

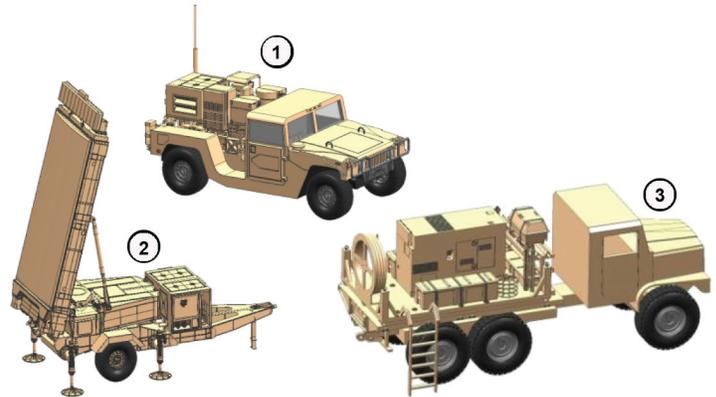
Ground/Air Task Oriented Radar (G/ATOR)

Executive Summary

- The Ground Air/Task Oriented Radar (G/ATOR) Block 1 and Block 2 Developmental Test (DT) 1C and 1D are complete. Operational Assessments (OAs) for Block 1 and Block 2 are also complete. Six low-rate initial production (LRIP) systems in the Gallium Arsenide (GaAs) configuration supported DT1C, DT1D, and both OAs. LRIP systems in the Gallium Nitride (GaN) configuration will support DT1E and both IOT&Es.
- DT1C testing at Marine Corps Outlying Landing Field (MCOFLF) Atlantic, North Carolina, was limited in scope; however, Block 1 demonstrated the ability to detect and track aircraft targets in the littoral environment and its ability to support the intended mission areas.
- During DT1C, the Program Management Office (PMO) led and the Marine Corps Operational Test and Evaluation Activity (MCOTEA) observed a Cooperative Vulnerability Assessment (CVA) and a limited Adversarial Assessment (AA). Though the CVA and AA identified cyber vulnerabilities, they were not sufficient to support a full assessment.
- During the Block 1 OA, the system demonstrated the capability to integrate into the Marine Air Command and Control System and to successfully track targets in support of air surveillance and air defense missions, but was not assessed against all target types. Block 1 demonstrated progress towards meeting reliability requirements, and did meet its operational availability requirement. The OA data were used to support an early fielding decision for two Block 1 systems in the GaAs configuration. DOT&E endorsed the early deployment in February 2018.
- During the Block 2 OA, the system demonstrated the capability to track targets in support of counterfire missions and demonstrated significant progress towards meeting reliability and availability requirements. Block 2 did not meet the time requirements for displacement and emplacement of the system. The PMO did not request an early fielding for Block 2.
- DT1E for both Block 1 and Block 2 in the GaN receiver/transmitter configuration are complete.
- IOT&E of Block 1 completed in October 2018. Evaluation and reporting are in progress. IOT&E for Block 2 is scheduled for 1QFY19.

System

- The AN/TPS-80 G/ATOR is a short- to medium-range, air-cooled Active Electronically Scanned Array (AESA) radar under development for the Marine Corps. It is intended to replace up to five current radar systems and augment the AN/TPS-59 long-range radar. The PMO plans to procure 45 G/ATOR systems.



1 - Communications Equipment Group (CEG)
 2 - Radar Equipment Group (REG)
 3 - Power Equipment Group (PEG) on MTVR pallet
 MTVR - Medium Tactical Vehicle Replacement

- The PMO is developing G/ATOR in three increments.
 - Block 1 develops the basic hardware and provides Air Defense/Surveillance Radar (AD/SR) capability. It replaces the AN/UPS-3, AN/MPQ-62, and AN/TPS-63 radar systems.
 - Block 2 is a Ground Weapons Locating Radar (GWLR) to acquire, track, and classify hostile indirect fire and replaces the AN/TPQ-46 radar system.
 - Block 3 was a series of enhancements, including Identification Friend or Foe Mode 5/S that will now be engineering changes. The term Block 3 is no longer used.
 - Block 4 replaces the AN/TPS-73 radar system for Expeditionary Airport Surveillance Radar capability, which will be a future development effort.
- The G/ATOR baseline system configuration is comprised of three subsystems:
 - The Radar Equipment Group consists of the radar array mounted on an Integrated Mobile Pallet trailer towed by a Medium Tactical Vehicle Replacement.
 - The Power Equipment Group includes a 60-kilowatt generator and associated power cables mounted on a pallet. The generator pallet is carried by a Medium Tactical Vehicle Replacement.
 - The Communications Equipment Group provides the ability to communicate with and control the radar and is mounted inside the cargo compartment of a High Mobility Multi-purpose Wheeled Vehicle.
- The first six LRIP systems have receiver/transmitter modules built using GaAs. Subsequent systems, representing the majority of the production buy, will have GaN receiver/transmitter modules.

