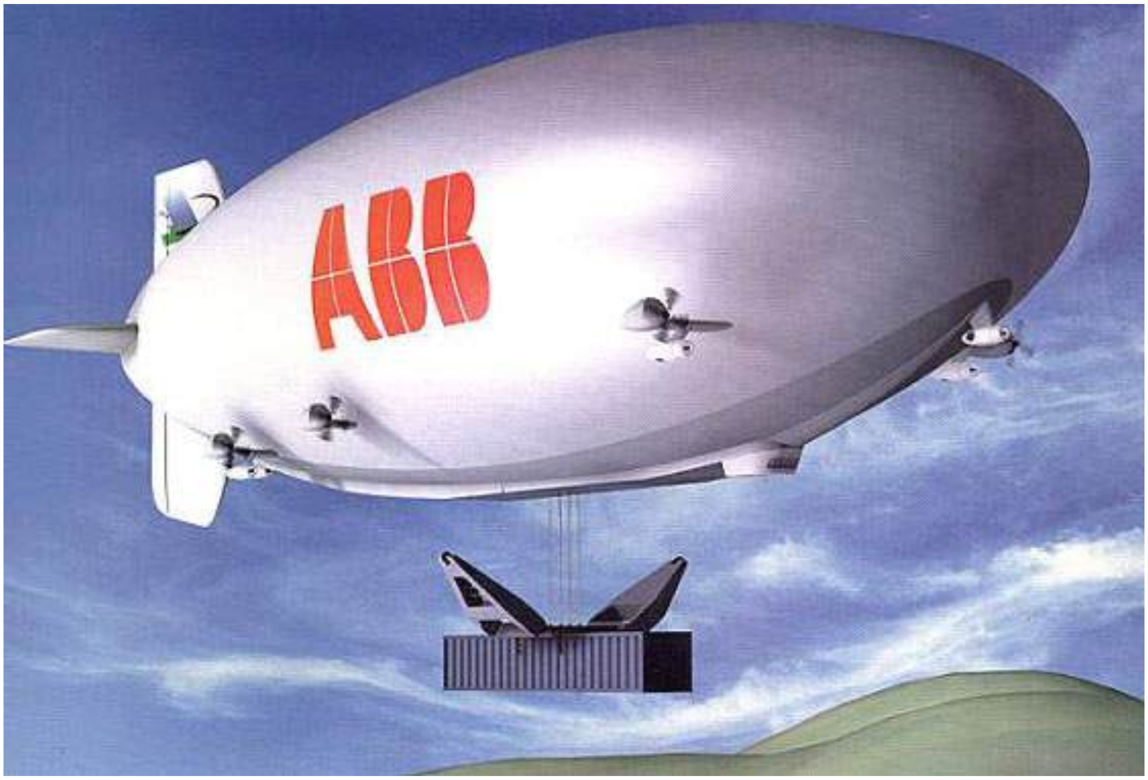
Source, three graphics: CargoLifter AG

CL160 early generation airship begins load exchange process by lowering the payload supported from a load frame.




(L) Water tanker truck approaches & starts delivering water ballast to the load frame. (R) Water trucks have delivered sufficient ballast water to transfer the load of the cargo to the ground. About 42,250 gallons of water (7 to 9 semi-trailer tanker trucks) would be needed for a 160 metric ton load transfer.

Cargo on the ground, load frame disconnected and being retracting as airship leaves the site after delivery. Source, four graphics: CargoLifter AG, via screenshots from promo video (2001).



Early generation CargoLifter variant, with an alternate main propulsion and maneuvering thruster arrangement, carrying a large cargo item as an external sling load. Source: CargoLifter AG via Aerospace Technology (July 2002)

6.4 CL-160 mid-generation, circa 2001

This is the version of the CL-160 described in patent application GB2359534A, “Airship having a device for altitude control and/or pitch angle trim,” which was filed on 22 February 2001 and published on 29 August 2001. The general arrangement of this mid-generation CL160 is shown in patent Figures 1 and 2, reproduced below.

