A Radar for All Missions

The G/ATOR will replace five older Marine Corps systems

By RICHARD R. BURGESS, Managing Editor

Quick Set-Up

The G/ATOR will provide the Marine Corps with a mobile multimission expeditionary radar system.

- The three-vehicle system is transportable by three helicopters.
- Active electronically scanned array was developed from modern airborne radar designs.
- G/ATOR may satisfy radar needs for the Air Force and Army.

The Ground/Air Task-Oriented Radar (G/ATOR), designed for the Marine Corps as an expeditionary multimission radar, is going through system and integration testing and heading for a planned initial operational capability (IOC) in 2016. The TPS-80 G/ATOR, which is intended to replace five older radar systems, also is showing potential to adapt to the requirements of a long-range radar system under competition for the Marine Corps and Air Force.

Northrop Grumman Electronic Systems in Baltimore has built two production-standard G/ATOR prototypes and is testing them in the environs of Baltimore-Washington International Thurgood Marshall Airport, which provides plenty of air-tracking opportunities. One set was built with Marine Corps funding, the other was built with Northrop Grumman team funding to support integration and testing.

G/ATOR is designed to detect and track targets ranging from manned and unmanned aircraft to cruise missiles to projectiles from mortars, artillery and rocket launchers.

The G/ATOR system's major components include the Radar Equipment Group — the radar antenna and its rotating drive system — mounted on a trailer that can be towed by a truck. The flat-screen antenna array lies flat for transport and is erected for operational use. The antenna includes hundreds of transmit/receive modules for the active electronically scanned array (AESA), which benefited from development of the APG-81 AESA radar for the F-35 Lightning II Joint Strike Fighter.

The AESA radar rotates to provide 360-degree coverage, said Jeff Palombo, vice president and general manager for land forces programs at Northrop Grumman. Even while stationary and scanning in one direction, it can focus separate beams on other areas.

"If the radar is spinning and it identifies a threat, it can send the beam to linger on that threat," he said.

The UPX-44 IFF (Identification Friend or Foe) System, built by Telephonics in Farmingdale, N.Y., is installed in the radar.

The G/ATOR's Power Equipment Group that includes a generator to provide electrical power for the system is mounted on the truck that tows the radar trailer. A third component, the Communications Equipment Group, is a High Mobility Multipurpose Wheeled Vehicle (Humvee)-mounted palletized communications system that transmits radar data to a command-and-control center.

The Marine Corps is developing the Common Aviation Command-and-Control System that in the future will receive and analyze the data feed from the G/ATOR.

The entire system can be airlifted into an operational site by three CH-53E Super Stallion heavy-lift helicopters or MV-22B Osprey tiltrotor aircraft, or by a single C-130 transport aircraft. The system is required to be set up on-site within 45 minutes.

"We will be able to set up that system as designed in less than 30 minutes," Palombo said.

The G/ATOR will replace five legacy radar systems currently in Marine Corps service: the TPS-63 (air defense), TPS-73 (air-traffic control), MPQ-62 (short-range air defense), TPQ-46 (counter-fire target acquisition) and UPS-3 (target tracking).

NORTHROP GRUMMAN

The Ground/Air Task-Oriented Radar (G/ATOR), designed for the Marine Corps as an expeditionary multimission radar, is mounted on a trailer that can be pulled by a 7-ton truck and the Medium Tactical Vehicle Replacement. Northrop Grumman displayed the towable G/ATOR system at its test site at Baltimore-Washington International Thurgood Marshall Airport in September.

The G/ATOR is in its system development and demonstration phase, with qualification testing scheduled to begin next year. A decision for low-rate production is planned for 2013.

The Marine Corps has structured the G/ATOR procurement program in four increments. The Corps plans to procure 69 systems — 17 Increment 1, 38 Increment 2 and 14 Increment 4 systems — to equip the various air and ground combat elements, said David Branham, spokesman for the Marine Corps' program executive officer for land systems.

Increment 3, scheduled for 2019, is an enhancement to the other increments that includes some noncooperative target recognition and more enhanced counter measures, upgrades to IFF modes and codes, said Lee Bond, the G/ATOR program manager for the program executive officer for land systems.

Increment 1, scheduled for IOC in 2016, is "all about air surveillance, air defense, battlespace awareness, to [give] the Marine Air-Ground Task Force ashore an ability to track everything from friendly and hostile UAVs [unmanned aerial vehicles] to stealthy cruise missiles and tactical aircraft … and provide all that kind of information real-time to the forces on the ground," said Bond.

Increment 2, scheduled for service in 2017, is designed to perform the counter-battery, or ground-weapon location, mission. The radar will be able to detect incoming projectiles and compute the origins of their launch, enabling friendly forces to return fire at the source.

Increment 2 uses "slightly different waveforms, slightly different operator interface," Bond said. "One of the key nuances here is to translate those two missions, the air defense mission and the ground defense mission, that were done by two completely separate radars and two different combat elements. Now, we're going to have one radar that can fulfill either mission with G/ATOR."

In a program change, Increment 4 will precede Increment 3 and enter service in 2018. Increment 4 will replace the TPS-73 air-traffic control radar.

