ELECTRONIC WARFARE TEST

SFC Charles Corley, Electronic Warfare Officer with 2nd Squadron, 108th Cavalry Regiment, 224th Sustainment Brigade, 103rd Sustainment Command (Expeditionary), checks equipment for a convoy escort team at Contingency Operating Base Adder, Iraq. PEO Simulation, Training, and Instrumentation tested electronic warfare systems against new threats during the Army's first Network Integration Evaluation. (U.S. Army photo by SGT Alan Smithee.)

THREAT TEST

Realistic electronic warfare and computer network operations environment supports Network Integration Evaluation

by William H. Spinks Jr., Jim Wood, and Chip Brown

As the Army's tactical network has evolved into a system-of-systems architecture with advanced cyber technologies, a cohesive information operations (IO) capability—especially electronic warfare and computer network operations—is required to test against new threats and to ensure that the Army's tactical systems are resilient and survivable against adversaries with developing IO capabilities.

To help achieve these capabilities, the U.S. Army Program Executive Office for Simulation, Training, and Instrumentation (PEO STRI) provided key support to the Army's first Network Integration Evaluation (NIE) this summer through its Project Manager Instrumentation, Targets, and Threat Simulators (PM ITTS) office.

With the NIE's focus on an integrated network, the U.S. Army Test and Evaluation Command (ATEC) implemented a test plan calling for a robust and viable threat force and technically advanced instrumentation equipment. To satisfy the NIE's threat needs, PM ITTS established and fielded a robust electronic warfare and computer network operations environment, deploying threat systems and personnel to White Sands Missile Range, NM, to provide threat signal intelligence, direction finding, and jamming representation consisting of signal analysis systems, a Threat Computer Network Operations Team (TCNOT) under the purview of 1st Information Operations Command (1st IOC), and a suite of six threat jammer assets.

"Our support to NIE represents the largest deployment of threat equipment to a single event in over a decade and is a direct result of several years of successful acquisitions and planning to stay synchronized with Army needs," said Brian Hill, Acting Director of PM ITTS' Threat Systems Management Office (TSMO).

PROTECTING ESCORT TEAMS

SPC Harold Davis, a Computer Detection Systems Repairer with the 749th Combat Sustainment Support Battalion, 4th Sustainment Brigade, 103rd Sustainment Command (Expeditionary), upgrades a Counter Remote Control Improvised Explosive Device Electronic Warfare system at Contingency Operating Base Adder, Iraq. Specialists such as Davis work to keep convoy escort teams safe from remote-controlled improvised explosive devices in Iraq and Afghanistan. These devices were tested against new threats during the NIE. (U.S. Army photo courtesy of 4th Sustainment Brigade.)

INTEGRATED THREAT FORCE

Because PM ITTS' support to NIE is expected to increase with follow-on NIE events, PM ITTS is developing solutions that will enable the fielding of the Army's first Integrated Threat Force (ITF).

The ITF is designed as a test and evaluation solution to augment threat mission control, situational awareness, threat fidelity, and reporting of threat force portrayal. The ITF accomplishes this by seamlessly integrating individual threat-faithful systems into one cohesive threat force capable of providing the following capabilities: mission control, communications, situational awareness visualization, and collaboration.

ITF is designed to support various test sizes and constructs using the following threat systems:

- **Networked Electronic Support Threat Sensors,** a suite of electronic surveillance capabilities that includes direction finding, signal collection, and signal exploitation. The system provides ITF the ability to detect, locate, and identify Blue Force emitters.
- **Threat Signals Injection Jammer (TSIJ),** an electronic attack system that allows tactical radios to be jammed and evaluated without conducting disruptive open-air electronic warfare testing. The program develops and procures state-of-the-art threat signal injection jammers with remote control capability. The TSIJ program consists of two components: the Control Signal Transmitter (CST) and Remote Jamming Unit (RJU). The CST controls the amplitude of the injected waveform, as well as the selection of the jamming waveform. The RJU is a jamming component that is connected directly to the system under test. It can perform jamming on communication and GPS signals.
- **Network Exploitation Test Tool (NETT),** a comprehensive computer network operations capability that delivers an integrated suite of open-source exploitation tools. It is designed to enable information warfare professionals to conduct live penetration and distribution tests on friendly

force systems for vulnerability analysis and system evaluation. The NETT system allows for the security testing of computer network-based systems, whether they are enterprise- or battlefield-focused platforms.

