# ARMY AL&T

July–September 2010

## FOCUS ON CS&CSS SYSTEMS

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ACQUISITION SUPPORT CENTER

## From the Army Acquisition Executive

# Focus on Ground Combat Systems (GCS) and Combat Support and Combat Service Support (CS&CSS)

On behalf of the Army Acquisition Corps and the greater acquisition workforce, I would like to take this opportunity to extend my sincere congratulations to Frank J. Anderson Jr. on his recent retirement as Defense Acquisition University (DAU) President. Frank has been a personal friend since his days as a bright, energetic, and very talented Air Force general officer. I greatly enjoyed the opportunity to serve with him on active duty and later as a member of the DAU Board of Visitors. Frank will always be remembered for transforming a miscellaneous consortium of service schools, including the Defense Systems Management College, into an award-winning, internationally recognized corporate university. He also implemented the Acquisition, Technology, and Logistics (AT&L) Performance Learning Model that now provides continuous learning assets well beyond the classroom to the more than 130,000 Defense Acquisition Workforce members. It is clear that Frank's lasting legacy is his great success in significantly expanding educational opportunities and the resulting tremendous increase in our workforce's professionalism and capability.

The importance of a well-educated, appropriately sized cadre of acquisition professionals with the right skills and training to successfully perform their jobs cannot be overstated. Over the last two decades, the acquisition workforce suffered a sharp reduction in personnel and an increase in workload that contributed to the inability to effectively apply remaining critical skills. That trend is being reversed! With assistance from Congress and the Office of the Secretary of Defense, we have begun to rebuild our ranks and have plans in place to grow the acquisition workforce and hire a bench of technically trained personnel, including cost estimators, systems engineers, and quality assurance specialists. With these hiring initiatives on track, I am now focusing my energies on leading the transformation of Army acquisition to improve management and execution of the acquisition process from start to finish, in close collaboration with our stakeholders, including Congress and our defense industry partners. Join me in this effort! I urge you to summon the courage to challenge the status quo. "No" is a perfectly acceptable answer. We must each have the moral courage to stand and speak the truth, or true transformation will not be achieved.

To ensure an efficient and effective acquisition system, we are guided in our efforts by the *Weapon Systems Acquisition Reform Act of 2009*, which was designed to help put major defense acquisition programs on a sound footing from the outset by addressing program shortcomings in early acquisition phases. Additionally, we are undertaking a far-reaching set of reforms and studies, including the Value Task Force established by the Under Secretary of Defense for AT&L, the Army Acquisition Study chartered by the Secretary of the Army, and other critical initiatives and improvement opportunities generated from within our community. Our ongoing operations in Iraq and Afghanistan and the projections of a continued, complex operational environment demand more agile, innovative, and streamlined processes and institutions, including how we acquire goods and services.

We are also guided in our important work by the Army Modernization Strategy, which focuses on three major lines of effort:

- *Developing and fielding new capabilities*. We must leverage technologies harvested from the Army's science and technology program and shorten the time between requirement identification and solution delivery.
- *Continuously modernize equipment to meet current and future capabilities needs through procurement of upgraded capabilities, recapitalization, and divestment.* In conjunction with our strategic partners, we must validate and implement affordable capability portfolio strategies for selected equipment fleets and capitalize on technology-based initiatives.
- *Meet our force's needs through Army priorities and the Army Force Generation (ARFORGEN) model*. It is essential that we embrace ARFORGEN as a key driver to inform our modernization investment decisions, as we continue to support ongoing operations in Iraq and Afghanistan and effectively support responsible drawdown and reset.

The Army modernizes for our Soldiers. The Army's objective is to develop and field a versatile and affordable mix of the best equipment available to allow Soldiers and units to succeed in both today's and tomorrow's full-spectrum operations. In addition to our statutory responsibilities, we in the Army acquisition community have an absolute moral responsibility to ensure our Soldiers have the best equipment in sufficient quantities, so that they always have a distinct and significant advantage in any fight. This responsibility requires us to constantly explore new technologies, conduct exhaustive testing and experimentation, and never be afraid to ask ourselves if every aspect of our equipping programs can withstand the scrutiny of rigorous cost-benefit analyses.

This issue of *Army AL&T* Magazine showcases two of our program executive offices (PEOs): PEO GCS and PEO CS&CSS. It is clear that both PEOs have a critical role in executing the Army's Modernization Strategy and transforming our acquisition capabilities to meet current and future warfighter needs. The articles that follow provide valuable insights into this transformation and the ways these PEOs are addressing their many challenges and opportunities.

**Dr. Malcolm Ross O'Neill**
Army Acquisition Executive

ARMY AL&T

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# Acquisition, Logistics & Technology

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**PB 70-10-03**

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# Acquisition, Logistics & Technology

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*Army AL&T* Magazine (ISSN 0892-8657) is published quarterly by the ASAALT. Articles reflect views of the authors and not necessarily official opinion of the Department of the Army. Articles may be reprinted if credit is given to *Army AL&T* Magazine and the author.

Private subscriptions and rates are available from:
SUPERINTENDENT OF DOCUMENTS
U.S. GOVERNMENT PRINTING OFFICE
WASHINGTON, DC 20402
(202) 512-1800

Periodicals official postage paid at Fort Belvoir, VA, and additional post offices.

POSTMASTER: Send address changes to:
DEPARTMENT OF THE ARMY
ARMY AL&T
9900 BELVOIR RD SUITE 101
FORT BELVOIR, VA 22060-5567

# Focus on Combat Support and Combat Service Support (CS&CSS) Systems

This issue features articles from Program Executive Office Ground Combat Systems (PEO GCS) and PEO CS&CSS, both of which play an integral role in sustaining the joint warfighter through mission-capable systems and technologies. Leading the development, acquisition, testing, systems integration, fielding, sustainment, and improvement of the Army's GCS, PEO GCS ensures that safe, effective, suitable, and supportable GCS capabilities are delivered within prescribed cost, schedule, and performance goals. PEO CS&CSS directs and coordinates the efforts of project and product managers (PMs) in managing the life cycles of more than 300 Army systems, including several joint programs, and is committed to ensuring that the best possible products are available to support the Current Force and beyond.

Our lead article, *PEO GCS—Our Mission is Our Warfighters' Future*, provides an overview of PEO GCS' responsibility for leading and executing every aspect of total life-cycle systems management for the U.S. Army's GCS. *PEO GCS Leads Combat Vehicle Modernization* describes the ground combat force's future through modernization of the Ground Combat Vehicle fleet, which will combine unparalleled effectiveness and suitability into an Infantry Fighting Vehicle. The modernization of the Stryker Family of Vehicles through use of the DOD Systems Engineering process, and its associated challenges, is detailed in *Stryker Modernization—Systems Development and Systems Engineering Requirements Versus Reality*. *Forward Repair Activity-Iraq (FRA-I) Drawdown* details the shift of FRA-I's mission and capabilities to FRA-Afghanistan, which will support Stryker brigades in Afghanistan. *Equipping Joint Warfighters Through Modernization of Unmanned Ground Systems (UGS)* discusses the PEO GCS Robotic Systems Joint Project Office's actions and strategy for equipping joint warfighters through modernization of UGS capabilities. PEO GCS' last article, *Commonality of Towed Artillery Digital Fire Control Systems (DFCS)*, describes commonality of DFCS across towed artillery platforms and a new initiative by Joint Program Manager Lightweight 155mm Howitzer between the M777A2 and the M119A2 towed howitzers.

PEO CS&CSS' *Fleet Management of Tactical Wheeled Vehicles (TWVs)* provides an overview of the Army's TWV fleet as a critical asset that executes a wide range of combat and noncombat missions and describes the unique challenges of each of the light, medium, and heavy fleets. *Fire Suppression Systems (FSS) Enhance TWV Survivability* describes the numerous FSS used by the Army and U.S. Marine Corps to meet current and emerging threats, to include accidental vehicle fires or battle damage fires from ballistic attacks. *Joint Light Tactical Vehicle (JLTV) Technology Development (TD) Phase Vehicles Delivered on Schedule, Competitive Prototyping Proves Fruitful* recounts delivery of the TD phase JLTV prototypes, marking the beginning of the JLTV 12-month test and evaluation effort and the larger 27-month TD phase. In *The Next Generation Automatic Test Station (NGATS) Offers Organic Off-System Test Capability for the U.S. Army*, NGATS is described as the latest iteration of the Army's organic off-system test capability, with significant improvements in capability and system reliability and reduced system costs over previous solutions. The Army's PM Sets, Kits, Outfits, and Tools' efforts to fulfill an Operational Need Statement requesting mobile fire suppression refill stations are detailed in *Army Rapidly Develops Expeditionary Fire Suppression Refill Station*.

Several more PEO CS&CSS articles highlight the Mine Resistant Ambush Protected Vehicle Program, Route Clearance Vehicles, Force Provider Expeditionary Base Camps, Operation $H_2O$, and Low-Cost Aerial Delivery Systems.

We hope you enjoy this issue filled with important information highlighting PEO GCS' and PEO CS&CSS' efforts to develop, field, sustain, and reset integral equipment and technologies for our Soldiers. Their efforts in keeping our Soldiers outfitted with the most effective systems helps to ensure our Army is the best equipped and most prepared in the world.

***Ben Ennis***
***Executive Secretary, Editorial Board,***
***U.S. Army Acquisition Support Center***

# Program Executive Office Ground Combat Systems (PEO GCS)—Our Mission is Our Warfighters' Future

April M. Louis

**Headquartered at the TACOM Life Cycle Management Command in southeastern Michigan, PEO GCS is responsible for leading and executing every aspect of total life-cycle systems management for the U.S. Army's GCS. PEO GCS serves as the system-of-systems (SoS) integrator for all GCS employed by the U.S. military and leads Army transformation initiatives focused on evolving future systems for the Objective Force while maintaining a current combat-ready one.**

PEO GCS is responsible for managing more than 90 battle-proven GCS, including the Abrams tank. The original M1 Abrams tank, fielded in the early 1980s, has undergone incremental upgrades, resulting in an analog M1A1 model and a digital M1A2 model, each with several variants in theater today. (Photo courtesy of PM HBCT.)

As outlined by the *Goldwater-Nichols Act of 1986*, the PEO reports directly to the Assistant Secretary of the Army for Acquisition, Logistics, and Technology/ Army Acquisition Executive and is formally chartered to lead, facilitate, and oversee the strategic, operational, and tactical activity of the four project management offices it encompasses (two of which are jointly managed with the U.S. Marine Corps). Project Manager (PM) Heavy Brigade Combat Team (HBCT), PM Stryker BCT (SBCT), and the Robotic Systems Joint Project Office are all collocated with PEO GCS headquarters in Warren, MI; Joint Program Manager Lightweight 155mm Towed Howitzer is remotely located in Picatinny, NJ. Regardless of location or their GCS responsibility, PEO GCS PMs and product managers are considered to be world-class in their field. They continuously seek out and exploit unique windows of opportunity to ensure successful execution of their GCS programs and expeditious, smart resolutions to the many challenges associated with executing Chief of Staff of the Army (CSA) strategic imperatives to sustain, prepare, reset, and transform Current to Future Force ground combat weapon systems.

## A PEO Postured for Excellence

Strategically focused on its organizational vision to "be the premier acquisition organization by equipping joint and allied forces with unparalleled lethal and survivable GCS," the PEO executes its mission to "lead the Army's GCS programs by providing the joint warfighter with mission-capable systems as part of a full-spectrum force, through sound life-cycle management." To ensure mission success, PEO GCS has developed an overarching strategy that was specifically designed to align with CSA imperatives and address the PEO's top priorities to equip the warfighter in our Nation's defense, manage human capital, strengthen the enterprise, and transform the organization. To that end, key components of the strategy—PEO initiatives—focus on what the organization must accomplish in the short term so as to generate results and realize benefits in the long term.

PEO GCS serves as the SoS integrator for all GCS employed by the U.S. military and leads Army transformation initiatives focused on evolving future systems for the Objective Force while maintaining a current combat-ready one.

The following initiatives are the framework of overarching PEO GCS strategy:

- Improve and modernize the Army's GCS through the design, development, and acquisition of new systems and integration of emergent capabilities into current force systems.
- Synchronize sustainment maintenance operations of the Army's GCS, such as recap, overhaul, and reset, in accordance with Army priorities as outlined in the Army Force Generation (ARFORGEN) model.

**The Bradley Fighting Vehicle (BFV) accounts for more than two-thirds of the available combat power in the formation. Here, Soldiers from the 2nd Combined Arms Battalion, 5th Brigade (Army Evaluation Task Force), 1st Armored Division, run toward their objective after dismounting from a Bradley. (U.S. Army photo by MAJ Deanna Bague, Fort Bliss, TX, Public Affairs.)**

Known for its lightweight, non-developmental combat platform, the Stryker FOV is the foundation of the extremely versatile, mobile BCT. Here, a Stryker vehicle awaits in an airfield staging area in Southwest Asia for transportation to warfighters in Afghanistan. (U.S. Army photo by SGT David Nunn, Third Army/U.S. Army Central Command Public Affairs Office.)

The Army's GCS are more capable now than ever before to support full-spectrum operations as part of the joint force, and they will continue to provide the prompt, sustained, and dominant response necessary to ensure our Nation's security for years to come.

- Assess and improve logistics management of the Army's GCS to create an environment that ensures support of Army goals and objectives.
- Manage the health and readiness of the Army's GCS industrial base to prevent diminished manufacturing and repair capabilities.
- Lead strategically to increase situational awareness and institutionalize fact-based decision making to mobilize positive organizational change through data-driven process improvements.
- Enhance processes and common management methodologies to drive continuous improvements, enhance organizational strengths, improve organizational sustainability, and increase organizational effectiveness.
- Manage information technology and information assurance to ensure secure and robust information storage, management, access, and collaboration across multiple integrated environments.
- Develop partnerships and conduct outreach to enhance customer service and provide better products to the Soldier faster.
- Ensure human capital is strategically aligned with and supports mission execution and vision attainment.
- Facilitate leadership and knowledge development to cultivate a high-performing workforce.
- Promote a positive, collaborative, and diverse organizational climate that is fostered by open, honest, and clear communication at all levels. Ensure age, ethnicity, and cultural diversity are valued by both management and peers.
- Enhance internal and external strategic communications with customers and stakeholders to build awareness, advocacy, and cooperative relationships that further the strategic vision and mission of the Army's GCS, facilitate execution of GCS programs, and secure GCS resources.
- Manage and execute GCS financial resources.

