

Wren Skyships Ltd. & Advanced Airship Corporation

Peter Lobner, 24 August 2021

1. Introduction

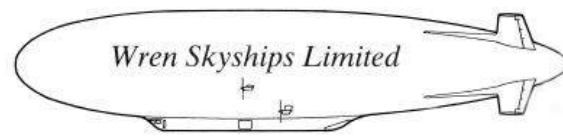
In 1972, Major M.W. (Malcolm) Wren was one of the founders and Managing Director of the firm Mercantile Airship Transportation Limited (MAST), which was formed for the development of large rigid airships to fill a transportation gap between fast jet air transportation and slower sea transportation. In 1978, the firm reincorporated on the Isle of Man as Thermo-Skyships Limited (TSL), focused on developing Thermo-Skyship rigid thermal airships.

In May 1980, TSL acquired Roger Munk's firm Airship Developments Ltd. (AD) for £1 million. A goal for this acquisition was to form a single firm that was large enough to produce a large rigid airship and a smaller non-rigid airship. In July 1980, TSL changed the name of the newly merged firm to Airship Industries Limited (AI).

During the next two years, AI resources were divided between nonrigid and rigid airship projects. AI's rigid airship team, under Major Malcolm Wren, developed two different, large rigid airship designs, the conventional R40 / R130 and the metal-clad R150 metal-clad.

While there was significant interest from FedEx and Redcoat Air Cargo, no contracts were placed for rigid airships. Development of Wren's Thermo-Skyship hybrid thermal airship ended during this period. You'll find more information on this airship in my separate article on Thermo-Skyships Ltd. (TSL).

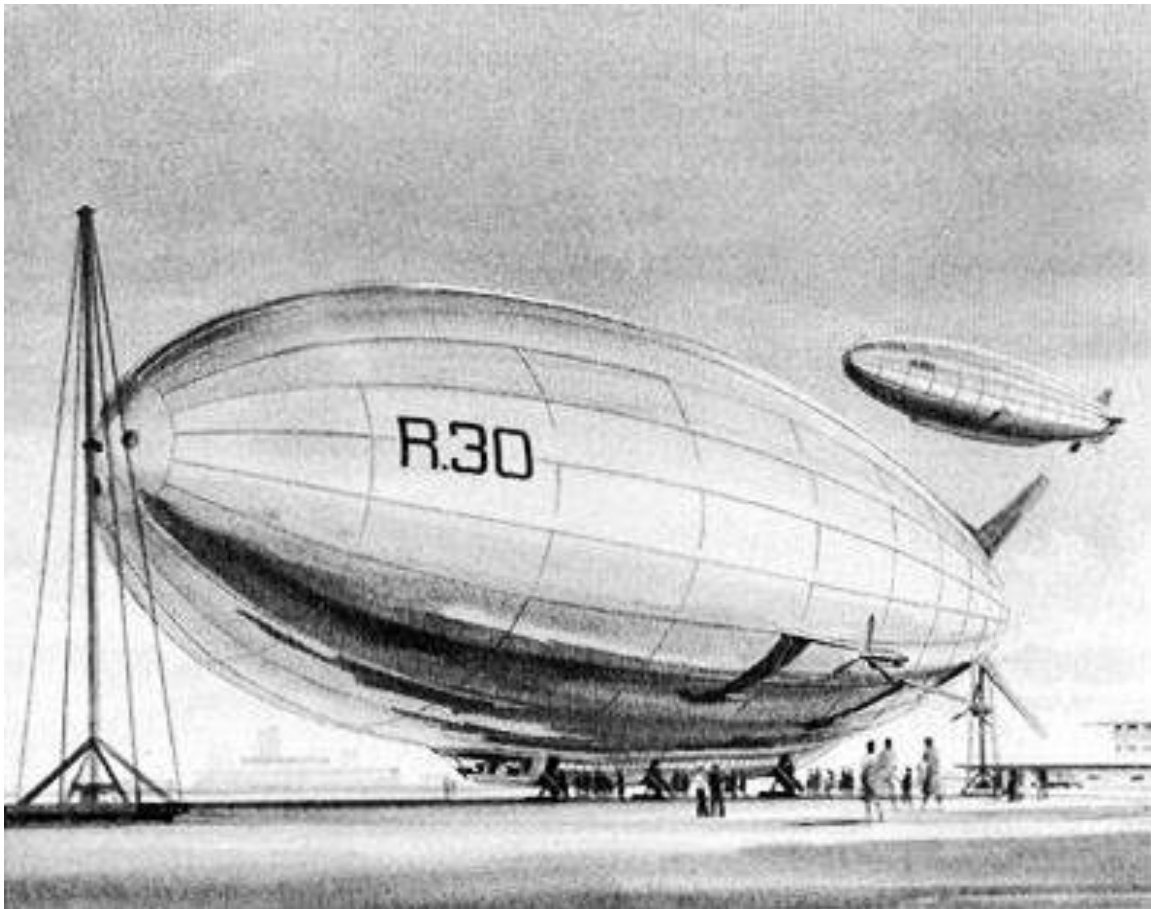
Airship Industries was in significant financial difficulty in 1982. In late 1982, a "de-merger" was agreed, and the former TSL rigid airship technical and management team left AI to form Wren Skyships, Ltd. on the Isle of Man with Major Wren as Managing Director. Their focus was on developing the R.30 and the RS.1 metal-clad rigid airships. Roger Munk remained with AI.



