CargoLifter airships

Peter Lobner, 1 May 2019

Background

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.

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 measuring 360 m (1,180 ft) long x 220 m (720 ft) wide x 106 m (348 ft) high. This hanger is the largest free-standing building in the world.

Two different types of CargoLifter airships were planned, the CL75 “Aircrane” transportation balloon and the much larger CL160 semi-rigid airship. The CargoLifter CL160 was much larger than the Hindenburg zeppelin built in the 1930s.

<table>
<thead>
<tr>
<th>Airship</th>
<th>Envelope length (m)</th>
<th>Envelope length (ft)</th>
<th>Envelope width (m)</th>
<th>Envelope width (ft)</th>
<th>Envelope volume (m³)</th>
<th>Envelope volume (ft³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CargoLifter CL160</td>
<td>260</td>
<td>853</td>
<td>65</td>
<td>213</td>
<td>550,000</td>
<td>19,423,067</td>
</tr>
<tr>
<td>Hindenburg LZ-129</td>
<td>245</td>
<td>804</td>
<td>41.2</td>
<td>135</td>
<td>200,000</td>
<td>7,062,000</td>
</tr>
</tbody>
</table>

Cargolifter AG planned to build up to 50 CL160 airships and 10 CL75 transportation balloons by 2015 and establish the global infrastructure that could support this fleet of airships.

Unfortunately, Cargolifter AG became insolvent and failed in mid-2002 before their first airship was built.
The CargoLifter CL160 airship

The semi-rigid CL160 airship had a long structural keel under the envelope to support all heavy loads and distribute those loads into the airship’s envelope.

CL160 general arrangement drawing.  
Source: https://www.slideshare.net/1st_TSG_Airborne/cl160-lta

CL160 cutaway drawing showing the keel structure.  
Source: Carl Schweizerhof / Wilhelm Rust, “Finite element load limit analysis of thin-walled structures…..” July 2002
You can appreciate the scale of the CargoLifter hanger at Brand-Briesen in the following graphic, which shows a single CL160 airship inside the hanger.
The CL160 would have been capable of carrying very large and heavy payloads; and capable of making an in-flight load exchange (drop off or pick up cargo) while hovering over its destination. The CL160’s lift gas (helium) would have fully supported the weight of the airship and its cargo, thereby enabling vertical takeoff and landing (VTOL) and hovering.

**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. As described on the Aviation Technology website ([https://www.aerospace-technology.com/projects/cargolifter/](https://www.aerospace-technology.com/projects/cargolifter/)) the CL160 would have performed 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 100m 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.”

If the CL160 was receiving new cargo during this load exchange transaction, the amount of water ballast needed would be reduced. An in-flight load exchange is illustrated in the following graphic.
CargoLifter Epilogue

Almost two decades after the demise of CargoLifter AG, the CL160 adventure remains as an important milestone in the development of the technology and the business case for modern heavy cargo airships.

The successor firm, CL CargoLifter GmbH & Co. KGaA, was founded in Berlin in 2005. This new entity owns the patents of the former CargoLifter AG and seeks to sell lighter-than-air technology, services and products. They advertise that, “Based on proven and certified components of the AirTruck product range, CargoLifter can develop and build a full-fledged AirShip. Suited for extremely over-sized loads of more than 60 (meters) and payloads of more than 80 tons, with a flexible load bay for various industrial components. As a rigid airship, it would follow the proven design of the Hindenburg.” Their rigid aerostructure design is shown in the following diagram.
You’ll find more information on the CargoLifter website is here:

https://www.cargolifter.com/en/company/

The giant hanger in Brand-Briesen 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/tropical-world/