RQ-7Bv2 Block III SHADOW – Tactical Unmanned Aircraft System

Executive Summary

- The Army completed the RQ-7Bv2 Block III Shadow FOT&E II totaling over 400 flight hours at Fort Bliss, Texas, in September and October 2020. Initial findings can be assessed on early test observations. The data analysis is ongoing and will be published in a future FOT&E II report.
- A major wiring and power issue was discovered when mating the Shadow vehicle-mounted ground control station (GCS) to the Joint Light Tactical Vehicle (JLTV). The JLTV was not configured to support GSC compatibility resulting in a wiring and power issue causing excessive smoke that the program must address.
- Initial user feedback on the new Shadow Electro-Optical (EO)/ Infrared (IR) Laser Designator (SHEILD) payload is positive. The image quality is exceptional when compared to the legacy Plug-in Optronic Payload 300 on earlier versions of the RQ-7B Shadow.
- The Army demonstrated the ability to establish manned-unmanned teaming (MUMT) connectivity between the Shadow and both the AH-64E Version 6 and AH-64D during FOT&E II. The assistance of program experts at the FOT&E test site enabled successful MUMT connectivity by assisting in refinement of local procedures. Current training and reference materials for the employment of the MUMT, for both manned and unmanned aircrews, are not adequate and do not posture crews for success. The Army should take a multi-system approach to improve MUMT connectivity.
- The Shadow has not been tested in a contested environment with an active electronic warfare threat. The program manager acknowledges this test limitation and will continue to search for capability improvements.

System

- The RQ-7Bv2 Shadow Block III is a modernization of the RQ-7Bv2 fielded to the Army in 2014. The Block III is a grouping of engineering changes developed since the introduction of the RQ-7Bv2. These changes are designed to increase reliability, reduce maintenance burden, and improve operational effectiveness.
- The RQ-7BV2 Shadow Block III provides 16 hours of continuous coverage within a 24-hour period, with capability of surging to 24-hours continuous coverage for a 72-hour surge coverage period. The maximum range is 125 kilometers with a maximum ceiling of 15,000 feet mean sea level (MSL). The Shadow will generally operate between 8,000 to 10,000 feet above ground level during the day and 6,000 to 8,000 feet above ground level at night.
- Shadow RQ-7Bv2 Shadow Block III improvements include:

  - New more powerful and more reliable engine
  - Improved propeller design that increases power while reducing noise signature
  - Redesigned muffler to reduce noise signature
  - New more powerful mission processing computer; Small Mission Computer (SMC)
  - Very High Frequency (VHF) and Ultrahigh Frequency (UHF) radio communications
  - Improved sensor payload; SHEILD
  - Improved environmental protection/weatherization
  - Improvements to structural components to account for increase weight
- The RQ-7B Shadow Block III needs an improved surface to serve as a runway. The aircraft is launched using a hydraulic/ pneumatic launcher and is recovered on a runway using the Tactical Automatic Landing System. The Shadow can recover on a short runway by using an arresting cable/arresting hook system.

Mission

RQ-7B Shadow Block III provides Commanders with increased situational awareness, improved wide-area target acquisition, and high-value target tracking to conduct both shaping and decisive operations. The system conducts manned-unmanned teaming with the AH-64D/E to designate targets for air-to-ground missile engagements.

Major Contractors

- Unmanned Aerial System: Textron Systems – Hunt Valley, Maryland
- Sensor Payload: L3 Harris WESCAM – Burlington, Ontario, Canada

Activity

- The Army conducted all testing in accordance with a DOT&E-approved Test and Evaluation Master Plan and test plan. The RQ-7Bv2 Block III Shadow FOT&E II was conducted at Fort Bliss, Texas, in September and October 2020.
- The RQ-7Bv2 Block III Shadow program has experienced no operational testing or milestone decision delays due to the effects of the coronavirus (COVID-19) pandemic. Some developmental and integration test events have shifted, but the program remains on schedule.
- The Program Office began integration testing of the new SHEILD payload in October 2019 at Dugway Proving Grounds, Utah. Integration testing with the SHEILD payload completed in November 2019 with the payload completing 45.6 operational hours.
- The Shadow completed environmental, Electromagnetic Environment Effects (E3), and transportability testing at Redstone Test Center, Alabama, during November and December 2019.
  - Environmental testing was completed in a test chamber to assess the aircraft's improved weatherization.
  - E3 testing is done to determine the vulnerabilities of equipment to ambient natural and manmade electromagnetic activity.
  - Transportability testing assessed the aircraft ability to withstand the impact shocks associated with tactical ground movement.
- The Program Office completed two software updates in FY20 in preparation for FOT&E II. Software build 6.2 was released in February 2020 to address communication relay and improvements to the tactical automatic landing system. Software build 6.3 was released in May 2020 to address engine control unit issues. Software build 6.3 is the system under test for FOT&E II.
- The Army planned to conduct developmental and integration testing with the AH-64E Version 6 at Dugway Proving Grounds, Utah, in March and April 2020 to assess the Shadow's ability to conduct manned-unmanned teaming. This developmental and integration testing was postponed due to COVID-19, but completed in July 2020 in preparation for FOT&E II.

Assessment

- The RQ-7Bv2 Block III accumulated over 400 flight hours during FOT&E II conducted at Fort Bliss, Texas, in September and October 2020. Reliability assessments are ongoing and results will be published in a future FOT&E II report.
- The Army demonstrated the ability to establish MUMT connectivity between the Shadow and both the AH-64E Version 6 and the AH-64D during FOT&E II. The Army has not developed a standard procedure for establishing MUMT connectivity. Successful MUMT operations require coordination between unit subject matter experts to develop local tactics, techniques, and procedures. The Army should document and codify procedures required to establish connectivity for the Shadow operating with the AH-64D and the AH-64E.
- Initial user feedback on the new SHEILD payload is positive. The image quality is exceptional when compared to the legacy Plug-in Optronic Payload 300 on earlier versions of the RQ-7B Shadow. A final suitability assessment and user surveys will be published in a future FOT&E II report.
- The SHEILD payload will allow for the development of new tactics, techniques, and procedures through new capabilities, such as the picture-in-picture function and other pilot-vehicle-interface improvements.
- The RQ-7Bv2 Block III Shadow includes multiple improvements designed to reduce audio signature of the aircraft at operational altitudes. Initial test site observations support developmental test findings on effectiveness of design changes. A final determination will be made in the FOT&E II report.
- A major wiring and power issue was discovered when mating the Shadow vehicle-mounted GCS to the JLTV. The JLTV was not configured to be compatible with the GCS resulting in a wiring and power issue causing excessive smoke that the program must address.
- The Shadow has not been tested in a contested environment with an active electronic warfare threat. The program manager acknowledges this test limitation and will continue to search for capability improvements.

Recommendations

- The Army should:
  1. Determine compatibility of the JLTV wiring the Shadow GCS and the potential risk across other truck mounted systems.
  2. Develop and codify in procedures for establishing MUMT connectivity with the AH-64D and the AH-64E.
- The program manager should:
  1. Plan and conduct electronic warfare testing to better understand system survivability in a contested environment.