2. R.30 rigid airship

The R.30 was a scaled-down version of the R150 developed by Wren and the design staff at Airship Industries before the de-merger in 1982. Both were similar in concept to the successful US Navy metal-clad ZMC-2 airship built in 1929. Design work on the R.30 metal-clad, rigid airship was initiated at Wren Skyships in 1982 in response to a US Coastguard requirement for a patrol airship.

Design concepts also were developed for passenger and cargo / utility versions. Both versions shared the same metal-clad envelope. With four turboprop engines, the passenger version was substantially faster than the cargo / utility version, which had two turboprop engines. For passenger service, the R.30 was expected to be practical and economically competitive with other forms of commuter travel over distances up to 400 km (249 miles). European city pairs, such as London-Paris and London-Amsterdam are within this range.



Concept drawing of the R.30. Source: Airships Online

General characteristics of the R.30

Parameter	R.30
Airship type	Rigid, aluminum alloy frame, metal-clad
Frame	24 longitudinal & 14 ring frames, two of which were heavy duty to support engines and loads.
Length	328 ft (100 m)
Diameter	75.5 ft (23 m)
Width	108.3 ft (33 m), including turboprop engines
Height	82 ft (25 m) overall
Lift gas	Helium. No individual lift gas cells. The metal-clad envelope was the lift gas cell.
Envelope type	<ul style="list-style-type: none"> • Metal-clad envelope, no individual gas cells • Alclad 2024-T3 aluminum with a thickness range of .010 to .025 in. (0.254 to 0.635 mm)
Envelope gross volume	1,100,000 ft ³ (31,149 m ³) with two ballonets
Propulsion system	<ul style="list-style-type: none"> • Passenger: 4 x Honeywell TPE 331-15 turboprops @ 1,650 shp (1,230 kW) each, driving three-bladed feathering and reversing propellers, 16.4 ft (5 m) in diameter. Total installed power: 6,600 shp (4,920 kW) • Cargo/utility: 2 x Honeywell TPE 331-15 turboprops, same propellers. Total installed power: 3,300 shp (2,460 kW)
Fuel load	10,000 lb (4,536 kg)
Payload	<ul style="list-style-type: none"> • Passenger: 15.5 tons (14 metric tons), for a passenger capacity of 100 – 120 depending on seating density • Cargo/utility: 17.6 tons (16 metric tons) of low density cargo
Speed, maximum	<ul style="list-style-type: none"> • Passenger: 154 mph (248 kph) • Cargo/utility: 122 mph (197 kph)
Speed, cruise	<ul style="list-style-type: none"> • Passenger: 149 mph (240 kph) • Cargo/utility: 116 mph (187 kph)
Range, maximum	770 nautical miles (1,426 km)
Endurance	7.7 hours
Range with ferry tanks	3,500 nautical miles (6,482 km) max. (with special in-flight ballasting arrangements)

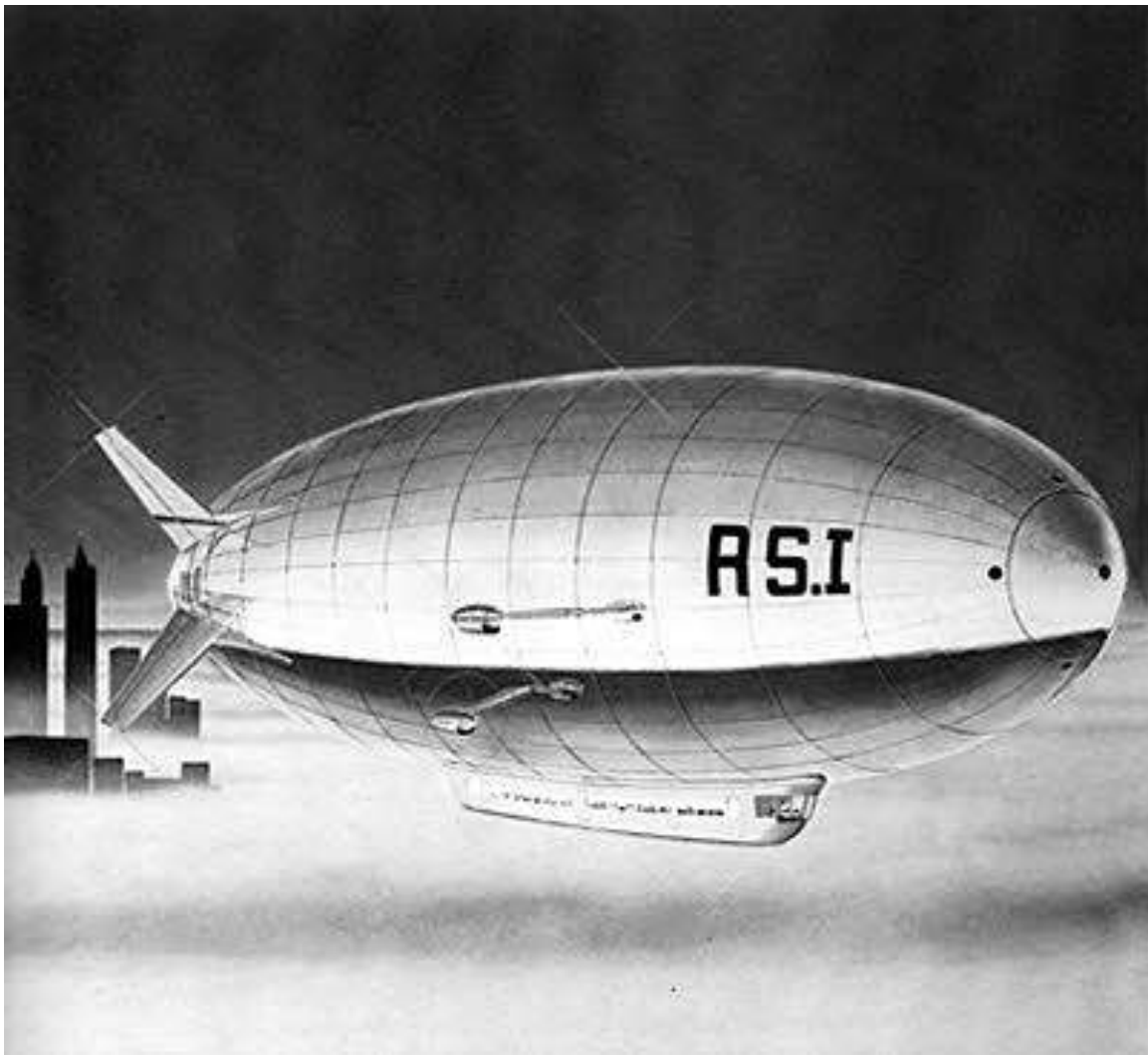
Source: Adapted from UNIDO (1983) and other sources