- **Threat Intelligence Electronic Warfare Environment (TIEW-ENV),** which supports the establishment of a wrap-around threat environment to evaluate, demonstrate, and employ the electronic warfare capabilities of enemy forces in simulated real-world test and training events. TIEW-ENV provides the capability to import vignettes, establish virtual entities, connect live assets, and interact among the live, virtual, and constructive environments.
- **Mobile Commercial Network Infrastructure Test Range,** a closed-loop cellular network infrastructure capable of generating a realistic electromagnetic environment that provides a wireless network capable of supporting voice and data communications across the 2-2.75 Generation Global System for Mobile Communications and 3G Universal Mobile Telecommunication Standard for cellular devices.
- **CICADA,** a highly mobile, state-of-the-art communications jamming system capable of jamming numerous active radio nets, including frequency hoppers. It features several jamming modes that can be used against frequency hoppers, cell phones, and satellite navigation. The jammers are controlled either by an operator or remotely by an electronic warfare operations center. The operator can program the system to jam only certain signals, scan the environment, and/or become active only when those signals are present. Specific signals also can be "blanked out" or blocked from jamming.
- **Threat Unmanned Devices (TUD),** an intelligence, surveillance, and reconnaissance capability that portrays threat force sensor-to-shooter engagement timelines and linked unmanned ground sensor and aerial sensor capabilities. The TUD program encompasses the integration of aerial sensor packages (electro-optical/infrared sensor and laser designator) and a control signal transmitter onto a low-radar, cross-section aerial platform. Plans include procuring and integrating seismic and acoustic ground sensors over the course of this program.
- **Wideband Configurable Controlled Jammer,** which provides a dynamic, flexible, re-programmable open-air jamming asset designed to replicate threat jamming systems, with special consideration for video and microwave links. The system uses digital waveform generators to replicate waveforms that are threat-representative and controllable in power. More important, it can be tailored to notch out or inhibit

ANALYZING THE SPECTRUM

CPT Thomas Mesloh, Electronic Warfare Officer for 2nd Squadron, 108th Cavalry Regiment, 224th Sustainment Brigade, 103rd Sustainment Command (Expeditionary), discusses the measurements on a spectrum analyzer with a convoy escort team commander at Contingency Operating Base Adder, Iraq. During the NIE, PM ITTS tested electronic warfare systems against the possibility of new threats from adversaries with IO capabilities. (U.S. Army photo by SGT Alan Smithee.)

> "OUR SUPPORT TO NIE REPRESENTS THE LARGEST DEPLOYMENT OF THREAT EQUIPMENT TO A SINGLE EVENT IN OVER A DECADE AND IS A DIRECT RESULT OF SEVERAL YEARS OF SUCCESSFUL ACQUISITIONS AND PLANNING TO STAY SYNCHRONIZED WITH ARMY NEEDS."

transmissions in certain protected radio frequencies, thereby minimizing any spurious or out-of-band emissions.

COLLABORATIVE EFFORTS

Other test support provided by PM ITTS during the NIE included augmentation of the 1st Battalion, 1st IOC "Red Team," as part of an ongoing cooperative relationship between the 1st IOC and the TSMO TCNOT. The 1st IOC Red Team emulates adversarial capabilities that target a unit's information system, mission control system, and decision-making process. Red Team missions have a dual purpose—to strengthen unit readiness and to verify the effectiveness of countermeasures.

To support future efforts such as the NIE and to find reuse for capabilities produced under the Operational Test-Tactical Engagement System Communications Upgrade (OT-TES CU) program, PM ITTS has been working with members of ATEC at Aberdeen Test Center, MD, and White Sands Missile Range to use the KOV-37s developed under the OT-TES CU program. The KOV-37 is a ruggedized, electromagnetic-compliant, Type I encryption-certified device. It is a highly efficient processing and memory system capable of storing and applying digital terrain databases. The KOV-37's possible uses include a variety of test and training applications for which an in-line encryptor is required to protect classified data transmissions or to meet network security requirements.

Along with the KOV-37s, the Hybrid Network (HyNet), another product developed under the OT-TES CU program, has reuse capability. HyNet is an Internet Protocol-based, spectrum-efficient network solution. HyNet is easily adapted to support a variety of test, training, and possibly tactical network communication requirements where network coverage and reliability are priorities.