At all times, PEO GCS maintains a total armed forces perspective in managing the development, acquisition, testing, systems integration, product improvement, and fielding of the Army's GCS, ensuring that each program meets cost, schedule, and performance goals and that the best ground combat capabilities are delivered into the hands of our Soldiers at the right place and time. As PEO GCS continues to successfully implement and execute its strategy at all levels of the organization, Army imperatives will be met and desired results will be achieved.

## Reliable, Relevant, and Ready

In total, PEO GCS is responsible for managing more than 90 battle-proven GCS to include the Abrams tank, the

PEO GCS intends to leverage past investments in already developed Ground Combat Vehicle technologies to accelerate the fielding of advanced GCS capabilities to all BCTs.

Bradley Family of Vehicles (FOV), the Stryker FOV, Ground Combat Fire Support Systems, Joint Lightweight Towed Artillery, and the Army's Unmanned Ground Systems (UGS). Now, as in the past, these systems are constantly being sustained, maintained, and upgraded to ensure that the Army's GCS remain superior to any and all adversarial weapon systems and can defeat any magnitude of challenge or threat decisively.

The Army's current fleet of GCS is unmatched and ever-evolving. The original M1 Abrams tank, fielded in the early 1980s, has undergone incremental upgrades, resulting in an analog M1A1 model and a digital M1A2 model, each with several variants in theater today. Likewise, the BFV, which accounts for more than two-thirds of the available combat power in the formation, has also been incrementally improved and enhanced. The Bradley A3, the latest Bradley upgrade, is now the most advanced, lethal, mobile, and survivable infantry platform in the world. The Army's Stryker FOV consists of 10 unique variants. Known for its lightweight, non-developmental combat platform, the Stryker FOV is the foundation of the extremely versatile, mobile BCT. Also an integral part of the fleet, GCS towed artillery platforms incorporate the latest in fire direction and fire control systems, while the Army's UGS (robots) provide unique, cutting-edge technologies and capabilities to the joint warfighter that protect from exposure to enemy threats, high-risk tasks, hazardous materials, and other dangerous conditions. The Army's GCS are more capable now than ever before to support full-spectrum operations as part of the joint force, and they will continue to provide the prompt, sustained, and dominant response necessary to ensure our Nation's security for years to come.

However, almost a decade of persistent conflict has taken a toll on our equipment. It is in need of reset, recapitalization, or replacement. The imminent task of returning the equipment to fully mission-capable standards to fulfill ARFORGEN fielding requirements is critical to retaining Army operational goals. Using a combination of commercial and organic industrial base manufacturing in both CONUS and in theater, PEO GCS works diligently to meet our warfighters' deployment timelines and training requirements. Although operating tempo to sustain and maintain the capabilities and readiness levels of the current GCS fleet is high, PEO GCS must also focus on modernizing the fleet to meet future requirements. As the PEO develops a GCS modernization strategy, prudent decisions are being made that will drive the planning, development, and acquisition of future systems to replace the current ones as they retire.

To meet and defeat future challenges, the PEO must enhance the current fleet by advancing the firepower, mobility, and survivability of our combat platforms and ensure the provisioning of dominant and sustainable joint combat vehicles that can conduct full-spectrum operations, both domestic and abroad. To replace Cold War-era Ground Combat Vehicles, the Army will develop a Ground Combat Vehicle concept that incorporates lessons learned from persistent warfare, technological and network advances drawn from the Ground Combat Vehicle Body of Knowledge, and key technologies that are already being used in Iraq and Afghanistan. PEO GCS intends to leverage past investments in already developed Ground Combat Vehicle technologies to accelerate the fielding of advanced GCS capabilities to all BCTs. The PEO will continue to work closely with the Office of the Secretary of Defense, Congress, and industry partners to capture what we have learned, mitigate new risks, maintain the momentum of spinning out emerging capabilities to the warfighter, and move expeditiously forward to plan, develop, and acquire future ground combat platforms as we continue to build joint and Army systems to meet our Nation's needs for the 21st century.

It's an undisputed fact that the Army's mission-capable GCS are the backbone of the U.S. military and are renowned for their multidimensional utility, proven reliability, and unmatched, decisive dominance across the full spectrum of operations. By successfully managing innovative risk and developing creative solutions to meet unique customer needs, PEO GCS delivers unparalleled lethal and sustainable GCS capabilities to joint and allied forces around the globe to ensure national security, provide national defense, and protect the vital interests of the U.S. and its allies.

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# Program Executive Office Ground Combat Systems (PEO GCS) Leads Combat Vehicle Modernization

Anthony Desmond

**Over the last 40 years, the U.S. Army's ground combat fleet has provided the heavy muscle of the world's premier ground combat force. The Army's "Big Five" modernization strategy, started in the 1970s, provided the Army with the M1 Abrams and M2 Bradley Family of Vehicles (FOV). These vehicles spearheaded the coalition victory over Iraq in *Operation Desert Storm*, and, in conjunction with the M109A6 Paladin self-propelled howitzer, provided the ground combat power to overthrow the Iraqi government in 2003.**

A Bradley Fighting Vehicle with the 2nd Battalion, 69th Armor Regiment, 3rd Heavy Brigade Combat Team, 3rd Infantry Division, rolls back into Forward Operating Base Reno during a training exercise at Fort Irwin, CA. The Ground Combat Vehicle will replace the IFV variant of the Bradley. (U.S. Army photo by 1LT Duncan MacQueen IV.)

The M1 Abrams and M2 Bradley FOV have provided essential ground combat power to U.S. forces. Here, an M1A1 Abrams tank fires at Besmaya range, Iraq, April 14, 2010, during a partnered firing exercise with the Iraqi army. (U.S. Army photo by PFC Jared Eastman.)

However, lessons learned from the last 8 years of warfare identified common capability gaps in all of our platforms, including the Stryker FOV. The greatest gap was in survivability, especially against lower intensity conflict weapons, such as rocket-propelled grenades, improvised explosive devices (IEDs), and under-armor blast from explosives or artillery shells. Our solutions ranged from the slat armor that was so effective for the Stryker, to the Tank Urban Survival Kits and Bradley Urban Survival Kits for protection of the Abrams and Bradley, to the Counter-Radio Controlled IED Electronic Warfare System that can jam detonation signals. These have all been effective, but at the cost of extra weight and power requirements that have reduced or eliminated the reserve space, weight, and power capability of the vehicles. In addition, the aging of the fleet, along with the inevitable obsolescence issues inherent in 40-year-old platforms, have significantly driven up the Army's operations and support costs.

The cornerstone of the future ground combat force will be the new Ground Combat Vehicle. Using the best of today's mature technologies, the Ground Combat Vehicle will be able to combine unparalleled effectiveness and suitability into an Infantry Fighting Vehicle (IFV) that will be dominant on any future battlefield, urban or rural.

Using the best of today's mature technologies, the Ground Combat Vehicle will be able to combine unparalleled effectiveness and suitability into an IFV that will be dominant on any future battlefield, urban or rural.

However, it will take considerable time to replace the 30,000-plus tracked vehicles in the Army's combat fleet. The initial increment of the Ground Combat Vehicle, as a replacement for the IFV variant of the Bradley, is slated to replace approximately 51 percent of the Bradley FOV and only 18 percent of the total current tracked vehicle fleet. When we field new brigade combat teams within the Army Force Generation model, the brigade must act as a single formation, able to maneuver in the same environment, fight against the same threat, interoperate on the same network, and be sustained under the same logistics footprint as a unified fighting force.

## Modernization

Using technologies from the Ground Combat Vehicle program as well as other Army modernization programs, PEO GCS will execute a series of affordable, incremental recapitalization and reset programs for the Abrams, Bradley, and Stryker platforms, as well as execute a Paladin obsolescence program to ensure that the single fleet can address common capability gaps and continue to operate on the modern battlefield.

In planning these programs, we are following a series of key modernization tenets:

- Addressing the trends driving the need for combat vehicle modernization, including the need to use integrated lethal and nonlethal effects in net-enabled operations to proactively adjust to and defeat an adaptive enemy.
- Using a systems engineering approach within a fleet context. Where possible, we will use a common systems engineering approach across the entire fleet, harmonizing requirements, developing common functional and physical architectures, and using common design solutions to speed development time, leverage scarce development and test dollars, and minimize the need to mature multiple technologies.
- Coordinating/synchronizing within the Assistant Secretary of the Army for Acquisition, Logistics, and Technology. In conjunction with PEO Integration and our sister PEOs, we will work on development of common open systems architectures and interfaces and standards to ensure "plug-and-play" interoperability between ground platforms and the radios, sensors, and other components developed by other PEOs.
- Buying back space, weight, power, and cooling capability. The first increment of each modernization plan will incorporate mature technologies to allow us to recover size, weight, and power margins through chassis and power generation upgrades that will enable the integration of future mission equipment packages, theater-provided equipment, and transport layer and battle command hardware and software to ensure brigade interoperability. Our future increments will incorporate other mature technologies, including vehicle electronics and drive upgrades, health monitoring to enable condition-based maintenance, and other components, as funding permits.

The Army's ground combat fleet is currently the world's best. Selected, judicious modernization will ensure that it will continue to support the Nation's needs.

**ANTHONY DESMOND** is the Director of Systems Engineering and Integration (G7) and Chief Systems Engineer for PEO GCS. He holds a B.S. in both chemical engineering and biomedical engineering from Carnegie Mellon University and an M.S. in systems management from the Florida Institute of Technology. Desmond is Level III certified in systems planning, research, development, and engineering (SPRDE)-systems engineering; SPRDE-program systems engineer; and program management. Desmond is a U.S. Army Acquisition Corps member.

**PEO GCS will execute a series of affordable, incremental recapitalization and reset programs for Stryker vehicles. Here, a completed Stryker awaits transportation to its unit, recently returned from Iraq. (U.S. Army photo by Barbara Toner, U.S. Army Sustainment Command.)**

# Stryker Modernization—Systems Development and Systems Engineering (SE) Requirements Versus Reality

Macam S. Dattathreya, Pat Foley, and Daniel A. Teschendorf

**The Stryker modernization program will upgrade the Stryker Family of Vehicles (FOV). To produce a more capable and effective Stryker, Project Manager Stryker Brigade Combat Team (SBCT) is using the DOD SE process. This article discusses the SE process in Stryker modernization and highlights some of the challenges associated with upgrading a Non-Developmental Item (NDI) system within the current DOD acquisition framework.**

The Infantry Carrier Vehicle (ICV), part of the Stryker FOV, moves along an off-road test track in Afghanistan. The Stryker FOV is the primary combat and combat support platform of the SBCT. (U.S. Army photo by MAJ Misty Martin.)

## History

In response to the changing operational environment facing the Nation and the Army, the Army Chief of Staff announced a new Army vision in October 1999 to build a land-power force capable of strategic dominance across the full spectrum of operations. The vision established an explicit requirement for the Army to become more strategically responsive. The SBCT was the lead element of the Army's transformation to a lighter, more agile force. The Stryker FOV, formerly known as the Family of Interim Armored Vehicles, includes 10 vehicles built on a common chassis. The vehicles are the primary combat and combat support platform of the SBCT.

The initial acquisition encompassed all 10 Stryker variants and their life-cycle acquisition requirements. Commonality was the centerpiece of the Stryker program. The Stryker acquisition strategy was structured around the objective of rapidly acquiring the best-value solution for integration, production, fielding, and support while providing warfighters with a safe, reliable, supportable, and effective system. To accomplish this objective quickly, an NDI acquisition strategy was followed. This approach favored the acquisition of assemblies and components already in production as opposed to initiating a new developmental program. General Motors (GM) General Dynamics Land System (GDLS) Defense Group LLC was competitively selected to produce the Stryker. The joint venture combined the resources of GM Defense of Canada and GDLS to meet the accelerated program's requirements. (Since the award of the vehicle contract in 2000, GDLS has acquired GM Defense.)

The GDLS platform is based on the Light Armored Vehicle Generation III chassis. GDLS delivered the first Strykers just 15 months after contract award. In the fall of 2003, only 19 months after the first vehicle was delivered, the first Stryker Brigade was deployed to Iraq. Strykers have been in theater for 12 SBCT rotations since November 2003. The vehicles have been driven more than 25 million total miles supporting *Operation Iraqi Freedom*, and Strykers first deployed to Afghanistan in the summer of 2009. Operational readiness rates remain consistently high despite the high operational tempo and hostile operating environment.

**The Stryker FOV must evolve to meet existing lessons learned over the last 8 years of warfare, as well as new threats and evolving conflicts. Here, a Stryker ICV is test driven in Afghanistan. (U.S. Army photo by MAJ Misty Martin.)**

## The Need to Modernize

The Stryker FOV must now evolve to meet existing lessons learned over the last 8 years of warfare, as well as new threats and evolving conflicts. The vehicles were lightweight and highly transportable to provide superior light-infantry support. Heavy armor and firepower were traded for speed and maneuverability. While the mission has not changed, the threats have. Scalable, add-on-armor kits to counter improvised explosive devices, snipers, and rocket-propelled grenade attacks can increase vehicle weights by as much as 30 percent. New communication systems and high-powered frequency jammers are demanding ever-increasing electrical energy. The increase in weight and electrical load impacts vehicle performance and reliability.

Stryker modernization is employing the DOD SE process to update and enable Strykers to face current and future threats around the world. The SE process defines requirements early in the development phase and integrates engineering and nonengineering activities by unifying DOD's product vision with applicable resources. SE enables optimization of the development process to overcome cost, schedule, and performance constraints in producing a highly effective system.

