

Global Hawk High-Altitude Long-Endurance Unmanned Aerial System, RQ-4

Executive Summary

- The Global Hawk Block 20 and Block 30 systems completed initial developmental testing and entered IOT&E in October 2010.
- Poor aircraft and system-level reliability and availability remain the most significant Global Hawk operational performance deficiencies. The Global Hawk Block 20 and Block 30 systems are unlikely to meet operational availability or reliability performance thresholds during IOT&E or for initial fielding in FY11. Enhanced Integrated Sensor Suite (EISS) technical performance, aircraft all-weather capabilities, and system interoperability with supporting intelligence exploitation systems also experienced problems during developmental testing.
- The Airborne Signals Intelligence Payload (ASIP) sensor successfully completed initial integration testing on the Global Hawk Block 30 aircraft. The system demonstrated a useful level of operational utility with some notable shortfalls in communication signal collection and processing.
- Multi-Platform Radar Technology Insertion Program (MP-RTIP) sensor testing on the Proteus surrogate test aircraft demonstrated improved radar system stability. Both stand-alone and concurrent ground map and moving target indicator modes showed improved performance and were approved for integration on the Global Hawk Block 40 system.
- The Global Hawk Combined Test Force (CTF) completed the first phase of Global Hawk Block 40 aircraft performance and envelope expansion testing. The first MP-RTIP sensor was delivered for ground testing on the Block 40 aircraft.
- A Global Hawk “Nunn-McCurdy-like” program review led by the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD (AT&L)) concluded that major revisions to the Global Hawk acquisition, development, and test strategies will be required to successfully complete the program and deliver mature system performance.
- The Air Force successfully integrated and tested the Battlefield Airborne Communications Node (BACN) payload on two Block 20 aircraft in response to a U.S. Central Command (CENTCOM) Joint Urgent Operational Need (JUON) request.

System

- Global Hawk is a remotely piloted, high-altitude, long-endurance airborne intelligence, surveillance, and reconnaissance system.
- The Global Hawk system includes:
 - The RQ-4A (Block 10) aircraft or the larger RQ-4B (Blocks 20, 30, and 40) aircraft.



- A payload consisting of electro-optical, infrared, and radar imaging sensors, electronic emission detection sensors, or communications relay systems.
- Launch and recovery and mission control ground stations.
- The RQ-4A Block 10 payload is the Integrated Sensor Suite (ISS) which includes infrared, optical, and synthetic aperture radar sensors for imaging ground targets.
- The RQ-4B Block 20 payload can be either the EISS or the BACN system. The EISS sensor includes infrared, optical, and synthetic aperture radar sensors for imaging ground targets. The BACN system is a theater communications relay system.
- The RQ-4B Block 30 multi-intelligence payload includes both the EISS infrared, optical, and synthetic aperture radar sensor and the ASIP electronic signal collection sensor.
- The RQ-4B Block 40 payload is the MP-RTIP synthetic aperture radar designed to simultaneously collect imagery intelligence on stationary ground targets and track ground moving targets.
- Ground crews use line-of-sight and beyond line-of-sight satellite and radio communications to control the Global Hawk system and transmit collected data.
- Distributed ground stations receive collected intelligence data directly from the air vehicle via data link or from the mission control ground station across existing ground or satellite data distribution systems.

AIR FORCE PROGRAMS

Mission

- Air Force Global Hawk units provide high-altitude, long-endurance intelligence collection capabilities not available in other theater intelligence collection systems. Progressive fielding of the RQ-4B Block 30 system will enable the eventual retirement of the Air Force U-2 intelligence, surveillance, and reconnaissance aircraft.
 - The RQ-4 Global Hawk system collects and provides still imagery and/or signals intelligence information to the theater commander's intelligence exploitation assets, such as the Distributed Common Ground Station. Global Hawk can also provide imagery intelligence directly to forward-based personnel through direct line-of-sight data link systems.
- Ground-based intelligence analysts exploit collected imagery and signals information to provide intelligence products in support of the entire spectrum of theater operations.
- The theater Air Operations Center tasks Air Force Global Hawk reconnaissance units to collect imagery and signals data in order to answer essential elements of information identified by the theater commander or to directly support a ground unit.

Major Contractor

Northrop Grumman Aerospace Systems, Strike and Surveillance Systems Division – San Diego, California

Activity

Block 10

- All Block 10 Global Hawk aircraft are fielded in support of deployed CENTCOM operations or Air Force training activities. Sustainment activities necessary to support these aircraft continued during 2010. Current Air Force plans call for these aircraft to be replaced by Block 30 aircraft beginning in FY11.