Integration tests with the KOV-37s, HyNet, the Advanced Distributed Modular Acquisition System, and the Common Range Integrated Instrumentation System Rapid Prototype Initiative radios in May were successful. The certification event at Aberdeen is scheduled for October and involves additional assets from the OT-TES CU program.

COL Mike Zarbo, PM ITTS, said of the support his organization provided to the first NIE, "Not only do we provide the threat equipment to ensure our systems under test get put through their paces in a realistic, threat-representative operational environment, we also provide the right mix of instrumentation required to determine if these systems are performing up to expectations."

William H. Spinks Jr. is Chief of the Test Investment and Support Division for PM ITTS' Threat Systems Management Office (TSMO). Spinks holds a B.A. in theatrical design and technology and a B.S. in electrical engineering from Auburn University. He is Level III certified in program management, Level I certified in systems planning, research, development, and engineering – systems engineering, and Level I certified in systems planning, research, development, and engineering – program systems engineering. Spinks is a member of the U.S. Army Acquisition Corps.

Jim Wood, an Electronic Consulting Services Inc. employee, supports the TSMO as a Systems Engineer. Wood holds an A.A.S. in electronics from El Paso Community College.

Chip Brown is a Senior Advisor for PM ITTS supporting the OT-TES, Objective Helicopter Icing Spray System, and the Aviation System Test Integration Lab. Brown holds a B.S. in aeronautics from Embry-Riddle Aeronautical University and is pursuing an M.S. in aerospace engineering at Embry-Riddle.

INTEGRATION IMPERATIVE

Transforming live training through common standards

by James Todd and Dr. Jeremy T. Lanman

FORCE-ON-FORCE

1st Cavalry Division Soldiers enter a Joint Readiness Training Center village at Fort Polk, LA, to conduct maneuvers during a force-on-force (FOF) exercise. The LT2 training systems, provided by PEO Simulation, Training, and Instrumentation, allow for feedback during FOF and force-on-target training. (U.S. Army photo by Linda Crippen, U.S. Army Training and Doctrine Command.)

The Army "Leader Development Strategy for a 21st Century Army," released in November 2009, puts forth an imperative to "replicate the complexity of the operational environment in the classroom and at home station." GEN Martin E. Dempsey, Chairman of the Joint Chiefs of Staff and former Army Chief of Staff, has stated that one of the important initiatives underway to ensure that we address this imperative is the Army Training Concept.

In his article "Driving Change Through a Campaign of Learning" in the October 2010 issue of *Army* Magazine, Dempsey, then Commanding General (CG) of U.S. Army Training and Doctrine Command (TRADOC), stated, "The concept of our concurrent integrated training environment is designed to make our training more rigorous and relevant in the schoolhouse, at home station and at the combat training centers." Dempsey went on to explain that the "Army Learning Concept addresses the learning environment we envision in 2015. Its objective is to improve our learning models by employing technology without sacrificing standards."

TRADOC expands on this objective in the *U.S. Army Training Concept 2012-2020*. LTG Michael A. Vane, now retired and then Deputy CG, Futures and Director of the Army Capabilities Integration Center, stated that the Army Training Concept identifies the training requirements and capabilities necessary to build and sustain an Army that is adaptable in full-spectrum operations.

The Program Executive Office Simulation, Training, and Instrumentation (PEO STRI), through its Project Manager Training Devices (PM TRADE), has the mission to transform live training to meet the objectives outlined by Dempsey. PEO STRI is in the business of training Soldiers and growing leaders by providing responsive, interoperable simulation, training and testing solutions, and acquisition services. Within these capabilities is a dynamic set of live, virtual and constructive, embedded and interoperable products that are used throughout the world, including the Live Training Transformation (LT2) product line (see Figure 1).

The LT2 product line consists of open architectures, common components, standards, processes, policies, governance, documentation, and other core assets reflecting common standards that promote industry innovation and competition and establish frameworks for developing live training systems in support of the Army's objectives.