## Requirements Versus Reality

To produce a more capable Stryker, several challenges exist, including cost, space, weight, power, and cooling. Using SE, the Stryker modernization team has completed the process of decomposing user needs into clear technical requirements and is conducting trades to develop the preliminary design. The Stryker vehicle is an interconnected system in which each subsystem affects and is affected by the others.

To face the evolving threats, new survivability requirements have been levied on Stryker modernization. At the same time, fuel efficiency requirements limit vehicle weight growth. With the increased weight of the survivability improvements, structural reinforcements are necessary to ensure the integrity of the hull. These reinforcements displace stowage areas and impinge on other vehicle systems. A rigorous SE methodology optimizes the vehicle's structure while taking into account competing space claims of other vehicle subsystems. While the Stryker modernization team is undertaking an

intensive look at the impacts of design changes on various vehicle subsystems, they are simultaneously constrained by the existing hull envelope.

SE is best applied at the initial stages of program formulation. The NDI strategy and the accelerated pace of the original program precluded the rigors of the SE processes, as the SE documentation was not developed for the first Strykers. The Stryker modernization team is now retroactively characterizing the baseline vehicle. The process is not only long and difficult, but also expensive. Traditional, but lengthy, developmental programs designed from the ground up provide information and documentation that facilitates follow-on modernization efforts. In the case of Stryker modernization, adding layers of SE processes retrospectively, while complicated, will result in much better documentation and analysis for further growth.

Long-term planning based on stable requirements is crucial for successful SE implementation. If a piece of the design or requirements puzzle is removed or changed, the whole design has to be re-evaluated or the system may not be optimized. Consequently, SE does not respond well to incremental requirements changes, evolving capabilities, or schedule and funding uncertainties. In Stryker modernization, the user's needs, while challenging, have remained fairly stable; program execution has been less certain. The Stryker modernization project schedule has had to be adjusted to align with available funding. This has resulted in a series of changes to the requirements baseline and several modifications to the contract. Altering vehicle capabilities because of schedule and funding impacts has caused Stryker modernization to rework the system architecture, as well as rebaseline the project, to ensure proper earned-value management system controls are in place.

Stryker modernization is employing the DOD SE process to update and enable Strykers to face current and future threats around the world. (U.S. Army photo by MAJ Misty Martin.)

Program success following a thorough SE process is contingent on stable long-term plans that align the expected production schedule with funding in the out-years. Unfortunately, available funding and priorities cannot be reliably predicted. For Stryker modernization, the research, development, test, and evaluation funding has been in place as needed; however, authorization from leadership to proceed has been uncertain. Changes in law and regulation have also impacted the schedule.

The SE approach does not lend itself to rapid fielding. SE is a structured and meticulous approach to designing a product to meet user needs. As such, SE requires a significant upfront investment in time and money. An aggressive schedule can extend to 9 or 10 years from developing the Initial Capabilities Document to Initial Operational Capability. Recently, mandated competitive prototyping and reliability growth testing, while beneficial, will make the acquisition cycle even longer. Therefore, the extended schedule is exposed to more external factors that can stop or delay projects indefinitely.

The DOD SE process is not easily tailored to address legacy system upgrades. Stryker modernization is starting from a draft Capabilities Development Document requirements baseline. However, upgrading the Stryker through a remanufacture program requires working from an existing hardware baseline. Reconciling this incongruity has been a challenge from the start of Stryker modernization. Maximum reuse from the original Stryker vehicles is necessary to ensure an affordable remanufacture program.

The challenge is in modifying and adapting an existing system to meet a new set of requirements. The SE process has been indispensible in evaluating and trading system capability and performance against the burdens of space, weight, and cost. SE does not respond well to incremental requirements changes, evolving capabilities, or schedule and funding uncertainties.

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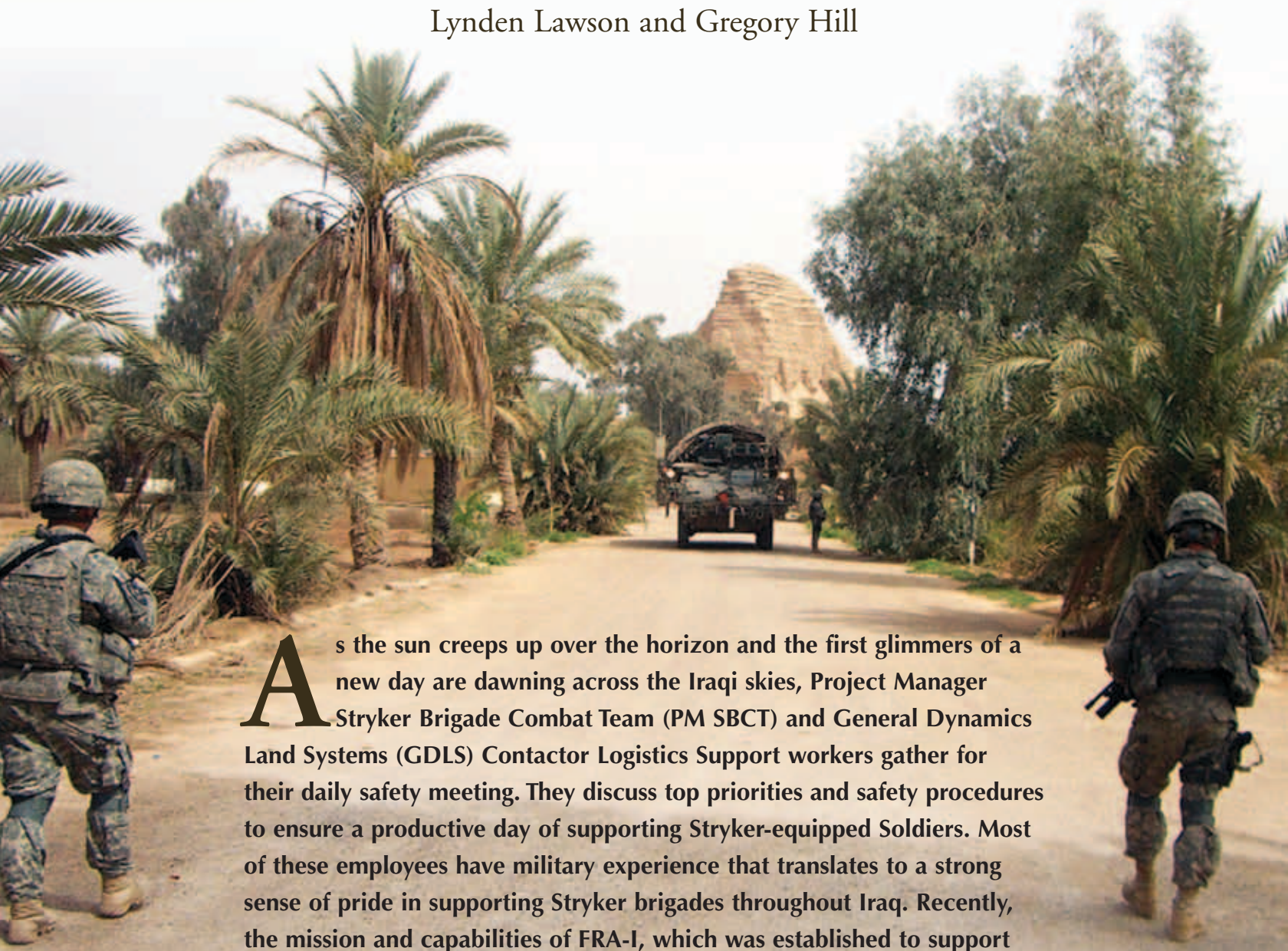
# Forward Repair Activity-Iraq (FRA-I) Drawdown

Lynden Lawson and Gregory Hill



**As the sun creeps up over the horizon and the first glimmers of a new day are dawning across the Iraqi skies, Project Manager Stryker Brigade Combat Team (PM SBCT) and General Dynamics Land Systems (GDLS) Contactor Logistics Support workers gather for their daily safety meeting. They discuss top priorities and safety procedures to ensure a productive day of supporting Stryker-equipped Soldiers. Most of these employees have military experience that translates to a strong sense of pride in supporting Stryker brigades throughout Iraq. Recently, the mission and capabilities of FRA-I, which was established to support *Operation Iraqi Freedom* (*OIF*), are being shifted to the FRA-Afghanistan (FRA-A) to support Stryker brigades there.**

Soldiers of 4th SBCT, 2nd Infantry Division, patrol in Aqar Quf, Iraq, March 11, 2010. The FRA-I, as a supply node for forward-deployed Stryker units, has provided support to SBCTs and Stryker-equipped Soldiers for years. (U.S. Army photo by SPC David Robbins, Headquarters and Headquarters Co., 16th Engineering Brigade.)

## FRA-I Overview

FRA-I was established in 2003 at Camp Anaconda, Iraq, which is now known as Joint Base Balad (JBB). FRA-I is a supply node for forward-deployed Stryker units and provides a higher maintenance level for the brigade support battalion, whose mission is to maintain and sustain the equipment required for combat operations. FRA-I is the central node for executing retrograde operations of battle-damaged Strykers and retrofit operations to install Stryker survivability and sustainment capabilities. After years of providing support to Stryker Brigades in Iraq, FRA-I began indirectly supporting operations during *Operation Enduring Freedom* (*OEF*) by sending parts, people, equipment, and various capabilities to Afghanistan until the FRA-A was established.

The mechanics at FRA-I perform limited technical inspections on battle-damaged and rebuilt vehicles that cycle through. They also install new upgrades to vehicles that include slat armor, hull protection kits, and mine protection kits. These kits are all part of the blast mitigation system and retrofits being implemented on Strykers. The operations at FRA-I also include maintaining a ready-to-fight (RTF) fleet of vehicles that can be used to replace combat-damaged Stryker losses or those with mechanical failures. The RTF fleet, which once numbered more than 70 vehicles, is now less than 20 at the time this article was written.

Pallets of slat armor at FRA-I await shipment to Auburn for reconstitution into slat kits. (Photo by Lynden Lawson.)

The component repair/rebuild shop is where retrograde Full-Up Power Packs (FUPPs) are received and rebuilt for reissue to the units. FUPPs can be removed from Stryker vehicles in their area of operation and then sent back to FRA-I for repair. Upon receipt, the unserviceable retrograde FUPPs go through a cleansing and teardown phase. They are rebuilt to factory standards, run on a test stand to ensure that they can withstand the intense performance expected during combat situations, and set into a shipment can for 24 hours to check for leaks or broken seals. They are then packaged and sent to a unit with their test results. Once a spare FUPP is installed, the vehicle is ready to proceed with operations.

FRA-I also has a supply warehouse for receiving and shipping parts to the brigades and other units, and also serves to ship parts back to the United States, European Distribution Center (EDC), Afghanistan, or Qatar. In 2003, FRA-I was stood up, managing 127 lines of parts. Since that time, the lines of parts managed has grown to more than 622 lines with well more than 125,000 parts on the footprint at JBB. The FRA-I supply section manages all parts coming in and out of theater.

GDLS contractors at the FRA-I tire shop reassemble a Stryker wheel and tire assembly that will be put back into the forward supply system. (Photo by Lynden Lawson.)

## FRA-I Drawdown

As part of President Barack Obama's plan to have all combat troops out of Iraq by August 2010, the PM SBCT, COL Robert Schumitz, ordered a comprehensive plan to be developed in October 2009. The plan not only centered around drawing down Stryker capabilities and footprint in Iraq, but also addressed how to sustain seamless support there while repositioning capabilities to support operations in *OEF*. Schumitz delegated authority of the drawdown plan to the Deputy Product Manager Logistics, LTC Aaron Roberson, who improved and expanded existing plans to ensure timelines had built-in triggering mechanisms to keep the momentum. All personnel and sections at FRA-I embraced the plan and have been steadily drawing down the footprint while maintaining the quality of support.

Capabilities that were very useful at FRA-I before drawdown began were repairing differentials and refilling fire extinguishers on Stryker vehicles. These capabilities were important because units could have equipment repaired or serviced in theater, instead of sending it back to the vendor or the United States. This reduced replacement time, as well as shipping and processing costs. These capabilities are transitioning to FRA-A to support operations in *OEF*.

Another entity that was very useful before the drawdown began was the tire shop. This shop received unserviceable wheel assemblies from units; rebuilt them using run flats, new rubber tires, and rims (if serviceable); and then returned them for use in combat operations. The tire shop averaged 200–300 assembly repairs weekly, improving the combat readiness of both brigades in theater. Additionally, wheel assemblies were sent to Afghanistan until the tire shop at FRA-A was operational. The FRA-I tire shop has now been relocated to Qatar, where it will be used to support operations in both *OIF* and *OEF* theaters.

The vetronics shop at FRA-I was used as a station to diagnose and repair common chassis electronic line-replaceable units (LRUs). This capability was extremely important at FRA-I since LRUs did not have to be sent back to the vendor for repair. This saved shipping fees, time, and the cost of replacement LRUs. The vetronics shop, which is now located in Qatar, saved the government $833,484 in 2009.

The remote weapons systems (RWS) shop, also part of FRA-I, has been repositioned as well. One station was relocated to FRA-A in support of *OEF*, and one station was relocated to Qatar to provide continuing support to *OIF*. The RWS shop screens systems for no evidence of a fault (NEOF) and troubleshoots and repairs the systems. Technicians diagnosed and repaired RWS for a savings of $2,939,404 in 2009. There was also a mobile gun system (MGS) shop located at FRA-I that tested and screened LRUs for NEOFs and conducted repairs that saved the government more than $100,000. This capability is being relocated to the United States.

GDLS workers prep a container for shipment at a supply warehouse in FRA-I. (Photo by Lynden Lawson.)

Although the drawdown signals a shift in priorities and mission, FRA-I will continue reducing its footprint while supporting the units still in theater until no longer necessary.