In 1983, the targeted sale price for an R.30 was in the \$8 million to \$12 million range. Plans were made for Wren's US subsidiary, American Skyship Industries Inc., to establish a US manufacturing facility at Lansdowne Airport, Ohio. That facility was not built.

3. RS.1 rigid airship (redesigned RS30)

The metal-clad RS.1 multi-mission airship was much larger than the contemporary non-rigid Skyship 600 being developed at that time by Airship Industries. Design concepts were developed for four versions: maritime patrol, passenger carrier, car/passenger carrier and cargo carrier. None were built.

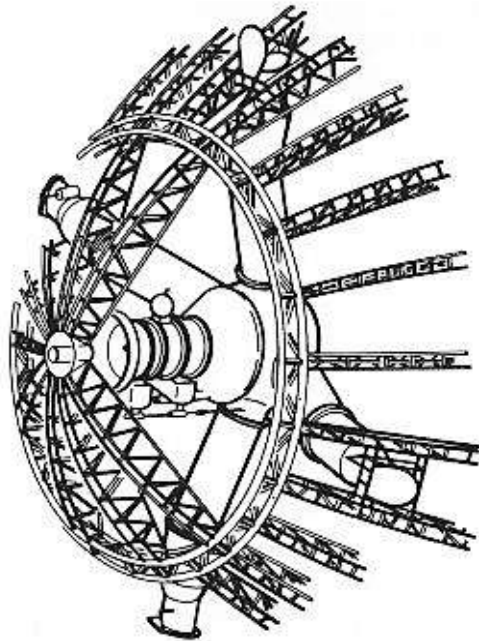
In 1987, when Wren Skyships Limited was reorganized and became the Advanced Airship Corporation (AAC), the RS.1 and R.30 projects were cancelled.



Concept drawing of the RS1. Source: Airships Online

General characteristics of the RS.1

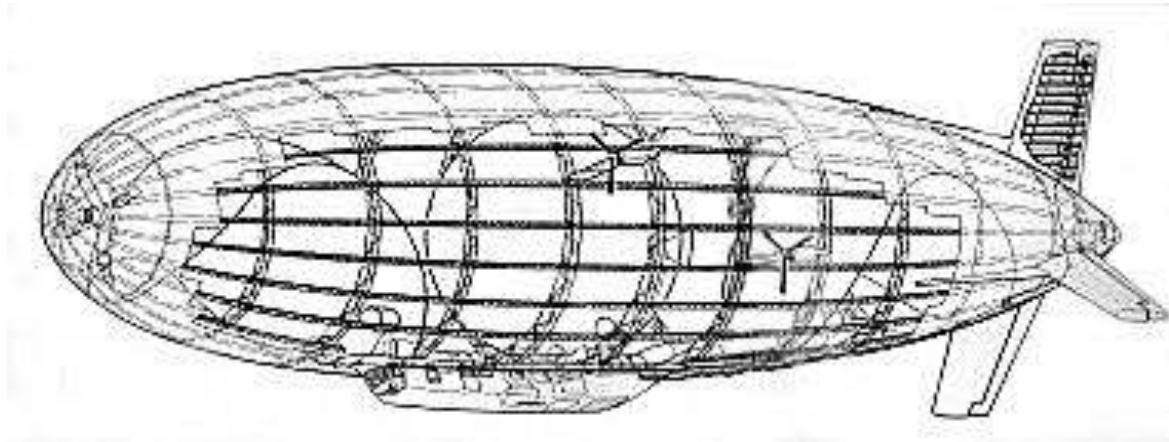
Parameter	RS.1
Airship type	Rigid, aluminum alloy frame with aluminum alloy envelope
Application	Maritime patrol, passenger carrier, and passenger/car ferry
Length	420 ft (128 m)
Diameter	83 ft (25.3 m)
Lift gas	Helium. No individual lift gas cells. The metal-clad envelope was the lift gas cell, with two internal ballonets.
Envelope type	Metal-clad, likely similar to R.30
Envelope gross volume	1,592,000 ft ³ (45,080 m ³)
Payload	27.5 tons (25 metric tons)
Propulsion system	<ul style="list-style-type: none"> • 4 x Honeywell TPE 331-15 turboprops @ 1,650 shp (1,230 kW) each, thrust-vectoring engine mount, driving 3-bladed propellers. Total installed power: 6,600 shp (4,920 kW) • 1 x auxiliary power source for bow and stern thrusters
Speed, maximum	149.3 mph (240 kph)
Altitude, maximum	5,000 ft (1,524 m)



