

## MQ-9 Reaper Armed Unmanned Aircraft System (UAS)

### Executive Summary

- The MQ-9 Unmanned Aircraft System (UAS) continues to support ongoing global combat operations. The MQ-9 UAS has met urgent combat operational needs through accelerated production and the rapid incorporation of emergent sensor and systems technologies outside of the MQ-9 baseline program of record.
- The Air Force accelerated the planned FY13 Milestone C Decision for the Block 5 remotely-piloted aircraft (RPA) to September 2012. USD(AT&L) approved Block 5 RPA Milestone C and Low-Rate Initial Production in September 2012 and the MQ-9 UAS Increment One designation as an Acquisition Category 1C program in conjunction with the Milestone C decision.
- The Air Force Operational Test and Evaluation Center (AFOTEC) conducted an operational assessment (OA) of the Increment One UAS to inform the Block 5 RPA Milestone C decision. A limited flight demonstration comprising 5 functional capabilities sorties and 18 flight test hours demonstrated basic integration and functionality of the Block 5 RPA configuration to inform the Milestone C decision.
- Ongoing developmental challenges precluded operational testing and subsequent fielding of baseline program enhanced capabilities to operational MQ-9 units in FY12 (Operational Flight Programs (OFP) 904.2, 904.4, and Joint Direct Attack Munition (JDAM)).

### System

- The UAS includes both the MQ-9 RPA and a Ground Control Station (GCS).
  - The MQ-9 RPA is a remotely-piloted, armed air vehicle that uses optical, infrared, and radar sensors to locate, identify, target, and attack ground targets. The RPA is a medium-sized aircraft that has an operating ceiling up to 50,000 feet, an internal sensor payload of 800 pounds, an external payload of 3,000 pounds, and an endurance of approximately 14 hours.
  - The GCS provides aircraft launch/recovery and mission control of sensors and weapons. C-band line-of-sight datalinks are used for RPA launch and recovery operations, and Ku-band satellite links are used for RPA mission control.



- The MQ-9 RPA carries AGM-114, Hellfire II anti-armor precision laser-guided missiles and GBU-12, 500 pound laser-guided bombs.
- The Air Force is using an evolutionary acquisition approach for meeting Increment One Capability Production Document (CPD) requirements, with Block 1 and Block 5 RPAs and Block 15 and Block 30 GCSs.
- The Air Force is currently fielding the Block 1 RPA.
- The Air Force designed the Block 5 RPA to incorporate improved main landing gear, an upgraded electrical system with more power, an additional ARC-210 radio, encrypted datalinks, a redesigned avionics bay and digital electronic engine control system, the BRU-71 bomb rack, high-definition video, and upgraded software to allow the two-person aircrew to operate all onboard systems.

### Mission

- The Combatant Commander uses the MQ-9 onboard sensors and weapons to conduct armed reconnaissance and pre-planned strikes. Units equipped with MQ-9s can find, fix, track, target, engage, and assess critical emerging targets (both moving and stationary).
- MQ-9 units can also conduct aerial intelligence gathering, reconnaissance, surveillance, and target acquisition for other airborne platforms.

### Major Contractor

General Atomics Aeronautical Systems Inc. – San Diego, California

### Activity

- The Air Force conducted MQ-9 testing in accordance with the DOT&E-approved Test and Evaluation Master Plan.
- In July 2012, the Air Force Requirements Oversight Council approved changes to the MQ-9 reliability requirements. The

Air Force changed the Mean Time Between Critical Failure threshold requirement from 500 hours to 19 hours for the MQ-9 RPA and from 500 hours to 224 hours for the GCS.

# AIR FORCE PROGRAMS

- MQ-9 Block 1 RPA software, Block 5 RPA hardware and software, and Block 30 GCS developmental testing were ongoing throughout FY12. The final MQ-9 Increment One UAS configuration will include the Block 5 RPA, Block 30 GCS, and OFP 904.6.
- Planned FY12 Air Force Air Combat Command (ACC) Force Development Evaluation (FDE) testing of MQ-9 Block 1 OFPs 904.2 and 904.4 did not occur. Software immaturity coupled with the implementation of new Air Force airworthiness requirements resulted in developmental delays.
- The 2009 GBU-38, 500-pound JDAM FDE to support limited MQ-9 fielding remains in a pause status pending resolution of MQ-9 OFP fuzing and weapons envelope discrepancies identified in 2010.
- The new Block 5 RPA completed five early developmental demonstration flights in FY12. These functional capabilities sorties demonstrated basic integration and functionality of the Block 5 RPA configuration.
- AFOTEC began an OA of MQ-9 in May 2012 in support of the September 2012 Block 5 Milestone C decision. AFOTEC conducted the testing in accordance with a DOT&E-approved OA plan.
- USD(AT&L) approved MQ-9 Block 5 RPA Milestone C and low-rate initial production in September 2012.
- The program made incremental progress towards resolving deficiencies discovered during the 2009 MQ-9 JDAM FDE testing; however, the OFP has yet to demonstrate readiness for resumed JDAM operational testing.
- Findings from the AFOTEC OA of the Increment 1 Block 5 RPA indicated progress in conducting limited flight testing of the integrated hardware suite and early revisions of OFP 904.6 software in a prototype Block 5 RPA controlled with a Block 15 GCS. Across 5 sorties and 18 flight test hours these missions demonstrated:
  - Functional operation of aircraft handling, flight control systems, and payload systems
  - Successful operation of the heavyweight landing gear system
  - All power modes of the high capacity power system
  - Dual ARC-210 radio and wingtip antenna functionality in both clear and secure modes
  - Encrypted Ku-band satellite datalink control
  - Multi-spectral Targeting System B functionality in standard definition video format
  - Synthetic aperture radar legacy modes, including ground moving target indicator mode operation
- As was the case in FY11, Information Assurance (IA) vulnerabilities and deficiencies are not well characterized because the Air Force has only completed limited IA testing on the MQ-9 system. As of the end of FY12, the system is operating under an Interim Authority to Test, pending full system IA testing.

## Assessment

- The Air Force intends to fulfill the MQ-9 Increment One CPD requirements with a final UAS configuration consisting of the Block 5 RPA, Block 30 GCS, and OFP 904.6. AFOTEC will conduct formal operational testing of the final MQ-9 Increment One UAS in 2014. This operational testing will assess Increment One UAS effectiveness, suitability, mission capabilities, and satisfaction of CPD key performance parameters.
- The MQ-9 program continues to face systemic challenges in prioritizing and maturing software OFPs to meet development and fielding timelines for the Increment One program of record. During FY12, such delays precluded the completion of developmental testing of OFPs 904.2 and 904.4 to support planned FY12 operational testing. Development, operational testing, and fielding of Increment One program of record capabilities will likely experience continued delays unless the program is able to better prioritize and control maturation of these capabilities.

## Recommendations

- Status of Previous Recommendations. In FY12, the Air Force satisfied several of the DOT&E FY11 recommendations. However, two FY11 recommendations remain outstanding:
  1. The Air Force should complete the JDAM FDE.
  2. The Air Force should conduct IA testing to include adversary system penetration testing.
- FY12 Recommendation
  1. The Air Force should complete the development of the Increment One UAS hardware and software to support FOT&E of the Increment One system to assess operational effectiveness, suitability, and mission capability of the final Increment One UAS configuration.