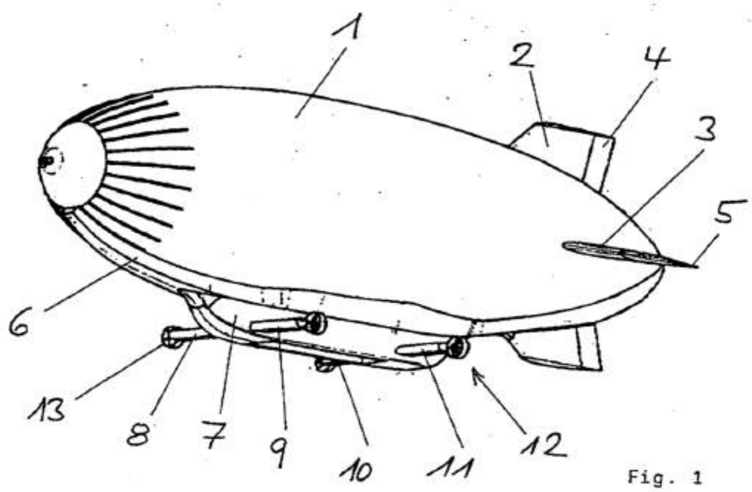


Fig. 1

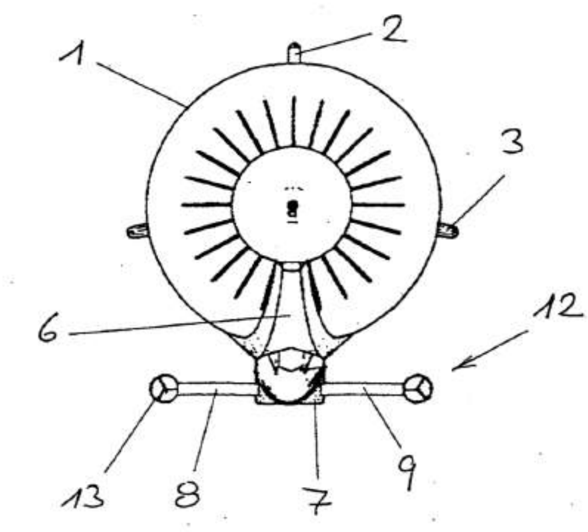
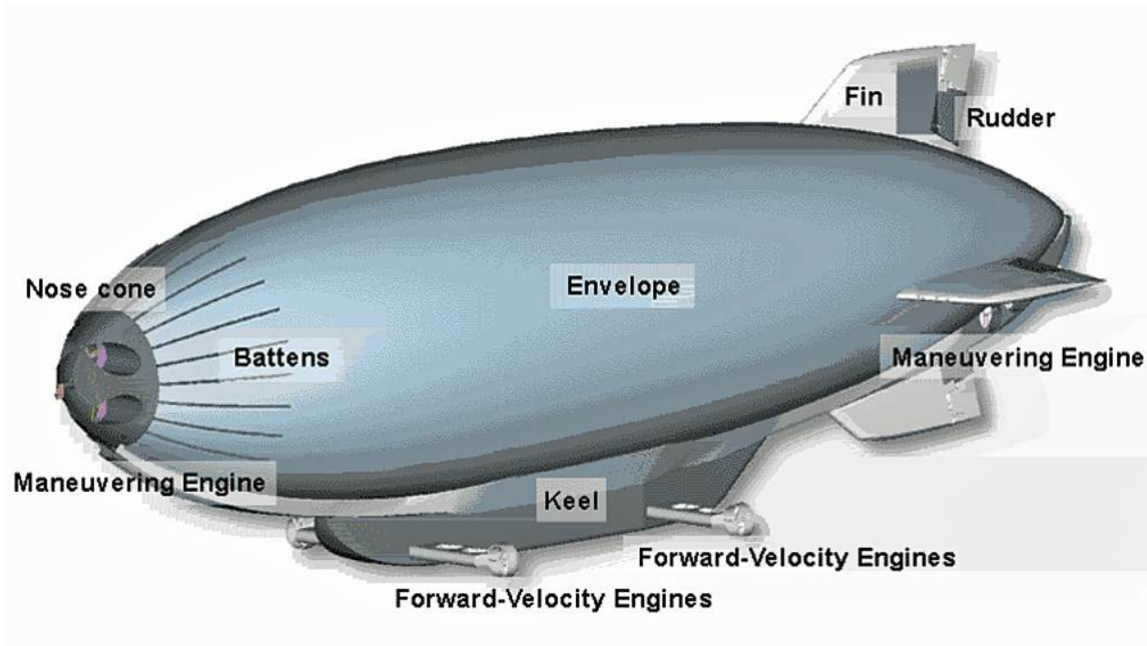


