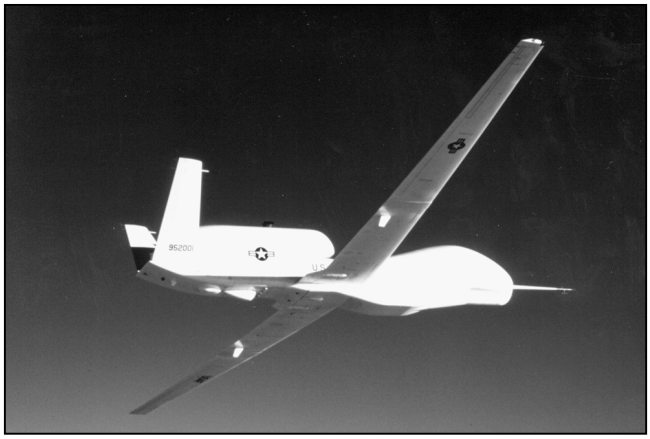
HIGH ALTITUDE ENDURANCE (HAE) UNMANNED AERIAL VEHICLE (UAV) SYSTEMS: RQ-4A GLOBAL HAWK AND RQ-3A DARK STAR



Advanced Concept Technology Demonstration

Total Number of Systems:	
Global Hawk Air Vehicles:	5
Dark Star Air Vehicles:	4
Common Ground Segments:	2
Total Program Cost (TY$):	$949M
Average Unit Cost Goal (FY94$):	$10M per air vehicle
MS II Production Review:	4QFY00

Prime Contractor

Northrop Grumman (Global Hawk)
Lockheed Martin (Dark Star)
Raytheon E-Systems (Ground Control Segment)

SYSTEM DESCRIPTION & CONTRIBUTION TO JOINT VISION 2010

The High Altitude Endurance (HAE) Unmanned Aerial Vehicle (UAV) program is a long-term demonstration to satisfy broad area coverage and deep target surveillance and reconnaissance shortfalls. The Global Hawk air vehicle is to provide high resolution Synthetic Aperture Radar (SAR) and Electro-Optical/Infrared (EO/IR) imagery at long range with long loiter times over target areas. The Dark Star air vehicle may provide SAR or EO imagery at shorter ranges with less loiter time but with the capability to collect imagery within highly defended areas. Used in conjunction with other manned and unmanned collection platforms, HAE will act as a force multiplier. Potential missions for HAE cover the spectrum of intelligence collection capability to support joint combatant forces in worldwide peace, crisis, and wartime operations. These systems will support the in-theater CINC ***in precision engagement and full-dimension protection through information superiority.***

Each HAE UAV system is composed of an air vehicle segment (consisting of air vehicles with sensor payloads, avionics, and data links), a ground segment (consisting of a launch and recovery element (LRE), and a mission control element (MCE) with embedded ground communications equipment, a support element, and trained personnel.

The Global Hawk air vehicle is optimized for long range and endurance; it should be capable of providing 24 hours on-station at a 3,000-nautical mile range from the launch site or unrefueled ferry range of 13,500 nautical miles. It has a wingspan of 116 feet and length of 44 feet, and is powered by an Allison AE3007H turbofan engine providing speeds of 0.6M and altitudes of 65,000 feet MSL.

Dark Star is made of graphite composite for low weight, and has a 69-foot span and 15-foot length. The air vehicle is powered by a Williams FJ44 turbojet engine, providing speeds greater than 250 knots and altitudes up to 45,000 feet MSL. This air vehicle will carry either an EO or SAR payload. (IR capability is not planned).

Navigation of both air vehicles is via inertial navigation with integrated Global Positioning System updates. They are intended to operate autonomously and "untethered" using a satellite data link for sending sensor data from the aircraft to MCE. Data rates up to 100 Mbps are expected via commercial satellites. The common data link (CDL) may also be used when UAV is operating within line-of-sight.

The ground segment consists of an MCE for mission planning, command and control, and image processing and dissemination; an LRE for controlling launch and recovery; and associated ground support equipment. By having separable elements in the ground segment, MCE and LRE can be operated in geographically separated locations, and MCE can be deployed with the supported command's primary exploitation site. MCE is contained in a military shelter powered by two 90kW generators with two external Ku-band antennas for communication with air vehicles.

