

## MQ-1C Gray Eagle (formerly Extended Range Multi-Purpose (ERMP)) Unmanned Aircraft System (UAS)

### Executive Summary

- The Secretary of the Air Force approved renaming the MQ-1C Mission Design Series aircraft from Extended Range Multi-Purpose (ERMP) to Gray Eagle on August 19, 2010.
- In response to the Secretary of Defense's directive to increase intelligence, surveillance, and reconnaissance support in Iraq and Afghanistan, the Army is deploying two early versions of the Gray Eagle Unmanned Aircraft System (UAS) for operational use.
- Deployment of the Gray Eagle Quick Reaction Capability 1 and 2 (QRC 1 and 2) is taking place prior to completion of IOT&E and the full-rate production decision. The QRC 1 unit completed deployment in August 2009. The Army conducted a Limited User Test (LUT) of the QRC 2 capability in conjunction with training for unit deployment to Afghanistan from May to June 2010 and deployed the QRC 2 unit in 1QFY11.
- DOT&E completed an Operational Assessment in January 2010 supporting the Gray Eagle program of record Milestone C decision and an additional Operational Assessment in August 2010 assessing the QRC 2 unit's ability to accomplish its wartime mission based on its performance demonstrated during the LUT.

### System

- The QRC 2 UAS is an early version of the Gray Eagle UAS program of record system.
- The QRC 2 unit has 17 military personnel and 29 Contractor Field Service Representatives.
- The Gray Eagle QRC 2 system consists of the following major components:
  - Four unmanned aircraft each with an AN/DAS-2 electro-optical/infrared with a Laser Range Finder/Laser Designator payload, and a Lynx II Synthetic Aperture Radar/Ground Moving Target Indicator (SAR/GMTI) sensor payload
  - Each aircraft has the ability to carry up to four Hellfire P+ missiles
  - Two Ground Control Stations designated as the One System Ground Control Station (OSGCS)



- Two Tactical Common Data Links/Ground Data Terminals
- One Satellite Communications Ground Data Terminal
- An Automatic Take-off and Landing System (ATLS)
- One General Atomics "Legacy" Ground Control Station with two C-Band Ground Data Terminals
- The QRC 2 system uses the "Legacy" MQ-1 Predator Ground Control Station for all ground and maintenance operations, as well as in case of emergency, loss of data link, or malfunction of the Automated Take-off and Landing System.

### Mission

- The QRC 2 unit is to provide 22 hours of mission support per day conducting reconnaissance, surveillance, target acquisition, armed reconnaissance, attack, and communications relay to supported units, operating day and night based on the commander's priorities and scheme of maneuver.
- The QRC 2 unit is able to autonomously and cooperatively employ Hellfire missiles.

### Major Contractor

General Atomics Aeronautical Systems, Inc., Aircraft Systems Group – Poway, California

### Activity

- The Secretary of the Air Force approved renaming the MQ-1C Mission Design Series aircraft from ERMP to Gray Eagle on August 19, 2010.
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and Afghanistan, the Army is deploying two early versions of the Gray Eagle UAS for operational use.

- Deployment of the Gray Eagle QRC 1 and 2 is taking place prior to completion of IOT&E and the full-rate production decision. The QRC 1 unit completed deployment in August 2009. The Army conducted a LUT of the QRC 2 capability in conjunction with training for unit deployment to Afghanistan from May to June 2010. The Army deployed the QRC 2 unit in the 1QFY11.
- The Army conducted the QRC 2 LUT at Edwards AFB, California, and the National Training Center (NTC), Fort Irwin, California, May 19 through June 4, 2010. The QRC 2 unit was based at Edwards AFB, where each sortie originated and concluded. The QRC 2 unit conducted missions in support of the Army's 3rd Armored Cavalry Regiment, a brigade-sized unit training at the NTC approximately 110 kilometers away. The QRC 2 unit flew 181 flight hours and conducted missions at operational ranges exceeding 150 kilometers and at altitudes exceeding 22,000 feet above mean sea level. The Army conducted the QRC 2 LUT in accordance with the DOT&E-approved Test and Evaluation Master Plan and test plan.
- DOT&E completed an Operational Assessment in January 2010 supporting the Gray Eagle program of record Milestone C decision and an additional Operational Assessment in August 2010 assessing the QRC 2 unit's ability to accomplish its wartime mission and its performance demonstrated during the LUT.

