Are Airships for Real?

After decades of military irrelevance, lighter-than-air vehicles could be making a modest comeback.

By Rebecca Grant

Lockheed Martin illustration

Artist's conception of the proposed high-altitude airship, capable of loitering at near-space heights.

In June 1937, the Army Air Corps walked away from lighter-than-air aviation. The AAC had been operating two airship and two balloon squadrons, but Congress and Army leaders, facing tight budgets, decided they had to go. Maj. Gen. Oscar Westover, the AAC Chief, turned over the fleet to the Navy and got the nation's premier air arm out of the blimp business—seemingly forever.

Airships virtually disappeared from public consciousness over the next 70 years. However, they did not completely die out. Lighter-than-air systems—in small numbers and operated in other armed services or agencies—all the while have occupied niche roles in US national defense.

Now, to the surprise of virtually everyone, airships seem to be making a modest comeback, more than a century after the Army fielded its first models. Some new types are being flown by the Air Force.

These are not the blimps of old, which were unwieldy, unreliable, and often dangerous to life and limb. The new types could take on missions such as resupply of American ground forces overseas and defense against cruise missiles.

This new breed of airships ranges from unmanned, high-altitude aerostats designed to stay in one place to experimental giant cargo airships capable of carrying several times the tonnage hauled by a C-5 airlifter.

Sausage Squadrons

In World War I, "sausages" (the term used in the early days of ballooning) were commonly used for artillery spotting and other observations. In fact, the first unit in the US Army Air Service to be declared operationally ready was a balloon company that came up to the Western Front in late February 1918.

In the US military, the Navy dominated the lighter-than-air community. It kept balloons in use for coastal defense through World War II. Naval aviators in those days opted either for the lighter-than-air or the heavier-than-air track—each with its distinct service badge.

In the early days, the reputations of airships were irremediably tainted by highly publicized accidents. The Navy's USS *Shenandoah* went down in a 1925 storm, with much loss of life. It was the specific event that provoked

Army airship RS-1 is shown in this May 1926 photo. A series of airship disasters gave lighter-than-air military craft a bad reputation.

Army Brig. Gen. William Mitchell to accuse the Army and Navy of treasonable aviation management. (See "The Keeper File: The Blast From Billy Mitchell," July, p. 28.) Britain's R101 airship crashed near Beauvais, France, in 1930. Then came the *Hindenburg* disaster at Lakehurst, N.J., in 1937. The hydrogen-filled dirigible exploded in an immense fireball.

The Navy's airship investments created enough of an industrial base to support production of what came to be the legendary Goodyear blimps. Goodyear built its first blimp—named "Pilgrim"—in 1925.

The Navy had 10 airships at the outset of World War II. Thereafter, production expanded and, in 1945, the service could call on 141 operational K-type blimps, used mainly for open ocean escort. According to an official history, these Navy aircraft escorted some 89,000 surface ships without the loss of a single vessel to enemy submarine attack. The Navy kept some semblance of a program until 1962.

Today's developments could propel airships into military operations over the next decade. New technologies—and changing geopolitics—are making airships relevant for such missions again.

Airships have already returned to military service in a traditional role: surveillance. In 1980, North American Aerospace Defense Command inaugurated use of the Tethered Aerostat Radar System (TARS). This Air Force airship operates on the southern border of the United States.

The aerostat is a slimmed-down cousin of the original airships. Filled with helium, it looks and performs like an unmanned cross between a blimp and a balloon. A cable provides a tether and power sufficient to keep the aerostat airborne for months at a time. A TARS aerostat can reach an altitude of 12,000 feet while carrying a payload of sensors weighing more than a ton.

Given its high-altitude vantage point, the radar on the aerostat can detect targets such as small airplanes at a distance of 230 miles. Positioning several aerostats on the border forms a steady and cost-effective radar screen. The TARS aerostats were first used as radar platforms for drug interdiction. They picked up a new homeland security mission after the Sept. 11, 2001 attacks.