Block 20 and Block 30

- The combined Global Hawk Block 20 and Block 30 developmental test program continued in 2010 in preparation for the Global Hawk Block 20/30 IOT&E and initial fielding. In August 2010, the Global Hawk Combined Test Force (CTF) completed Global Hawk Block 20 and Block 30 aircraft, sensor, and ground station developmental test events required to enter IOT&E. Some planned Global Hawk Block 20/30 operational capabilities were deferred for future delivery in order to maintain the Block 20/30 acquisition program schedule.
- Global Hawk Block 20 and Block 30 production acceptance test responsibilities were transferred from the Global Hawk CTF at Edwards AFB, California, to the Global Hawk operational unit at Beale AFB, California. This transfer was intended to increase the pace of Global Hawk Block 20 and Block 30 developmental testing.
- In February 2010, DOT&E participated in a Global Hawk Block 20/30 Comprehensive Test Review conducted by the USD (AT&L) staff. This review assessed the progress of the Global Hawk Block 20/30 developmental test program. Results were reported to the OSD Overarching Integrated Product Team in March 2010.
- In March 2010, the Air Force conducted a Global Hawk Block 20/30 Integrated Systems Evaluation (ISE) as a system-level developmental test "graduation" event. The ISE was intended to demonstrate Global Hawk end-to-end system performance for imagery and signals intelligence collection and dissemination. This test revealed significant interoperability, radar moving target detection, and EISS

image quality problems. Following a technical review of these deficiencies, the Air Force conducted additional interoperability flight tests in July and September 2010 that verified interoperability corrective actions.

- In August 2010, the Air Force certified the Global Hawk Block 20 and Block 30 systems ready for IOT&E. Global Hawk Block 20/30 IOT&E began in October 2010 and is scheduled to conclude in January 2011.
- In September 2010, the Air Force initiated a multi-year Global Hawk Block 30 FOT&E program to complete system development and deliver all remaining operational capabilities specified in the Global Hawk operational capabilities documents. The initial phases of this program will deliver hardware and software improvements necessary to commence Pacific Command (PACOM) and European Command (EUCOM) operations in 2011.
- In response to a CENTCOM JUON request, the Air Force completed a separate Block 20 developmental and operational flight test program to support rapid fielding of the BACN communications relay payload on two Global Hawk Block 20 aircraft. The Global Hawk CTF executed this test program concurrently with the ongoing Block 20/30 and Block 40 developmental test programs. Testing was completed in September 2010.

Block 40

- In 2010, the Air Force continued MP-RTIP sensor risk-reduction developmental flight testing using the Proteus surrogate test bed aircraft. These flight tests focused on improving radar technical performance for the basic MP-RTIP radar ground map and moving target indicator modes. These tests evaluated system improvements necessary to operate these basic radar modes simultaneously. The program also accomplished limited testing of the high-range resolution radar mode.
- The Air Force proposed an initial Global Hawk Block 40 development and test schedule leading to a Global Hawk Block 40 and MP-RTIP IOT&E and initial fielding in FY13.

The Air Force began execution of this schedule with the first Global Hawk Block 40 aircraft in March 2010. The Global Hawk CTF completed eleven aircraft flight envelope expansion test missions focusing on flying qualities, aircraft performance, and flight safety. These missions were accomplished using a basic Block 40 aircraft with no sensor installed. This initial phase of testing was delayed for 3 months due to competing Block 20 and Block 30 test program priorities.

- In July 2010, the first MP-RTIP sensor payload was delivered for integration and ground testing on the Global Hawk Block 40 aircraft. Ground sensor integration testing will continue through February 2011. Integrated Block 40 and MP-RTIP sensor flight testing is planned to begin in February 2011.

All Blocks

- In July 2010, in response to continued Global Hawk program cost growth, USD (AT&L) initiated a Global Hawk “Nunn-McCurdy-like” program review covering the entire Global Hawk acquisition, development, and test program. USD (AT&L) deferred further Global Hawk procurement decisions pending completion of this review.