## Assessment

- The QRC 2 LUT is an excellent example of combining testing and training to support a rapid fielding initiative while simultaneously informing continued development.
- The Gray Eagle system has more capability and functionality today than it demonstrated in previous operational tests. Significant increases in capability demonstrated during the 2010 LUT include autonomous and cooperative Hellfire missile engagement capability; a Lynx II Synthetic Aperture Radar/Ground Moving Target Indicator payload; and the ability to conduct aircraft operations via satellite communications data link.
- The QRC 2 unit successfully completed 22 of 41 attempted missions during the LUT, resulting in a mission success rate of 54 percent.
- The QRC 2 unit demonstrated the capability to collect accurate and actionable combat information, but had poor capability to share that information with supported ground units. ARC-231 secure radio communications were not reliable over the line-of-sight data link and non-existent over the satellite communications data link. This precluded mission accomplishment in 6 of the 19 failed missions.
- During the LUT, remote video from Gray Eagle to the One System Remote Video Terminal was generally not available, not clear, and not reliable. Integration of Gray Eagle with a reliable remote video display system is not complete. Video integration problems accounted for two failed missions.
- Gray Eagle did not meet reliability requirements for the OSGCS, the aircraft, and the electro-optical/infrared sensor payload. The poor aircraft reliability was largely due to ARC 231 radio subsystem failures. The LUT Mean Time Between System Abort point estimate/requirement for the OSGCS is 20.1/300, the aircraft is 20.1/100, and the electro-optical/infrared payload is 90.5/250. Reliability problems accounted for six failed missions. The QRC 2 unit has an operational tempo requirement to provide 22 hours of mission support per day. The QRC 2-configured system demonstrated 78 percent operational availability during LUT compared to a requirement of 80 percent.
- Training afforded to the QRC 2 unit before the LUT was not complete. Soldiers did not receive training on fundamentals of reconnaissance, mission planning, set-up and operation of radios, distribution of video, or optimal employment of Gray Eagle. NTC observer controllers and personnel from the Training and Doctrine Command Capabilities Manager's office for UAS filled this gap during the test. The unit only received 110 of the 245 hours planned for the Doctrine, Tactics and Techniques training program due to an inability to fly because of strong winds and maintenance issues. Inadequate unit training or tactics accounted for four failed missions.
- Manning of the QRC 2 unit is not adequate to sustain the required operational tempo of 22 flight hours per day. Unit manning accounted for one failed mission.
- The operator's manual is not current and in some cases not accurate.
- The Automatic Take-off and Landing System and "Legacy" Ground Control Station worked as designed.
- The QRC 2 unit demonstrated effective target detection and recognition capability using the electro-optical/infrared sensor with Laser Range Finder/Designator. During the LUT, the QRC 2 unit had eight hits out of eight attempted live Hellfire missile engagements.
- The design of the OSGCS shelter has a number of features that reduce operator efficiency and increase operator stress and fatigue.
  - The payload video is presented to the operator on a small 5 by 7 inch window making it difficult to conduct reconnaissance tasks and identify targets.
  - The workspace allotted to each operator is limited. Operators reported inadequate space for manuals, checklists, mission orders, personal equipment, and legroom.
  - Air conditioning is required to maintain normal operation of the computers and avionics within the OSGCS. Air conditioning controls operate in either the on or off mode. There is no thermostat control allowing operators to control the internal OSGCS temperature. In order to stay warm, OSGCS operators wore hats, gloves, and cold weather gear.
  - Operator controls are not efficient. OSGCS employs a joystick that has no triggers or buttons that would allow one-handed control of the payload or aircraft. Both hands are required for many basic tasks as the operator

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provides inputs to both the joystick and the keyboard while operating the system. A cyclic-type joystick, such as those found in Army helicopters, would allow for one-handed multifunction operation of the system.

## Recommendations

- Status of Previous Recommendations. The Army addressed two of the four FY09 recommendations. Recommendations concerning the completion of development and integration of secure satellite communications links and the improvement of Ground Control Station reliability and Ground Control Shelter design remain.
- FY10 Recommendations.
  1. The Army should modify and fix the communications design so the unit is able to communicate with supported ground elements through the satellite communications data link.
  2. The Army should develop, optimize, and publish standardized procedures for distribution of Gray Eagle video to One System Remote Video Terminal and similar remote video terminals.
  3. The Product Office should redesign the ground control station by accommodating Soldier feedback on the design of seats, keyboard, air conditioning, joystick, and displays.
  4. The Product Office should improve OSGCS reliability.
  5. The Product Office should improve the reliability of the ARC 231 radio subsystem on the aircraft.
  6. The Army should revise and expand the training program and update the operator's manual.
  7. The Army should increase the manning of the QRC 2 unit or reduce its operational tempo.

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