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Mission

The Marine Air-Ground Task Force (MAGTF) commander will employ G/ATOR within the Air Combat Element (ACE) and the Ground Combat Element (GCE). Within the ACE, G/ATOR Block 1 will provide enhanced situational awareness and additional capabilities to conduct short- to medium-range radar surveillance and air defense, and air traffic control missions.

Within the GCE, G/ATOR Block 2 will provide ground weapons locating capability for conduct of counter-battery/counter-fire missions.

Major Contractor

Northrop Grumman Mission Systems – Linthicum, Maryland

Activity

- The PMO delivered six G/ATOR LRIP systems with GaAs semi-conductor technology. LRIP systems supported DT1C, DT1D, and both OAs.
 - The PMO conducted DT1C for Block 1 from May 2017 to September 2017 at NASA Wallops Flight Facility, Virginia; Marine Corps Air Station (MCAS) Cherry Point, North Carolina; MCOLF Atlantic, North Carolina; and MCAS Yuma, Arizona. DT1C included interoperability testing at Wallops Flight Facility, and at MCAS Cherry Point, while littoral testing was conducted at MCOLF Atlantic. Additionally, a PMO-led Marine Corps Information Assurance Red Team conducted a CVA and a limited AA during DT1C.
 - DT1D for Block 2 was conducted from September 2017 to March 2018 at U.S. Army Yuma Proving Ground (YPG), Yuma, Arizona, and White Sands Missile Range, New Mexico. During DT1D data were collected in support of counter-battery/counter-fires missions against rocket, mortar, and artillery munitions.
 - The Marine Corps completed OAs for both Block 1 and Block 2 during FY18 in accordance with DOT&E-approved test plans. The Block 1 OA was completed in October 2017 at MCAS Yuma, Arizona, and the Block 2 OA was completed in May 2018 at YPG, Yuma, Arizona. The results from the Block 1 OA supported an early fielding decision. DOT&E endorsed the early deployment in February 2018. The PMO did not request an early fielding for Block 2.
 - DT1E for both Block 1 and Block 2 in the new GaN receiver/transmitter configuration was completed at MCAS Yuma, Arizona, and at YPG, Yuma, Arizona.
 - Since the Marine Corps was collecting data in an operationally realistic environment, DOT&E approved DT1C, DT1D, and DT1E as integrated tests with MCOTEA observation. Further, DOT&E approved data collected to support the Block 1 and Block 2 OAs and IOT&Es.
 - The IOT&E of Block 1 completed in October 2018. Block 2 IOT&E is scheduled for 1QFY19.
- Littoral testing at MCOLF Atlantic was limited in scope, using scheduled aircraft sorties as well as aircraft targets of opportunity. Block 1 was able to detect and track these targets in the littoral environment, demonstrating its support of the following mission areas: surveillance, positive control of friendly aircraft, and intercept of hostile aircraft and missiles.
 - During the Block 1 OA, the system maintained connectivity with the Composite Tracking Network and integrated into a Cooperative Engagement Capability Network. Further, Block 1 integrated with the Phase 2, Common Aviation Command and Control System and was capable of successfully supporting Marines conducting air surveillance/air defense missions from within the Tactical Air Operations Center. However the target resources during the OA were limited and data were not collected against all target types to make a full operational assessment of the system's capabilities. Block 1 demonstrated progress, but did not meet all reliability requirements, predominately due to software instability. Block 1 met its availability requirement.
 - During the Block 2 OA, the system was capable of tracking counter-battery threat targets; however, the system did not quite meet availability requirements. As with Block 1, software stability problems, particularly during startup, degraded system reliability. This is amplified for Block 2 because the counter-battery mission requires more frequent displacement and emplacement of the system, when compared to Block 1. Additionally, Block 2 did not meet time requirements for displacement and emplacement.

Recommendations

1. The PMO should continue to monitor G/ATOR reliability and availability during the current developmental testing in preparation for the upcoming IOT&Es scheduled for 1QFY19. Additionally, the PMO should note any changes to reliability and availability as a result of the introduction of the GaN-based technology.
2. In order to fully assess G/ATOR capabilities, MCOTEA should ensure that the Marine Corps Information Assurance Red Team conducts a Cooperative Vulnerability and Penetration Assessment (CVPA) and an AA on both the Block 1 and Block 2 systems in an operationally realistic environment in support of IOT&E. The CVPA and AA should also assess operator responses to various cyber attacks in end-to-end scenarios.

Assessment

- The CVA and limited AA conducted during DT1C helped to characterize system cyber vulnerabilities. However, they were not conducted under operationally realistic conditions and did not assess operator responses to various cyber-attacks in end-to-end scenarios and therefore cannot support a full assessment.

3. MCOTEA should ensure that operationally realistic testing is conducted for all target types during IOT&E or during integrated test to fully assess G/ATOR capabilities to meet operational requirements.

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