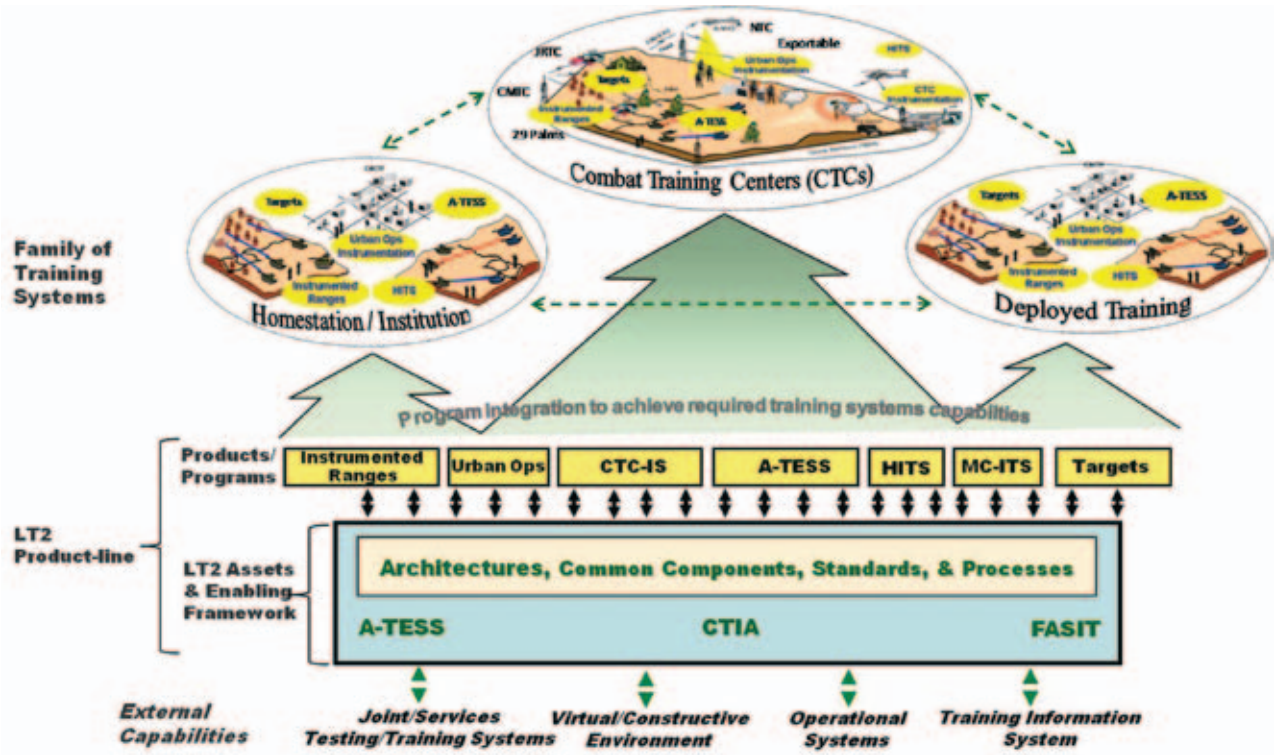
The Common Training Instrumentation Architecture (CTIA), the foundation architecture of the LT2 product line, expands on current capabilities by eliminating gaps between current and future weapon systems and the live training systems available to support them. The LT2 product line strategy synergizes training instrumentation, targets, and tactical engagement simulation systems to ensure the efficiency and effectiveness of training during peacetime, mobilization, mission rehearsal, and in theater during deployed military operations.

ADVANCED TRAINING

Fort Jackson, SC drill sergeants line up to fire from 300 meters during Asymmetric Warfare Group training. The course reinforces Basic Rifle Marksmanship skills and is intended to give drill sergeants tools they apply to training their Soldiers. The LT2 program reduces the burdens on live-fire ranges by eliminating the unique training and maintenance associated with having multiple control systems. (U.S. Army photo by Chris Rasmussen, *Fort Jackson Leader*.)

System Capabilities

Figure 1



SYSTEM CAPABILITIES

The LT2 Family of Training Systems is designed to ensure the efficiency and effectiveness of training during peacetime, mobilization, mission rehearsal, and in theater during deployed military operations. (SOURCE: PEO STRI.)

STRATEGIC BENEFITS

The next generation of products is proceeding under the new Consolidated Product-Line Management (CPM) contract. The CPM is a development strategy to address future training system acquisitions by focusing on the shared requirements and automated configuration management of all live training systems. The strategic objectives are to maximize commonality, encourage systematic reuse of software components, and ensure interoperability within the Live, Virtual, and Constructive Integrated Training Environment.

