

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

### Executive Summary

- Significant delays to all Global Hawk blocks occurred in FY09. Slow test progress, low air vehicle reliability, growing concurrency of production acceptance testing and developmental flight testing, and a serious incident during flight test all contributed to very little progress.
- The Air Force declared a schedule breach for Block 20/30 IOT&E, Block 40 IOT&E, and the full-rate production readiness review in February 2009. Though the Service intended to resolve issues by April, a new program schedule was not available by the end of the fiscal year.
- The IOT&E for Block 20 and Block 30 systems will not occur before early FY11, a three year total delay from the baseline developed during the 2006 re-plan. IOT&E will not be complete until after nearly all of these systems have been procured. The Block 40 system IOT&E delay is at least two years, extending into FY13, despite deferral of two of four sensor operations.
- OSD and the Joint Staff added requirements to the Global Hawk program by requiring the integration of the Battlefield Airborne Communications Node on Block 20 systems, a new requirement created through the joint urgent operational needs process.

### System

- Global Hawk is a long-range surveillance and reconnaissance system.
- The Global Hawk system includes:
  - An Unmanned Aerial Vehicle capable of high altitude (above 60,000 feet) and long endurance (greater than 24 hours) operations
  - Launch/recovery ground station and mission control ground station
- The current Block 10 payload includes infrared, optical sensors, and synthetic aperture radar, all of which image ground targets and areas of interest.
- Ground crews use satellite and radio communications to control the system and transmit collected data.
- Appropriately equipped distributed ground stations receive data either directly from the air vehicle via a data link or from the mission control ground stations for exploitation to meet the theater commander's intelligence needs. Signals intelligence will be processed in a similar manner.
- The program plans to produce additional systems of air vehicles and ground stations (Blocks 20, 30, and 40) capable of greater payloads that include the following:



- Imagery intelligence only (Block 20)
- Multi-intelligence including Imagery and Signals intelligence (Block 30)
- Radar surveillance only (Block 40)

### Mission

- A unit equipped with this system would provide surveillance and reconnaissance imagery and data to the theater commander's exploitation assets, such as the Distributed Common Ground Station. Ground personnel assigned to exploit the collected material then develop the intelligence products to support theater operations.
- Units with Global Hawk provide persistent intelligence gathering through long-range and long-loiter capability when other assets are not available.
- The theater Air Operations Center tasks Air Force Global Hawk reconnaissance squadrons to either 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.

### Prime Contractor

- Northrop Grumman, Unmanned Systems Division, Rancho Bernardo, California

## Activity

### Block 20

- The Combined Test Force accomplished 40 percent of the test point goal planned in the developmental test and evaluation of the Block 20 imagery intelligence capability with the Enhanced Integrated Sensor Suite payload. In February 2009, the Service Acquisition Executive declared that the program baseline schedule threshold dates for the Block 20 IOT&E could not be met. Primary causes were:
  - Low air vehicle reliability, approximately 15 percent of the contracted value for mean time between critical failure
  - Concurrent production acceptance flight test needs exceeded the Combined Test Force capacity
- The Air Force completed comprehensive reviews of the size and efficiency of both developmental and production acceptance testing. The test force implemented specific efficiencies and reduced content of the test plans.
- In May 2009, one Block 20 system experienced a serious spoiler actuator and software malfunction requiring an emergency landing, which eventually disabled the aircraft. Service authorities suspended all Block 20 and Block 30 flight test operations until a safety investigation could be complete. Following the investigation, in accordance with the Air Force's approved return-to-flight plan, the Combined Test Force began testing a replacement spoiler actuator in mid-September. The Service resumed the developmental flight test program in October 2009.
- In response to a recent joint urgent operational need statement, the Air Force identified two Block 20 air vehicles for integration of the Battlefield Airborne Communications Node. The Service intends to begin testing in spring of 2010.

### Block 30

- A Block 30 system equipped with the Airborne Signals Intelligence Payload (ASIP) was able to progress through approximately 30 percent of Global Hawk developmental flight test plans before the May 2009 spoiler incident suspended flight test operations. The test team completed signals intelligence sensor calibration and most of the engineering evaluation flights for the sensor; however, only one short duration mission (less than 12 hours) was completed in the multi-intelligence environment (both signals and imagery intelligence sensors operating).
- Developmental and operational testing of the ASIP sensor on the U-2 aircraft continued supporting fielding of three developmental units by the Air Force.

### Block 40

- Using the Proteus surrogate flight test bed, the Multi-Platform Radar Technology Insertion Program (MP-RTIP) completed the Radar System Level Performance Verification test phase for two "core" modes: Synthetic Aperture Radar (SAR) imagery and Ground Moving Target Indicator (GMTI) tracking. Only limited testing of the two other required modes (concurrent SAR/GMTI and high-range resolution) occurred after the Joint Staff and the Defense Acquisition

Executive encouraged the Air Force to consider deferral. These modes have not completed contractor development.

- Since the Joint Staff's Joint Capabilities Board recommended prioritization of core modes in FY08, there has been no formal relief of the requirement for all modes and no plan for completing the modes at a later date.
- The program is orchestrating mode prioritization to avoid production of Block 40 systems without any capability. The Service has procured three of 15 systems.
- The Air Force's strategy was to complete verification of all sensor modes on the surrogate test bed by August 2008, enabling Block 40 developmental flight test to begin in early 2009. Delays due to the sensor calibration issue reported last year and working off system deficiencies in surrogate flight test, including dealing with poor system stability, resulted in no Block 40 flight testing occurring in FY09.