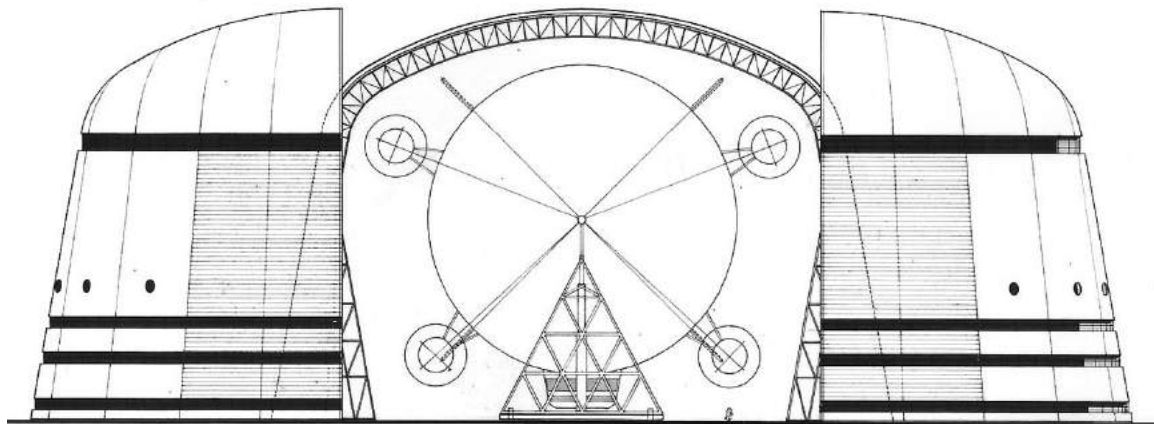
RS.1 bow/stern 5-port thruster configuration (similar to R.150 and R.30 configurations). Source: Airship Heritage Trust

RS.1 Maritime Patrol Configuration

The RS.1 rigid, metal-clad airship was capable of long range, long endurance missions operating with regular naval forces. For the search and rescue role, the gondola was equipped with an all-weather seaboat tender that could be deployed and recovered at sea. Up to 200 survivors could be accommodated in the gondola.



*RS.1 Maritime Patrol variant, rigid hull layout.
Source: Airship Heritage Trust.*