LT2 products provide the means to plan, prepare, execute, and provide training feedback for force-on-force and force-on-target training. Further, LT2 products provide plug-ins to virtual and constructive training systems, the Army's mission command systems, and Joint National Training Capability systems. After initial annual investments, the LT2 product line has achieved approximately $160 million in total system life-cycle cost avoidance and is projected to achieve an additional $40 million in cost avoidance over the next five years (see Figure 2 on Page 54).

CUSTOMER VALUE

The Marine Corps Range Modernization/Transformation (RM/T) program is a Live Training Family-of-Systems program that supports planning, situational awareness, exercise control, and after-action review capabilities. However, because of system complexity, various acquisition strategies led the Marine Corps to produce stovepipe systems resulting in duplicative capabilities. A requirements analysis determined that the Marine Corps should leverage the Army's LT2 product line. As a result, the Army's PM

> "THE CONCEPT OF OUR CONCURRENT INTEGRATED TRAINING ENVIRONMENT IS DESIGNED TO MAKE OUR TRAINING **MORE RIGOROUS AND RELEVANT** IN THE SCHOOLHOUSE, AT HOME STATION AND AT THE COMBAT TRAINING CENTERS."

TRADE and the Marine Corps' Program Manager Training Systems (PM TRASYS) formally signed a memorandum of agreement (MOA) to establish a partnership. The two PMs expanded this relationship with an MOA signed in June.

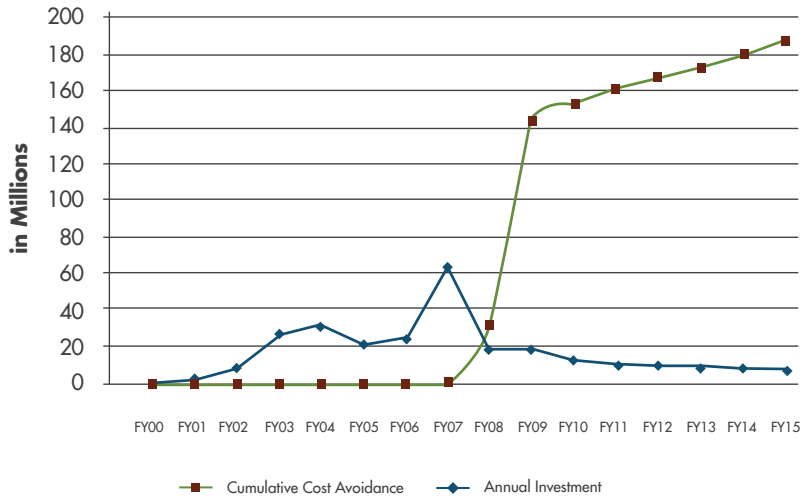
The primary goal is to achieve life-cycle cost savings across Marine Corps RM/T and Army LT2 programs by: promoting joint interoperability; implementing architectural standardization; and maximizing reusability and commonality of existing LT2 product-line assets.

The first Marine Corps product to be co-developed was the Marine Corps-Instrumented Training System (MC-ITS). The MC-ITS program was developed with 87 percent reuse of Army LT2 product-line software components and infrastructure. The remaining 13 percent were Marine Corps-specific capabilities that were developed and subsequently extended back into the LT2 product line.

The acquisition cost and schedule for building a new alternative system were quoted at $19 million and nine years. The actual cost and schedule were $8 million and two years, resulting in an immediate cost savings of $11 million and a seven-year schedule.

LT2 Product Line Return on Investment

Figure 2



COST AVOIDANCE
It is projected that the LT2 product line will achieve an additional $40 million in exponential cost avoidance over the next five years. (SOURCE: PEO STRI.)

TARGET MODERNIZATION

The Target Modernization program is a dynamic example of the strengths of the LT2 product line. The core of the program is the Future Army System of Integrated Targets (FASIT) standard. Leveraging common performance, communications, protocol standards, and specifications, FASIT defines an architecture and product line that aligns with the CTIA and LT2 constructs. FASIT helps the Army lower the total ownership and operating costs of its live-fire ranges.

Using the FASIT standard, the Target Modernization program provides a common solution set for range devices, including a single, government-owned, common controller for all Army targets; a standard performance specification; a

WORKING PARTNERSHIP

U.S. Marine Corps Col David Smith (left), Program Manager Training Systems (PM TRASYS), and COL Mike Flanagan, Project Manager TRADE, sign a memorandum of agreement establishing a partnership of technical support between PM TRADE's LT2 product line and PM TRASYS' common live training systems. (U.S. Army photo courtesy of PEO STRI.)

standard set of interfaces; and a methodology for target development and technology insertion.