Fig. 2

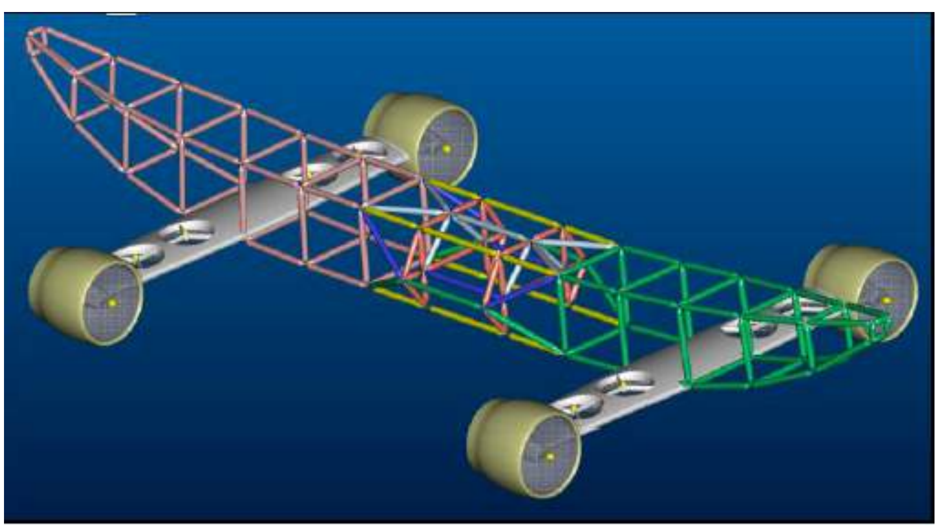
Legend: *Pressure-stabilized gas envelope (1) with cruciform tail fins (2, 3) and conventional aerodynamic control surfaces: rudder (4) and elevator (5). The rigid keel (6) attached under the envelope carries the large gondola (7) with four wings (8, 9, 10, 11), each having a fixed main propulsion shrouded propeller installed at the wingtip (12, 13) and vertical thrusters (not shown).*

General arrangement of CL-160 mid-generation, circa 2001.
Source: GB2359534A, Figs. 1 & 2

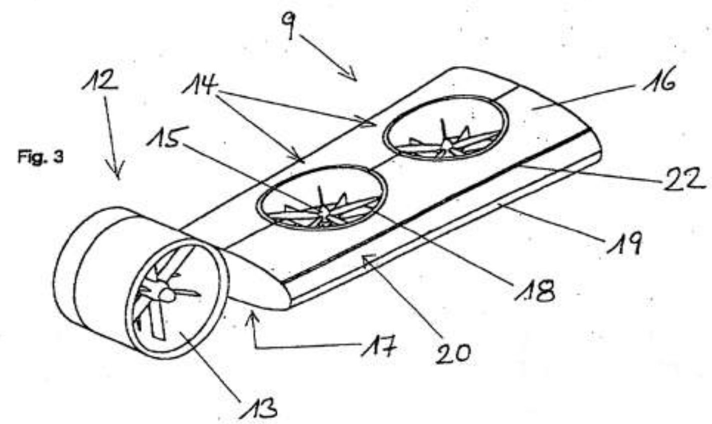


General arrangement of the CL-160 mid-generation. Source: CargoLifter AG

The long, rigid structural keel under the envelope carries most of the heavy structural loads, encloses the cargo bay, and supports two sets of large wings with fixed, shrouded propellers installed on the wingtips for main propulsion. As shown in the following patent Figures 3 to 5, vertical thrusters integrated in the wing structure can generate up to 40 tons of lift while hovering and during VTOL. Wing trailing edge surfaces are "blown" with high pressure air for additional lift control.

