

Rigid Airship Design - RA-180 / Holland Navigator

Peter Lobner, updated 8 March 2022

1. Introduction



Rigid Airship Design (RAD) N.V. was a Dutch airship company formed in May 1998 with the goal of building a prototype large, rigid, multi-purpose airship at a new production facility to be built in Lelystad, Netherlands, and then mass producing that airship for a worldwide market

estimated to be more than 1,000 airships over the next 20 years. The Lelystad facility was expected to have a single large construction hangar and several smaller buildings, employ 200 – 250 persons onsite, and generate a total of 1,300 new jobs, including suppliers.



Rendering of the RA-180. Source: RAD

Scottish airship designer and former CEO of Imperial Airships Ltd., Ian Alexander, started developing the basic design for this rigid airship, originally named NL-1, after moving to the Netherlands in 1995. He unveiled his design in July 1996 at the International Airship Convention and Exhibition in Bedford, UK.

In addition to roles as a passenger and low-density cargo carriers, Alexander and RAD anticipated that the worldwide market included rigid airship applications in the following areas:

- General surveillance
- General border patrol
- Drug patrols
- Monitoring activities within the 200 nautical mile (370 km) exclusive economic zone (EEZ)
- Navigational safety work / surveys
- Communications broadcast, data link and mobile services
- Anti-submarine warfare (ASW) / airborne early warning (AEW) AEW / command, control & communications (C3)
- Search & rescue
- Supply to remote facilities
- Disaster relief

The start-up capital for the RAD venture was put up five major investors, including two Dutch aviation firms, a shipbuilding firm and two financial investors.

The firm submitted the detailed design and request for type approval to the Dutch Civil Aviation Authority (then known as RDL) in April 1999. Their initial goal was to have the RA-180 prototype ready to start test flights by the end of 2001.

After the airship type certification process was complete, the firm planned to start mass production. Most of the manufacturing work was to be subcontracted, with final assembly at the new RAD facility at Lelystad. The largest original investor, RDM Aerospace, was to have the role of supervising airship final assembly. However, RDM Aerospace later abandoned the project.

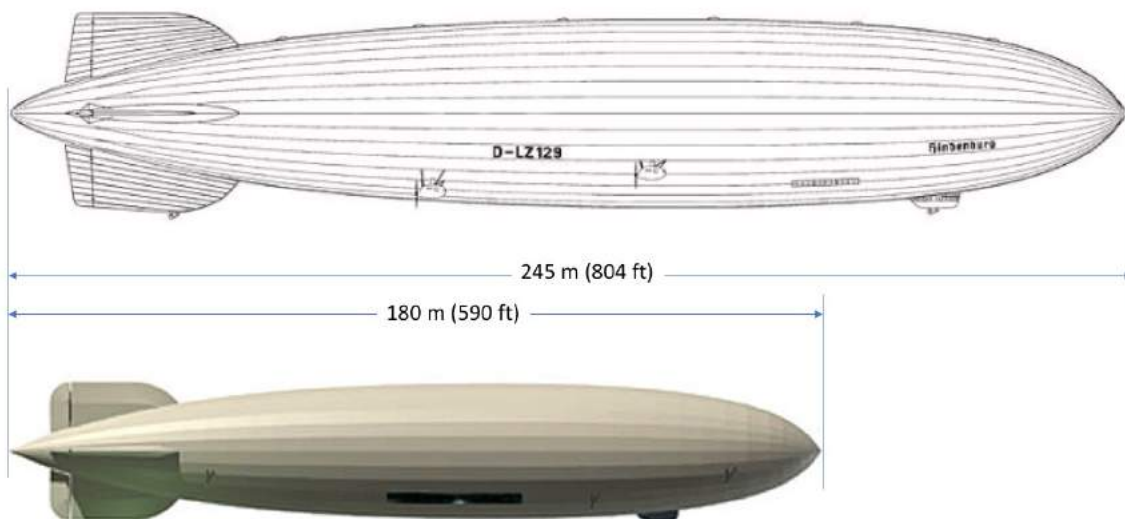
The Lelystad hangar measured 237 meters in length x 48 meters in height x 73 meters in width (778 x 157 x 240 feet). Construction work originally was scheduled to start during the second half of 1999. However, a building license was never issued and the hangar was not built.

Author Arno Landewers explained, “The delay of the construction of the hangar was a symptom of RAD’s increasing lack of finance. Although during September 1999 over 10 million guilders (about USD \$20.8 million) were put into the project, it was estimated that over 120 million (about USD \$250 million) was needed..... The dubious and questionable financing of RAD was also the reason that the Dutch government hesitated to support RAD financially.”

