

Sensing Beyond the Visible

Combat-Enabling Technologies Increase Warfighter Safety in Iraq

Christina Cavoli ■ Maj. Fritzgerald McNair, USA

Effective acquisition command, a unique relationship with the Army's Night Vision and Electronic Sensors Directorate (NVESD) at Ft. Belvoir, Va., rapid integration of cutting-edge technology, and dedication to providing the warfighter with the ability to "see beyond the visible"—the combination has resulted in three unique battlefield revolutions.

Product Manager Forward Looking Infrared (PM FLIR), located at Ft. Belvoir, is the product management office under the Program Manager Night Vision/RSTA responsible for providing infrared (IR) imaging sensors for DoD combat platforms. The goal of PM FLIR is to enable "sensing beyond the visible" to reveal threats that might otherwise remain unseen or blended into the environment. When soldiers are in harm's way, these technologies give them the ability to see what is really out there and protect themselves like never before.

Of the 14 different programs currently managed by PM FLIR, three are of particular note as capabilities that have been proven combat enablers, have enhanced mission capability, and provide both force protection and a distinct advantage over the bad guys: Second Generation FLIR (SGF); Long Range Advanced Scout Surveillance System (LRAS3); and Driver's Vision Enhancer (DVE).

Second Generation FLIR Tops 2,000 Fieldings

The SGF program provides enhanced reconnaissance, surveillance, and target acquisition capabilities. It is particularly effective when other systems fail as a result of reduced visibility from poor atmospheric conditions or in the presence of battlefield obscurants. The Army's Horizontal Technology Integration (HTI) Second Generation



Driver's Vision Enhancer provides thermal imagery to increase drivers' vision and, therefore, mobility in low-visibility conditions of all kinds. On the left, the view at night as seen with the naked eye; on the right, the DVE-assisted view. U.S. Army photographs.

FLIR (SGF) systems provide a common battlefield scene to armor, mechanized infantry, and reconnaissance forces, and allow warfighters to see more clearly and farther than ever before.

The Army's Second Generation Forward Looking Infrared (FLIR) via the HTI concept, or commonality of design, involves insertion of a common second-generation thermal sensor, known as the B-Kit, into the Army's highest priority ground-based platforms: the M1A2 SEP Abrams tank, the M2A3/M3A3 Bradley Fighting Vehicle, M707 Knight Vehicle, M1114 Up-Armored HMMWV, the next generation M1151 Armored HMMWV, the Stryker Brigade Combat Team's Reconnaissance and Fire Support Variant (RV/FSV), and the Navy's PHALANX Weapon Systems (CIWS), Close-In Weapons Systems. The B-Kit is integrated into each platform through the use of platform-unique integration A-Kits.

Since the fielding of the 1,000th SGF in September 2002, another 1,000 SGFs have been fielded to U.S. combat vehicles. On Jan. 27, 2005, PM FLIR fielded their 2,000th SGF to combat vehicles in the 1st Battalion, 8th Infantry (Fighting Eagles), 3rd Brigade Combat Team at Fort Carson, Colo.

Cavoli is Defense AT&L contributing editor. McNair is assistant product manager for the Driver's Vision Enhancer program and was a liaison officer to the multi-national corps in Iraq during Operation Iraqi Freedom 2.

Greater Capability, Lower Cost

SGF now provides warfighting forces worldwide with greatly increased probability of target detection, recognition, and identification at longer ranges than the first generation FLIR. The SGF program provides M1A2 SEP tanks and M2/M3A3 Bradley Fighting Vehicles with a “hunter-killer” capability that allows the vehicle commander to scan for threats while the gunner engages targets. SGF doubles combat identification ranges previously achieved with first generation FLIR.

An impressive aspect of the SGF B-Kit is that the improved design comes with a lower price tag. It has continually been reduced in unit price over the duration of the production phase for a total savings of over 119 percent. This is particularly significant in that the product management office has continuously maintained two qualified suppliers who have greatly enabled industrial base responsiveness throughout the fluctuating demands of wartime production.

LRAS3 Saves Lives in Iraq

The LRAS3 provides U.S. Army armor and infantry scout platoons with a long-range reconnaissance and surveillance sensor system whose capability is significantly enhanced when compared to the previously fielded AN/TAS-6, Night Observation Device, Long Range (NODLR). The LRAS3 permits scouts to detect targets at ranges in excess of three times the NODLR system’s capabilities, enabling them to operate well outside the range of currently fielded threat direct fire and sensor systems. The line-of-sight, multi-sensor suite provides real-time target detection, recognition, and identification capability with 24-hour and adverse-weather operation. The LRAS3 also determines far-target location coordinates. The LRAS3 operates in both mounted and dismounted configurations.

The LRAS3 consists of an SGF with long-range optics, an eye-safe laser rangefinder, a day video camera, and a global positioning system (GPS) with altitude determination. The LRAS3 is a digital system, allowing it to export targeting information to the Army Battle Command System (ABCS). The LRAS3 exports far-target location coordinates to the Force XXI Battle Command, Brigade-and-Below (FBCB2) System.