Tactical Aerostats

Today two tactical aerostat variants are assisting US troops in other ways. REAP—the Rapidly Elevated Aerostat Platform—is a joint Army and Navy program. Just 25 feet long, REAP is designed to operate 300 feet above the surface with day and night electro-optical sensors.

Big brother to REAP is the newer Rapid Aerostat Initial Development (RAID) system. It's twice as big and can carry payloads of sensors to 1,000 feet. RAID's main purpose is force protection.

The need for defense of US soil from cruise missile attack opened up an entirely new mission for sophisti-

Lighter Than Air, Long on Notoriety

One hopes that airship operations of the future do not become as notorious as those of the early 20th century. After World War I, military experimentation began in earnest. The resulting trail of disaster was long indeed.

The Army Air Service got things off to a bad start with *Roma,* a 410-foot-long dirigible acquired from Italy in 1920. In a test flight on Feb. 21, 1922, *Roma* struck some high-voltage wires, which touched off its hydrogen gas. The explosion killed 34 of 45 crew and civilians on board.

Thereafter, however, the Navy suffered a string of spectacular mishaps:

USS *Shenandoah* was built for coastal defense and fleet surveillance. The airship was a popular sight, flying over state and county fairs until it went down during one such publicity tour in September 1925. Fourteen crew members died.

USS *Akron* ran into a violent storm and crashed into the Atlantic in April 1933, and a smaller J-3 Navy airship crashed during the rescue attempt.

USS *Macon* encountered a storm off California and crashed into the Pacific in February 1935.

Such problems left the Navy more than willing to sign a contract in October 1935 for the new LZ-129 *Hindenburg* to operate from NAS Lakehurst, N.J. The Navy swapped landing rights and servicing in return for seats for Navy observers on the homeward flights.

Hindenburg was the largest airship ever to fly. Sixteen gelatin-coated gas cells encased the hydrogen lifting gas. Four diesel engines provided power for liftoff and cruise. *Hindenburg* was a passenger liner that made 10 successful trips from Frankfurt to Lakehurst during 1936.

The airship's course took it across the Atlantic at about 1,000 feet and then over Manhattan on the way to Lakehurst.

On May 6, 1937, disaster struck. While *Hindenburg* was trying to dock at the mooring tower, it caught fire at the stern. Hydrogen-fed flames consumed the airship in a little over a minute, killing 36 passengers and crew. Many of the survivors owed their lives to the sandy soil of the landing area, which cushioned their falls from the

The first all-metal airship, the Navy's ZMC-2, makes an appearance at the 1929 National Air Races in Cleveland.

cated aerostats. The Joint Land Attack Cruise Missile Defense Elevated Netted Sensor (JLENS) system dates to the mid-1990s. JLENS was conceived as part of the solution to the challenge of detecting and tracking low-flying cruise missiles.

Defending against cruise missile attack calls for continuous surveillance with no gaps. While high-end systems such as the Airborne Warning and Control System aircraft and the Aegis system are more than capable of picking up the low-fliers, the trick is keeping sets of E-3s or Navy cruisers in place all day, every day.

An expanded aerostat system could in theory remain on guard continuously at much lower cost. JLENS posited a two-layer system to perform the early over-the-horizon detection and fire-control missions for cruise missile intercept. In theater operations, the JLENS airship would be accompanied by a mobile mooring station and a separate processing station for the radar data.

According to a recent Congressional Research Service report, "JLENS is seen by some to be an important part of DOD's network-centric warfare approach, because it is the centerpiece of a larger attempt to seamlessly link together numerous sensors across services to build a 'single integrated air picture' that will enable effective cruise missile defense."

Pushing aerostats to the next level entails moving from the 12,000-foot altitudes of TARS to the "near space" altitudes of about 70,000 feet. Radars permanently positioned at that height could greatly expand the integrated air picture of activities on Earth.