PRODUCTION BUILDING FOR AIRSHIP TYPE RS1

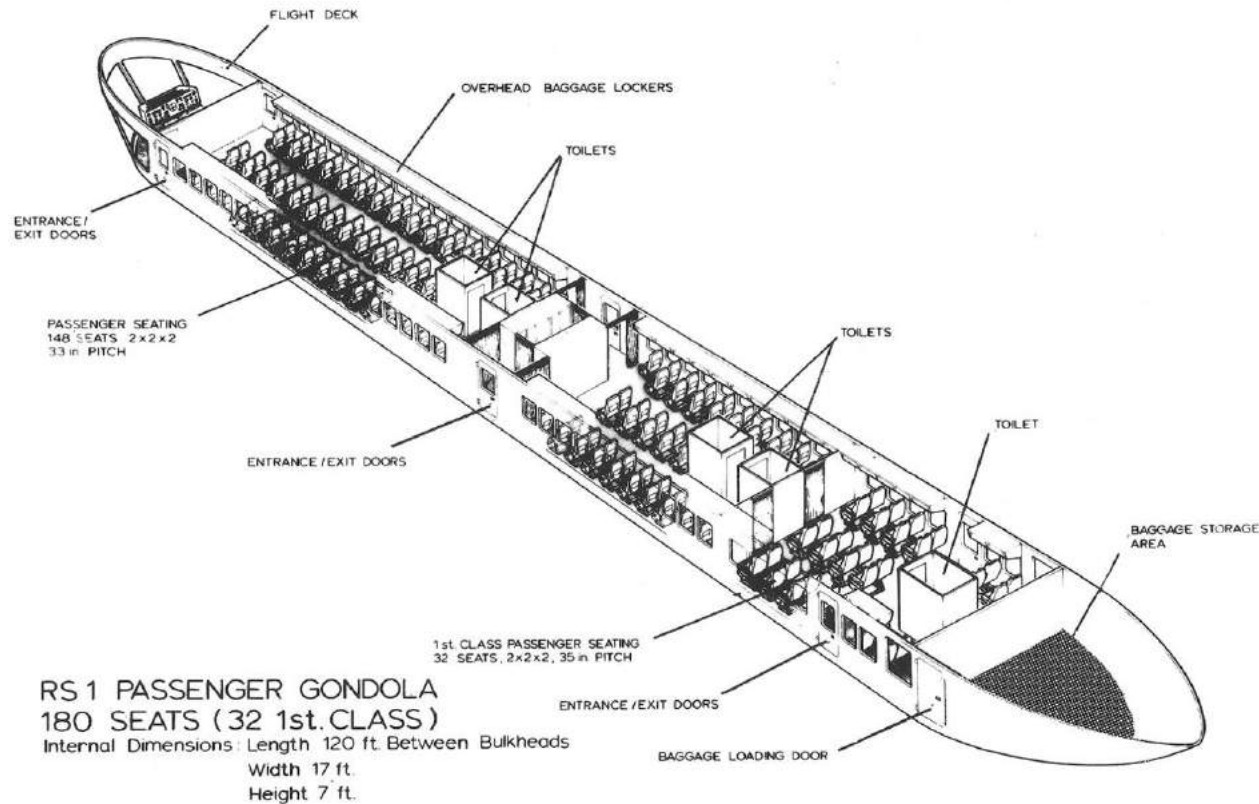
END ELEVATION WITH OPEN DOORS

ARCHITECTS CHRISTOPHER DEAN ASSOCIATES

RS.1 construction hangar. Source: Airship Heritage Trust

RS.1 Passenger Configuration

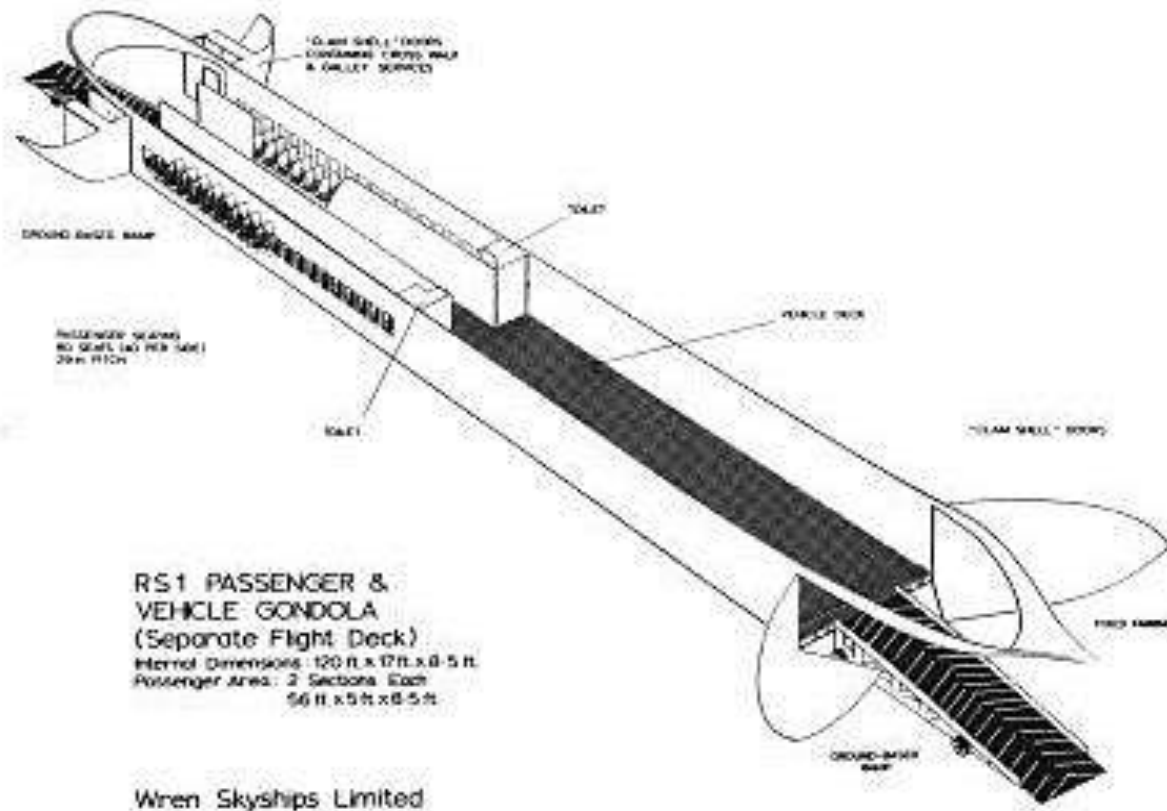
The passenger carrier was designed to accommodate 180 passengers, 148 in economy and 32 in a first class cabin.



Source: Airship Heritage Trust.

