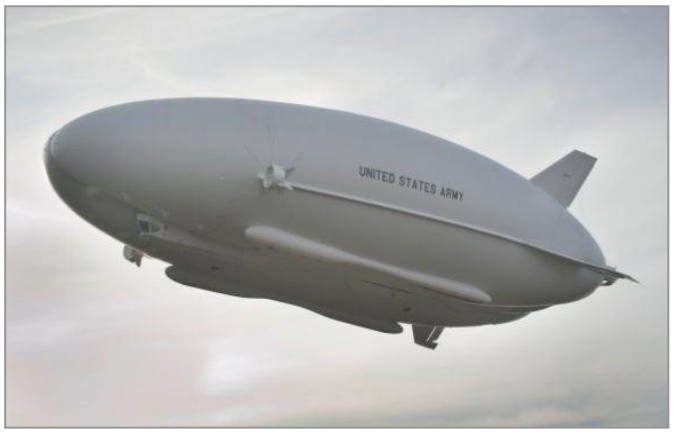
Federation of Model Engineering Societies

Modern airships

This document was written by John Fuller and was originally published by Worthing and District SME in their newsletter in the Summer of 2014.



A little while back I wrote some articles on the German Zeppelin and the British R101 airships. Recent advances in materials and technologies have sparked some new developments in airship design both in America and in this country. In Britain, Hybrid Air Vehicles Ltd assisted the American Grumman Corporation in the design of a hybrid airship design named the AIRLANDER 50, which was based on a number of entirely new concepts. The design was financed by the American government but when funding was withdrawn, Hybrid Air Vehicles Ltd (HAV) purchased the hardware that had been designed and flown for £300,000 and brought it back to this country for final development assisted by a grant from the British government of £2,500,000. It is interesting to note that the original hangars used to build the R101 at Cardington now house this new hybrid airship during its final development stages.

The first major change is the use of helium as the lifting gas; the earlier airships all used hydrogen which was extremely flammable. Helium is a far safer gas as it is inflammable, invisible, and tasteless and has no smell, its main disadvantage is that it is slightly heavier than hydrogen and as a consequence provides less lift. According to Chris Daniels the Head of Communications at HAV Ltd the helium gas is sourced from BOC and is a by-product of most natural gas wells globally, so there's plenty of it. The AIRLANDER 50 uses about 100,000 m³ to fill and when in use it will need regular topping up, a bit like a car tyre, to the tune of about 15% per annum

To provide compensation for this reduced lift, the shape of the airship has been completely modified;

the cigar shape of the earlier airships has disappeared to be replaced by a structure that has an aerofoil shape, wing like, so that when it is in motion through the air it will provide lift. The final change is that the engines providing the motive power are all of the vectored type enabling power to be directed forward, backward, upwards and downwards or at any angle in between.

The envelope is constructed from a laminated fabric that offers strength, a gas barrier and protection against the elements. It also has an internal catenary system supporting the payload module. The hull is an aerodynamic shape; an elliptical cross-section allied to a cambered longitudinal shape, which when in motion will provide roughly 40% of the vehicle's lift. The internal diaphragms required to support this shape allow for some compartmentalisation, further enhancing the fail-safe nature of the vehicle. Multiple air-filled ballonets located fore and aft in each of the hulls form part of the automated pressure management system.

Since the AIRLANDER 50 is effectively an aircraft with inherent buoyancy, it is fitted with significant power plants that are more akin to those found on fixed wing aircraft. While most of the earlier airships have less than 1,000 SHP (Shaft Horsepower), the AIRLANDER 50, for example, will have four turbine engines generating around 10,000 SHP.

The AIRLANDER 50 is being developed with two configurations:

1. Surveillance offering up to 5 days persistent surveillance.
2. Heavylift, offering a variety of configurations including 20, 50 and ultimately 200 tonne payloads.

The AIRLANDER 50 is 390 feet long, 196 feet wide and 115 feet high. The volume of the envelope is 3,640,000 ft.^{3}. It has an endurance of up to 4 days manned, with a range of 2000 nautical miles, and a cruising speed of 195 km/hr. The payload capacity is 132,300 pounds.

I gather that it will be later this year before it will make its maiden flight in this country.