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Featured Projects

Keeping The Patriot Vigilant

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First used in combat during Operation Desert Storm in the early 1990s, the Patriot Missile System is the Army's most advanced air defense system. Using ground-based radar to locate and track its targets, the system can defeat high-performance aircraft such as Russian MiG jet fighters. It can also overcome tactical ballistic missiles, cruise missiles, anti-radiation missiles, and unmanned aerial vehicles.

Notably, the system can lock onto tactical ballistic missiles from as far as 50 miles away. In fact, the Patriot—in Army service since 1985—is the only anti-ballistic missile system ever to have successfully engaged and destroyed a tactical ballistic missile in combat. (See "[Patriot Counters Missiles During Operation Iraqi Freedom](#).")

Susceptible to Corrosion

The Patriot weapon system is deployed worldwide. It is often exposed to the highly corrosive environments that exist at salt-laden tactical sites near the ocean or sea. Like any equipment left unprotected from such conditions, the Patriot system is vulnerable to corrosion that would negatively impact its reliability, performance, and overall mission readiness. More importantly, the safety of personnel would be jeopardized should a corrosion-induced mechanical failure lead to an accident. Also, corrosion would likely force the Army—and ultimately the taxpayers—to shoulder a greater financial burden. More maintenance would be required and the demand for spare and repair parts would increase.

A key component of the Patriot missile system is the fire unit, which consists of a phased array radar set (RS). According to the Army, the radar set provides all tactical functions of airspace surveillance, target detection, identification, classification, tracking, and missile guidance and engagement support. To function properly, the radar set relies on cables that serve as interface electrical connections for the phased array antenna. Corroded cables could prevent the radar set from working properly.

"The radar system could become non-mission-capable," said Jim Roberts, a Senior Engineer/Analyst with SAIC (Science Applications International Corporation), who works for the Army's Aviation and Missile Life Cycle Management Command (AMCOM). He explained that a radar system that fails to function would seriously diminish the Patriot firing battery's capability to detect, track, and engage targets such as incoming enemy aircraft and/or missiles. To mitigate the risk of failure, the Army traditionally has anticipated replacing the cables in the Patriot weapon system at least once during the system's life cycle.



The Patriot fire unit consists of an engagement control station (top) and up to 16 launching stations (like the one below) that fire up to 64 missiles. Photo courtesy of Army Aviation and Missile Command (AMCOM).



Another Approach

AMCOM and the U.S. Naval Air Systems Command (NAVAIR) have developed a cable covering material designed to protect the cables from corrosion under actual field conditions in all theater environments. The covering material uses proven sealant technology that has been qualified in accordance with strict Army Aviation and Missile Research Development and Engineering Center (AMRDEC) airworthiness guidelines.

According to AMCOM, applying the cable covering material properly would eliminate the need to replace the cables and would save approximately \$72 million over the life cycle. The AMCOM/NAVAIR team has launched a project to apply the cable covering to cables on 145 Patriot radar sets, particularly those deployed in the most corrosive environments.

Roberts noted in August 2008 that the project vendor has begun initial deliveries of these "Patriot Boot Kits" to Letterkenny Army Depot in south central Pennsylvania for installation onto the missile systems. Letterkenny provides repair support to various DoD missile systems, including the Patriot missile and its ground support and radar equipment.

At this early stage in the project's implementation, no usage data are available and none will be available for some time. However, compared to the eight-digit cost of replacing corroded cables at least once in a life cycle, the project is a testament

to the cost-effectiveness of corrosion control. The price tag of procuring and applying the cable covering on 145 Patriot systems, along with gathering and analyzing field data to prove their effectiveness, is a relatively paltry \$700,000.

Joining Jim Roberts on this project are project lead Steve Carr, AMCOM Corrosion Program Manager; Shanon Dunlap, a Senior Engineer/Analyst at SAIC who supports AMCOM; and Kate Bilderback, Lower-Tier Project Manager with the Program Executive Office—Missiles.



The Patriot radar set can detect, identify, classify, and track missile targets, as well as provide guidance and engagement support. AMCOM is taking steps to protect the radar system's vital cables from corrosion. Photo courtesy of AMCOM.