On 18 September 2001, the Amsterdam court of justice declared RAD bankrupt.

2. Description of the RA-180

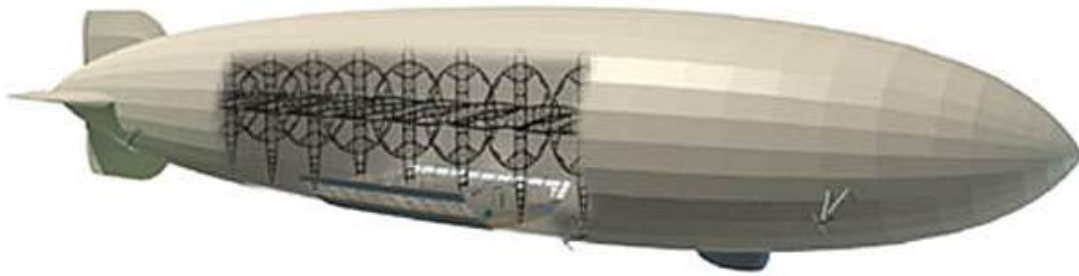
The RA-180 was a design concept for a modern, conventional, rigid zeppelin-style airship, similar in exterior layout to, but smaller in scale than, the LZ129 Hindenburg.



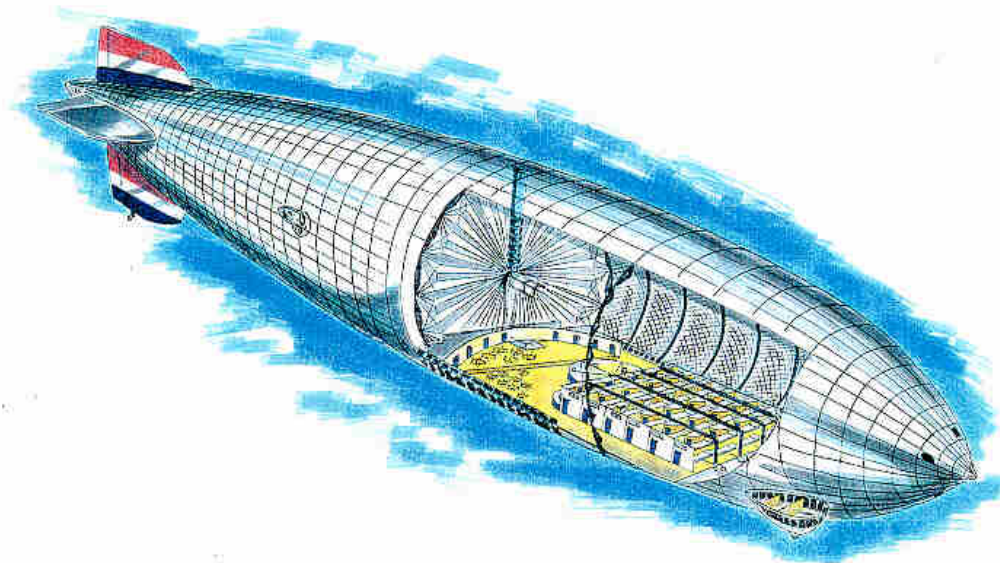
*Relative scale of the RA-180 & the LZ129 Hindenburg
Source: RAD & px PIXELS*

General characteristics of the RA-180

Parameter	RA-180
Airship type	Rigid, synthetic fabric outer skin stretched over an aluminum frame
Frame construction	21 aluminum ring girders, longitudinal girders and wire bracing
Length	180 m (590.6 ft)
Diameter	30 m (98.4 ft)
Fineness ratio	6.0
Lift gas	Helium in 20 laminated Mylar lift gas cells, secured between each pair of ring girders
Envelope gross volume	83,100 m ³ (2,935,000 ft ³), including space for passengers, cargo and engines
Lift gas volume	78,000 m ³ (2,755,000 ft ³)
Gross lift	82.7 metric tons (91 tons) @ 1.06 kg lift per 1 m ³ of helium
Weight, empty	43 metric tons (47.3 tons)
Payload	30 - 35 metric tons (33 - 38.5 tons)
Accommodations	240 passengers
Propulsion system	<ul style="list-style-type: none"> • 6 x reciprocating engines @ 600 hp (447 kW) each, with exhaust water recovery systems. <ul style="list-style-type: none"> ○ 4 x engines drive thrust vectoring propellers near the bow and stern, used for propulsion and for control during takeoff and landing ○ 2 x engines drive fixed main propulsion propellers • Total installed power: 3,600 hp (2,684 kW) • Choice between petrol and Diesel engines was not made
Speed, maximum	148 kph (92 mph) with 6 x engines operating
Operating altitude	500 – 1,500 meters (1,640 – 4,921 ft)
Range, maximum	> 20,000 km (12,427 miles)
Endurance, maximum	Weeks