Assessment

Block 20 and Block 30

- The Global Hawk CTF stabilized test schedule execution for the combined Global Hawk Block 20 and Block 30 developmental test program in 2010. The CTF was able to maintain the revised Block 20/30 flight test schedule leading to the start of Global Hawk Block 20/30 IOT&E in October 2010. Transfer of Global Hawk production acceptance flight test activities from the Global Hawk CTF at Edwards AFB, California, to the operational unit at Beale AFB, California, significantly improved the pace of Global Hawk Block 20/30 flight test execution. The final transition of production acceptance flight test activities from Beale AFB to Air Force Plant 42 in Palmdale, California was completed in September 2010.
- Poor aircraft system reliability and availability remain the most significant operational deficiencies for all Global Hawk systems. The operational advantages inherent in the long endurance Global Hawk aircraft platform will not be realized unless system reliability improves. USD (AT&L) directed the Global Hawk program to develop a comprehensive reliability improvement program to address critical system reliability shortfalls. Program reliability metrics have been refined to improve identification and tracking of reliability shortfalls. However, the final Global Hawk Reliability Performance Improvement Plan has not been finalized or funded for implementation.
- DOT&E concurs with the OSD Global Hawk Comprehensive Test Review findings and conclusions. As of February 2010, the Global Hawk Block 20/30 development program was making progress, but remained short of required operational capability thresholds in several

key areas. The review concluded that the program would not deliver some key operational capabilities in time to support IOT&E and initial fielding. Identified high-risk areas included system-level reliability and availability, EISS technical performance, and some aircraft all-weather and communications capabilities required for worldwide operations.

- The Air Force deferred development of some Block 20/30 operational capabilities in order to maintain program schedule. Deferrals include EISS ground moving target detection, EISS sensor resolution, imagery-derived target geolocation, some all-weather and communication system capabilities, and system-level reliability and availability performance thresholds. These capabilities will not be delivered for the Global Hawk Block 20/30 IOT&E or initial fielding. The Joint Requirements Oversight Council (JROC) did not approve these operational capability deferral decisions.
- Due to Global Hawk program delays and decisions to defer significant operational capabilities, the current Global Hawk Capabilities Development Document (CDD) no longer provides an accurate roadmap to guide Global Hawk Block 30 and Block 40 development and test planning.
- The March 2010 Global Hawk Block 20/30 ISE end-to-end system flight tests identified significant EISS image quality, radar moving target detection, and system interoperability deficiencies. These deficiencies were discovered near the end of the Global Hawk Block 20/30 developmental test program. Additional corrective actions and re-test efforts appeared to resolve many of the interoperability problems prior to IOT&E. Late discovery of these issues indicates a need to increase emphasis on Global Hawk interoperability and end-to-end operational performance during follow-on Block 30 and Block 40 developmental testing.
- The Global Hawk CTF completed the pre-IOT&E phase of Global Hawk Block 30 ASIP developmental testing in April 2010. The ASIP sensor did not meet all system specification requirements. However, with the exception of some specific signal collection problems, observed specification shortfalls did not appear to have a significant operational impact.
- Low spare parts availability is expected to limit system operational availability during the Global Hawk Block 20/30 IOT&E and initial fielding. Spare parts shortages will be exacerbated by the system reliability shortfalls observed during developmental testing.
- In August 2010, the Air Force certified the Global Hawk Block 20 and Block 30 systems ready to enter IOT&E. DOT&E concurs with this decision despite known system performance and reliability shortfalls. A comprehensive operational test of the Global Hawk 20/30 system is required to evaluate delivered system operational performance prior to further Global Hawk production decisions and the FY11 operational employment decision.

- Following the FY11 Global Hawk Block 20/30 IOT&E, the Air Force will continue Block 30 system development and testing. Follow-on developmental and operational tests are required to correct known deficiencies, enable FY11 Block 30 EUCOM and PACOM initial operations, support eventual U-2 aircraft retirement, and meet all remaining operational capability thresholds. The first phase of a multi-year, Block 30 FOT&E program was initiated by the Air Force in August 2010. Concurrent execution of this long-term Global Hawk Block 30 test program with ongoing Global Hawk Block 40 testing and other program test priorities will be a challenge. The Air Force has not complied with previous USD (AT&L) direction to submit a comprehensive and resourced Global Hawk Test and Evaluation Master Plan (TEMP) for a Block 30 follow-on test program. The full scope, schedule, and cost of the Block 30 follow-on test program have not been defined.
- In September 2010, the Air Force successfully completed the Global Hawk Block 20 BACN test program in support of the CENTCOM JUON request. The program executed 13 developmental and operational flight test missions leading to initial fielding in October 2010. Operational test results indicate that the BACN payload, as installed on the Global Hawk Block 20 aircraft, provides the expected operational communications relay capability. However, Global Hawk aircraft reliability and availability shortfalls may limit the operational utility of deployed Block 20 BACN systems.

