

MQ-9 Reaper Armed Unmanned Aircraft System (UAS)

Executive Summary

- The MQ-9 program continues to face systemic challenges in prioritizing development and testing efforts between evolving program of record requirements and other capability development efforts outside of the system's program of record. Evolving priorities and competing development and fielding desires continue to stress operational test agency capacity to support both program of record testing requirements and accelerated fielding of capabilities desired by the Air Force.
- Planned FY14 FOT&E of the Block 5 Remotely Piloted Aircraft (RPA), Block 30 Ground Control Station (GCS), and software Operational Flight Program (OFP) 904.6 did not occur due to additional developmental testing to address thermal and power management problems. FOT&E did not occur in FY15. A combination of additional Block 5 RPA developmental testing and competing non-program of record development and test priorities overtaxed available operational test resources needed to support planned FY15 FOT&E. This FOT&E is planned to begin in 2QFY16.
- General Atomics delivered the final Block 1 RPA to the Air Force in 2QFY15 and transitioned the production line to Block 5 RPAs. There is no Full-Rate Production decision associated with MQ-9 deliveries; the Air Force will complete the MQ-9 fleet acquisition under low-rate initial production.
- The current DOT&E-approved MQ-9 Test and Evaluation Master Plan (TEMP) supports FOT&E of the Block 5 RPA, Block 30 GCS, and OFP 904.6. Upon completion of FOT&E of this configuration, a new TEMP will be required to document the incorporation of new program of record content (e.g., the Block 50 GCS) into the MQ-9 Increment 1 system.

System

- The MQ-9 Reaper Unmanned Aircraft System (UAS) is a remotely piloted, armed, air vehicle that uses optical, infrared, and radar sensors to locate, identify, target, and attack ground targets.
 - The MQ-9 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 commands the MQ-9 RPA for 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 1 Capability Production Document 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 and the Block 15 GCS.
- 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

- Combatant Commanders use units equipped with the MQ-9 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

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Activity

- The Air Force conducted all MQ-9 testing in accordance with the DOT&E-approved test plan and TEMP.
 - The Air Force completed additional formal developmental testing on OFP version 904.6 Revision K for the Block 5 RPA and Block 30 GCS in 2QFY15. This software revision incorporated fixes to deficiencies and will be the OFP evaluated in the forthcoming FOT&E.
 - FOT&E did not occur in FY15. A combination of additional Block 5 RPA developmental testing to address thermal and power management problems and competing non-program of record development and test priorities overtaxed available operational test resources needed to support planned FY15 FOT&E. FOT&E will not begin until 2QFY16.
 - The Air Force purchased a new, more powerful 5-ton cooling cart and modified the Block 5 RPA with a plenum to direct cooled air into the forward avionics bay to increase cooling capacity. Developmental testing in 4QFY15 demonstrated that these measures mitigated previous FY14 transmitter overheating problems.
 - Thermal and power management problems led to FY15 developmental test mission ground aborts due to depleted batteries that become too hot for charging on the ground prior to takeoff. As of the end of FY15, the Air Force had not determined a resolution to ongoing overheating problems.
 - General Atomics delivered the final Block 1 RPA to the Air Force in 2QFY15 and transitioned the production line to Block 5 RPAs. As of 3QFY15, General Atomics had delivered 199 of 364 RPAs (Block 1 and Block 5 combined) to the Air Force. General Atomics plans to deliver the final Block 5 RPA in FY21. There is no Full-Rate Production decision associated with MQ-9 deliveries; the Air Force will complete the MQ-9 fleet acquisition under low-rate initial production.
 - The final configuration of the MQ-9 Increment 1 UAS continued to evolve throughout FY15. The Air Force intends to incorporate an improved Multi Spectral Targeting System-B electro-optical/infrared sensor, additional weapons, avionics hardware, and further system software revisions into the Increment 1 program of record capabilities.
 - In FY15, the MQ-9 UAS Program Office adopted a new hybrid acquisition strategy approach in response to changing non-program of record content desired by the Air Force and for delivering desired additional capabilities. Candidate capabilities are intended to be delivered in a series of bundled software/hardware releases under an accelerated development and testing schedule as an extension of the existing program of record.
- development efforts outside of the system's program of record. Evolving priorities and competing development and fielding desires continue to stress operational test agency capacity to support both program of record testing requirements and accelerated fielding of capabilities desired by the Air Force.
- Thermal management and overheating problems identified in FY14 were not fully resolved in FY15 despite the introduction of Block 5 RPA design changes and the introduction of additional ground cooling equipment. Although these measures mitigated RPA forward avionics bay redundant control module and transmitter overheating shortfalls, 4QFY15 hot weather developmental testing revealed power management problems that preclude charging batteries on the ground leading to depleted batteries prior to takeoff and leading to mission aborts. After an operationally representative taxi time in warm to hot weather, batteries that become too hot will be inhibited from charging to prevent battery overheating. If this occurs, required battery back-up power for takeoff may be insufficient and the mission could be aborted. As of the end of FY15, the Air Force had not identified a solution to the ongoing Block 5 RPA overheating problems. A combination of additional Block 5 RPA developmental testing and competing non-program of record development and test priorities overtaxed available operational test resources needed to support planned FY15 FOT&E. This FOT&E is planned to begin in 2QFY16.
 - The Air Force originally intended to fulfill the MQ-9 Increment 1 Capability Production Document requirements with a final UAS configuration consisting of the Block 5 RPA, Block 30 GCS, and OFP 904.6. AFOTEC will conduct FOT&E of this configuration when ongoing thermal management problems are resolved. Subsequent AFOTEC FOT&E will be required consistent with the evolving MQ-9 program of record content, and at a minimum will include evaluation of the planned Block 50 GCS in conjunction with the appropriate system capabilities being delivered under the Air Force FY15 hybrid acquisition strategy.
 - Electromagnetic Environmental Effects testing on the Block 5 RPA will not take place until after completion of planned FY16 FOT&E. Such testing recently completed on the Block 1 aircraft revealed vulnerabilities, and due to the similarities between the Block 1 and Block 5 aircraft, similar vulnerabilities may exist on the Block 5 aircraft.
 - The current DOT&E-approved MQ-9 TEMP supports FOT&E of the Block 5 RPA, Block 30 GCS, and OFP 904.6. Upon completion of FOT&E for this configuration, a new TEMP will be required to document the incorporation of new program of record content (e.g., the Block 50 GCS) into the MQ-9 Increment 1 system.

Assessment

- The MQ-9 program continues to face systemic challenges in prioritizing development and testing efforts between evolving program of record requirements and other capability

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Recommendations

- **Status of Previous Recommendations.** In FY15, the Air Force completed the development of the MQ-9 UAS to support planned FOT&E of the Block 5 RPA, Block 30 GCS, and OFP 904.6. The Air Force made progress toward, but did not fully satisfy, the FY14 recommendation to resolve the hot weather operating shortfalls.
- **FY15 Recommendations.** The Air Force should:
 1. Resolve the remaining Block 5 RPA thermal and power management shortfalls prior to the start of AFOTEC's FOT&E.
 2. Complete planned FOT&E of the Block 5 RPA, Block 30 GCS, and OFP 904.6.
 3. Upon completion of the planned FOT&E (Block 5 RPA, Block 30 GCS, and OFP 904.6), submit a new TEMP documenting the incorporation of new content and capabilities (e.g., Block 50 GCS) and the T&E strategy and resources required to mature and test these capabilities.

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