

U.S. Army Gun-Monitoring RFID Prototype Gets Upgrade

Developers from Augusta Systems and the Army's Benét Labs have crafted a new design to ensure the Abrams tank guns get serviced in a timely fashion.

By Claire Swedberg

Sept. 28, 2007—One year after developing a prototype system to track the rounds fired by U.S. Army battle tanks, the U.S. Army's Benét Laboratories, together with integrator and developer Augusta Systems, has completed a redesign incorporating new sensors and an RFID interrogator deployed at a weapons depot instead of in each tank. The revamped version, the lab claims, will make it possible for military personnel to monitor RFID data for its tanks out of regional central locations.

The sensor device was designed to count the rounds fired by M1 Abrams Main Battle Tanks in the field, thereby helping the Army track when the weapons need to be serviced. A weapon fired too often can fail to operate properly and, in some instances, fire a blast inward toward the tank operators. Currently, vehicle and weapon operators manually log the number of times a weapon was fired, along with the types of ammunition used. This information is then evaluated by personnel at the weapons depot.

The initial system prototyped in 2006 included micro-electro-mechanical sensors (MEMS) that counted each firing of the weapon by detecting the pressure created by each shot (see U.S. Army Developing RFID System to Track Weapons Usage). The latest system, in contrast, will use American Science and Technology (AST) piezoelectric sensors, which contain a crystal that generates an electric current commensurate to the pressure, acceleration, strain or force applied to it. Piezoelectric sensors are more durable than MEMS, says Augusta Systems' president and chief operating officer, Patrick Esposito II, because the thin flexible piezoelectric membrane easily conforms to the surface of the gun barrel. In addition, he adds, such sensors can better withstand extreme temperatures and have a stronger serviceable life.

Another change is the elimination of a tablet PC originally slated for installation in each tank inside the vehicle. The PC, which contained an RFID interrogator to capture firing data from a tag on the weapon itself, is being replaced by readers that will be used at the Army's weapons depot, Esposito says. With the tablet PC, tank operators would have been able to view the number of firings on a screen in real time, then take the PC back to the weapons depot, where the data could have been uploaded to the Army's network. However, the physical space inside a tank is limited.

"When looking at the M1 Abrams or any similar vehicle," Esposito explains, "the available area for tablet PCs is minimal." Therefore, the Intelleflex battery-assisted passive UHF (902-928 MHz) STT-7000 tag, complying with the ISO 18000-6c air-interface protocol, will store a count of weapon firings on a microprocessor built into the tag. When the tank returns to the weapons depot for servicing, he says—which happens at varying degrees of regularity—the tag's data and unique ID number will be captured by a fixed-position Intelleflex I-Beam reader.

Sometime next year, Esposito says, Augusta and Benét Laboratories intend to transition to a handheld RFID interrogator that has more features and can be carried to the tank to capture data, then send that data wirelessly. The data itself will be routed from the interrogator to an Army PC, and Augusta's SensorBridge software will direct that data to the Army's back-end system, as well as to the PC screen for review by weapons maintenance staff. Personnel can also input environmental conditions that might affect the operation of the weapon, such as hot weather and sand, which could influence the ultimate determination as to when the weapon requires its next servicing.

The system is expected to be in use by the U.S. Army by the fall of 2008, Esposito says. In the meantime, researchers at Augusta and Benét Laboratories intend to increase the durability of the tags, which attach to the barrel of the weapon, allowing them to better withstand harsh operating environments. This ruggedization, he notes, can be achieved by encasing the tag in packaging or enclosure materials designed to endure environmental extremes. "So, the emphasis will be more on the packaging or enclosure than the sensor or RFID tag." The partners also hope to migrate the platform, he says, making versions of the system for other vehicles or branches of the military.

RELATED_ARTICLES "Obviously," says Esposito, "we're very proud that Bénet Labs and our team were able to put the system together so quickly." He predicts the RFID system will increase operational efficiency for the Army, while also reducing the risk of a misfire.

Over the next few months, Bénet and Augusta researchers intend to test additional sensors that would measure the intensity of the applied force, heat, vibration and other physical effects on a gun barrel. Their goal is to integrate such sensors into tags the Army will start using in 2008.

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