The FASIT construct is built on the following principles:

- Solutions that allow interoperability of any vendors' devices on the same network at the same time, with no unique configuration settings.
- Requirements definition that includes only capabilities utilized by all use cases, with modular solutions for the remaining requirements.
- Strongly managed interface documents that define communications between the control system and range devices.
- LT2/CTIA-based components and framework allowing the components to be used in other parts of the product line and in products that extend training across the virtual and constructive domains.

The centerpiece of the Target Modernization program has been the successful development and deployment of the single common target control system, called Targetry Range Automated Control and Recording (TRACR). TRACR provides a single control system that is usable on all Army live-fire training ranges with implementation of the FASIT interface standards. It has the inherent capability to interface with or control the legacy Enhanced Remote Equipment Target Systems targets.

TRACR is the first PM TRADE product to be 100 percent composed of LT2 components, thus leveraging savings for small-arms ranges. The common use of TRACR also reduces the burden on ranges by eliminating the unique training and maintenance associated with having multiple control systems. To date, more than 110 ranges (80-plus small-arms ranges and 30-plus maneuver ranges) have been upgraded and use the TRACR control system.

The Target Modernization program includes plans to upgrade an additional 40-plus ranges over the next year. Furthermore, the Army has committed to deploying all future new ranges with TRACR and to using FASIT-based devices. The technical solutions identified through the Target Modernization program will allow the Army to revitalize existing ranges at a fraction of the cost associated with constructing new ranges.

The Target Modernization and FASIT architecture are predicated on lowering life-cycle costs through open standards, leveraging commercial communication frameworks, and a tight coupling of the interfaces to the control systems. The decoupling of the ranges from specific vendors and the ability to move targets between ranges create significant savings. The Target Modernization program has documented more than $15 million in value engineering cost avoidance through deployment of the TRACR program alone.

THE FUTURE

PM TRADE is now focusing on establishing interface standards for live, virtual, and constructive training that can be partially or fully embedded into weapon systems. While embedded training (ET) has been difficult to define, let alone achieve, TRADOC's vision, as outlined in the *U.S. Army Training Concept 2012-2020*, includes training while deployed.

Training in a deployed environment will necessitate maximum use of organic equipment and minimum use of appended training devices that require warehouses and maintainers. PM TRADE will leverage the experience of the LT2 product line, expanding it to include standards and architecture for ET. Over the next year, PM TRADE will be working with weapon system PMs and TRADOC to leverage the LT2 approach.

Based upon the benefits demonstrated by MC-ITS and Target Modernization, the future of live training devices will drive leader development, training, and education outcomes, and will continue to expand the LT2 product line and realize necessary savings during this era of better buying initiatives. PM TRADE will be the premier provider and integrator of all live training products that are made available through the integrated training environment and that evoke the behaviors necessary to achieve Army training standards today and beyond.

CONTROLLING FIRE

A Soldier uses the TRACR Control System at the Modified Record Fire Range at Fort Eustis, VA. TRACR uses the FASIT interface with a single control system that is compatible with all Army live-fire training ranges. (U.S. Army photo courtesy of PEO STRI.)

JAMES TODD is the Lead Systems Engineer and Architect for FASIT at PEO STRI, and a Senior Systems Engineer for the LT2 product line. Todd holds a B.S in mechanical engineering from the University of New Orleans and an M.S in industrial engineering from Texas A&M University.

DR. JEREMY T. LANMAN is the Lead Systems Architect for PEO STRI's CTIA and CPM construct, supporting the LT2 Family of Training Systems. Lanman holds a B.S. in computer science from Butler University, an M.S. in software engineering from Embry-Riddle Aeronautical University, and a Ph.D. in modeling and simulation from the University of Central Florida.

IMPROVED TRAINING

Four M1A2 SEP v2 tanks conduct a Table XII platoon-level exercise on the new Digital Multi-Purpose Range Complex (DMPRC). (U.S. Army photos by MAJ Pon Tran, PEO STRI.)

READY, AIM, UPGRADE

Rapid acquisition of digital technology brings high-performance training capabilities to Soldiers in Korea

by LTC Timothy M. Ward (USA Ret.) and LTC Bryce R. Christensen (USA Ret.)