RS.1 Car Ferry Configuration

The car ferry was designed for roll-on/roll-off operation with clam shell doors forward and aft. Vehicles would drive on via the rear loading ramp and park on the vehicle deck. Passengers would move to seating areas, consisting of 80 seats that were positioned 40 seats on each side of the gondola.



Source: Airship Heritage Trust

RS.1 cargo configurations



*RS.1 delivering heavy external cargo for a pipeline project.
Source: Airship Heritage Trust*



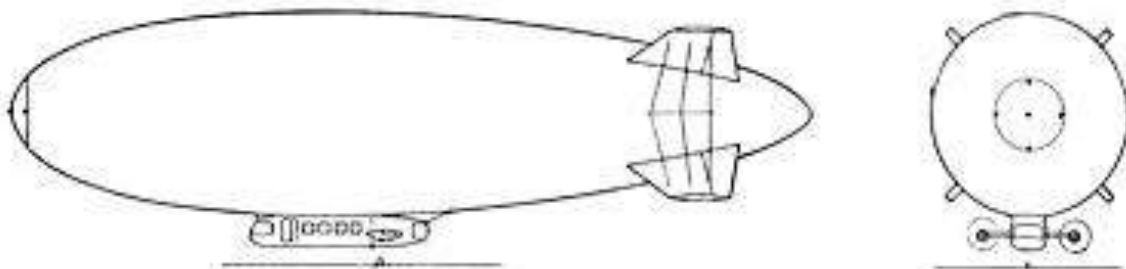
*RS.1 delivering emergency medical facility modules.
Source: Airship Heritage Trust*



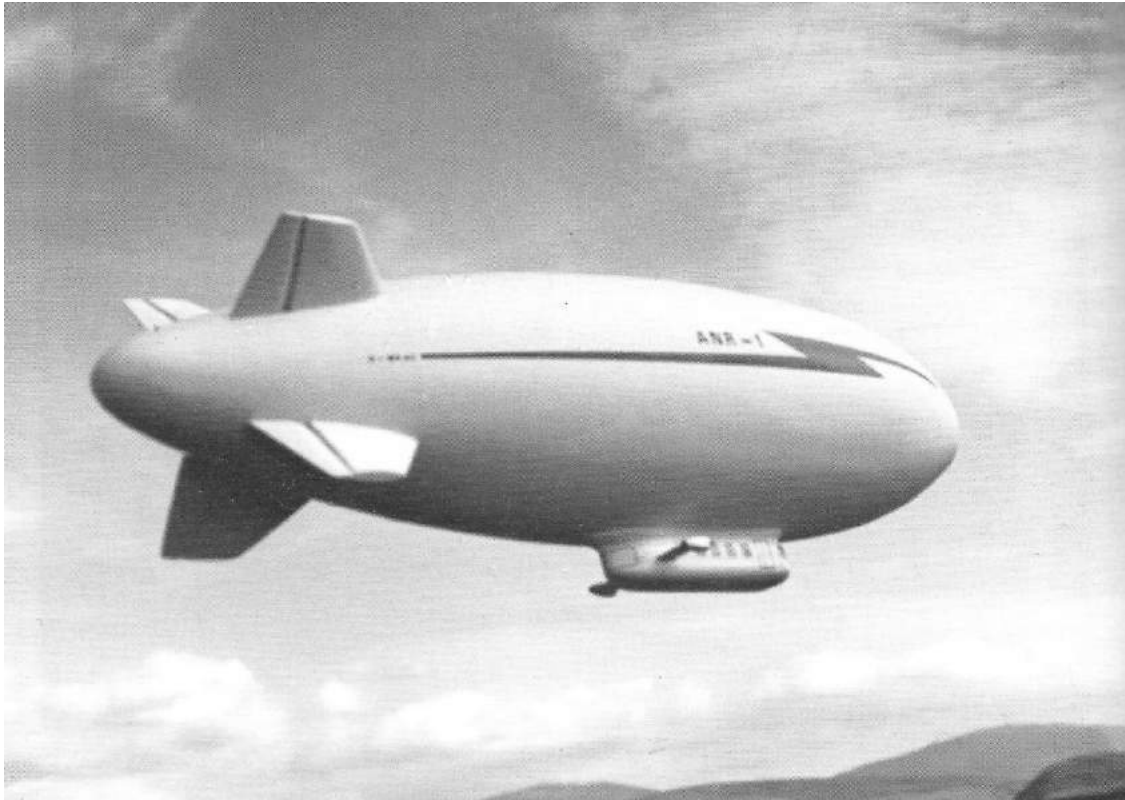
RS.1 offloading a ship. Note the four turboprop main engines mounted on stub wings. Source: Airship Heritage Trust

4. The Advanced Non-Rigid (ANR) airship

The ANR airship was designed to be a cost-effective passenger transport for regular point-to-point routes of up to 80 nautical miles (148 km), such as from the UK to the Isle of Man, or UK to Ireland, with a higher airspeed than the SkyShip models being developed by Airship Industries.