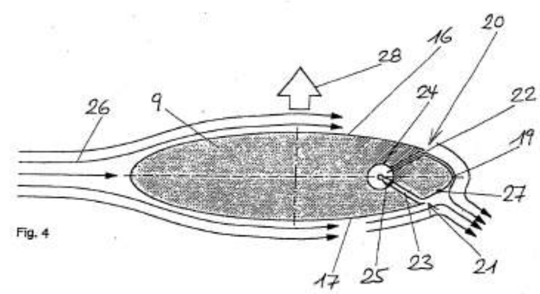


CAD rendering of the keel and wing structures for a mid-generation CL160. Vertical thrusters can generate up to 40 tons of lift. Source: NASA Ames Research Center, June 2016

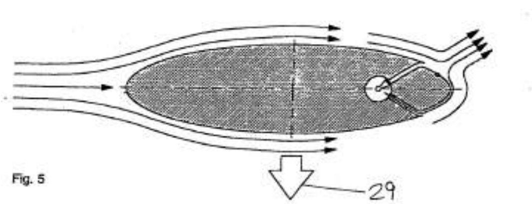


Front port wing viewed obliquely from the rear and above.
Source: GB2359534A, Fig. 3

Legend: *Wing (9) supports a fixed shrouded propeller at the wingtip for main propulsion (12, 13), with vertical thrusters (14, 15) integrated with the wing through openings (18) between the wing upper surface (16) and lower surface (17). When the vertical thrusters are not operating, retractable aerodynamic covers (not shown) close the opening (18). Along the wing trailing edge (19), the upper and lower trailing edges of the wing (20, 21) could be blown with compressed air discharged via slots (22) along the respective trailing edge surface. The compressed air to the slots is supplied via compressed air channels in the wing (23), which in turn are supplied from a compressed air pipeline in the wing (24). The flow of compressed air to the upper or lower trailing edge slot is controlled by a rotary slide valve (25). As the free air stream (26) passes around the wing, operation the blown trailing edge feature moves the rear stagnation point (27), thereby changing the lift characteristics of the wing. When the lower trailing edge is "blown" (Fig. 4), an upward lifting force (28) is generated. When the upper trailing edge is "blown" (Fig. 5), a downward force (29) is generated.*



Rotary slide valve aligned to blow the lower trailing edge and generate an upward lift force (28). Source: GB2359534A, Fig. 4



Rotary slide valve aligned to blow the upper trailing edge and generate a downward force (29). Source: GB2359534A, Fig. 5

Flying model of a variant of the mid-generation CargoLifter, with fore and aft pairs of lateral thrusters in the keel and fore and aft stub wings attached under the keel, each housing two vertical thrusters. Main propulsion propellers are pylon-mounted and attached to the keel rather than to the wingtips.

Source: Three screenshots from CargoLifter promo video (2001)

6.5 CL160 final generation, circa 2002

In February 2002, the Preliminary Design Review (PDR) was completed, confirming the technical feasibility of the project and leading to the next stage in its development, the Detailed Design phase. This final generation design dispensed with the four long wings with lifting fans and other high-lift devices. The large shrouded propellers were relocated to short pylons supported from the rigid keel structure and given a thrust vectoring capability