On May 31, the Republic of Korea, Land of the Morning Calm, awoke to a new era in armor gunnery training. Korea's Rodriguez Live Fire Complex (RLFC) was transformed from a legacy gunnery range to a new, world-class facility with two digitally enhanced ranges.

This modern complex now touts a Digital Multi-Purpose Training Range (DMPTR) and a Digital Multi-Purpose Range Complex (DMPRC). These ranges provide technologically enhanced digital capabilities with distinct range modifications, which improve doctrinal training.

CONFIGURING THE RANGE

The Rodriguez Range Multi-Purpose Range Complex is shown in its original configuration before the installation of the Digital Range Training System and changes to the lanes and battle positions.

In the words of 2nd Infantry Division (2ID) Commander MG Michael S. Tucker, "This technology allows us to achieve high-performing 'killer crews' in half the time required when using non-digital ranges."

THE CHALLENGE

In early March 2010, Tucker challenged the Program Executive Office Simulation, Training, and Instrumentation (PEO STRI) to modernize his combat vehicle ranges. Real-world events accelerated the fielding to 2ID of the Army's newest Abrams tanks and Bradley Fighting Vehicles, the M1A2 System Enhancement Package (SEP) v2 and the M2A3 Bradley. The existing Eighth Army ranges, however, were inadequate to maximize the potential of the newest digital combat vehicles. PEO STRI assigned the urgent requirement to the Product Manager Digitized Training (PdM DT), the team responsible for developing and fielding the Army's Digital Range Training System (DRTS).

Meeting the urgent need was initially rated a high risk. The DRTS Program was faced with executing two unanticipated, major range upgrades under the constraints of an OCONUS location within eight months. Adding to the complexity of the project was the requirement to work jointly with the U.S. Army Corps of Engineers (USACE) Far East District and associated contractors in making extensive physical range changes at the same time that instrumentation and testing were set to occur.

The two legacy RLFC analog ranges were not capable of meeting the expanded requirements of the Army's newest tanks and Bradleys. The ranges also lacked the tools needed for quality after-action reviews (AARs). The smaller Multi-Purpose Training Range was equipped with Targetry Range Automated Control and Recording, but the system was not optimal because of information assurance constraints unique to Korea. The Multi-Purpose Range Complex was even further behind technologically, with rudimentary target controllers and outdated field cameras. Additionally, it lacked the capability to view and record Thru-Sight Video in real time.

INHERENT CAPABILITIES

The technical solution to the 2ID's urgent training need was logically found in the inherent capabilities of DRTS, which is a live-fire gunnery and tactical training support system. DRTS provides the capability to train, evaluate, and stress today's Soldiers and their modern equipment with a realistic, train-as-you-fight operational environment.

The instrumentation suite includes control consoles to digitally plan and control live-fire Abrams, Bradleys, aviation assets, and Strykers with dismounted infantry training. The integrated software executes the training scenarios through the Scenario Development Tool.

DRTS uses the onboard Integrated Player Unit (IPU) with third-generation Internet Protocol technology to wirelessly stream data including the vehicle's location, audio, Thru-Sight/crew video, and digital 1553 data buss information (for trigger pulls/ammo select/turret azimuth/elevation). The IPU is mounted on the vehicle's exterior and retransmits vehicle data using a wireless mesh infrastructure to the Range Operations Center. The latest IPU accomplishes this data transmission requirement at reduced cost and installation time compared with earlier versions.

After gunnery exercises, DRTS subsystems support training data analysis, preparation, presentation, and immediate feedback in the AAR theater on the range. Commanders and crews alike benefit from the real-time precise analysis of gunnery tables from individual through platoon levels.

MULTIPLE PRESSURES

The RLFC upgrade manifested all the challenges inherent to an acquisition program with regard to cost, schedule, and performance. The requirement to upgrade the RLFC ranges was identified in March 2010, with initial operational capability (IOC) set for no later than May 30, 2011—a small window of opportunity from contract execution to completion, and a radical departure from the three-year military construction and DRTS installation timeframe required for similar digital ranges.

The budgetary latitude to initiate the unprogrammed project was gained through a congressional funding addition and the skillful reprogramming of DRTS funds.

Trade-off analysis was also an integral part of maintaining functionality and reducing costs in key areas. A prime example was the busbar and rail system for Moving Armor Targets. The Training Support Activity Korea (TSAK) wanted to retain the existing busbar system on the DMPRC, but its unsafe condition and degradation warranted a complete replacement with an unexpected cost of roughly $650,000. The trade-off in this instance came from the installation of docking stations and use of the current rail system, which cost only $150,000. System functionality was maintained, and the solution was acceptable to TSAK and 2ID.