Positive Feedback

Prior to having LRAS3, soldiers would maneuver vehicles along the low ground to avoid detection by enemy forces. Because of the system’s long-range target acquisition capabilities, after receiving LRAS3, soldiers have increased flexibility in their tactics, techniques, and procedures to allow maneuverability along the high ground. This allows the crew greater opportunity to acquire more enemy targets without having to assume unnecessary, higher-risk courses of action. The range capability and image clarity

The SGF program provides M1A2 SEP tanks and M2/M3A3 Bradley Fighting Vehicles with a “hunter-killer” capability that allows the vehicle commander to scan for threats while the gunner engages targets.

provided by LRAS3 are credited with preventing several fratricides in Iraq because operators could distinguish between enemy and friendly vehicles beyond the ranges of other conventional systems.

Feedback from the field is positive. Infantry scouts interviewed from D/9 Cavalry (Dark Horse), 1CD, attested that “now, when we use it [LRAS3], we can tell the difference between a man planting a bomb and children playing several miles away on a moonless night. We love it! We could not have done our jobs without it and it has definitely saved lives.”

Training Opportunity

In February 2005, PM FLIR, in concert with Raytheon Co., NVESD, PM Light Tactical Vehicles, and O’Gara-Hess/Armor Holdings Co., successfully conducted critical LRAS3 installation training on an M1114 Up-Armored HMMWV in rapid response to operational requirements from combat units in Iraq. This was a rare and valuable training opportunity, since there are currently only a handful of M1114s in the continental United States, as most of the fleet is in operation overseas. Also, PM FLIR and the Raytheon installation team were able to rapidly deploy as a combined product improvement team to Iraq in March 2005 in support of OIF 3, where they installed numerous LRAS3 vehicle installation kits on combat vehicles for the 3ID(M).

The training allowed key players to validate the materials, tools, equipment, and time necessary to complete an up-armored HMMWV installation. This crucial materiel-

readiness exercise was successfully conducted under austere and hostile conditions in a theater where resources are extremely scarce. Additionally, the event allowed managers, engineers, and technicians from multiple organizations to network together, paving the way for future teamwork, coordination, and problem solving for upcoming LRAS3 fieldings on up-armored vehicles.

The LRAS3 program also produces a specialized system variant known as the Fire Support Sensor System (FS3) featuring a modular laser designator that is integrated on the LRAS3. FS3 provides field artillery fire support teams the capability to detect, recognize, locate, and designate targets, and to send digital self/target location data to fire-support computers. FS3 enables the commander to attack targets with a variety of conventional and precision (GPS- and laser-guided) munitions at extended ranges, with increased accuracy, and in both day and night operations.

DVE Reveals the Invisible

The DVE program provides U.S. armed forces a thermal imaging system for use on combat vehicles and tactical wheeled vehicles, allowing for safer movement in support of fast-paced combat operations. DVE provides thermal imagery that greatly increases the operator's mobility in rain, snow, or fog, either day or night, and in battlefield obscuring agents (dust, sand, and smoke). DVE provides for situational awareness, vehicle tracking, and allows combat and combat-support elements to move as an integrated force. DVE greatly enhances force projection operations for watercraft as well as ground vehicles.

The DVE sensor module uses second-generation uncooled (lowest-cost) thermal imaging technology. The driver uses a state-of-the-art flat-panel display and control module that provides easy access to interface controls. Power for DVE is provided from the vehicle electrical system. DVE video imagery may be distributed to other vehicle crewmembers, and as a designated HTI system, the DVE can be easily adapted to any current or future U.S. or NATO combat and tactical wheeled vehicle.

The DVE system cost is very low compared to other FLIR sensors. The sensor module is a state-of-the-art second-generation FLIR with high resolution and fidelity. The display screen consists of a high-quality commercial flat-panel display and control module. The system is driver-friendly and easy to use on wheeled and tracked vehicles alike.

Fielding the System

In support of the Department of the Army's accelerated priority fielding to the 82nd Airborne Division for the DVE system and the division's operational requirement for thermal night vision driving capability, PM FLIR fielded DVE systems to all Improved Target Acquisition Systems

companies within the division's infantry battalions. The fielding also supports the 82nd's combat readiness for rapid deployment to combat theaters.

As part of the fielding, PM FLIR's new equipment training team provided soldiers with hands-on, train-the-trainer-level instructions on complete operations and maintenance of the DVE system, including driver's training. As a result, soldiers who are current operators/maintainers within the division are now certified to serve as instructors for sustainment training within each unit.

Just prior to the DVE fielding to the 82nd Airborne Division, PM FLIR worked intensively from March through May 2004 with the U.S. Army Operational Test Command's Airborne Special Operations Test Directorate for Airborne Drop Testing. The DVE system survived the series of tests and left the Normandy drop zone with the coveted all-American seal of approval in the form of an airborne drop test certification. This major milestone authorized the DVE system to be fielded to all U.S. Army Airborne and Special Operations Units.

