

The Self-Protection Adaptive Roller Kit (SPARK) — Negating the Improvised Explosive Device (IED) Threat for Soldiers and Vehicles

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The number one threat to Soldiers in Iraq and Afghanistan is the IED, which has been responsible for almost 40 percent of U.S. casualties in *Operation Iraqi Freedom*. There are numerous ways to activate IEDs, ranging from crude timers to command wires to remote activation via cell phone. However, one of the most common activation methods is a pressure-sensitive trigger that relies on targets to activate the IED by rolling over it themselves as they would, for example, in a vehicle. Commonly called the “Victim-Operated IED,” it is typically buried beneath the many long roads that U.S. and Coalition Forces patrol on a daily basis.

Currently, the Army has equipped three vehicle platforms with the SPARK in Iraq. Since the HMMWV is the most used vehicle in theater, it is also the most vulnerable to IED threat. Here, a SPARK-mounted HMMWV is tested at YPG before being deployed to Iraq in March 2007. (U.S. Army photo.)

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One of the newest weapons in our arsenal against this threat is the SPARK, a modular mine roller system designed to be mounted on tactical wheeled platforms. It is currently being used in Iraq on three platforms: the M114/1151 armored High-Mobility Multipurpose Wheeled Vehicle (HMMWV), the RG-31 and the M900 5-ton truck series. SPARK is managed by Product Manager IED Defeat/Protect Force (PM IEDD/PF), which is a part of the Project Manager Close Combat Systems (PM CCS), Program Executive Office Ammunition (PEO Ammo), based at Picatinny Arsenal, NJ.

Two SPARK configurations are currently available in theater. The track-width front roller configuration attaches to the frame of the RG-31 and the HMMWV, the two vehicles most commonly used for deliberate route-clearance operations. The full-width configuration attaches both a front and rear roller to the M900 5-ton truck series. This version is intended for use on vehicles that are part of fast-moving logistical convoys.

In both configurations, the front roller consists of two roller banks on the vehicle's left and right side, its sole purpose being the defeat of any IED. These roller banks provide contact with the ground, causing the IED to detonate on the roller, forcing as much of the blast down and out as possible, as opposed to underneath the vehicle. The purpose of having the two rollers in front and back in the full-width configuration is that the rear roller also has a hydraulic system that controls rollers, allowing the vehicle to move faster down the road and be more stable.

Need Necessitates Invention, While Research Refines Effectiveness

Before SPARK, there was no mine roller kit available to Soldiers for a

tactical wheeled vehicle platform. So, like many innovations, its creation was born out of immediate need and improvisation. In early 2006, enterprising U.S. Army 3rd Infantry Division members took it upon themselves to create a roller for their HMMWV out of tow bars and wheels for the M1113 vehicle.

“Soldiers do what Soldiers do best,” says COL Ray Nulk, PM CCS. “If there is a threat out there, they will take whatever they can find to protect themselves and their vehicles.”

Responding to Soldiers' needs, the Rapid Equipping Force quickly fielded two mine roller variants based on these improvisational solutions in late 2006/early 2007 — the Sharp Edge and the Sharp Knife rollers. While these new designs addressed the immediate warfighter needs, the rollers were only stopgap measures until a more effective solution could be found.

In September 2006, a Joint Urgent Operational Need Statement (JUONS) for 313 mine rollers was approved, and the newly formed PM IEDD/PF teamed with the U.S. Tank Automotive

Research, Development and Engineering Center (TARDEC) to present a commercial-off-the-shelf solution to the Joint IED Defeat Office (JIEDDO). The two organizations pooled their resources to gather data from outside sources on available alternatives.

“Prior to our JUONS, the U.S. Marine Corps had already fielded mine rollers from several different vendors,” said Robin Gullifer, Deputy PM IEDD/PF. “TARDEC had assisted them in effectiveness analysis, so we were able to leverage that data for our own purposes.”

After a thorough assessment, it was determined that of the various mine rollers in use, Pearson Engineering offered the best solution for the Army against the IED threat. Aside from having the only option that provided both blast dampening and a modular, easily repairable design, Pearson Engineering already had a history with the Army.

“Since the late 1990s, Pearson has provided a roller variant for the Stryker engineer vehicle,” noted Gullifer. “Having a similar system already in

A HMMWV equipped with SPARK and a Rhino IED detection system is put through its paces at YPG. SPARK has undergone grueling endurance testing at both YPG and ATC to ensure it was field ready for deployment to the theater of operations. (U.S. Army photo.)



production provides commonality of key components that make long-term sustainment feasible.”

Tight Collaboration Enables Rapid Acquisition

Once the Pearson roller was selected, JIEDDO approved funding on Dec. 22, 2006, and a contract through the U.S. Army Tank-automotive and Armaments Command Acquisition Center was awarded Jan. 9, 2007. Three urgent materiel releases (UMRs) for rollers to equip the HMMWV, the RG-31 and the M900 5-ton truck series were issued soon after in an extremely short time span, which needed to be fulfilled in a rapid sequence to meet fielding requirements. PM IEDD/PF received funding in December, and in a record 90 days, Soldiers in Iraq received the first delivery of SPARKs.