In theory, a small band of high-altitude airships could survey the entire United States, including the interior, and do it well above commercial and military aircraft lanes.

The operational concept calls for an airship to carry an over-the-horizon radar, much like a low-flying satellite would do. Ten high-altitude airships could provide overlapping coverage of an entire US coast.

An operational airship would have to be about 25 times the volume of a Goodyear blimp for the helium to function at 70,000 feet. The huge airship may also become the structure for the radars it carries. An active electronically scanned array radar with long antennae on the sides of the giant blimp could provide stunning power, coverage, and reliability. The Defense Advanced Research Projects Agency is researching the concept.

The Air Force Research Laboratory has funded experimental research on a high-altitude airship capable of remaining on station as long as one year. To keep a geostationary position, the airship would need its own fuel cell—still under development—and thrusters to reposition it in the winds at 65,000 feet, according to Purdue University professor John Sullivan.

Hybrid Airships

These craft face some of the same challenges that bedeviled the zeppelins of old. Thunderstorms brought down

Perhaps the most famous airship was the dirigible* Hindenburg, *seen here at its home base at Rhein-Main, Germany, circa 1937.

US Navy photo

The Navy is testing this Skytrain 500, a British-built airship, for its handling qualities and radar signature. Unmanned blimps have been serving as a radar picket on the US-Mexico border since the 1980s.

USS *Shenandoah,* but the classic summer storm might be nothing compared to the turbulence at 70,000 feet.

To get around this problem, the high-altitude airship would, in theory, be able to "fly" under its own power, change altitude, and reposition itself to avoid dangerous conditions.

Plans call for the high-altitude airship demonstrator to fly in 2009.

The real successors to the airships of bygone days may be a new crop of hybrid systems able to carry vast quantities of cargo. DARPA, the Navy, and the Army all set hybrid airship research in motion in recent years.

The hybrid airship is technically heavier-than-air. It combines static lift from the buoyancy of helium gas with aerodynamic lift derived from the lifting body shape of the pressure envelope. Theoretically, the combination makes huge payloads possible.

Hybrid airships would take off and land at low airspeeds that allow flight controls to remain effective. Engine-driven propellers and vectored thrust increase control and handling options.

The impetus behind this new activity is a recurring requirement: cheaper intercontinental lift for heavy ground forces. Since the end of the Cold War, the Army has been seeking ways to deploy units more quickly. The ideal solution is a vertical takeoff and landing vehicle that could operate in austere locations without large runways.

Could hybrid airships fill the bill? That's what DARPA set out to explore with a program called Walrus. Requirements called for an airship to deliver a payload of 500 tons over a distance of 13,800 miles in less than seven days.

In 2005, DARPA awarded two formal contracts for competitive development of a behemoth Walrus cargo airship. Lockheed Martin squared off against newcomer Worldwide Aeros Aeronautical Systems.

Then, Congress zeroed out funding. DARPA opted to close down Walrus after completion of the first phase.

This does not spell the end for hybrid airships, however. Lockheed Martin flew a test hybrid airship dubbed the P-791 in California in early 2006.

Observers described the P-791 as the size of three 200-foot-long Fuji blimps joined together. It has air cushions for landing gear. Reportedly, airship pilots took hovercraft training to get a feel for the ground handling of the demonstrator.

Promising as some of the demonstrators may be, the new airships still have hurdles to overcome. These include ground handling difficulties, development costs, and lingering questions about vulnerability in a combat environment.

The cargo hybrids face integration challenges, and even the high-altitude airships have to contend with thermal and ozone factors and days when winds in the stratosphere top 115 mph.

"They're not cool," quipped retired Gen. John P. Jumper, former Air Force Chief of Staff, who also saw their value.

A recent Congressional report estimated that 32 companies across Europe, Asia, and North America are designing and manufacturing airships, mostly for commercial or experimental purposes.

It seems that, this time, blimps may be around for a while. ■

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