

Lockheed Wins \$1.59B Contract for High Altitude Airship (updated)

16-Jan-2016 00:24 | [Permanent Link](#)

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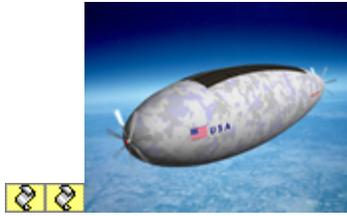
Lockheed HAA
(click to view full)

DID has covered the **growing US interest** in blimps for everything from low-altitude **surveillance and communications** relay, to **air mega-transport**, to **near space operations**. Lockheed Martin Maritime Systems & Sensors in Akron, OH received a \$1.59 billion cost-reimbursable contract to build and demonstrate the technical feasibility and military utility of the High Altitude Airship (HAA). The Missile Defense Agency issued this contract (HQ00016-01-C-0001), and eventually plans to deploy approximately 10 blimps to provide overlapping coverage of U.S. coastal regions.

The HAA is envisioned as an unmanned, radar-carrying surveillance blimp that will float above the jet stream to detect and track incoming ballistic missiles, or even low-flying cruise missiles that may have slipped underneath ground-based radars. Once operational, it will be an important early-detection element of the broader U.S. missile defense architecture. It may also act as a weather surveyor and telecom relay. As **Avionics Magazine's April 2008 issue notes**:

"In reality, the HAA is an aerial truck, a large bubble of helium intended to haul aloft a sophisticated surveillance, communications or even weapons payload. Sitting out of harm's way in the upper reaches of the atmosphere, a sensor – typically commanding a 100-mile (160 km) diameter footprint – will "see" threats with higher resolution than is available from satellites in space. And they will use less power in the process... while the time lag that often mars communication via satellites will be much reduced."

There are a number of challenges associated with an effort of this nature.



HAA: Galileo concept
(click to view full)

Solar cells and an advanced fuel cells that can deliver up to 600 kW must be developed to power the craft. An aerodynamic design and a control system must be developed to help keep the airship steady amid the high winds at that altitude, without consuming excessive power. Another important factor is determining how the airship would react to changing temperatures as the sun rises and sets every day, heating and cooling the helium. Then there's the major challenge of finding materials for the airship's skin that are capable of withstanding the extreme ultraviolet radiation at such high altitudes for extended periods without becoming brittle.

Lockheed Martin received its first production contract for a lighter-than-air vehicle, the rigid USS Akron airship, in 1928 from the U.S. Navy. For the High Altitude Airship program, Lockheed has previously received a \$7 million contract for **preliminary concept work**, followed by a **\$20 million design and risk reduction contract** in late September 2002. **Nav Log reports** that this Phase 2 concluded with the Critical Design review in late 2003. Over 50 fabrics were designed, produced, and tested to determine the airship's best "skin," and after propulsion testing, hull design, and manufacturing procedures testing a 12,000 cubic foot volume aerostat was built. StratCom International LLC in Keedysville, MD subcontracted to the program.



Lockheed Concept
(click for full)

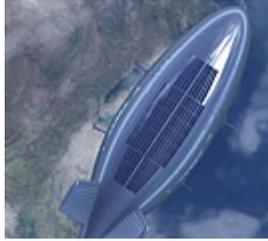
Under this latest demonstration contract, Lockheed Martin will develop an unmanned and untethered prototype airship with the requirement of remaining on station for one continuous month at a nominal cruise altitude.

Nav Log notes that "according to the US Army Space and Missile Defense Command, HAA is to have an endurance of one month at 70,000 feet, carry a payload of at least 500 pounds, provide at least 7 Kw of continuous power, have a cruise speed of 70 knots, and station-keeping accuracy of less than 7 kilometers 50% of the time and less than 100 kilometers 90% of the time." This actually refers to the prototype vehicle, as opposed to the operational HAA which will have a payload of 2,000 pounds (about 907 kg).

Dave Kier, Lockheed Martin's vice president and managing director for missile defense, **told C&SI Journal** that an operational version of the airship would have a volume of about 0.7 million cubic feet, about 70 times the volume of the Goodyear blimps. Preliminary specifications call for the operational payload to consist of a forward/upward-looking radar for ballistic missile tracking and discrimination problem, plus a look-down radar for ocean/land surveillance capability.

Indeed, the radar is part of a **closely related DARPA project called ISIS**, which stands for "Integrated Sensor Is Structure" because it aims to incorporate radar antennas that are almost the size of the blimps themselves. Such huge radars would have incredible power, and **using AESA radars gives one a number of new capabilities**. These include easier maintenance, better readiness rates, dual air-air and air-ground capability simultaneously, and possibly even massive communications and bandwidth capabilities.

Kier says Lockheed Martin hopes to keep the unit cost of the operational airship at roughly \$50-70 million before its advanced radars, sensors et. al. are installed. If so, its long endurance would give it operating costs in the tens of dollars per payload-pound per hour, as opposed to aircraft or even satellites whose comparable costs are hundreds or thousands of dollars.



HAA concept, top view
(click to view full)

The hardware and the prototype airship's structure are under construction, with first inflation set for mid-2007 and hopes for first testing of the single prototype in 2009. Completion of this HAA contract is expected by November 2010. After Phase 2 testing has been completed, the Missile Defense Agency has the option to conduct an Extended User Evaluation Period Phase for up to a year, to continue its evaluation of the HAA as a military vehicle.

Meanwhile, work on this contract will take place at an historic site. Lockheed Martin's "Airdock" facility in Akron, OH is a cavernous 1,170 feet long, 220 feet wide and 211 feet high. The City of Akron, The Summit County Port Authority, and the State of Ohio are active supporters of the program to rebuild and update the Airdock, a historical building built in 1929 and last used to assemble the US Navy's airships of the 1920s.

The airships of the 2010s could turn out to be far more influential.

Additional Readings

- **DefenseTech has more information today re: this story.**
- DID FOCUS Article – **DARPA's ISIS Project Seeks Slow, Soaring Surveillance Superiority** ISIS is associated with HAA, and refers to a radar/sensor array that may be almost as large as the airship itself.
- Claremont Institute, MissileThreat.com – **High Altitude Airship**
- GlobalSecurity.org – **High Altitude Airship (HAA)**. Describes the evolution of the technology, and some of the challenges.

- Lockheed Martin – **High Altitude Airship**
- Nav Log – **Anti-Terror High Altitude Airship Project Moves into Third Stage**
- DID (May 19/06) – **Akron Airdock Fire: from Refurbishment to Rescue 9-1-1**
- C&SI Journal (Jan 10/05) – **Prototype Airship to Fly in 2009.**
- Science Daily (April 1/05) – **Purdue Team To Float High-altitude Airship For Weather, Security.** The problem they're working on has a great deal of overlap with the HAA, and this article deals with many of the technical issues they're grappling with.
- Avionics Magazine (April 1/08) – **Airships: Making a Comeback.** Very strong re: links between ISIS and HAA.
- Space Daily (Sept 20/02) – **Lockheed Martin To Develop High Altitude Airship for Missile Defense**

(Originally posted Dec 12/05; Last modified March 1/07)