In October 2009, support that shifted to Afghanistan included a welding trailer, a forklift, eight pallets of parts, tents, a generator, and 11 FUPPs, until FRA-A had its component repair facility up and running. The component repair facility at FRA-A received 15 FUPPs from FRA-I to help with support until it could operate at normal capacity. There were other internal reasons that made making FRA-A a mirror twin of FRA-I difficult. The infrastructure was quite different, as Kandahar, Afghanistan, where FRA-A is located, was yet to be developed to the same level as JBB in Iraq. This made planning especially important so that capabilities did not shrink in Iraq until the full capability existed in Afghanistan.

December 2009 marked a turning point for setting concrete timelines for the drawdown of FRA-I. All sections and personnel were tasked to inventory all gear, parts, and equipment, and to identify items that were over the authorized limit, so these excess parts and equipment could be better repositioned to support all units in both theaters of combat operations.

FRA-I received more than 110,000 parts in the last 6 months and shipped more than 170,000 parts to units in Qatar, the EDC, Afghanistan, and back to Auburn, WA. Further, FRA-I has shipped more than 50,000 parts in the last 2 months as part of the responsible drawdown. FRA-I also identified items no longer needed that could be turned into the Defense Reutilization and Marketing Office, so that other units had the opportunity to use these items in their own production and repair facilities. FRA-I has sent out more than 20 conex boxes of rubber tires alone and several more conex boxes full of slat armor that will be reconstituted in Auburn and assembled into complete sets.

The FRA-I mission continues to support the units and, most importantly, the Soldier in the field who is conducting combat operations. Although the drawdown signals a shift in priorities and mission, FRA-I will continue reducing its footprint while supporting the units still in theater until no longer necessary. To date, the FRA-I footprint has been reduced by more than one-third and the RTF fleet reduced by more than 50 percent; meanwhile, the FRA-A capability to support *OEF* continues to grow to support vehicles there. "We Support the Troops," is not just a saying on the sides of our shipping crates; it is the "plan of the day!"

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# Equipping Joint Warfighters Through Modernization of Unmanned Ground Systems (UGS)

Jeff Jaczkowski

**This article discusses the Program Executive Office Ground Combat Systems (PEO GCS) Robotic Systems Joint Project Office's (RS JPO's) actions and strategy for equipping joint warfighters through modernization of UGS capabilities. The initial section provides an RS JPO overview and a historical perspective on the mission application growth over time associated with ground robot employment in *Operations Enduring* and *Iraqi Freedom* (*OEF*/*OIF*). The next section details the RS JPO's robot modernization strategy, a 3-axis approach centered around a family of common mobility platforms equipped with modular mission equipment packages. Improvements to the base platforms for increased agility, mobility, size, weight, power, cooling, and transportability will be addressed. Finally, the article discusses the RS JPO's Unmanned Systems Road Map, emerging requirements, and future technology enablers.**

**The Mini-EOD, which delivers a man-portable system to support dismounted operations in the rugged terrain and elevations of Afghanistan, searches through a field. (U.S. Army photo courtesy of RS JPO.)**

In line with the Army's modernization initiative, the RS JPO emphasizes getting the right capabilities in the hands of Soldiers and Marines, while developing versatile capabilities required for future challenges. The RS JPO leads all aspects of UGS life-cycle management to ensure that safe, effective, and supportable capabilities are provided while meeting applicable cost, schedule, and performance. With more than 6,000 robotic systems fielded to date, these systems have proven to be combat enablers and permit our Soldiers to perform some of the most dangerous jobs on the modern asymmetric battlefield. Capability enhancements reflect the lessons learned from ongoing operations and better posture robotic systems for a broader range of relevant applications. The RS JPO also manages the Joint Robotic Repair and Fielding (JRRF) activity to provide sustainment support for robotic platforms that includes training, maintenance, assessment, and accountability. JRRF detachments in *OEF* and *OIF* provide theater support sustainment capability for all robots in theater.

The RS JPO leads all aspects of UGS life-cycle management to ensure that safe, effective, and supportable capabilities are provided while meeting applicable cost, schedule, and performance.

## Overview of Current Portfolio

The majority of current ground robotic systems are commercial-off-the-shelf (COTS) equipment that were procured and fielded against Joint Urgent Operational Needs Statements (JUONS), addressing capability gaps that were determined to be urgent and compelling. The stalwarts of RS JPO's robotic system fleet include the MarcBot, Talon, PackBot, and Mini-Explosive Ordnance Device (EOD). These man-transportable (35–110 pounds) robotic systems are used to identify and neutralize roadside bombs and other improvised explosive devices (IEDs), and are designed for locating, identifying, and disarming explosive and incendiary devices and collecting forensic evidence. The RS JPO currently has one fully funded program of record (POR) reflected in the FY10–15 Program Objective Memorandum (POM) for route clearance, which includes the M160 (MV-4B) Mechanical Anti-Personnel Mine-Clearing System and Man-Transportable Robotic System Route Clearance small robot.

Support to overseas contingency operations (OCO) has greatly accelerated acquisition and fielding timelines. Delivering safe, effective unmanned systems with a variety of mission payloads in response to JUONS has created numerous opportunities, as well as challenges, for the RS JPO and its partners. Operational needs from theater have defined mission requirements for ground robots from explosive ordnance disposal, to area and route clearance, to reconnaissance and surveillance. This has resulted in the proliferation of ground robots on the battlefield. The U.S. industrial base has grown to meet the demand for unmanned systems. This growth is evident across all sectors of the market, from basic and applied research at academic institutions and government laboratories; to prototyping and commercialization by small businesses; to manufacturing, production, and sustainment operations by traditional defense contractors, automotive suppliers, new companies, and government organizations.

## Modernization

The RS JPO's platform modernization strategy is threefold:

- Recap existing assets currently supporting OCO.
- Integrate a host of capability improvements stemming from theater requirements.
- Execute operational assessments of advanced robotic capabilities in conjunction with emerging requirements.

This strategy takes maximum advantage of existing systems by making necessary improvements in both capability and reliability, while adapting to mitigate the risk of uncertainty caused by an evolving threat. It also promotes commonality and interoperability in parts, operation, maintenance, and support of future systems.

Thousands of COTS, or modified COTS, ground robots have been used in tens of thousands of missions, incurring hundreds of thousands of hours of operation. In many instances, the same robot has been repaired multiple times and put back in the fight without major overhaul. Rapid Fielding Initiatives (RFIs) have resulted in a variety of platforms and platform generations, creating configuration management and sustainment challenges. Robots are issued as theater-provided equipment (TPE) and turned over from one unit to another during the relief in place, transfer of authority process. As the drawdown of military force in Iraq commences, units turn in their TPE robots to one of the JRRF activities in *OIF*. These systems are inspected and overhauled from top to bottom. Platform modernization entails chassis upgrades, replacement of robot manipulator arms, migration to laptop-based operator control units, and system software and embedded processor enhancements (which incorporate the hooks for future upgrades to semi-autonomous operations, digital

mapping, and modular payload integration). Assets are then postured for refielding based on U.S. Central Command priorities, primarily to support the *OEF* surge. This modernization of the existing ground robot fleet will provide an additional 3-year operational life per platform, while improving the health of the U.S. industrial base.

The second initiative of the JPO's modernization strategy is to integrate a host of capability improvements from lessons learned from the fight and theater requirements. These enhancements include everything from increased agility to improved situational awareness 360-degree sensing; video recording; and chemical, biological, radiological, nuclear, and explosive detection. Some of these technology improvements are bundled in a plan with the Joint IED Defeat Organization (JIEDDO) to integrate, test, assess, and field more than 1,500 robots in the upcoming months.

The third tenet of the RS JPO's modernization strategy involves conducting operational assessments of advanced robotic capabilities in conjunction with emerging requirements. These efforts are typically performed in conjunction with operational units or other user representatives and other government agencies including the U.S. Army Training and Doctrine Command (TRADOC), Rapid Equipping Force, Asymmetric Warfare Division, JIEDDO, and Army laboratories. One example of an RFI and operational assessment that has had great success is the Mini-EOD. Warfighters required a lighter, more agile robot for IED interrogation and explosive ordnance disposal. The Mini-EOD delivers a man-portable (34.5 pound) system to support dismounted operations in the rugged terrain and elevations of Afghanistan. More than 200 systems have been delivered and approximately 100 more will be fielded by October.

A Talon ordnance disposal robot prepares to unearth a simulated IED during an exercise. The Talon is an element of RS JPO's robotic system fleet. (U.S. Navy photo by MC3 Kenneth G. Takada.)

## Unmanned Ground Vehicle (UGV) Emerging Requirements

Unmanned systems can support future forces and expanded operational environment concepts by serving as economy of force assets and enhancing force protection by providing standoff operational capabilities for many warfighter functions. TRADOC has developed an Initial Capabilities Document for a family of unmanned systems, which supports the development of underpinning requirements documents for ground, air, and maritime systems. The Maneuver Center of Excellence has convened the first Joint Ground Robotics Integration Team (JGRIT) summit, which resulted in an integrated list of combat-developer desired capabilities that UGVs are expected to fulfill in the coming years. Common throughout the JGRIT list of UGV future capabilities is the need for interoperability between UGVs and manned platforms.

To set the foundation for this, the RS JPO has embarked on an initiative involving the development and application of standards for integration across UGVs, leveraging open architecture and open interfaces to address problems with proprietary robotic system architectures. The expected result of this effort will culminate with a set of standards coalesced in a series of profile documents containing open standards and interface specifications to achieve modularity, commonality, and interchangeability across payloads, UGV control, video/audio standards, data, and communication links. The purpose of this effort is to establish standards to enhance competition, lower life-cycle costs, and provide warfighters with enhanced robotic capabilities that enable commonality and joint interoperability within the unified battle command.

Delivering safe, effective unmanned systems with a variety of mission payloads in response to JUONS has created numerous opportunities, as well as challenges, for the RS JPO and its partners.


The RS JPO currently has one fully funded POR reflected in the FY10–15 POM for route clearance, which includes the M160 (MV-4B) Anti-Personnel Mine Clearing System seen here. (U.S. Army photo courtesy of RS JPO.)

As robotics technology advances, future land combat forces will gain significant new operational capabilities, permitting paradigm shifts in the conduct of ground warfare that are a result of significantly greater survivability, flexibility, and sustainability.

## Opportunities and Recommendations

The RS JPO has equipped joint warfighters with unmanned system capabilities while mitigating several significant challenges. A lack of POR requirements and associated funding in the POM necessitates creative solutions to realize product improvements and system sustainment. Reactionary modifications and payload integrations have created configuration management, obsolescence, sustainment, and interoperability challenges. It will become a major challenge to continue to meet operational needs without having a stable funded budget line for COTS robotic systems and support; therefore, reset funds have been requested in the FY12–17 POM submission. Ground robotic systems must be an established part of a unit's table of organization and equipment and integrated into the brigade combat team structure. This will embed robotic systems in predeployment training and doctrine, synchronized within the Army Force Generation cycle, while providing a common basis for modernization.

As robotics technology advances, future land combat forces will gain significant new operational capabilities, permitting paradigm shifts in the conduct of ground warfare that are a result of significantly greater survivability, flexibility, and sustainability. It is anticipated that robotics platforms will be integrated with other unmanned air, ground, and sea assets and unattended ground sensor networks to enhance overall operations within a fully integrated and seamless global information grid. In the near- and mid-term, it is anticipated that robots will continue to operate under some human control. However, as technology progresses, robots will require less human interaction and will be capable of higher levels of autonomy and independent operation. Principal limiting factors on the degree of autonomy of robotic systems used by military forces remain the reliability of the system and the complexity of the task environment. Robots operating in a task environment that is complex and containing unpredictable and changing conditions will require highly reliable sensing and decision-making technologies. Until these technologies are developed and proven, humans will continue to manipulate robots based on abilities and the conditions in which they operate.

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# Commonality of Towed Artillery Digital Fire Control Systems (DFCS)

Joseph Lipinski

**Commonality of components across towed artillery platforms has been practiced at the basic weapon level for some time. Examples are common hydraulic fluids and other lubricants, as well as high-usage rate cannon components and optical fire control components. Commonality of DFCS across towed artillery platforms is a new initiative by the Joint Program Manager Lightweight 155mm (JPM LW155) Howitzer between the M777A2 and the M119A2 towed howitzers. The 155mm M777A2 was the first towed howitzer to have a DFCS. A program to integrate a DFCS capability onto the 105mm M119A2 towed howitzer was approved by Program Executive Officer Ground Combat Systems and the Field Artillery School Center of Excellence Commanding General on Jan. 24, 2008. Direction was provided to maximize commonality across the Infantry Brigade Combat Team (IBCT) to the maximum extent possible, thus minimizing the IBCT's logistic footprint.**

The 155mm M777A2 was the first towed howitzer to have a DFCS. Here, 108th Field Artillery Regiment (FAR), 56th Brigade, 28th Infantry Division, Pennsylvania Army National Guard (ARNG) Soldiers fire the M777A2. (U.S. Army photo courtesy of Fort Sill, OK, library.)

This mission was assigned to the JPM LW155, who is also the life-cycle manager of the 155mm M777A2 towed howitzer. Additionally, the JPM is responsible for the Army's 155mm M198 towed howitzer (no plans for digitization), the M111 Improved Position and Azimuth Determining System, the Gun Laying and Positioning System, and the Towed Artillery Digitization program. Recently, the JPM has been assigned to manage the "non-standard" D-30 howitzer mission by the Vice Chief of Staff of the Army.

The digitized M119A2 program and the commonality effort between it and the M777A2 are being executed in an evolutionary approach. The goal is to be common where possible and as quickly as possible, without adding high technical or other programmatic risk to either of the two target platforms. The decision document to proceed with digitizing the M119A2 required the program to maximize use of hardware already within the IBCT, where possible. To accomplish this, the dismounted 120mm mortar line-replaceable unit (LRU) DFCS hardware was used as a baseline, with the goal of achieving commonality with the other artillery platforms at a later date. The digitized howitzer will be Type Classified Standard as a M119A3, consisting of all digitization hardware and Block 1.1 software that provides the capabilities of basic navigation, aiming, pointing, and Joint Variable Message Format communications with the Fire Direction Center. A comprehensive plan has been put in place to achieve the commonality goals between the future M119A3 and the M777A2 within 3 years.