DVE now provides the 82nd ABN Division the same combat-tested and proved enhanced capability to perform maneuver operations, reconnaissance, and security missions with greater speed, safety, and survivability by means of a 24-hour, all-weather driving capability that the heavier Stryker Brigade Combat Teams have successfully employed in OIF. Additionally, since 2002, the United States Marine Corps has fielded 2,248 DVE Systems with PM FLIR for its M1A1 tanks, light armored vehicles, and amphibious assault vehicles.

Co-author Maj. Fitzgerald F.S. McNair, the assistant product manager for DVE and a liaison officer to the multi-national corps in Iraq during OIF 2 says, "Our [DVE] product team conducts after-action reviews with units and crews as often as possible. We've successfully worked over the past 12 years of the DVE program translating troop feedback into system improvements for our product line that have directly increased troop survivability and effectiveness in the most harsh and hostile combat environments."

DVE Passes Muster

During OIF1, the 2nd Transportation Company was attached to 4th Infantry Division with a mission to move combat equipment on a 24-hour basis. According to the unit commander, "This technology [DVE] is a true combat multiplier. Just as the combat arms require the ability to maneuver in adverse conditions in order to gain the edge over enemy forces, this technology allows the 'supporters' to gain the edge and maneuver the warfighter into the theater in order to do their jobs. The technology, coupled with experience, allowed the 2nd Transportation Heavy Equipment Transport (HET) Company to lead the

To sustain its edge in sensing beyond the visible in a hostile world, the U.S. Army is pursuing revolutionary developments in sensor hardware and software to preserve our warfighters' technical superiority.

way in moving the 4ID, 3ACR, 1AD, 2ACR into the fight and then the retrograde of 3ID.”

DVE was equally lauded by combat arms troops. McNair, citing one Marine Corps OIF consolidated field report, says, “Tank crews stated that the DVE had an excellent picture. It was a plus to be able to see through dust and smoke. Crewman felt that the DVE was far superior to the older night optical device. USMC Scout and TOW units requested HMMWV mounts for DVEs similar to ones used on U.S. Army platforms.”

The DVE fielding to the 82nd Airborne Division was the first to U.S. Army Light Infantry Forces. Because of growing operational demand for low-cost infrared sensors on the battlefield, DVEs are scheduled to be fielded to all brigade combat teams in all Army divisions starting in January 2006. “DVE and PM FLIR products allow ground troops in combat to ‘See First, Understand First, and React Sooner.’ Soldiers are our best sensors and the best in the world. We strive to provide the warfighter who leads the charge with the very best acquisition corps support possible. This way, the best continues to support the best.

The next version of DVE, currently under development, will feature an ability to export data for linkage to the digital battlefield. The current DVE version is in full-rate production, and over 4,500 DVEs have been fielded to Army, DoD, and U.S. government agencies. DVEs have also been installed on the following watercraft: the Army’s Theater Support Vessel; the U.S. Coast Guard 26-foot patrol boat;

and the city of Los Angeles Harbor Department 31-foot patrol boat.

A Formula for Success

Several factors account for the success of PM FLIR programs. The collocation of PM FLIR and PM NV/RSTA headquarters with the Army’s Night Vision and Electronic Sensors Directorate (NVESD) at Ft. Belvoir has allowed for a close and symbiotic professional relationship to develop over the past eight years. This synergy also leverages NVESD’s 51-year history as the premiere night vision research and development institution in the world, directly responsible for U.S. forces’ pre-eminence in owning the night. This scientific and business partnership enables PM FLIR to provide the best night vision technology to soldiers at the possible best value.

PM FLIR has further demonstrated acquisition excellence through its rapid and effective ability for spiral development in taking new technology research, development, and design and turning them corporately into cost-effective solutions for warfighters that yield tangible results—saving lives. PM FLIR is effectively responding to the rising demand for inexpensive infrared sensors on the battlefield for a growing population of DoD maneuver platforms. The bottom line remains that improved IR sensors = greater situational awareness + greater combat identification + greater combat effectiveness + fratricide reduction. PM FLIR continually strives to meet these validated joint/coalition requirements through operationally relevant evaluations, improving and implementing combat-ready material solutions, and effectively managing life cycle costs.

On the horizon is 3rd generation FLIR. To sustain its edge in sensing beyond the visible in a hostile world, the U.S. Army is pursuing revolutionary developments in sensor hardware and software to preserve our warfighters’ technical superiority. The suite of emerging technologies promises the warfighter increased lethality and survivability by allowing troops to rapidly detect targets and subsequently engage them at ranges double those that are currently possible. Exploiting the advantages of multiple infrared wave bands in a single, state-of-the-art thermal detector housing will enhance target acquisition of even obscured targets and overmatch enemy countermeasures (such as camouflaged targets, smoke, electromagnetic interference). The 3rd Generation FLIR will be a critical element in maintaining the warfighting dominance of U.S. current and future forces as the eyes of the battlefield.

For more information, contact fritzgerald.mcnair@belvoir.army.mil.