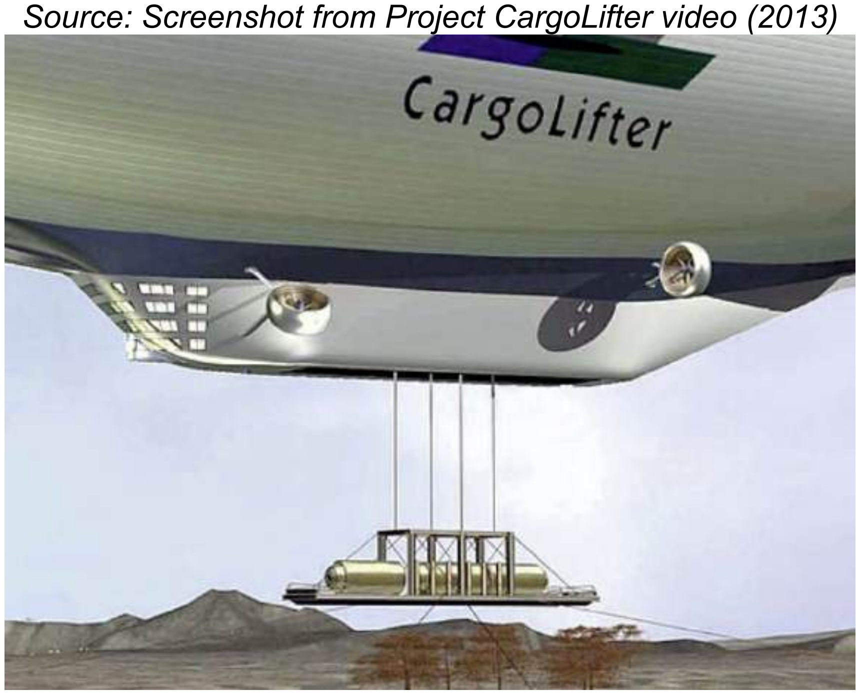
Final CL160 configuration, circa 2002. Source: migenda.weebly.com

General design parameters of the CL160 final generation

Parameter	CL160
Length	260 m (853 ft)
Diameter, max.	65 m (213 ft)
Height, overall	82 m (269 ft)
Envelope volume	550,000 m³ (19,423,067 ft³)
Envelope material	Proprietary two-layer laminate with embedded LCP (liquid crystal polymer) fibers
Payload bay volume	3,200 m^3 (113,000 ft^3)
Crew size	10 to 12 people
Cargo capacity	160 metric tons (176 tons, 352,000 lb)
Load frame dimensions	50 x 8 x 8 m (164 x 26.2 x 26.2 ft)
Propulsion and control	8 x GE CT7-8L turboshaft engines (1,864 - 2,237 kW / 2,500 – 3,000 shp class), driving 4 x thrust vectoring shrouded main propulsion propellers and 4 x fixed maneuvering thrusters (2 x bow lateral, 1 x stern lateral and 1 x stern vertical thrusters)
Speed, cruise	90 kph (56 mph)
Speed, max.	125 kph (77.7 mph)
Altitude, max.	2,000 m (6,562 ft)
Range	Up to 10,000 km (6,214 miles)

As with earlier variants, the CL160 final generation was designed for conducting airborne, tethered load exchanges. The airship does not land to pick up or drop off cargo. Instead, cargo carried in the internal cargo bay or as a suspended sling load, is lowered to the ground on a load frame from a hover altitude of about 100 m (328 ft). A water ballast exchange occurs at the load frame before the tether can be released and the load frame hoisted back to the airship.

Starting to lower the load frame with four tethers deployed.
Source: Screenshot from Project CargoLifter video (2013)



Load frame supported by four hoist cables and stabilized with four tethers. Source: CargoLifter AG

Final CL160 configuration, circa 2002. Source: CargoLifter AG

The General Electric GT CT7-8 turboshaft engine was selected as the powerplant for the CargoLifter CL160. With a takeoff rating of over 1,864 kW (2,500 shaft horsepower), it was newest and most powerful member of the GE T700/CT7 engine family, which had become a common powerplant found in medium helicopters around the world.

The final CL160 configuration had 8 x GE CT7-8L turboshaft engines driving 4 x thrust vectoring shrouded main propulsion propellers and 4 x fixed maneuvering thrusters (2 x bow lateral, 1 x stern lateral and 1 x stern vertical thrusters).

At the time it was selected for the CL160, the engine was being certified by the U.S. Federal Aviation Administration (FAA) and the European Joint Aviation Authorities (JAA, now EASA) and originally was targeted for completion before the end of 2000. Certification of the CT7-8 series actually was completed by the FAA on 11 April 2003 and by the JAA in November 2004.

7. CargoLifter AG epilogue

More than two decades after the demise of CargoLifter AG, the CL160 business venture remains as an important milestone in the development of the technology and the business case for modern heavy-lift cargo airships.