One of the important objectives of the range redesign was to make the range more tactically challenging to tank and Bradley crews with "rolling battle positions," crossing lanes, and low-water crossings. These additional construction activities, begun after initial DRTS installation, introduced performance and schedule challenges. In a traditional range project cycle, USACE completes all range design and construction before instrumentation occurs. Concurrent construction threatened to change the range architecture markedly, which in turn would alter the Radio Frequency analysis for network coverage and potentially create conflicts among competing contractors.

INTEGRATED UNITS

An M1A2 Sep v2 tank conducts live fire on the new DMPRC. The tank is instrumented with the Integrated Player Unit, which supports the training with wireless data streaming.

All of these conditions would extend the schedule under normal conditions. The logistical issues with a project of this scope were multiplied because the project was conducted in a remote OCONUS location. The time and distance factors imposed by shipping components to Korea from CONUS affected order and ship times for all components, International Traffic in Arms Regulations actions for sensitive items, and responsiveness to unanticipated component needs.

Fortunately, the challenges imposed by regulatory constraints, time, and distance were identified early in the acquisition process and were worked intensively by the DRTS Team, system integrators, and TSAK to resolve or mitigate logistical problems.

COORDINATING SUCCESS

The 2ID leadership, in concert with TSAK, supporting contractors, and the DRTS Team, worked from a Common Operating Picture (COP) to coordinate all construction, instrumentation, and tactical unit support requirements toward the desired end state. The COP, in conjunction with weekly in-progress reviews, became an invaluable tool to manage the expectations of all stakeholders, to identify and resolve problems immediately, and to adjust rapidly and efficiently to changing environmental conditions that ultimately would affect project completion. The reviews included all stakeholders and initially were conducted biweekly. As the testing phase neared, the frequency increased to weekly in light of the dynamic nature of concurrent efforts.

Achieving the RLFC objectives would not have been possible without a COP that was reviewed and endorsed by the Assistant Division Commander (Maneuver), BG Charles L. Taylor, and the command's willingness to dedicate Soldiers and equipment to support the incremental testing

ANALYZING DATA

2ID Soldiers conduct crew evaluations in the Exercise Control Center of the Warrior Valley DMPTR. The multiple displays on the screen depict the combat vehicle situational awareness, gunner's and commander's views, crew compartment video, and 1553 data.

phases. This close association between the user and materiel solution provider significantly contributed to the rapid fielding mandated in the project.

One initial objective was to provide an early range capability to support the ongoing Operator New Equipment Training (OPNET) gunnery requirements for the new M1A2 SEP tanks. In response to this need, the prime contractor implemented efficiencies and lessons learned into its processes, and the DMPTR was completed three weeks ahead of schedule to provide 2ID with a functioning range to facilitate its OPNET.

Having accepted the smaller DMPTR, the stakeholders were able to focus all resources and management processes in a time-phased approach to complete the construction, instrumentation, and testing of the DMPRC in time for the May 30 IOC. To underscore the urgency and importance of these ranges, units of the 2ID were conducting live-fire tank gunnery operations on the DMPRC the day after government acceptance.

The ultimate success of the RLFC DRTS project was the direct result of the remarkable collaborative efforts of all stakeholders involved. The key players maintained extraordinary continuity with a clearly defined end state to effectively overcome the challenges of meeting the user's needs in a compressed timeline. Tucker best qualified the successes of the RFLC from his user perspective: "This is the most modern, mission-focused precision gunnery complex in the world. The unique combination of range technology and terrain allows units to train 'as and where' they will fight if called upon to defend the Republic of Korea from aggression."

LTC TIMOTHY M. WARD (USA Ret.) is the Project Director DRTS for PEO STRI. He holds a B.S. in aeronautical engineering from Arizona State University and an M.S. in procurement and acquisition management from Webster University. Ward is Level III certified in program management and is a U.S. Army Acquisition Corps member.

LTC BRYCE R. CHRISTENSEN (USA Ret.) is the Senior Product Coordinator for DRTS, supporting PEO STRI for Electronic Consulting Services Inc. He holds a B.S. in biology from Creighton University and an M.S. in logistics management from the Florida Institute of Technology.