What made this quick turnaround possible was PM IEDD/PF working in concert with multiple key external organizations. “We collaborated with the Army Test and Evaluation Command (ATEC) and with TARDEC for engineer support, designing three unique brackets that would attach the SPARK to each vehicle.

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We were in constant communication with those in theater to coordinate distribution plans. We involved Pearson Engineering from the very beginning to work through any production issues. PM Stryker was invaluable in managing the contracting process, and the PMs for each of the vehicles were quick to offer their endorsement and support,” related Gullifer. “Working as a team with these outside organizations enabled us to put together test, UMR, production and distribution schedules that allowed us to get this equipment to the Soldier as fast as possible.”

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Thorough Testing Ensures a Solid Solution

Even though the SPARK was fielded quickly, no shortcuts were taken with testing. PM IEDD/PF, working with TARDEC and ATEC, conducted in-depth, safety-centric automotive performance testing

for the SPARK on each of the three vehicles at Aberdeen Test Center (ATC), MD. The team also performed a

SPARK mobility test at Yuma Proving Ground (YPG), AZ, where they captured data on braking, speed, turning and slope navigation. While at YPG, the SPARK underwent endurance testing, ensuring that the 3,200-pound roller system wouldn't cause any additional stress on the HMMWV — the most used, and therefore, most vulnerable vehicle of the three. Lastly, the SPARK

went through a successful blast test attached to the HMMWV.



A mechanic adjusts the tension arm of a SPARK on an M900 5-ton truck series at an FOB in Iraq. The 3,200 pound modular system has already been credited with saving dozens of Soldiers' lives in Iraq. (U.S. Army photo.)



Here, technicians finish outfitting an M900 5-ton truck series with SPARK at an FOB in Iraq. The rollers are designed to defeat pressure-sensitive triggered IEDs by forcing the blast down and away from the vehicle. (U.S. Army photo.)

Life-Cycle Management Plays Vital Part in System Success

PM IEDD/PF's involvement with the SPARK system doesn't end with system delivery. Once in theater, field support representative (FSR) teams based in four forward operating bases (FOBs) are on hand to handle installation, training and sustainment. According to Gullifer, "It's not easy sustaining anything in Iraq. In most cases, the Soldier won't contact you unless the system is falling apart or blown up. That's why our FSRs pay SPARK-issued units daily visits, interfacing with the warfighter, checking system maintenance, getting feedback on system performance, even lubing the fittings."

Vehicles equipped with the SPARK are on patrol every day, but not always with the same crew. That's why FSRs conduct regularly scheduled training on the system at FOBs, training new units, revisiting units for maintenance and training, making certain that everyone in the organization is familiar with every SPARK aspect.

Training consists of hands-on work on the roller, ensuring that units can install

and uninstall the roller, conduct basic maintenance, be cognizant of safety concerns and perform a test drive. Every crew member is given the opportunity to drive their SPARK-equipped vehicle until they feel sufficiently familiar and comfortable with it. In total, training takes from 30 minutes up to 1 hour to complete.

"Training doesn't stop with one class or one crew," remarked Gullifer. "It's a continual thing. That's why it's so important that we have FSRs on the ground integrated with the Soldier."

SPARK Saves Lives

Since the SPARK was first fielded in March 2007, it has been involved in 22 reported IED incidents and has been cited in saving many Soldiers' lives. In one instance, five Soldiers in a HMMWV hit an IED that propelled the 3,200-pound roller 20 feet from the vehicle, leaving a crater as big as the vehicle. All five crew members walked away from the blast, including the Soldier stationed in the turret. Countless times, the SPARK's modularity design has proven its effectiveness. In most

cases, systems damaged in an IED attack have returned to the battlefield within hours. One system has borne the brunt of four IED attacks and is still in the field performing its mission.

SPARK in the Future

At present, a revision to the initial JUONS is with the U.S. Army Central Command for approval to increase the number of SPARKs in theater significantly, while increasing the variety of vehicles the SPARK will support. Of the proposed new amount, the majority would be allocated to equipping armored HMMWVs, as the SPARK has proven itself to be especially effective when mounted on this vehicle.

Beyond requirements, PM IEDD/PF personnel are constantly finding ways to improve the SPARK on their own. Recent innovations include a version of the front-mounted track-width roller with lights mounted on it to assist night patrols, and integrating multiple IED defeat capabilities to combat various IED threats.

"We want to create a system-of-systems built upon the SPARK, providing the warfighter with a complete IED defeat toolkit. We are always investigating new ways to evolve the capability of the system, through analyzing event matrix data and talking directly to the Soldier in theater," Gullifer concluded.

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