"We're building [Increment 4] for the Marine air wing to come ashore and for the air traffic controllers to keep track of all the good guys and the potential hostiles in the air space of interest for the Marine Air-Ground Task Force," Bond said.

"Increment 3 doesn't give you new mission capabilities, but it makes all the other mission capabilities work better, in some cases, against the more advanced threat set," he said. "Increment 3 is not tied to specific systems in the inventory. The need is still there, but in dealing with fiscal realities of strained budgets, [we've] got to prioritize what the mission needs are. It made more sense to actually deliver the 69 systems with Increments 1, 2 and 4 capabilities therein and then come in behind that delivery schedule with Increment 3 enhancements and make everything that's already out there work better."

The G/ATOR design has gone through significant changes since it was originally envisioned. The radar originally was intended to be mounted on a Humvee, but real-world circumstances forced a change.

"Shortly after the contract was awarded, the word came back from Iraq and Afghanistan that we had to up-armor all of the vehicles to protect the occupants," Bond said. "When you put more armor on the vehicle, it means it can carry less payload, so the idea of taking the whole G/ATOR radar and setting it on an armored Humvee that still has a couple Marines in it [did not] fit anymore. We ran out of space and weight.

"We looked at how the Army does the Fire-Finder radar, the radar is built into a truck which pulls its generator," he said. "What we ultimately decided to do was take the generator, put it on a truck, put the radar on the trailer which could be pulled by a 7-ton truck and the Medium Tactical Vehicle Replacement. In the Humvee was the communications equipment group.

"To figure that out, literally, took the better part of the year of design iteration, so that's another thing that contributed to the growth in the schedule since the program inception in 2005," he said.

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LEE BOND, G/ATOR PROGRAM MANAGER FOR THE MARINE CORPS' PROGRAM EXECUTIVE OFFICER FOR LAND SYSTEMS

Critical to the air mobility of the G/ATOR is its lightweight cooling system. The G/ATOR is designed to operate in ambient temperatures of -40 to +55 degrees Centigrade, with cooling provided by forced circulation from fans blowing ambient uncooled air through the array.

"It's a wide temperature range compared to how in the past we tried to control the temperature of our electronics," Bond said. "The whole array has to, within a degree or so, have the same temperature. Otherwise, you start to get different performance through the different electronics components.

"The impressive upside of that is how much weight we saved as well as plumbing complexity because we don't have to have a two-stage cooling system," he added. "[This] helps keep it light and, in our lexicon, light equals mobile and expeditionary."

The Marine Corps is spending approximately $300 million on G/ATOR Increment 1. Once delivered, the service will have the hardware in place for the subsequent increments, which involve new wave forms, processing algorithms and some operator interface functions, all software-driven changes.

"I'm not trying to suggest that it's easy, but it isn't quite as complicated as a whole other radar which, of course, was the case in the past … with different hardware, different software, different vehicles, different everything," Bond said.

G/ATOR ultimately may result in force-structure changes for the Marine Corps, Bond said. Currently, for example, in a Marine aircraft wing, air control squadrons (for air defense) and air traffic control squadrons operate different legacy systems, but G/ATOR might allow the Corps to combine those functions into one type of unit.

"You can combine how you do maintenance because it's a common hardware suite," he said. "Then you can think in terms of combining some of the operator [military occupational specialties]. … Although our IOC is in 2016, it may be as much as 10 years beyond that before the Corps would make any significant move to start [consolidation]."

Separate from G/ATOR, the Marine Corps operates the TPS-59, a large, long-range surveillance radar that G/ATOR will complement.

"TPS-59 has a longer range and G/ATOR has finer accuracies, so together they do a fine job of surveillance of the air space," Bond said.

The Marine Corps had begun a program in 2005 to replace the TPS-59 with the Highly Expeditionary Long-Range Surveillance Radar, which became a casualty of budget constraints, he said. Instead, it joined the Air Force's program to replace its similar TPS-75 radars with the program known as 3DELRR (Three-Dimensional Expeditionary Long-Range Radar, pronounced "three dealer").

Industry teams led by Lockheed Martin and East Syracuse, N.Y.-based Sensis Corp. are competing in the technology demonstration phase for 3DELRR. Northrop Grumman, which is not a participant, has proposed G/ATOR as a possible competitor when the 3DELRR program proceeds to its next phase.

The G/ATOR, which exceeds the performance of the single-mission TPS-75, meets most of the 3DELRR requirements but would have to be modified to meet all of them, Palombo said.

"We're already looking at a radar system as developed for the Marine Corps that has tremendous capability, versatility and already makes a greater than 85 percent of the 3DELLR requirements for the Air Force," he said. "The fact that [we] can provide the one capability that they've asked for and then offer other mission capabilities is the icing on the cake to the specification that is required.

"The fact that G/ATOR has such a head start, we can cut up to two years off of the anticipated 3DELLR schedule that's in place today," he said, as well as reduce unit cost to the Air Force and Marine Corps by 20 percent.

Northrop Grumman also sees G/ATOR as a possible solution for the Army's Multimission Radar (MMR) requirement.

"G/ATOR, as designed, exceeds all of the MMR specifications as we anticipate them," Palumbo said. "The one thing that would probably change for the Army is they are looking for simultaneous mission capability. We're able to do simultaneous multimission with software changes, not hardware changes." ■