Work on a heavy-lift rigid airship is continuing at the successor firm, CL CargoLifter GmbH & Co. KGaA, which was founded in Berlin in 2005 and acquired CargoLifter AG intellectual properties, including patents. CL CargoLifter GmbH & Co. KGaA is the subject of a separate article.

The airborne load exchange process developed by CargoLifter and demonstrated in 2002 with a prototype load frame and their CL75 AC transport balloon is quite similar to the airborne load exchange process being implemented almost 25 years later by Flying Whales for their LCA60T heavy-lift rigid airship.

8. For more information

CL160 heavy-lift airship

- Ingolf Schafer, "Structural Design Aspects of the CargoLifter CL160," AIAA-99-3910, American Institute of Aeronautics & Astronautics, 1999: https://arc.aiaa.org/doi/pdf/10.2514/6.1999-3910
- Kevin Bonsor, "How CargoLifter's Airship Will Work," HowStuffWorks: https://science.howstuffworks.com/transport/flight/future/CargoLifter.htm
- "CargoLifter CL160," Aerospace Technology, 2 July 2002: https://www.aerospace-technology.com/projects/CargoLifter/
- "CargoLifter CL160," GlobalSecurity.org: https://www.globalsecurity.org/military/systems/aircraft/CargoLifter.htm
- Mike Steere, "The Baron's Big Balloon," Wired, 1 August 2000: https://www.wired.com/2000/08/airships/

- “All hangar, no airship,” Forbes, 28 April 2002: https://www.forbes.com/global/2002/0429/034.html?sh=67ae273185df
- “Grund zur Hoffnung - Verhandlungen mit dem britischen Luftschiffbauer ATG sollen aus der Insolvenz führen (Reason for hope - Negotiations with the British airship builder ATG should lead out of bankruptcy),” Manager Magazin, 9 May 2002: https://www.manager-magazin.de/finanzen/artikel/a-212568.html
- F.A. Gonzalez Redondo, “Leonardo Torres Quevedo, 1902 – 1908. The Foundations for 100 Years of Airship Design,” (see p.9 for CL160 details), Document ID 71192, 7th International Airship Convention, 2008: https://www.torresquevedo.org/LTQ10/images/7th_International_AirshipConvention_71192.pdf
- “Deutsche Zeppeline und Zeppelinprojekte nach 1945 (German Zeppelins and Zeppelin Projects Since 1945),” migenda.weebly.com: https://migenda.weebly.com/deutsche-zeppeline-und-zeppelinprojekte-nach-1945.html
- “SIAT GmbH CargoLifter 1997–1999” (a detailed description of the CargoLifter hangar), 425AR, August 2018: https://www.atlasofplaces.com/architecture/CargoLifter/
- “Die CargoLifter Story,” Chapter 5, “Weglassen statt Hinzufügen,” (“Subtract rather than add”), (pre-release, available in German only), Lifter News, 2014: https://cargolifter.com/fileadmin/Ressourcen/CL_CargoLifter/Documents/LifterNews/Sonderdruck-LifterNews-Auszug-Kap5.pdf
- Ron Hochstetler, Girish Chachad & John Melton, “Future Trends in Logistics & Sustainment,” (see p.35 for CL160 details), NASA Ames Research Center, 9-10 June, 2016: https://ntrs.nasa.gov/api/citations/20170001665/downloads/20170001665.pdf
- “Die Insolvenz der CargoLifter AG | Mitteilungen,” (in German), Initiative Lichter als Luft e.V., 2026: https://leichter-als-luft.org/verein/insolvenz-news

CL75 AC AirCrane

- “CargoLifter sells first CL 75 AC,” CTK Protext press release, 2001: https://www.protext.cz/novy/press-release.php?id=3789

Joey experimental airship (renamed Ziphius 900)

- “Das Versuchsluftschiff ‘Joey’ (The experimental airship ‘Joey’),” Zukunft-in-Brand e.V., LTA Technik & Gesellschaft,12 May 2006: https://zukunft-in-brand.de/lta/lta-technik-gesellschaft/2006/joey.html
- “The dirigible airship: could it have a comeback?,” InOut.rennes, 11 September 2019: https://inout.rennes.fr/en/blog/the-dirigible-airship-could-it-have-a-comeback/

