



## HA

### High Altitude Efforts



#### Summary

- Demonstrates military utility of LTA and HTA HA platforms
- USASMD/ARSTRAT launched LTA airships to greater than 60,000 feet in recent tests (2005, 2008, 2010 and 2011.)
- Spiral development of the HiSentinel airships with 50-200 pound payload and objective of 200-1,000W power
- Spiral development of HAA airship with 80 pounds/150W payload with objective system of 2,000 pound/15kW payload
- DARPA ISIS program seeking advancement in material development to advance overall airship capability
- Zephyr UAS flight demonstration to validate military utility
- DARPA Vulture program is working to develop a five year aircraft capable of 1,000 pounds of payload with 5kW of dedicated payload power

#### Developing High Altitude (HA) systems and testbed framework to provide persistent surveillance and/or continuous communications capabilities.

The U.S. Army Space and Missile Defense Command/Army Forces Strategic Command is the proponent for High Altitude (HA) for the U.S. Army. The command's Space and Missile Defense Technical Center (SMDCTC) develops HA systems that include platforms, ground stations and payloads. HA platforms include both lighter-than-air (LTA) and heavier-than-air (HTA). LTA platforms will demonstrate the military utility of a large, unmanned, helium-filled airship. SMDCTC manages two LTA efforts: the HiSentinel Airship and the High Altitude Airship (HAA). SMDCTC participates in a third LTA effort, the Defense Advanced Research Projects Agency (DARPA) Integrated Sensor is the Structure (ISIS) airship. SMDCTC HTA efforts in the past have included: management of the ORION Unmanned Aerial System and participation in the Zephyr Joint Concept Technology Demonstration. Currently, SMDCTC supports DARPA Vulture Program as the lead for payload integration. SMDCTC also has a payload integration laboratory effort for testing, verifying, and validating payloads for the HA systems. Leveraging its subject matter experts, SMDCTC supports U.S Transportation Command for logistic lift technologies.

## Overview

The objective is to demonstrate engineering feasibility and potential military utility of both LTA and HTA HA systems for persistent payload operations. LTA systems will be unmanned, helium-filled airships that can fly untethered at altitudes greater than 60,000 feet, carrying a multi-mission payload, and providing 325 mile line-of-sight to the horizon. The HAA and DARPA ISIS will transit from CONUS to the theater of operation. The HAA family of airships will allow the Warfighter to launch a system with multi-purpose payloads with a large weight and power capability.

The HiSentinel80 was launched in 2010 and has a capability of 80 pounds/50W payload and a 67,000 feet as a step in a spiral development toward an objective system in the future. The HALE-D was launched in 2011 with a capability of 80 pounds/150W payload at 60,000 feet as a step in a spiral development toward an objective system in the future. The objective HAA will be capable of 2,000 pounds/15kW payload weight and power at 65,000 feet for more than 30 days. The DARPA ISIS is a complete system with a radar integrated within the structure of the airship. The HiSentinel family of airships will allow the Warfighter to tactically launch a system without a hangar to provide multi-purpose payloads. The Zephyr UAS was designed to carry lightweight payloads (five pound range) and remain airborne for 90 days. The Zephyr UAS in 2010 demonstrated a flight for two weeks. The DARPA Vulture objective is an aircraft that has the capability to fly for five years, carrying a 1,000 pound payload with 500W power.

## Benefits for Tomorrow's Defense

HA platforms will provide a much needed persistent 24/7 capability for surveillance and communication platforms to see over-the-horizon for theater and homeland defense operations. Presently, HA platforms are limited to short duration missions of about 24 hours, and then they must come down and be prepared for their next mission. The LTA platforms will provide an unmanned airship capable of carrying different payloads for durations greater than 30 days. The HA platforms will station keep within a two km radius at greater than 60,000 feet altitude providing a 325

mile line-of-sight capability to horizon. With the capability of station keeping and long duration, this can provide persistent communications and Wide Area Surveillance (WAS). The HTA platforms can provide persistent communication and WAS, providing different duration requirements per platform but potentially provide a quicker deployment time/turn than LTA platforms. Both LTA and HTA will benefit the Warfighter by providing quick and long endurance platforms to meet the requirements for communications and WAS.

## Technical Concept

The HA platforms involve several technological capabilities and operate in a harsh environment where the system would be exposed to low temperatures, ultra-violet radiation, turbulent winds and electrically charged weather patterns. It is required for the HA platforms to be integrated for long duration missions and require reliable performance in the following technical areas:

- Hull fabric/composites will require strength and environmental protection
- LTA platforms thermal management/mitigation
- LTA platforms gas pressure management
- Launch and recovery
- Stability and control
- Efficient power source
- Efficient propulsion system
- Payload recovery and reuse
- Overall system weight



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