BACKGROUND INFORMATION

The HAE UAV program is an Advanced Concept Technology Demonstration (ACTD) program aimed at developing and demonstrating long-dwell, high-altitude tactical reconnaissance. ACTD began in 1995 under Defense Advanced Research Projects Agency management, and in October 1998, transitioned to the Air Force systems program office at Wright Patterson AFB.

In 1996, USD(A&T) designated the HAE program as a pre-Major Defense Acquisition Program, and as such, it was also designated for OT&E and DT&E oversight. Following the end of the ACTD period, which is currently scheduled for June 2000, the Global Hawk program will begin a transition to an acquisition program. In August 1999, OSD directed the Air Force to initiate an acquisition program with a Milestone II decision at the end of the FY00. OSD further directed the Air Force to procure two EMD aircraft in FY01 and begin production of two aircraft per year beginning FY02. The acquisition program should include a plan for spiral development leading to Global Hawk air vehicles that satisfy the needs identified in the Military Utility Assessment and validated in the Operational Requirements Document. This plan should be provided to OSD by April 2000.

Five Global Hawk air vehicles have been produced and delivered to Edwards AFB.

The Air Force canceled the Dark Star program in January 1999 after four flights of the second air vehicle. (The first air vehicle crashed during takeoff for its second flight in April 1996). The Air Force determined that the system did not have enough payload capacity to provide military utility and that it was not worth continuing ACTD.

TEST & EVALUATION ACTIVITY

Global Hawk air vehicle Number 2 continued airworthiness tests this year. This air vehicle flew in military and limited civilian airspace, demonstrated handoff control of the air vehicle between LRE at Edwards AFB and MCE at San Diego, transmitted imagery from SAR and EO/IR payloads in wide area search and spot modes and exercised Ku SATCOM data link and CDL.

On March 29, 1999, air vehicle Number 2 crashed at China Lake Naval Air Weapons Center, CA, during an avionics developmental test flight. The air vehicle, SAR, and EO/IR payloads were destroyed. Subsequently, air vehicle Number 1 was modified for use as the primary test vehicle with air vehicle Number 3 designated for backup. One additional SAR payload was available, but no additional EO/IR payloads were immediately available.

Flight testing resumed with air vehicle Number 1 in May 1999; and in June 1999 Global Hawk entered Phase III of its ACTD, the 13-month demonstration and evaluation phase for military utility assessment. This phase is being conducted with a "crawl, walk, run" approach; i.e., beginning with technical demonstrations of the data links, flight performance, minimal payload evaluation, and as a non-obtrusive participant in exercises with a gradual increase in importance as an exercise participant, finishing with full integration into the theater collection and operations infrastructure.

Global Hawk began its "crawl" phase of demonstration and evaluation in Roving Sands '99, and has participated in several Joint Forces command-sponsored missions including the Joint Expeditionary Forces Experiment and Marine Corps Combined Arms Exercise. During these missions, the air vehicle has flown for up to 25 hours and altitudes of 66,000 feet operating in national airspace under Federal Aviation Administration control. The integrated sensor suite has been used to produce synthetic aperture radar (SAR) wide area and spot images. The moving target indicator has not been used successfully. In October, Global Hawk moved into the "walk" phase of demonstration and evaluation by flying an extended range mission to Alaska, thereby departing Continental U.S. airspace and demonstrating airworthiness at latitudes above 65 degrees North.

TEST & EVALUATION ASSESSMENT

The crash of air vehicle Number 2 was attributed to Air Force personnel at a different site testing flight termination equipment that triggered the airborne Global Hawk's self-destruct sequence. One other SAR payload was immediately available to continue the demonstration phase. An additional Integrated Sensor Suite with an EO/IR sensor was delivered in September 1999 and is supporting the ongoing demonstration activity. Participation in operational exercises was delayed about two months pending the accident investigation.

AFOTEC is observing and collecting data to assess system effectiveness, interoperability and suitability in each of the operational exercises. Although Global Hawk is still in ACTD status, this office is striving to maintain a policy of early involvement in the IPT process of demonstration and test development.