The goal is to be common where possible and as quickly as possible, without adding high technical or other programmatic risk to either of the two target platforms.

## Why Pursue Commonality?

In addition to the DFCS allowing the M119A3 to become more survivable on the battlefield by emplacing and displacing faster and providing more responsive fires, ensuring LRU and software commonality will have a significant payback. Commonality will result in shorter development times for new LRUs. With a common architecture between platforms, one platform's development can leverage off another platform's development, similar to what is done in software development. This will result in lower costs as well, since separate development efforts and teams would not be needed. This quicker development time is also important because of obsolescence issues with electronic components. Baseline designs are difficult, if not impossible, to reproduce and support within a few years of first hitting the field. When artillery platforms have common LRUs, there is a huge payback from having a common logistics base; sustainment costs are reduced due to fewer configurations

The DFCS capability is being integrated onto the 105mm M119A2 towed howitzer. Here, 1st Battalion, 258th FAR, New York ARNG Soldiers lift the back of an M119A2 howitzer to spin the cannon into firing position, March 8, 2010. (U.S. Army photo by SPC Ian Boudreau, 27th IBCT Public Affairs.)

Blasting a 155mm howitzer round during a gun-calibration exercise at Destiny Range, Mosul, Iraq, Soldiers make the earth tremble as they fire more than 30 rounds from an M109A6 Paladin, April 23, 2010. Possible commonality of DFCS with the Paladin self-propelled howitzer is being investigated. (U.S. Army photo by SPC Gregory Gieske, 2nd BCT, 3rd Infantry Division Public Affairs.)

having to be maintained. Commonality also provides for training similarities across platforms.

## Challenges

Each platform has unique performance and environmental requirements, such as shock loading and weight. Each platform has unique interface requirements and a different schedule for development, refresh, obsolescence, production, and fielding. The M777A2 DFCS is nearing the obsolescence and refresh timeframe, whereas, the M119A3 is in development. Lining up software development with hardware development is also challenging. Software development teams will need hardware early in their process. Also, mandated hardware changes, such as updated radio systems, may be service-unique. Each of these is a challenge to achieving commonality.

The survival of the Inertial Navigation Unit (INU) in the M119A2 shock environment is a known issue. Shock values when firing on the M119A2 are much higher than on the M777A2, so simply taking the INU currently on the M777A2 and putting it on the M119 was a non-starter. An effort was conducted to identify potential suppliers and evaluate the ability of their devices to meet M119A3 requirements while still being backward-compatible onto the M777A2.

Another commonality challenge is the DFCS power supply, since the size and weight of each system's power supply is driven by its own system level requirements. The M777A2 has more LRUs to power, and its run-time requirements are greater. The digitized M119A2 system has lower weight requirements. A new power supply, common to both platforms, is being designed with both systems' requirements being taken into account.

Some technical risk because of differences between the dismounted 120mm mortar's environment and the M119A2's environment is also present. This will be addressed through qualification testing. If an engineering modification is needed as a result of this evaluation, an Engineering Change Proposal will have to be negotiated with the common platform or an agreement from the user obtained to relax the requirement through a cost-as-an-independent-variable exercise.

The weight requirement for the digitized M119A2 is 4,500 pounds or less. Weight plays a big factor in transportability and operability of the M119A2.

In addition to the DFCS allowing the M119A3 to become more survivable on the battlefield by emplacing and displacing faster and providing more responsive fires, ensuring LRU and software commonality will have a significant payback.

The weight of the DFCS components and their configuration on the weapon also factor in the operability of the weapon for emplace/displace and out-of-traverse functions. Close attention has been paid to the weight and balance of the system, and an acceptable configuration has been determined and vetted with the user community.

## Commonality Steps

The first step in developing common hardware is to create a generic system architecture for towed artillery DFCS that meets all the associated platforms' requirements. Hardware diagrams specific to each platform then have to be prepared. These diagrams have to synchronize software development schedules for each platform and the proposed funding for refresh and obsolescence. Road maps, then created for each LRU, will include requirements development, prototype development and testing, system level testing, and procurements.

Commonality is being executed using the U.S. Army Armament Research, Development, and Engineering Center (ARDEC) as the systems integrator. ARDEC is the current design authority for the M119A3 howitzer and will become the design authority for the DFCS hardware on the M777A2 as more components become common. ARDEC has an established artillery fire control software capability used by the M777A2 and Paladin systems. Using ARDEC allows the program to leverage digitization hardware from other existing programs. In addition to systems integration, ARDEC will write the computer code using the M777A2 code as a baseline.

## Proposed Common LRUs

There are a number of planned common DFCS LRUs. The Muzzle Velocity System (MVS) will initially be a stand-alone system that will be integrated into the DFCS during a future software upgrade. The Power System and the Power Distribution System (PDS) will have a new power control and conditioning module, a power data hub, and new batteries. There will be a combined Mission Computer and Chief of Section Display; currently, these are separate LRUs on the M777A2. The digitized M119A2 will use a combined unit called the Fire Control Computer (FCC). Also, the Gunner's Display, INU, radio, and Platform Integration Kit (PIK)/integrated PIK (iPIK) will be common.

The first step in developing common hardware is to create a generic system architecture for towed artillery DFCS that meets all the associated platforms' requirements.

LRUs that won't be common between the digitized M119A2 and the M777A2 are the Laser Ignition System, the Electronic Thermal Warning Device, and the Hydraulic Power Assist Kit. However, the PDS and FCC will be designed to interface with these LRUs when implemented on the M777A2. The FCC used on the dismounted 120mm mortar achieves all requirements. Under the guidance to maximize commonality, the same computer will be acquired as part of the digitization package.

## Current Status

The solicitation for a common MVS has been released and includes all requirements for the M777A2 and the digitized M119A2 platforms. Bid sample testing will be conducted in support of a procurement decision. A working group has been established to write the power system specification and a draft currently exists. It is planned to build and test power system prototypes to this specification. The proposed M119A3 FCC solution was demonstrated on the M777A2 in January 2010 using modified software, and user assessment will be obtained after the demonstration. The proposed gunner's display was also demonstrated on the M777A2 in January. The M119A3 program is in the middle of a source selection for the new INU to meet specified shock requirements. After a down select, a compatibility study will be initiated to determine the steps needed for the INU to be retrofitted on the M777A2.

Both platforms currently use Advanced System Improvement Program (ASIP)-compliant radios. Since ASIP may be replaced in the near future, a study will be initiated to determine potential issues with integrating a new radio solution. The M777A2 currently uses PIK and the Defense Advanced Global Positioning System Receiver (DAGR). The M119A3 will use iPIK, which combines the functionality of the PIK and DAGR into one device. A study will be conducted to determine potential issues with integrating iPIK into the M777A2.

Possible commonality with the Paladin self-propelled howitzer is also being investigated. The same types of challenges will be encountered as those between the two towed platforms. A commonality study will be conducted by the offices of the JPM LW155 and PM Heavy BCT.

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# Fleet Management of Tactical Wheeled Vehicles (TWVs)

Connie Albrecht, Gary Balakier, David Dopp, and Robert Laichalk

**The Army's TWV fleet is a critical asset, executing a wide range of combat and noncombat missions. Some of these diverse missions include line-haul transiting Abrams main battle tanks; transporting and delivering cargo, fuel, engineering, and combat equipment and shelters; providing reconnaissance; serving as mobile launch platforms for Tube-launched, Optically-tracked, Wire-guided missiles; and operating as an expeditionary assault force transported by rotary-wing aircraft. The current fleet has been produced over the last 4 decades and includes the most modern armor-ready vehicles and legacy vehicles in need of modernization or replacement.**

The Army and USMC JLTV program is currently executing the Technology Development (TD) phase. In October 2008, TD contracts were awarded to Lockheed Martin (whose JLTV TD vehicle is shown), BAE Systems, and General Tactical Vehicles (a joint venture between General Dynamic Land Systems and AM General). (Photo courtesy of Lockheed Martin.)

The fleet strategy sets broad objectives and guidelines while fleet plans assess critical data and analyses operating within the boundaries of the strategy to define an execution plan to manage the fleet.

To successfully complete such a wide range of military operations, TWVs must be technically capable. These capabilities include being able to add and remove armor, travel cross country, mount and dismount weapons, dispense fuel, handle and unload basic cargo loads and International Organization for Standardization-compliant containers, automatically increase and decrease tire pressures based on terrain, and transport 70 tons of cargo at high speed. However, such varied capabilities cannot be engineered in a single vehicle. Three families of vehicles fulfill these missions:

- Light Tactical Vehicle (LTV) Fleet: high-mobility multipurpose wheeled vehicles (HMMWVs) and the planned next generation LTV, the Joint LTV (JLTV).
- Medium Tactical Vehicle (MTV) Fleet: Family of MTVs (FMTV) and legacy M35, M800, and M939 series.
- Heavy Tactical Vehicle (HTV) Fleet: Heavy Expanded Mobility Tactical Truck (HEMTT), Palletized Loading System (PLS), Heavy Equipment Transport (HET), and Line Haul.

Mine Resistant Ambush Protected (MRAP) vehicles and MRAP-All Terrain Vehicles (M-ATVs) were built specifically for *Operations Enduring* and *Iraqi Freedom*. MRAPs and M-ATVs will start to fill some armor-ready HMMWV requirements. Mission roles will consist of general purpose mobility, close combat weapons carrier, and convoy protection platform. Current LTV, MTV, and HTV fleets are at a worldwide density of 260,000 vehicles.

## Army Strategy and Challenges

The Army has a flexible and adaptable strategy. It allows for mitigating the risk of uncertainty caused by an evolving threat, for change to our force structure to meet our missions, and for changes impacting the Army budget. Army strategic guidance provides a basic framework through the following operating principles:

- Taking maximum advantage of and maintaining existing platforms through recapitalization (recap), product improvement modernization, and reset.
- Planning the integration of MRAPs into the fleet mix.
- Emphasizing a mixed-fleet approach that spans the "iron triangle" of protection, payload, and performance.
- Moving to an "armor-ready" fleet that has scalable protection (the ability to remove and replace armor).

Challenges will include the need for a consolidated database of key fleet planning data. Currently, work is ongoing with the Army's staff agencies to use standard Army databases and develop calculation models to standardize a set of management tools to better assess the fleet and review courses of actions in making key decisions to procure, recap, or divest vehicles.

## Current and Future Outlook of the TWV Fleet

The light, medium, and heavy fleets each have unique challenges because of their specific missions, requirements, and age. The LTV fleet has largely met force requirement quantities, meaning HMMWV production will decrease. The Army and U.S. Marine Corps' (USMC's) JLTV, with increased payload, protection, and performance capabilities, is intended to replace a portion of the aging/obsolete HMMWV fleet. The fleet management strategy for the LTV fleet then is to ramp down HMMWV production of current armor-capable variants, recap select utility and armor variants, and divest obsolete variants. The JLTV will gradually ramp up in production and replace aging and/or limited capability HMMWVs; the Army's LTV fleet will include a combination of HMMWVs and JLTVs for the extended future.

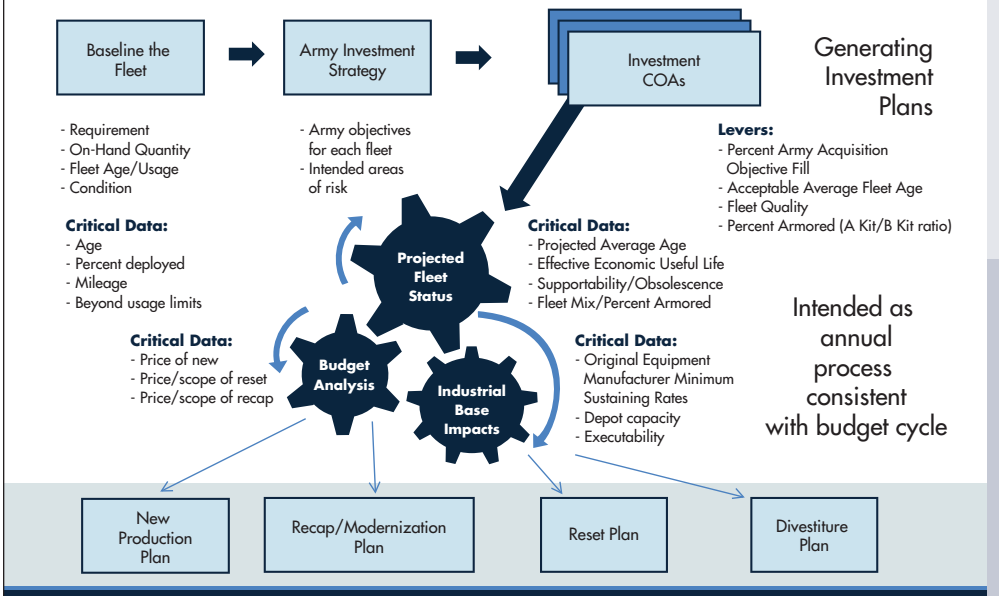
The current MTV fleet meets force requirement quantities, but includes significant quantities of outdated legacy vehicles, which need to be replaced with increased capability FMTVs. The fleet management strategy for the MTV fleet is to replace obsolete legacy vehicles with FMTV and cascade retrograded M939s. Current production FMTVs also include the ability to be armored.

The HTV fleet is also a combination of modern armor-ready and outdated legacy vehicles. The fleet management strategy for the HTV fleet includes new procurement of armor-ready variants to fill shortages for HEMTT and PLS; recap of legacy models of HEMTT and PLS to modernize armor-ready configurations; and procurement of HET and Line Haul to replace these aging and obsolete fleets.