Skyship 600B “Charly” training airship

- (Skyship 600B) “Airship order boosts CargoLifter preparation,” FlightGlobal, 3 April 2000: https://www.flightglobal.com/airship-order-boosts-cargolifter-preparation/31549.article
- “SkyShip 600 B “Charly,” LTA Technik & Gesellschaft, 7 May 2006: https://zukunft-in-brand.de/lta/lta-technik-gesellschaft/2006/charly.html

Videos

- “CargoLifter, ein Joey-Testflug (a Joey test flight),” (1:26 min), posted by CargoLifter GmbH, 10 July 2008: https://www.youtube.com/watch?v=HkcFjt0D42o&t=1s
- “Air Ship Cargolifter (Skyship 600B) Display,” (1:15 min), posted by inselvideo, 13 February 2011: https://www.youtube.com/watch?v=simkByPousc
- “CargoLifter CL-75 - Demonstration des Lastaustauschs,” (5:19 min), posted by CL CargoLifter GmbH & Co. KGaA, 5 May 2011: https://www.youtube.com/watch?v=lralh-LwcJQ&list=PLC0639C9A46DA71BA
- CARGOLIFTER_Hallenbau 1999 - 2000 Timelapse,” (Hangar construction, timelapse, 1:42 min), posted by Nils F, 18

February 2012:
https://www.youtube.com/watch?v=gBmxILJ62B0
- “Project Cargolifter,” (53:04 min, in German), posted by AeroCat, 30 December 2013: https://www.youtube.com/watch?v=idOMQNriBdo
- “Prinzip des CargoLifter-Lastaustauschs (Principle of the CargoLifter load exchange),” (2:14 min), posted by CargoLifter GmbH, 24 July 2014: https://www.youtube.com/watch?v=sedQ_9RdKVM
- “CargoLifter promo / company video N° 4 (2001),” (15:09 min), Project Cargolifter, posted by CargoLifter, 3 November 2014: https://www.youtube.com/watch?v=5tualQF8qPs
- “Profile of failed high tech project CargoLifter, in run up to elections,” (3:30 min), posted by AP Archive, 21 July 2015: https://www.youtube.com/watch?v=-GV3PxF3oww

CargoLifter AG patents (many now assigned to successor firm CL Cargolifter GmbH and Co KGaA)

- AU5407099A; “Device and method for the targeted placement or reception of goods carried by aircraft;” Filed 22 June 1999; Published 10 January 2000: https://patents.google.com/patent/AU5407099A/en
- DE10011319C2; “Airship and method for pitch angle trimming of airships;” Filed 10 March 2000; Published as DE10011319A1 20 September 2001; Granted 24 January 2002: https://patents.google.com/patent/DE10011319C2/en
- DE10058072B4; “Device for suspending a load hanging from a carrying device;” Filed 23 November 2000; Published 6 June 2002 as DE10058072A1; Granted 27 May 2004: https://patents.google.com/patent/DE10058072B4/en
- DE10120232A1; “Airship using helium as its operational buoyancy gas is filled during its construction and/or test flights phase with a mixture of helium and a gas heavier than helium;” Filed 19 April 2001; Published 31 October 2002: https://patents.google.com/patent/DE10120232A1/en
- DE10121854C1; “Airship mooring method, for large airship, uses three-line unit with main line and two stabilizing lines attached to nose of airship via central auxiliary line dropped

from latter;" Filed 4 May 2001; Granted 21 November 2002: https://patents.google.com/patent/DE10121854C1/en