Above: Ring girder & longitudinal girder arrangement. Source: RAD



Above & below: Passenger cabin layout. Source: RAD



RAD noted that the RA-180 airship's rigid structure prevents flexure and enables a speed (or fuel consumption) advantage of up to 10% over non-rigid blimps. The fabric envelope provides an insulating air layer between the ambient environment and the separate atmospheric pressure lift gas cells inside the envelope, thereby moderating changes in lift gas temperature a result of variations in solar heating.

The airship can take off and land vertically from almost any site with a mast and a turning space that has a diameter roughly equal to twice the length of the airship. The airship operating network can place landing sites away from already congested locations.

The RA-180 airships operate in marginal airspace that is unused by commercial aircraft, typically flying at 500 – 1,500 meters (1,640 – 4,921 ft) above ground level. The airship's low radiated noise signature would enable operation over densely populated areas and other areas with strict noise restrictions. In this respect, airship route usage will complement existing fixed-wing aircraft routes.

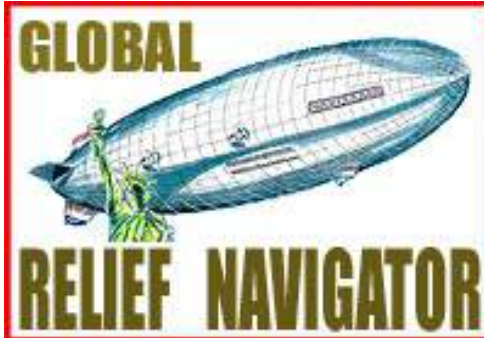
The passenger experience on an airship will be very different than on a fixed-wing passenger aircraft. On the airship, the passengers will not be confined to their seats and will have access to restaurants, bars and recreation facilities. The passenger cabin is not pressurized, so large panoramic windows can be installed to provide extraordinary views from a low cruising altitude.

The RA-180 can carry low density, high volume goods and reach remote locations that have little or no access to other modes of transportation, such as oceanic islands and remote jungle or desert regions. The RA-180 can hover over the same spot for at least several days to provide extended service in such regions.

3. Global Relief Navigator

In the postscript of his excellent essay on RAD, Arno Landewers provided the following summary: "Although it was tried to restart RAD after the bankruptcy, this failed. The airship lobby continued after the end of RAD; airships are still regularly mentioned as alternative means of air transport.

During 2004, an organization named Airship Holland made a feasibility study about the construction of a RA-180 like airship (the “Global Relief Navigator”) for relief transport after large disasters.”



The proposal was to have the Global Relief Navigator airship permanently stationed in Spain, where it would be available under contract to humanitarian organizations, such as the U.N., Red Cross, Red Crescent, UNICEF and UNHCR. The rigid airship would be capable of rapid deployment, with the goal of arriving in a disaster area within 24 hours of a deployment order and immediately providing emergency first aid, critical supplies and emergency telecommunication services.

The Global Relief Navigator airship was not built.

4. For more information

- Arno Landewers, “Rigid Airship Design – Rise and fall of a Dutch airship manufacturer,”
http://www.aerospacefacts.com/pictures/essay_19.pdf
- “Rigid Airship Design – RAD N.V.”:
<https://rigid.tripod.com/0air14.html>
- “Long Live Airship Holland,” Global Relief Navigator, 2006:
<https://rigid.tripod.com/english.html>
- Christopher Miller, “Airships Rise Again,” Popular Science, January 2001, pp. 78 – 83:
https://books.google.com/books?id=F4f6LnrW9NgC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false

Other *Modern Airships* articles

- *Modern Airships - Part 1*: <https://lynceans.org/all-posts/modern-airships-part-1/>
 - Airship Advertising & Laws Corp. rigid airship
 - Airship Industries – R40 / R130 & R150 rigid airships

- LTA Research and Exploration rigid airships
 - Wren Skyships Ltd. – R.30 & RS.1 rigid airships
- *Modern Airships - Part 2*: <https://lynceans.org/all-posts/modern-airships-part-2/>
 - Augur RosAeroSystems – DZ-N1 rigid airship
- *Modern Airships - Part 3*: <https://lynceans.org/all-posts/modern-airships-part-3/>