## Developing a Fleet Management Strategy

The overall objective of the TWV fleet management is to provide the right vehicle, in the right place, at the right time, and at the right price. The tools or methods to manage the fleets include optimized combinations of new procurement, recap, reset, and divestiture. The monetary resources to manage the fleets are prioritized to address the most pressing needs, such as filling shortages, replacing obsolete vehicles,

## FLEET MANAGEMENT PROCESS




PROJECTED FLEET STATUS

modernizing (e.g., armor integration), refurbishing (modernizing and reducing the effects of aging and use), resetting (component repair and replacement of war-exhausted assets), and divestiture of obsolete systems.

The fleet management process (see Figure) includes developing a fleet strategy and resulting fleet plans. The fleet strategy sets broad objectives and guidelines while fleet plans assess critical data and analyses operating within the boundaries of the strategy to define an execution plan to manage the fleet.

Two key aspects in developing the fleet plans include a fleet baseline to define the current condition of the fleet and develop courses of action (COAs), taking into account critical data elements that impact investment decisions. The resulting fleet plan sets appropriate levels of new procurement, recap, reset, and divestiture. Baselining a fleet takes many factors into account, including on-hand quantity in comparison to force structure requirements, fleet age, usage, condition, mileage, and numbers deployed.

This baseline information is assessed to determine if new procurement is required to either fill shortages or replace obsolete vehicles. It is also used to determine whether recap is required to insert technical improvements, such as armor, independent suspension, or improved safety features, or whether reset is required to replace components or subsystems because of over stress and/or extreme usage. Lastly, considering age, condition, and/or capability, fleet baseline information is used to determine when to divest obsolete vehicles from the inventory.

An effective fleet plan will manage and control the quantity, capability, and age of the fleet over time. The fleet plan includes yearly recommended levels of new procurement, recap, reset, and divestiture, which help to inform the Army Weapon System Review and Program Objective Memorandum builds. In any given year, it may not be affordable to execute all recommendations. However, by adjusting the fleet attributes or levers, investment COAs can be tailored to an optimum fleet mix, weighing in priorities and level of risk over time.

Army requirements and the fleet's condition will continue to be assessed using sound fleet management principles. The fleet management process will maintain a modernized fleet and enable investment decisions to provide the Soldier with the right vehicle, in the right place, at the right time, and at the right price.

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# Fire Suppression Systems (FSS) Enhance Tactical Wheeled Vehicle (TWV) Survivability

COL Michael Receniello

**TWVs have been lost or rendered inoperable in Iraq and Afghanistan because of accidental vehicle fires or battle damage fires from ballistic attacks, including improvised explosive devices (IEDs) and IED fragments. As a result, fire suppression experts from the Army and U.S. Marine Corps (USMC) have collaborated on providing numerous FSS to meet current and emerging threats.**

Alpha Co., 782nd Support Battalion MRAP vehicles are lined up in preparation to move out on a resupply mission in southern Afghanistan. In the JUONS in FY05, the original FSS threshold requirement for the TWV fleet stated a need for hand-held, portable fire extinguishers. MRAPs were retrofitted and fielded with the initial FSS requirements after the initial TWVs. (U.S. Air Force photo by SrA Kenny Holston.)

The harsh operational environments in Iraq and Afghanistan place great stress on TWVs. Added stress on vehicle components can cause electrical malfunctions and fuel leaks, which could lead to accidental vehicle fires. Furthermore, enemy forces are employing combustible accelerants combined with IEDs, causing initial impact destruction, blast over-pressurization, and secondary fires.

Various FSS are currently installed on fuel tank, tire, engine, and crew compartments of the Army and USMC TWV fleets. It is the responsibility of the services to ensure that the most survivable and supportable TWVs are fielded to warfighters. To do this, the Army and USMC conduct extensive market surveys and engineering studies to determine the most effective combinations of armor and fire protection for Soldiers and Marines, while maintaining the proper balance of mobility, operability, and sustainability of the TWVs.

This comprehensive approach has identified that no single fire protection technology is appropriate for all vehicle applications, meaning FSS are tailored to the unique configurations of each TWV within their space and weight constraints. Every TWV is equipped with one or more portable fire extinguishers.

It is the responsibility of the services to ensure that the most survivable and supportable TWVs are fielded to warfighters.

## Evolution of Requirements

FSS requirements for other vehicles in the TWV fleet stemmed from a Joint Urgent Operational Needs Statement (JUONS) in FY05. The JUONS did not initially include Mine Resistant Ambush Protected (MRAP) vehicles, but targeted the Army and USMC TWV fleet. The original FSS threshold requirement for the TWV fleet stated a need for hand-held, portable fire extinguishers. The objective requirement was for internal (crew cab) automatic activated FSS with manual (activated by a press of a button), external (engine, tire, and fuel tank areas) fire extinguishers. After the initial TWVs (light, medium, and heavy), MRAPs were retrofitted and fielded with the initial FSS requirements. The Army received additional ONS from the theater of operations for automatic FSS capabilities on all TWVs following.

The Army's FSS requirements for up-armored TWVs came through various ONS received from *Operations Enduring* and *Iraqi Freedom* (*OEF/OIF*), which were subsequently validated in August 2008. While these ONS identified the need for extinguishing fires on TWVs, they did not give specifics on what areas of the vehicles needed coverage or what type of system to use. The USMC's FSS requirements for up-armored TWVs came through Urgent Universal Need Statements, which reiterated the Army's FSS requirements, with one exception that related to crew compartment fires.

## Off-Platform (Non-Vehicle) Solutions

The Army's Product Manager Sets, Kits, Outfits, and Tools (PM SKOT) began developing and fielding enhanced off-platform firefighting capabilities in December 2007. These systems help Soldiers extinguish external vehicle fires caused by adverse action or maintenance-related failures. PM SKOT, under the leadership of the Army's Project Manager Joint Combat Support Systems, Program Executive Office Combat Support and Combat Service Support (PEO CS&CSS), issued 17 Soldier-portable firefighting sets, two trailer-mounted firefighting systems, and two refill kits to Soldiers in theater. Army and USMC units in theater have procured additional portable firefighting

**FSS will ultimately reduce casualties, reduce vehicle losses, and better enable warfighters to complete their missions. (U.S. Army photo.)**

sets to supplement the vehicle FSS, to include a backpack with 5 gallons of water-based foam and a compressed air cylinder to fight external vehicle fires.

## The Future of FSS

PEO CS&CSS, working alongside the U.S. Army Research, Development, and Engineering Command, is advancing FSS technologies. Research and development (R&D) initiatives are paving the way in evaluating emerging FSS technologies necessary to support the Army's modernization plans for legacy vehicles, as well as developing and evaluating new fire protection technologies for future TWV applications. These include fuel tanks, crew automatic fire extinguishing systems (AFES), and FSS agents.

Technologies are being developed in the form of a self-sealing bladder fuel tank, which is designed to be crash-tolerant. The systems provide significant increases in survivability when subjected to ballistic impacts. Another technology prototype is the integral fuel tank. This protection is a combination of the powder panel and self-sealing coating concepts. These systems are designed to be internal to the fuel tank, protecting fuel tanks from explosions and external fires following the impact from various threats.

In addition to fuel tank redesign and protection, the Army is investigating fire-resistant fuel (FRF) for ground vehicles. FRF is still under development for JP-8, and the logistics burdens associated with its fielding must be addressed before integration into the TWV fleet. FRF provides a safer, less flammable fuel to the warfighter. It is potentially compatible with all combat and tactical vehicles, but does cause a loss in vehicle power, torque, and range.

R&D initiatives are paving the way in evaluating emerging FSS technologies necessary to support the Army's modernization plans for legacy vehicles, as well as developing and evaluating new fire protection technologies for future TWV applications.

An advanced crew AFES technology under development is 'zero delay' activation. The principle behind this technology is to activate the crew AFES when the fuel tank is penetrated in a ballistic event, before a fire develops. The crew AFES will discharge before the fire fully develops. This concept has been tested with promising results, and additional development and test and evaluation (T&E) will be conducted to refine and verify the initial approach and assess the applicability to TWVs.

Further T&E is being conducted to identify possible alternate extinguishing agents for legacy vehicles as well as future applications. This effort will enable the Army and USMC to evaluate more effective and environmentally friendly extinguishing agents than those currently used.

The FSS procurement and integration plan must meet the Army Long-Term Protection Strategy of all TWVs and must be armor-capable.

The protection offered by the FSS is critical to crew survivability in combat operations; it is treated with the same level of importance as external armoring of vehicles. Priority of acquisition of the system must be given to TWVs in the Army Force Generation (ARFORGEN) Theater-Provided Equipment pool and preposition stocks, with second priority given to the TWV equipment requirements in the available pool. Additionally, certain TWVs in the ARFORGEN train/ready/define/explain pool will require the FSS for training purposes.

Future capability designs will require some type of FSS to mitigate risks. The U.S. Army Training and Doctrine Command and the USMC Combat Development Command, with the capabilities integration missions, will incorporate FSS capabilities into future requirements documents. Today, FSS can be linked back to current ONS/JUONS and will be integrated into future developments. FSS will ultimately reduce casualties, reduce vehicle losses, and better enable warfighters to complete their missions.

**The Army's FSS requirements for up-armored TWVs came through various ONS received from *OEF/OIF*, which were subsequently validated in August 2008. (U.S. Army photo.)**

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BAE Systems' JLTV design incorporates lessons learned from DOD's Mine Resistant Ambush Protected vehicle program and features the latest in lightweight, advanced armor and a V-shaped hull design to provide maximum crew protection. (Photo by BAE Systems.)

# Joint Light Tactical Vehicle (JLTV) Technology Development (TD) Phase Vehicles Delivered on Schedule, Competitive Prototyping Proves Fruitful

Ashley John

**The Army and U.S. Marine Corps (USMC) have taken delivery of TD phase vehicles, seven from each TD phase contractor, marking the beginning of a 12-month test and evaluation effort at Aberdeen Proving Ground (APG), MD, and Yuma Proving Ground (YPG), AZ. The services are currently executing a 27-month TD phase wherein armor coupons, ballistic hulls, vehicles, and trailers will be developed and undergo a series of performance and reliability testing that will include assessments from joint warfighters. "JLTV has taken the traditional TD phase testing and expanded it to focus more on system-level testing rather than the traditional component-level testing," stated COL John S. Myers, the Army's Project Manager Joint Combat Support Systems.**

"Rather than following a traditional TD test program, the JLTV program has adopted a more comprehensive approach. The JLTV approach will enable the services to gauge technical potential against JLTV key performance parameters, placing emphasis on modeling and simulation, systems component testing, risk reduction, and increased readiness for the Engineering and Manufacturing Development [EMD] phase," added LTC Wolfgang Petermann, the Army's Product Manager JLTV.

The expanded JLTV TD will include more emphasis on system evaluation, system performance testing (rather than component testing), reliability testing, ballistic testing (coupons, ballistic hulls, prototypes), limited transportability demonstrations using operational assets, and early warfighter evaluations.

Vehicles will undergo performance and ballistic testing at APG and reliability and maintainability testing at YPG. Once performance testing is complete on JLTV Category A, B, and C vehicles at APG, the vehicles will be subjected to a limited user test with Soldiers and Marines, running the vehicles through a series of vignettes and soliciting feedback from the user jury. Both JLTV Category A and B vehicles with full B-kit configurations will run at YPG for the entire test duration.

JLTV has taken the traditional TD phase testing and expanded it to focus more on system-level testing rather than the traditional component-level testing.

The Australian vehicles are scheduled for delivery during June–July 2010 and will concurrently undergo testing with the U.S. vehicles, enhancing global interoperability between the U.S. and Australian forces. The Australian vehicles feature right-hand operation; commonality with the left-hand operation vehicles is around 95 percent for all three TD contractors. Different design approaches among the three TD contractors have shown no weight increase for one contractor, as they have only modified existing parts without adding parts. The two other TD contractors have added parts, which resulted in a 20-pound weight increase for one contractor and a 40-pound weight increase for the other.

JLTV TD contractors will also deliver one ballistic hull and vehicle prototype with enhanced protection, called JLTV-A Enhanced Protection (EP), during the TD phase. This vehicle modification will increase the inherent protection requirements originally required for the JLTV Category A General Purpose vehicle by improving its side and underbody protection capabilities. The Essential Combat Configuration weight requirement for the JLTV-A EP modification is 15,300 pounds. The government will take delivery of the JLTV-A EP vehicle in October 2010.

## Rebalancing the Future of the LTV Fleet

Developing the JLTV reinforces the Army's approach to interoperable platforms that provide expeditionary and protected maneuver to forces currently supported by high-mobility multipurpose wheeled vehicles. The intent of the JLTV is to facilitate brigade combat teams' (BCTs') symmetric and asymmetric approaches to tactical and operational maneuvers by improving their versatility and agility. The JLTVs also improve payload efficiency through chassis engineering, enabling the vehicles to be deployed with the appropriate amount of force protection through scalable armor solutions.

The capability gaps within the existing light tactical wheeled vehicle fleet are the result of an imbalance in protection, payload, and performance. The JLTV Family of Vehicles (FOV) will be able to deliver all of these capabilities within a transportable and expeditionary vehicle, meeting the Army and USMC rotary- and fixed-wing air, sea, and overland transport requirements—something no existing light tactical wheeled vehicle can do. "The JLTV FOV is expected to achieve

**General Tactical Vehicles' (GTV's) vehicle design provides an armored crew capsule with a V-shaped hull for protection against mines and improvised explosive devices, high-performance and off-road mobility, and deployability by land, sea, and air. (Photo by GTV.)**

unprecedented commonality, which will be crucial in keeping life-cycle costs affordable," said Myers.

The JLTV program management office fully expects TD phase testing to demonstrate the achievability of purchase description (PD) requirements, as well as the technological maturity, integration achievability, and producibility of JLTV vehicles. During TD testing, the Capabilities Development Document and PD will be revised almost exclusively upon the basis of formal test results and/or approved analysis.