Block 40

- In 2010, the Air Force and Raytheon continued risk reduction developmental flight testing of the MP-RTIP sensor on the Proteus surrogate test bed aircraft. Contractor test results indicate that system stability improved significantly for the two MP-RTIP “core” radar modes: Synthetic Aperture Radar (SAR) ground map imagery and Ground Moving Target Indicator (GMTI) tracking. Fewer system resets were reported and system in-flight availability rates appear to be approaching operational requirement thresholds. System stability for the “concurrent” SAR/GMTI radar mode also improved, but remained short of required operational thresholds. Based on these improved test results, all three radar modes will be included in the Global Hawk Block 40 development and integration test program. Other MP-RTIP modes such as high range resolution (HRR), airborne moving target indicator (AMTI), and maritime moving target indicator (MMTI) were deferred for future development.
- The Global Hawk CTF completed the first phase of Global Hawk Block 40 aircraft envelope expansion and safety verification flights in July 2010. These tests evaluated the impact of Block 40 airframe design changes on aircraft flying qualities and performance characteristics. Initial test

results showed good aircraft flight stability and a positive correlation between predicted and actual flight performance. The second phase of Block 40 radar flight integration and verification testing in early 2011 will assess aircraft power and cooling system performance with the MP-RTIP sensor installed.

- Although the Global Hawk Block 40 flight test program commenced in 2010, the Air Force has not yet complied with previous USD (AT&L) direction to submit a comprehensive and resourced Global Hawk Block 40 TEMP. The Air Force has not fully defined the Block 40 test strategy, schedule, test requirements, or the resources necessary to complete this test program.
- The proposed Air Force Global Hawk Block 40 test schedule, leading to IOT&E and initial fielding in FY13, is high risk. Funding reductions will reduce Global Hawk CTF test capacity by at least 30 percent in 2011. It is unclear whether the Global Hawk CTF can execute the proposed Global Hawk Block 40 flight test program concurrently with Global Hawk Block 40 production acceptance tests, Block 30 follow-on tests, and other competing program test priorities. The availability of Global Hawk ground stations to support concurrent execution of the Global Hawk Block 40 test program and other competing Global Hawk test activities at Edwards AFB, California, is emerging as a critical limiting factor.
- Interoperability testing of the Global Hawk Block 40 system with supporting battle management command and control (BMC2), and intelligence tasking, processing, exploitation, and dissemination (TPED) systems is a critical part of the Block 40 development and operational test program. However, uncertainty regarding the Air Force and Army BMC2 and TPED architectures intended to integrate Block 40 intelligence collection capabilities continues to hinder system development.

All Blocks

- DOT&E concurs with the USD (AT&L) Global Hawk “Nunn-McCurdy-like” program review finding that the current Global Hawk program and test strategies are not adequate to match program complexity. A significant test strategy revision is required to support delivery of required Global Hawk Block 30 and Block 40 capabilities. Current system development and test schedules are no longer consistent with documented program operational requirements.
- DOT&E concurs with the Global Hawk “Nunn-McCurdy-like” review technical performance findings and conclusions. Global Hawk system reliability, sensor performance, and spare parts availability problems are likely to affect IOT&E results and limit initial operational capabilities.

Recommendations

- Status of Previous Recommendations. The Air Force made progress on all seven recommendations from previous annual reports. Five of the seven recommendations were resolved.
- FY10 Recommendations. The Air Force should:
 1. Finalize and implement a Global Hawk Reliability Performance Improvement Plan to address identified system reliability and operational availability deficiencies.
 2. Update Global Hawk Block 30 and Block 40 operational requirements to provide clear expectations and priorities for future development of Global Hawk operational capabilities.
 3. Develop a comprehensive Global Hawk Block 30 follow-on test strategy to support 2011 PACOM and EUCOM fielding, correction of known deficiencies, testing of previously deferred capabilities, and delivery of all future capabilities defined in Global Hawk operational requirements documents.
 4. Develop a comprehensive Global Hawk Block 40 test strategy and schedule to support delivery of Block 40 MP-RTIP radar modes and operational capabilities.
 5. Evaluate Global Hawk Block 30 follow-on test requirements, Block 40 development test requirements, and other Global Hawk test priorities to determine if concurrent FY11 through FY13 execution of these programs can be accomplished within the capacity of the Global Hawk CTF.
 6. Increase emphasis on early Global Hawk Block 30 and Block 40 interoperability testing with the supporting intelligence data exploitation “system-of-systems.” Early discovery and correction of deficiencies is required to assure that Global Hawk systems are effectively integrated with existing intelligence data transmission and exploitation systems.
 7. Define the supporting Global Hawk Block 40 BMC2 and intelligence TPED architectures planned for Global Hawk Block 40 IOT&E and initial fielding.

AIR FORCE PROGRAMS