ANR-1 general arrangement. Source: Airship Heritage Trust



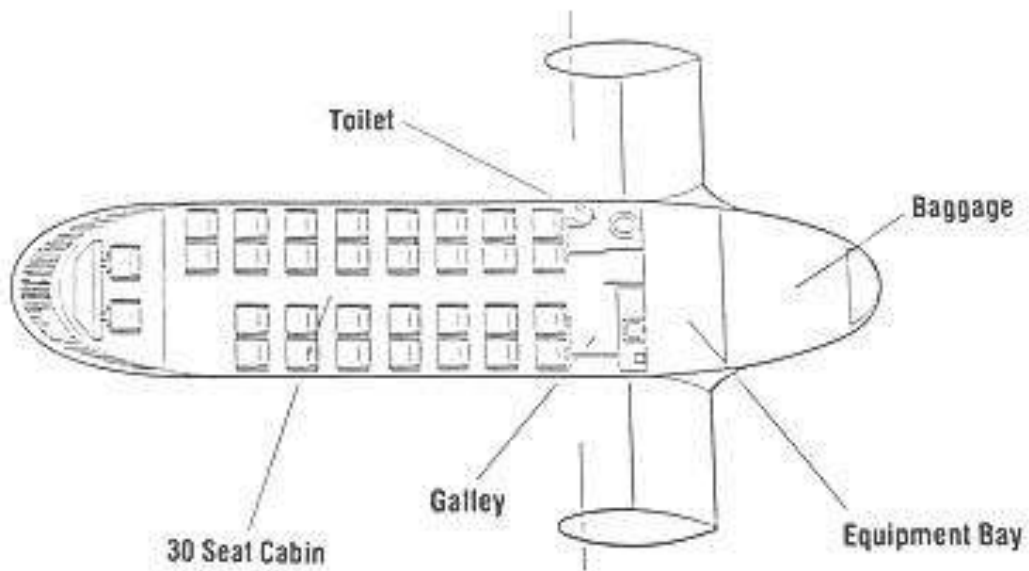
Rendering of the ANR-1 in flight. Source: Airship Heritage Trust



Rendering of ANR-1 boarding passengers. Source: Airships Online

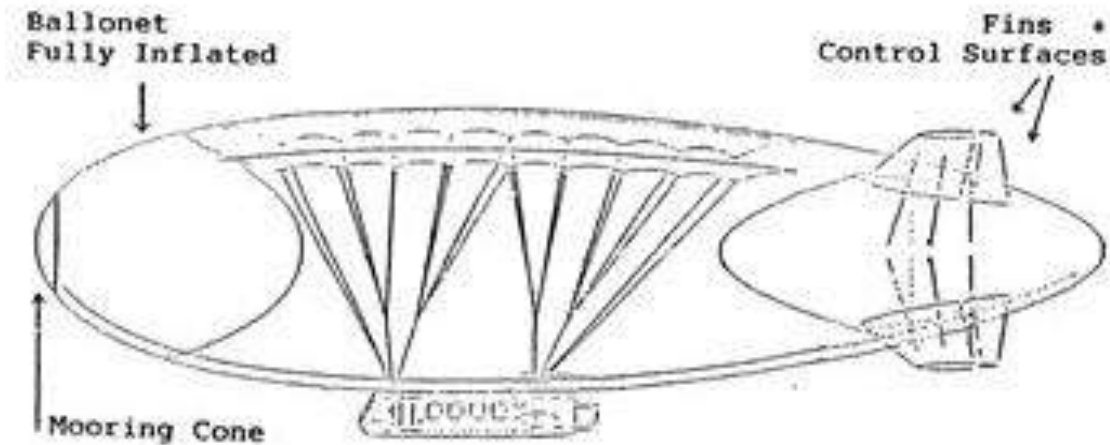


The ANR-1 aluminum gondola. Source: Airships Online, Photo by Anthony Leyfeldt (Skylarkair) at Aviodrome, Lelystad airport



Early ANR-1 gondola layout. Source: Airship Heritage Trust

The ANR-1 has two large air ballonets, one at the nose and the other at the tail of the envelope. Catenary curtains (fabric curtains and metal cables) arranged inside the envelope carry the load of the gondola and distribute that load broadly into the upper surface of the fabric envelope.



ANR-1 ballonet & catenary arrangement
Source: Airship Heritage Trust



ANR-1 gondola catenary curtains inside the envelope
Source: Airship Heritage Trust