## Assessment

### Block 20

- Test progress has been extremely slow due to poor system performance and production acceptance activities becoming concurrent with a high test tempo. Combined with the suspension of operations for four months due to the accident, this results in a minimum of an 18-month slip to the previously approved threshold IOT&E timeframe (from late FY09 to early FY11). Service plans to temporarily move portions of production acceptance testing to the training unit at Beale AFB, California, will reduce the load on the Combined Test Force but will only marginally improve the pace of developmental flight testing. The Service staffed and resourced the Combined Test Force to conduct testing of each block in sequence, without the significant additional effort required to concurrently complete production acceptance testing. Given the reality of concurrent tasks on the test force today, contemporary efforts to obtain additional trained personnel and ground elements that would be needed to dramatically improve test productivity for Block 20 and Block 30 systems are late and are not likely to have the desired affect soon.
- As concluded by the Air Force, it is ill-advised to further reduce the content of developmental testing in order to recover schedule. To verify the required system capability and prepare for a mission level operational evaluation before fielding, the Service should complete the planned testing.
- Air vehicle reliability is the most significant operational deficiency for all Global Hawk systems (all blocks and payloads) as long as high endurance mission capability (28 hours) is desirable. The remaining developmental testing should provide data to confirm fixes already identified by the program and determine the potential for improvement. Additional investment may be required.

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- Low reliability of Global Hawk demonstrated to date in developmental flight testing would make early operational fielding problematic.

## **Block 30**

- Developmental flight test of Block 30 aircraft equipped with the ASIP sensor and the Enhanced Integrated Sensor Suite is also significantly behind schedule. Block 30 multi-intelligence IOT&E, which will be concurrent with the Block 20 IOT&E, will also experience a minimum of an 18-month slip. These concurrent evaluations will not be complete before the next planned Global Hawk Block 30 system production decision in 2QFY10.
- Integrated testing conducted so far indicates the ASIP sensor meets most specification thresholds, but the testing is very limited in some signal types and sample size. Full understanding of the multi-intelligence operational capability of Global Hawk Block 30 is not yet available.
- Testing of the ASIP sensor on the U-2 aircraft enhanced the development of the sensor for Global Hawk by generating software improvements that increased geo-location accuracy for both platforms.

## **Block 40**

- Even though core modes recently completed verification testing on the surrogate test bed, developmental flight test of the Block 40 system will progress slowly until Block 20/30 IOT&E, and Block 20 Battlefield Airborne Communications Node flight test near completion in late FY10. The combined effect of the calibration design failure reported last year, resolution of discoveries during surrogate flight test, and work to determine root causes of poor system software stability will slip operational testing of Block 40 systems until FY13 – a 30-month delay. The potential exists that the contractor will deliver up to eight of the 15 planned Block 40 systems before a Block 40 system is ready for an operational evaluation. The program continues to re-plan Block 40 developmental flight test and has not determined final content.
- It is possible that prioritization of MP-RTIP “core modes” (i.e. SAR and GMTI) may enable the use of incremental development and test strategies culminating in the development and testing of all required modes. However, it continues to be unclear whether or not the Block 40 core mode-only system can accomplish required battle management missions. Additional investment is also needed in ground system development and manpower to complete the Service command nodes used to exploit Block 40 collections.

- Air Force Operational Test and Evaluation Center (AFOTEC) updated the operational assessment of the MP-RTIP sensor SAR and GMTI modes on the surrogate test bed and reported the results in August 2009. The AFOTEC results indicated the following:
  - The sensor is likely to meet requirements by IOT&E for SAR imagery quality and capability to generate GMTI tracks.
  - Poor stability of the software that controls sensor functions will create a significant adverse impact on mission performance.

## **Recommendations**

- Status of Previous Recommendations. The Air Force made progress on six of the 15 recommendations from previous annual reports. The remaining previous recommendations are valid and deserve resolution.
- FY09 Recommendations. The program should address the following:
  1. As developmental testing continues in FY10, program management should place special emphasis on measuring reliability, availability, and maintainability of all Global Hawk systems in an operationally realistic manner.
  2. Develop and fund a reliability growth plan specific to each block, the ASIP sensor, and the MP-RTIP sensor.
  3. Block 20 and Block 30 operational test plans should consider and include comparison evaluations using Block 10 and U-2 legacy systems to provide a critical context for evaluating mission capability.
  4. Achieve stability goals for the Block 40 sensor software and track progress towards maintaining suitable sensor stability through the remaining flight test.
  5. Complete the Block 20 imagery intelligence and Block 30 multi-intelligence developmental flight testing as planned and resolve the readiness to test issues identified by AFOTEC in the operational assessments.
  6. Resolve the plan for the remaining Block 40 sensor modes and mission capability (retain battle management, or delete it). Update and validate requirements and acquisition documentation so that adequate test planning and resourcing is possible.
  7. Complete and submit for DOT&E approval: a) Global Hawk Block 40 Test and Evaluation Master Plan (TEMP), b) ASIP Capstone TEMP and Global Hawk Annex, c) MP-RTIP Capstone TEMP and Global Hawk Annex.

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