- DE10139877A1; "Control system for lighter-than-air craft has at least one turning post-combustion chamber unit with convergent/divergent thrust jets on hull;" Filed 10 August 2001; Published 27 February 2003: https://patents.google.com/patent/DE10139877A1/en
- DE10164062A1; "Arrangement for anchoring and securing airships;" Filed 24 December 2001; Published 3 July 2003: https://patents.google.com/patent/DE10164062A1/en
- DE10164067A1; "Arrangement for loading and unloading anchored airships;" Filed 24 December 2001; Published 3 July 2003: https://patents.google.com/patent/DE10164067A1/en
- DE10201133A1; "Arrangement of power generators for lighter-than-air aircraft, especially large airships, has additional output shaft with coupling, gearbox, following compressor arranged on existing gearbox;" Filed 8 January 2002; Published 10 July 2003: https://patents.google.com/patent/DE10201133A1/en
- DE10252895A1; "Obtaining ballast for lighter-than-air aircraft, involves separating particles from ambient atmosphere around vehicle by generating electric field as thin film on outer or inner surface of vehicle;" Filed 12 November 2002; Published 19 May 2004: https://patents.google.com/patent/DE10252895A1/en
- DE10252910A1; "Drive, especially for lighter-than-air aircraft, has electric drive in propeller casing, windings in blade tips for magnetic regulation of constant small rotor/stator air gap, and integral magnetic drive;" Filed 12 November 2002; Published 19 May 2004: https://patents.google.com/patent/DE10252910A1/en
- DE10252911A1; "Anchorage mast has coupling arrangement for lighter-than-air aircraft, can be aligned relative to wind on mast or tower;" Filed 12 November 2002; Published 19 May 2004: https://patents.google.com/patent/DE10252911A1/en
- DE10226868A1; "Load transporter as especially ground vehicle has load or vehicle itself connected to lighter-than-vehicle in form of aerostat, the lift force of which corresponds at least partially to weight of load;" Filed 12 June 2002; Published 24 December 2003: https://patents.google.com/patent/DE10226868A1/en

- DE10228048A1, “Lighter-than-air craft is airship which by cable arrangement is detachably connected to at least one aerostatic lift component which has load holding means and designed statically heavy;” Filed 24 June 2002; Published 22 January 2004: https://patents.google.com/patent/DE10228048A1/en
- DE10252908A1, “Airship load frame ballast tank system, has all tanks connected by main, filling and trim pipes with remote controlled pump and gate valves;” Filed 12 November 2012; Published 27 May 2004: https://patents.google.com/patent/DE10252908A1/en
- DE10252909B4; “Arrangement for lightning protection of membrane structures of aircraft;” Filed 12 November 2002; Published 19 May 2004 as DE10252909A1; Granted 3 March 2011: https://patents.google.com/patent/DE10252909B4/en
- DE1965297A1, “Process for the targeted depositing or picking up of goods and people from aircraft;” Filed 25 June 1996; Published 8 January 1998: https://patents.google.com/patent/DE19625297A1/en
- GB2359534A; “Airship having a device for altitude control and/or pitch angle trim;” Filed 22 February 2001; Published 29 August 2001: https://patents.google.com/patent/GB2359534A/en
- US2002/0109045A1; “Spherical LTA cargo transport system;” Filed 19 November 2001; Published 15 August 2002: https://patents.google.com/patent/US20020109045A1/en
- US6231007B1; “Method for the precise setting down or picking up of cargo from airships;” Filed 16 June 1998; Granted 15 May 2001: https://patents.google.com/patent/US6231007B1/en
- WO2003/097451A1; “Method for recovering ballast from the exhaust gas of internal combustion engines on board airships;” Filed 21 May 2003; Published 27 November 2003: https://patents.google.com/patent/WO2003097451A1/en

Other *Modern Airships* articles

- *Modern Airships - Part 1*: https://lynceans.org/all-posts/modern-airships-part-1/
    - Airship Industries - SkyShip 600B

    - CL Cargolifter GmbH and Co KGaA – rigid heavy lift airships and balloon systems
    - Lockheed Martin - Large conventional semi-rigid airship
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    - Atlas LTA Advanced Technology – ATLANT rigid cargo airship
    - BASI – MB-30T rigid cargo airship
    - Euro Airship – 50T rigid cargo / passenger airship
    - Flying Whales – LCA60T
    - Millennium Airship, Inc. – SkyFreighter semi-rigid cargo airship
- *Modern Airships - Part 3*: https://lynceans.org/all-posts/modern-airships-part-3/