## Competitive Prototyping is Working

The TD phase is satisfying the intended purpose: to demonstrate the integration of mature technologies as a complete system, providing an assessment of the technical and performance risks relevant to entering the EMD phase. The TD phase will establish an achievable set of requirements for the JLTV program. "Based on the valuable information we have gained thus far, we are making adjustments to ensure the EMD phase is low risk and affordable for the services," Petermann said.

All three JLTV TD phase contractors delivered vehicles in accordance with contract schedules and within the original contract amounts. JLTV program execution has demonstrated that DOD's competitive prototyping policy is working, contributing to the program manger's ability to control cost, schedule, and performance. "Competitive prototyping has enabled JLTV to stay within our cost requirements. The government cost is not overrun and we are operating within our schedule and performance parameters," said Petermann.

"The process increases government leverage and we can see the results being driven by real data on actual hardware," said Kevin Fahey, Program Executive Officer Combat Support and Combat Service Support (CS&CSS). "This will provide the government with increased confidence in operational performance of the JLTV FOV through test and evaluation of actual performance capabilities over the next 12 months." Additionally, detailed cost information gathered during the TD phase is enabling the JLTV program management office to develop detailed cost estimates with greater confidence, reducing risk associated with affordability as we proceed to the EMD phase.

Following the TD phase, the services intend to conduct another full and open competition for the EMD phase, with Milestone B decision planned for the end of FY11. The EMD phase will focus on reducing program risk; ensuring operational supportability; designing for producibility; maximizing affordability; ensuring critical program information protection; and demonstrating system integration, interoperability, transportability, fuel efficiency, reliability, and utility. "The government anticipates full and open competition with award of two contracts for the EMD phase, which will last for 24 months," added Petermann. A Milestone C decision is planned for FY14 and full production and fielding is anticipated to start in 2015.

**JLTV is an FOV with companion trailers, as shown here by Lockheed Martin, one of the three TD phase contractors. JLTV will provide warfighters with a balanced solution—protection, performance, and payload—packaged in a transportable and expeditionary solution. (Photo courtesy of Lockheed Martin.)**

JLTV program execution has demonstrated that DOD's competitive prototyping policy is working, contributing to the program manger's ability to control cost, schedule, and performance.

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# The Next Generation Automatic Test Station (NGATS) Offers Organic Off-System Test Capability for the U.S. Army

Patrick A. Curry

**Sustainment of the Army's weapon systems is a significant capability requirement for the Soldiers and program managers charged with the task of deploying and maintaining various weapon systems. No matter how a faulty weapon system is diagnosed at the platform, there will be a requirement to repair the component, unless deemed nonreparable. This defines the mission of the Army's off-system testers. They ensure the availability of the Army's weapon systems by providing the diagnostic and test capability that enables the repair of the faulty system components. The support structure needed to ensure sustained system readiness has evolved, supported by academic and practical analysis with actual wartime experiences. This evolution took form from a system-centric concept with each platform requiring a suite of special purpose test equipment to a multisystem test, diagnostic, repair capability enabled by the Army's Integrated Family of Test Equipment (IFTE) general purpose automatic test systems (ATS).**

Soldiers install a Bradley Fighting Vehicle line-replaceable unit (LRU) during an operational test event at Fort Hood, TX. Soldiers benefit operationally from the NGATS system with its improved test capability, reliability, supportability, and deployability. (U.S. Army photo.)

## IFTE

DOD and the Army have developed objectives and policy enablers to support the IFTE concept. Findings from a RAND Corp. study in 1990 titled *Supporting Combined-Arms Combat Capability with Shared Electronic Maintenance Facilities* foreshadowed the shift in support concept from four to two levels of maintenance and recognized the need to move component maintenance tasks from the maneuver elements to the rear echelons, thus, relying on distribution channels to support simpler remove/replace tasks forward. There was also evidence that IFTE, as an adaptable maintenance system that can support multiple platforms, can improve system readiness and availability, resulting in significant cost savings.

DOD; the Assistant Secretary of the Army for Acquisition, Logistics, and Technology; and the services embraced and implemented this concept, issuing policy and regulatory guidance at all levels to include creating a joint services ATS Management Board to provide oversight. In the July 2004 *Undersecretary of Defense for Acquisition, Technology, and Logistics Memorandum, DoD Policy for Automatic Test Systems*, DOD established the IFTE program as the Army's designated organic "single family" of ATS. Currently, IFTE supports multiple systems, such as the Kiowa Warrior; Tube-launched, Optically-tracked, Wire-guided missile; Abrams; Bradley; Paladin; and Avenger, with capability in development to support systems such as the Common Remote Weapons Station and Stryker Remote Weapons Station components. The IFTE off-system tester can diagnose and enable the repair of both electronic and electro-optical components and assemblies.

NGATS takes advantage of modern COTS test instruments and open-system architecture, resulting in significant improvements in capability and system reliability and reduced system costs over the previous solutions.

## NGATS

NGATS is the latest iteration of the Army's organic off-system test capability. NGATS is managed by Product Director Test Measurement and Diagnostic Equipment (TMDE), aligned under the management of the U.S. Army Project Manager Joint Combat Service Support, which is under the leadership of Program Executive Office Combat Support and Combat Service Support. NGATS takes advantage of modern commercial-off-the-shelf (COTS) test instruments

**Soldiers perform LRU diagnosis during an operational test event at Fort Hood. (U.S. Army photo.)**

NGATS is easily reconfigurable and adaptable to any weapon system requirement. Shown is the Army's NGATS tactical configuration. (U.S. Army photo.)

and open-system architecture, resulting in significant improvements in capability and system reliability and reduced system costs over the previous solutions. Using COTS-based instrumentation allows the NGATS to take full advantage of modern test program development tools, improving the speed of test development for weapon systems and reducing total development costs. NGATS represents the evolution of the IFTE off-platform test capability and the achievement of the DOD and Army goal to reduce the multiple unique ATS to a single tester that can support any weapon system at any level.

NGATS meets the Army's sustainment, transportability, mobility, and logistics modernization capability objectives in the sustainment area, in support of the supply chain, and as required in the forward area in direct support to maintenance organizations. Also, the system can support the national maintenance centers, such as depots, with a more in-depth testing and repair capability inherent in the system. The ability to support multiple maintenance echelons with the same tester enables sharing of Test Program Set (TPS) development and data, which increases the effectiveness of diagnostics at all levels, resulting in a reduction in total support cost. TPS procurement is the responsibility of the weapon system program offices.

NGATS, as a net-centric capable system with an enhanced data capture and analysis capability, can capture and share component failure data throughout the supply chain.

## Components

NGATS is composed of a maintenance shelter that houses the actual test system and a second shelter that stores the system-specific TPS hardware required to test the system's components. Separating the prime mover from the test system eliminates the maintenance downtime related to vehicle maintenance and increases availability of the test system. The shelters were developed in the standard 20-foot International Organization for Standardization (ISO) container configuration, allowing for access to any commercial or military transportation mode. This gives maximum flexibility while meeting the Army's theater and strategic transportability requirements, to include C-130 transport, without any changes to the system configuration. Mobility is provided by the self-deploying and self-retrieving M1120A2 Load Handling System, which allows the system to be emplaced in minutes and operational shortly after emplacement. This ISO configuration enables the system to be

easily relocated using various prime movers available to commanders, from tractor trailers to Heavy Expanded Mobility Tactical Trucks.

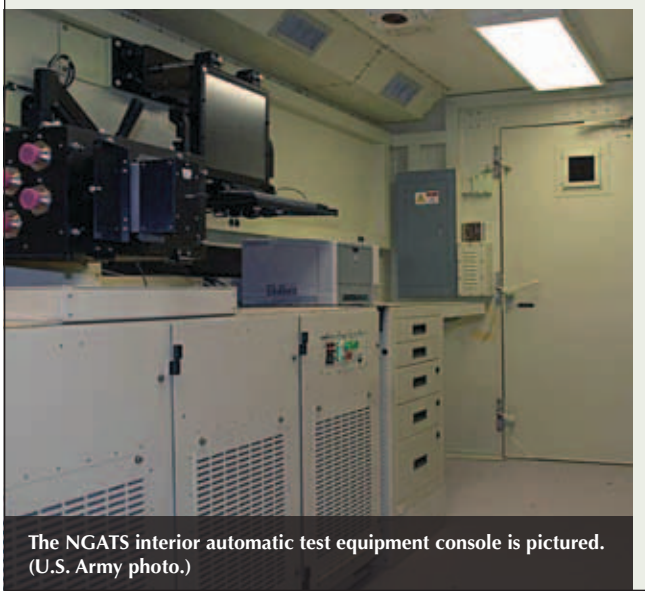
The improved test capability allows faster and more accurate diagnosis and repair of faulty or suspected faulty components. The state-of-the-art test instrumentation, coupled with system software and TPS, allows maintainers to diagnose and repair a wide array of system components, from repairable circuit cards to sophisticated electro-optic sensors and other critical weapon system components. NGATS is easily reconfigurable and adaptable to any weapon system requirement. As the Army embraces policies for DOD Enterprise Resource Planning and the net-centric environment to connect logisticians with maintenance, this data-rich environment will be used to enhance supply chain operations, maintenance decisions, and component design decisions. NGATS, as a net-centric capable system with an enhanced data capture and analysis capability, can capture and share component failure data throughout the supply chain, including all maintenance levels from field to organic sustainment to depot to factory.

The NGATS system has the advantage of being a joint capability. Its technology is derived from the U.S. Navy (USN)-led Agile Rapid Global Combat Support Advanced Concept Technology Demonstration (ACTD), which has an objective of exploring the potential benefits of developing and deploying a joint service automatic test capability. During the ACTD, NGATS was used as a demonstration system and was able to execute testing of Army, USN, and U.S. Marine Corps system components. This validated the contention that general purpose ATS is an interoperable commodity that can be leveraged for financial savings and, more importantly, an operational advantage to the warfighter.

NGATS offers significant advantages over currently fielded ATS, satisfying the dual sustainment functions of both diagnosis and repair while also achieving the DOD and Army objective to consolidate all ATS to a single, standard ATS family.

NGATS offers significant advantages over currently fielded ATS, satisfying the dual sustainment functions of both diagnosis and repair while also achieving the DOD and Army objective to consolidate all ATS to a single, standard ATS family. A reduction in the logistics footprint by displacing several aging and obsolete test systems with a modern test capability also supports the Army's logistics modernization initiatives. This is done by leveraging its net-centric capability into the component diagnostics and repair data collection and management process. This enables closed loop diagnostics by making real-time reliability and performance data available from the field to the factory. Even as systems move to become more self-diagnosing through embedded diagnostics and prognostics, until those same systems become self-repairing, NGATS will be required to provide organic support for system component diagnostics and repair.

NGATS has proven to be joint capable with its open-system architecture and use of industry standards and COTS components. The warfighter benefits operationally from the NGATS system with its improved test capability, reliability, supportability, and deployability. When coupled with its extreme flexibility, NGATS will be positioned to provide any level of component support at any point within a system's support strategy.



The NGATS interior automatic test equipment console is pictured. (U.S. Army photo.)

**PATRICK A. CURRY** is the Assistant Product Manager, Off-Platform ATS TMDE. He holds a B.S. in electrical engineering from the University of Central Florida and an M.S. in industrial engineering from Texas A&M University, and is a graduate of the U.S. Army Materiel Command's Advanced Test and Evaluation Engineering Program and the U.S. Army Management Engineering College. Curry is Level III certified in systems planning, research, development, and engineering and is a U.S. Army Acquisition Corps member.

# Army Rapidly Develops Expeditionary Fire Suppression Refill Station

Pat Schlue

**In September 2009, the Army's Product Manager Sets, Kits, Outfits, and Tools (PM SKOT) received the first of many Operational Need Statements (ONS) requesting a mobile fire suppression refill station. The ONS described common issues surrounding fire suppression equipment; variations in size, deployment type, and chemical composition were each addressed. Additionally, the refill equipment is disjointed and spread throughout the theater. The ONS addressed an urgent need to consolidate refill capabilities into a transportable container, effectively keeping a Soldier's fire suppression equipment fully mission capable. To expedite development, an integrated product team (IPT) consisting of various disciplines was rapidly assembled under PM SKOT guidance to research the problem and develop a materiel solution. The IPT consisted of leaders, logistical personnel, engineers, skilled laborers, Soldiers, former Soldiers, firefighters, and procurement personnel—all of whom brought a vast amount of knowledge to the task at hand. Upon thorough review of the various fire suppression apparatuses, as well as the refill requirements, the team set in motion a solid acquisition strategy.**


In September 2009, PM SKOT received the first of many ONS requesting a mobile fire suppression refill station. (U.S. Army photo by Laura MacManus, PM SKOT.)

## Teamwork

Using a previously tested and proven enclosure with self-contained power and environmental control, the team researched and procured the necessary commercial-off-the-shelf (COTS) refill devices to integrate within that container. The team members worked diligently during a 2-month period obtaining the components, designing a layout, and mounting the hardware. Their quick actions resulted in a proof of concept that was displayed and demonstrated at the quarterly Tool Set and Test, Measurement, and Diagnostic Equipment Transformation Board of Directors meeting in December 2009. "The IPT's approach to address this urgent requirement provides an outstanding example of how a system can be rapidly developed without significantly impacting logistical considerations," stated LTC Brian Tachias, PM SKOT.

The refill equipment is a COTS solution with publications that will be validated and augmented as required for Army use. (U.S. Army photo by Laura MacManus, PM SKOT.)

The enclosure assembly is fully provisioned and organically supported. Transportability of the system will use existing vehicular and Material Handling Equipment systems. The refill equipment is a COTS solution with publications that will be validated and augmented for Army use. Supply support for the COTS items will be provided by the PM SKOT warranty/replacement website, which provides support for all Army SKOT under PM SKOT's charter. "We are looking to field a mission-capable system in approximately 12–14 months," added Tachias. "Traditional approaches in the acquisition of Acquisition Category III systems of this type can take two to three times that long."

