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The Hindenberg, Airships and the Airlander is the Airship Rising Again?

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ABSTRACT
The airships slipped into history with the rise of fixed-wing aeroplanes and the Hindenberg disaster of 1937. Commercial, humanitarian and ecological concerns are reviving interest in these gentle giants once again. Multiple research companies are investing in the airship technology, and the airship is set to rise again. However, concerns regarding buoyancy, stability and economy remain. Currently, the airship is set to cater to a niche market, and it won't be long before we see some of these gentle giants in the skies again.

INTRODUCTION

The quest for flight is as old as man itself. Over the last two thousand years, attempts at flight have spanned kites, wings, balloons and aircraft. The modern airliner traces its origin to the famous flight by the Wright brothers on 17 December in North Carolina [1]. This flight demonstrated that heavier-than-air objects could be flown with engine power and clever wing design to provide lift. Even though this was a significant step forward, man was still some way from producing fixed-wing aircraft that could transport a large number of people. Overlapping with these developments was the use of lighter-than-air airships, which used engines to provide thrust only. The lift was provided by hydrogen. However, the Hindenberg disaster of 1937 put a full stop to this invention [2]. The flaming image of a colossal airship has endured in the public eye. However, recently, airship technology has received a fillip for several reasons [3]. One of the reasons is that the initial romanticism attached to flight has gradually been amalgamated with hard economics. The name ‘airship’ holds the clue to its future uses. An airship is a ship that ploughs through the air instead of water. Thus, the airship is uniquely suited to several needs. This article discusses what is new in airship technology and its future in flight.

THE AIRSHIP

Airships are lighter-than-air vehicles (or LTAs) that depend on the same essential physics that creates bubbles in water. They’re filled with extremely light gas, like helium and hydrogen, which allows them to achieve lift and hover in the air without burning fuel.

There are three types of airships:

1. Nonrigid airship, often called a blimp
2. Semirigid airship
3. Rigid airship, sometimes called a Zeppelin.

The forward thrust is provided by engines powered by fossil fuels or electricity.

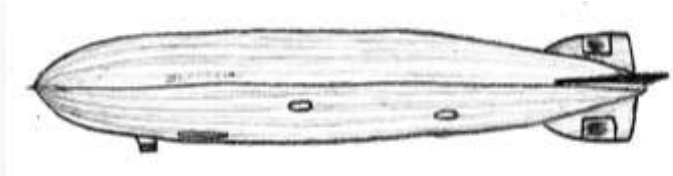

Figure 1. An Illustration of a Zeppelin.

DISCUSSION

The Montgolfier brothers, born in Annonay, France, were the inventors of the first practical balloon. The first demonstrated flight of a hot air balloon took place on June 4, 1783, in Annonay, France. On September 19, 1783 a sheep, a rooster, and a duck flew for eight minutes in front of Louis XVI, Marie Antoinette, and the French court.

However, transport of people over long distances remained a dream. Persistence by Ferdinand von Zeppelin led to the development of internally framed dirigibles, which were known as the Zeppelins. Of many subsequent zeppelins, the two most famous were the Graf Zeppelin, completed in September 1928, and the giant Hindenburg, first flown in 1936 [5]. The Graf Zeppelin inaugurated transatlantic flight service, and by the time of its decommissioning in 1937 had made 590 flights, including 144 ocean crossings, and had flown more than 1.6 million km (1 million miles).

The zeppelins led to the construction of the Hindenburg. The Hindenberg airships were designed to transport a large number of people. The Hindenburg was a 245-metre- (804-foot-) long airship of conventional zeppelin design that was launched at Friedrichshafen, Germany, in March 1936. It had a maximum speed of 135 km (84 miles) per hour and a cruising speed of 126 km (78 miles) per hour. The airship suffered a disaster in 1937 when it caught fire, which led to the death of 37 people. This led to the termination of flights in airships. Simultaneously, the fixed-wing aircraft developed. With reduced flying times and good safety, interest in airships waned [6,7].

One of the leading causes held responsible for the disaster was the use of hydrogen to provide lift in airships [8]. The usual gases used for lifting airships are hydrogen and helium. Hydrogen is the lightest known gas and thus has excellent lifting capacity, but it is also highly flammable and has caused many fatal airship disasters. Helium is not as buoyant but is far safer than hydrogen because it does not burn [3]. With the replacement of hydrogen with Helium and further improvements in technology, the interest in airships has increased.

The drivers of this renewed interest are

1. Environmental awareness. The desire to develop air transport with a low carbon footprint is being increasingly felt.
2. Speed. There is a need to transport heavier material over long distances with a speed that is greater than that provided by ships.
3. Difficult terrain. Airships could deliver or collect material to remote locations where the infrastructure is not highly developed. This could lead to better utilisation of natural resources.
4. Ecotourism.

In terms of transport speeds, the airship lies between the ship and the aeroplane. However, it is capable of carrying more load than aeroplanes. Trucks carry the maximum amount of cargo overland and the ship by sea. The airship could position itself as an airborne truck or ship offering higher speed and more economy [9].

To conquer the cargo market, the airships have to be made of a rigid construct and be able to carry 500 tons while travelling at 90 km per hour [9,10]. The Flying Whales is a company that is working to fill this space. It plans to develop airships that can haul heavy cargo, delivering material for electricity generation in remote areas, humanitarian aid, industry and manufacturing [11].

The Pathfinder 1 is being developed by LTA research and is focused on providing humanitarian aid [12,13]. Revival in airship interest is based on technological advances in materials, propulsion, solar panels, wireless communication, and energy storage systems [14]. However, Technology is still not quite able to come up with perfect solutions for difficulties that are inherent to the airship design.

1. Issues with maintenance are still being overcome. Giant airships require large manufacturing hangars.
2. Landing and taking off and the consequent balance between gravity and buoyancy are still being developed with a focus on compressors. Dumping water to reduce weight is not an ideal solution. Letting off helium to reduce buoyancy is expensive. This has led to a resurgence in the interest in using hydrogen with better safety parameters.
3. Sail effect. Large-sized airships can be disturbed by the slightest wind due to the surface area they present.

The Airlander, by contrast, plans to use their airships for experiential tourism. This tourism is meant to leave a shallow carbon footprint. This airship is designed on a hybrid model. A radically different design, it's a lifting body—and heavier than air. It relies on both aerostatic lift from helium and aerodynamic lift to fly, making it a hybrid airship. The advantage of the Airlander is that it can float down to earth once the engines are turned off, circumventing the problem of buoyancy [12,13].

The Pathfinder team is also trying to develop an internal ballast system that could solve the problem of buoyancy [12].

CONCLUSION

The airship is definitely seeing an uptick in interest. It is not going to be long before we see these gentle giants in the sky again, but it looks like they will serve only a portion of the aircraft market. That in itself is something to look forward to.

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