General characteristics of the ANR-1

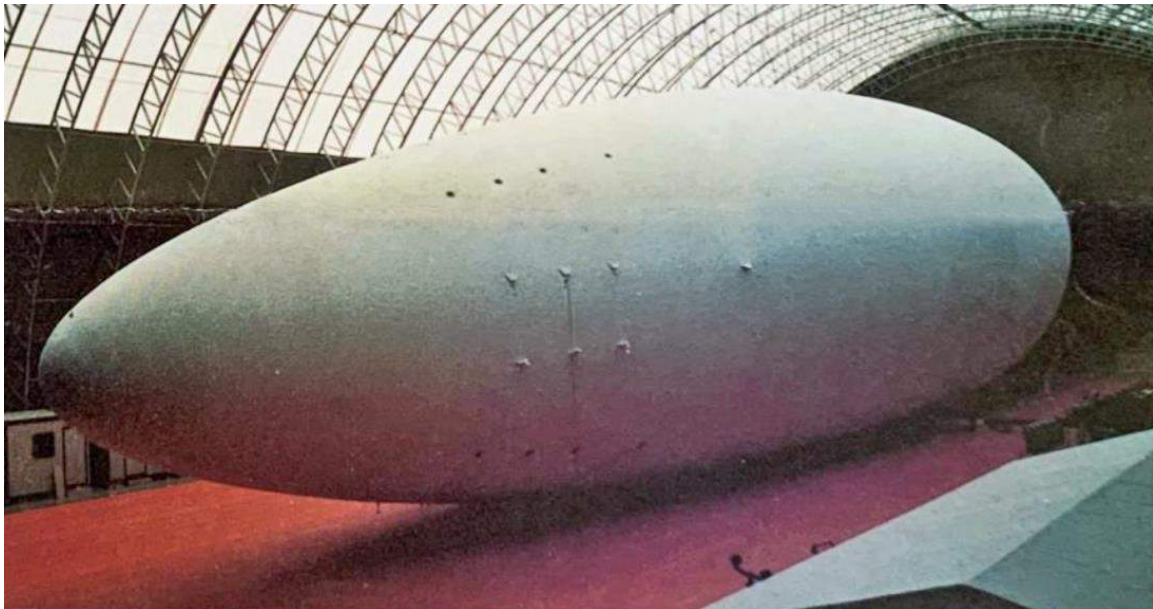
Parameter	ANR-1
Airship type	Non-rigid
Length	200 ft (61 m)
Diameter	50 ft (15.2 m)
Height	62 ft (18.9 m) overall
Lift gas	Helium
Envelope gross volume	257,000 ft ³ (7,277 m ³)
Envelope type	Multi-layer fabric
Payload	3.75 metric tons (4.1 tons)
Accommodations	2 crew and 25 to 30 passengers
Propulsion system	<ul style="list-style-type: none"> • 2 x Allison 250 - B17C turboprops @ 420 hp (313 kW) each. Total installed power: 840 hp (626 kW) • Engines mounted on vectoring aluminum wings
Speed	95 mph (152 kph) max, 89 mph (143 kph) cruise
Range	<ul style="list-style-type: none"> • 553 miles @ 80 mph (900 km @ 129 kph) • 872 miles @ 46 mph (1,403 km @ 74 kph)
Pressure altitude	5,000 ft (1,524 m)
Endurance	20 hours



The AAC airship shed at Jurby, Isle of Man, was officially opened on 14 June 1988 and demolished 2009. Source: Airship Heritage Trust

The AAC airship shed, at Jurby, Isle of Man, was officially opened on 14 June 1988 and construction of the ANR-1 began shortly thereafter.

The prototype envelope was delivered in August and air inflation tests were conducted starting in October 1988.



ANR-1 initial inflation test, stern quarter view. Note reinforced patches for fin support cables. Source: AAC newsletter, October 1988

During a winter storm in January 1989, the main fabric door on the hangar was torn and eventually destroyed. The airship's envelope was quickly deflated in order to safeguard the airship. In March, the envelope was re-inflated inside the repaired hangar.

Testing of the prototype envelope identified the need for a new envelope made of stronger fabric. A Kevlar-based fabric selected would be lighter, stronger and less permeable to helium gas. After receipt, the new envelope was inflated with air and was fitted to the prototype gondola and tail fins.

By mid-1990, the construction work focused on installation of avionics, fuel systems and main pilot controls. ANR-1 was approaching completion and work on the ANR-2 gondola had started. Not long thereafter, work on the two airships stalled. In June 1991, all work on the airships ceased and 90 of the 120 staff at the company were made redundant. AAC finally went into liquidation on 1 March 1993.



ANR-1 with gondola and fins attached to the envelope in the Jurby shed. Source: Airship Heritage Trust

Today a segment of the ANR-1 composite nose carapace, one fin structure and one ruddervator are on display at the Isle of Man Motor Museum.



5. For more information

- “Wren Skyships RS.1,” Airships Online / Airship Heritage Trust: <https://www.airshipsonline.com/airships/Wren%20Skyships%20RS%201/index.html>
- “Advanced Airship Corporation (AAC) – ANR-1,” Airships Online / Airship Heritage Trust: https://www.airshipsonline.com/airships/Advanced_Airship_Corporation/index.html

- “Airship Sheds – United Kingdom – Jurby,” Airship Heritage Trust: <https://www.airshipsonline.com/sheds/Jurby.htm>
- Anthony J. Dolman, “Current and Possible Future Developments in Lighter-Than-Air (LTA) System Technology,” United Nations Industrial Development Organization (UNIDO), pp. 58 – 59 (The Wren Skyship R30), 1983: <https://open.unido.org/api/documents/4793600/download/CURRENT%20AND%20POSSIBLE%20FUTURE%20DEVELOPMENTS%20IN%20LIGHTER-THAN-AIR%20>
- Don P. Simons, “Talk: Lansdowne Airport,” Wikiwand: https://www.wikiwand.com/en/Talk:Lansdowne_Airport

Related *Modern Airship* articles

- Airship Industries Ltd. airships
- Navy YEZ-2A (Sentinel 1000 & 5000)
- Advanced Hybrid Aircraft Ltd. - Patroller