Safety certification testing of a product representative system (PRS) was completed at Yuma Proving Ground (YPG), AZ, in March 2010. Following safety certification, the PRS will be released to Afghanistan for user feedback. A competitive solicitation will be used to ultimately award a production contract to support the quantities required by the ONS.

"This once again shows that the PM SKOT team is up to the challenge to support the warfighter," added Tachias. "The fielding of this system will not only increase readiness, but will ultimately save more lives by keeping crucial fire suppression systems fully mission capable."

Safety certification testing of a PRS was completed at YPG in March 2010. (U.S. Army photo by Laura MacManus, PM SKOT.)

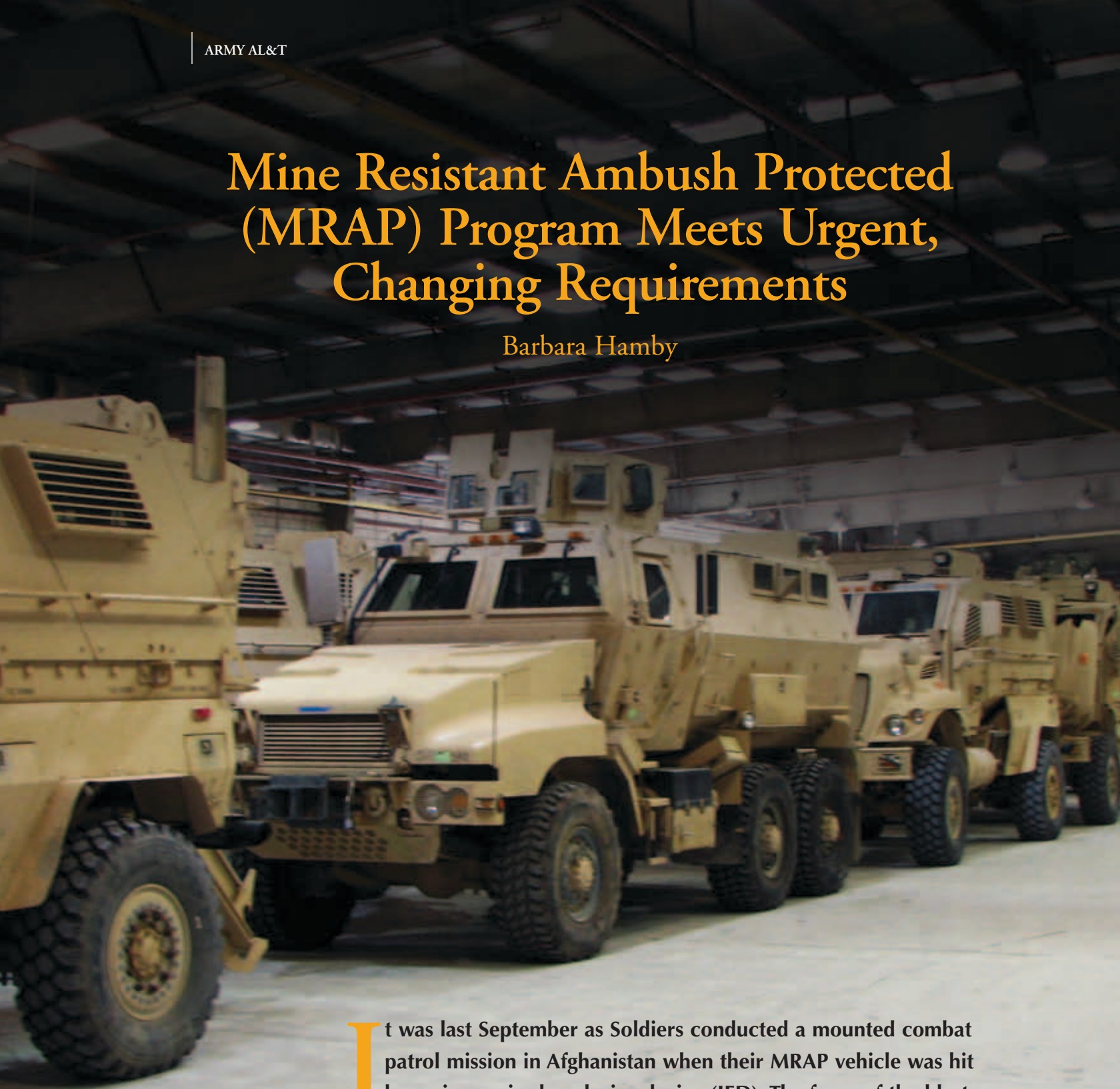
## PM SKOT

PM SKOT is aligned under the management of the U.S. Army Project Manager Joint Combat Service Support, which is under the leadership of Program Executive Office Combat Support and Combat Service Support. Their vision is to provide the Army and joint services with life-cycle oversight for all SKOTs, while providing high-quality services, modernizing and modularizing current SKOTs, and optimizing the logistical footprint for future systems. They provide warfighters with SKOTs that are high-quality, durable, reliable, modernized, deployable, and serve as a "one-stop shop" for life-cycle management service.

**PAT SCHLUE** is a Senior SKOT Engineer from the U.S. Army Edgewood Chemical Biological Center, providing engineering and logistic support services to PM SKOT. He holds a B.S. in industrial engineering from St. Ambrose University. Schlue is certified Level III in systems planning, research, development, and engineering and life-cycle logistics, and is a U.S. Army Acquisition Corps member.

# Mine Resistant Ambush Protected (MRAP) Program Meets Urgent, Changing Requirements

Barbara Hamby



**It was last September as Soldiers conducted a mounted combat patrol mission in Afghanistan when their MRAP vehicle was hit by an improvised explosive device (IED). The force of the blast destroyed the MRAP, but the vehicle had functioned according to its design and the Soldiers inside survived.**

MRAP vehicles are being re-missioned at the MSF in Kuwait and are being transitioned from the fight in Iraq to support the troop surge in *OEF*. This helps get these lifesaving trucks into the hands of warfighters faster and at considerably less cost to the American taxpayer than if they were shipped back to the U.S. for repair. (U.S. Army photo by Barbara Hamby.)


**The MSF in Kuwait was first established as a deprocessing center, supporting the onward movement of more than 11,000 MRAP vehicles. Since then, it has transformed into a first-class sustainment maintenance facility where trucks are being re-missioned as they transition from the fight in Iraq and into the fight in *OEF*. (U.S. Army photo by Barbara Hamby.)**

The MRAP is one of many innovations the U.S. military has developed to stay ahead of insurgents, who readily adapt to American technology. While there is no silver bullet against IEDs, the MRAP Family of Vehicles (FOV) has proven effective in countering the enemy's weapon of choice. "We continue to learn, but we are aligned in our efforts to deliver this capability," said Paul Mann, Joint Program Manager (PM) MRAP Vehicle Program. "It provides greater safety and survivability for U.S. forces."

## Equipping the Force

From 2003 to October 2006, the number of casualties caused by IEDs escalated during *Operation Iraqi Freedom*. While a number of countermeasures—to include adding armor to existing vehicles—had some success, there was an urgent need to produce and field a vehicle designed from the ground up to provide troops with a survivable platform from mines and IEDs. With that, they could successfully support mission requirements and safely return to base.

Both the U.S. Army and the U.S. Marine Corps had procured limited numbers of IED-resistant vehicles to support route clearance and explosive ordnance disposal operations. These vehicles had varying degrees of success and demonstrated that survivable vehicles could be built. All of these factors led to establishing the Joint MRAP Vehicle Program.

Since it was established in October 2006, the program's scope has increased dramatically. The initial requirement for 1,185 MRAP vehicles quickly grew to 4,060; then 7,774; to 15,374 by September 2007; and reaching 16,238 by November 2008. With the addition of the MRAP All-Terrain Vehicle (M-ATV) in 2009 and another increase in January 2010, the total requirement has increased to well more than 26,000 MRAP FOV in support of overseas contingency operations in Iraq and Afghanistan. Roughly 19,000 of these trucks are Army assets. As DOD's highest priority acquisition program, this infusion of survivable vehicles is unprecedented since World War II.

> While there is no silver bullet against IEDs, the MRAP FOV has proven effective in countering the enemy's weapon of choice.

"We have placed delivery orders for nearly 25,700 vehicles," said COL Kevin B. Peterson, MRAP Military Principal Deputy PM (DPM). "Bottom line: we are fulfilling requirements set by CENTCOM [U.S. Central Command] and procuring additional vehicles to meet the increasing demand signal for these lifesaving trucks in support of our troops," Peterson said.

As forces draw down in Iraq and surge in Afghanistan, the need to equip warfighters with a more mobile MRAP vehicle meant that the Joint Program Office (JPO) would need to quickly adapt to meet new and emerging requirements. Unlike Iraq, which has a mature infrastructure, Afghanistan has very few paved roads and rugged mountainous terrain that challenge a vehicle's ride quality and off-road mobility. In response to this urgent requirement, the JPO developed a refined rapid-acquisition strategy. "Our greatest focus right now is getting MRAPs to our forces in Afghanistan," Mann said.

Part of this equation included procuring more than 8,100 M-ATVs, which combine MRAP levels of survivability along with the capability to travel off-road. In addition, the JPO put on contract more than 1,300 Category I MRAPs equipped with new

A mechanic works on MRAP vehicles at the MSF in Kuwait. (U.S. Army photo by Barbara Hamby.)

independent suspension systems (ISS) designed to improve the blast-protected vehicles' off-road performance in Afghanistan. A third piece involves refitting a portion of the baseline MRAP fleet with ISS.

"This decision to go with improved suspensions is part of our ongoing commitment to providing Soldiers the safest, most survivable vehicle possible," Peterson said. "The improved suspension is aimed at providing better off-road capability and has the added benefit of improving the overall ride quality and vehicle performance on the unimproved roads found throughout theater."

## Capabilities Insertion (CI)

Just as the number of vehicles required has increased, each service and component also requires unique and evolving vehicle equipment configurations. The MRAP JPO continues to adapt and work toward testing and integrating effective and enhanced armor solutions as the enemy modifies its means of attack.

The MRAP CI program was developed by the JPO and formally launched in summer 2008, but "we actually started inserting things back into the vehicles almost immediately," said Dave Hansen, Principal Civilian DPM MRAP Program. "We focused on anything that helped us manufacture or install our government-furnished equipment and then on to survivability and safety issues, such as the GRS [gunner restraint system]."

The CI program was created to address multiple critical Joint Urgent Operational Needs Statements (JUONS) as a single program and single requirements base so optimization could ensue. It also had an eye toward the future to enable easier incorporation of solutions to future JUONS. The JPO leveraged the internal capabilities of the U.S. Army Tank Automotive Research, Development, and Engineering Center (TARDEC), as well as external partnerships to include the Joint MRAP enterprise. Thanks to a coordinated team effort across numerous DOD agencies and organizations, hundreds of new capabilities have been added, including overhead

The CI program was created to address multiple critical JUONS as a single program and single requirements base so optimization could ensue.

With the responsible drawdown in Iraq and surge in *OEF*, mission requirements have changed in ways that have required the MRAP JPO to also change to support warfighter needs.

wire mitigation, radio remote control, and enhanced visibility. Teams include product managers for the representative systems; TARDEC; the U.S. Army Aviation and Missile Research, Development, and Engineering Center; Space and Naval Warfare Systems Center Atlantic; and the U.S. Army Test and Evaluation Command's extensive capabilities at Aberdeen Proving Ground, MD, and Yuma Proving Ground, AZ.

While lifesaving and mission-enhancing capabilities, such as improved armor protection and better integrated vehicle electronics, receive top priority, the CI effort has resulted in other benefits to warfighters. "Some of them are just little tweaks and upgrades that help with human factors, safety, and survivability. We may modify seat belts or a better pass-through for wiring," Hansen said. He added that collaboration among defense and industry partners and continued feedback from warfighters all play a crucial role in equipping MRAP variants with greater lifesaving, mission-enhancing capabilities to warfighters.

## Sustaining the Fleet

With the responsible drawdown in Iraq and surge in *Operation Enduring Freedom* (*OEF*), mission requirements have changed in ways that have required the MRAP JPO to also change to support warfighter needs. With core values such as being responsive, adaptive, and perseverant, the JPO continues to meet the demand signal.

One of the JPO's biggest success stories is the MRAP Sustainment Facility (MSF) in Kuwait. Developed by the JPO 2 years ago, the MSF continues to increase in size and capacity. When stood up in November 2007, the MSF functioned as a deprocessing center, supporting onward movement of more than 11,000 MRAPs. Since then, it has transformed to a first-class sustainment maintenance facility for re-missioned assets transitioning from the fight in Iraq to the fight in Afghanistan. In recent months, the MSF has increased personnel and improved processes using Lean Six Sigma to better prioritize and move vehicles through the line. Today, an average of 100 MRAPS per week are refurbished and upgraded at the MSF.

"This represents not only a timesaver for our warfighters, but a cost savings for the American taxpayer," said COL Stephen Ward, PM Forward, MRAP JPO. "Doing the repairs close to the theaters of operation helps get the trucks into the fight as soon as possible, at considerably less cost and time spent than if we shipped MRAPs back to CONUS for repairs and upgrades."

Besides the MSF, the JPO Forward established regional support activities where vehicles are deprocessed or repaired onsite and near combat areas in Afghanistan and Iraq. According to Peterson, the intent is to perform repair as far forward as circumstances and facilities will support to minimize transportation requirements of these heavy vehicles within the theater.

## Home Station Training

A key lesson learned from the baseline MRAP program was the necessity of home station training. Sending trucks to home stations for training before deployment, "better prepares units so when deployed they are already familiar with the equipment they will use in theater," Peterson said. Among the tools available to the MRAP user community are the MRAP Egress Trainer (MET) and the Common Driver Trainer (CDT). Training is mandatory for the driver and all vehicle crew members.

The MET teaches service members the proper skills to safely egress in the event of a rollover. This tool provides the operator and vehicle crew with a better understanding of what happens during a rollover event or how to avoid one. It also helps reinforce the need to wear seat belts and personal protective equipment, and teaches the crew to work as a team during and after an event.

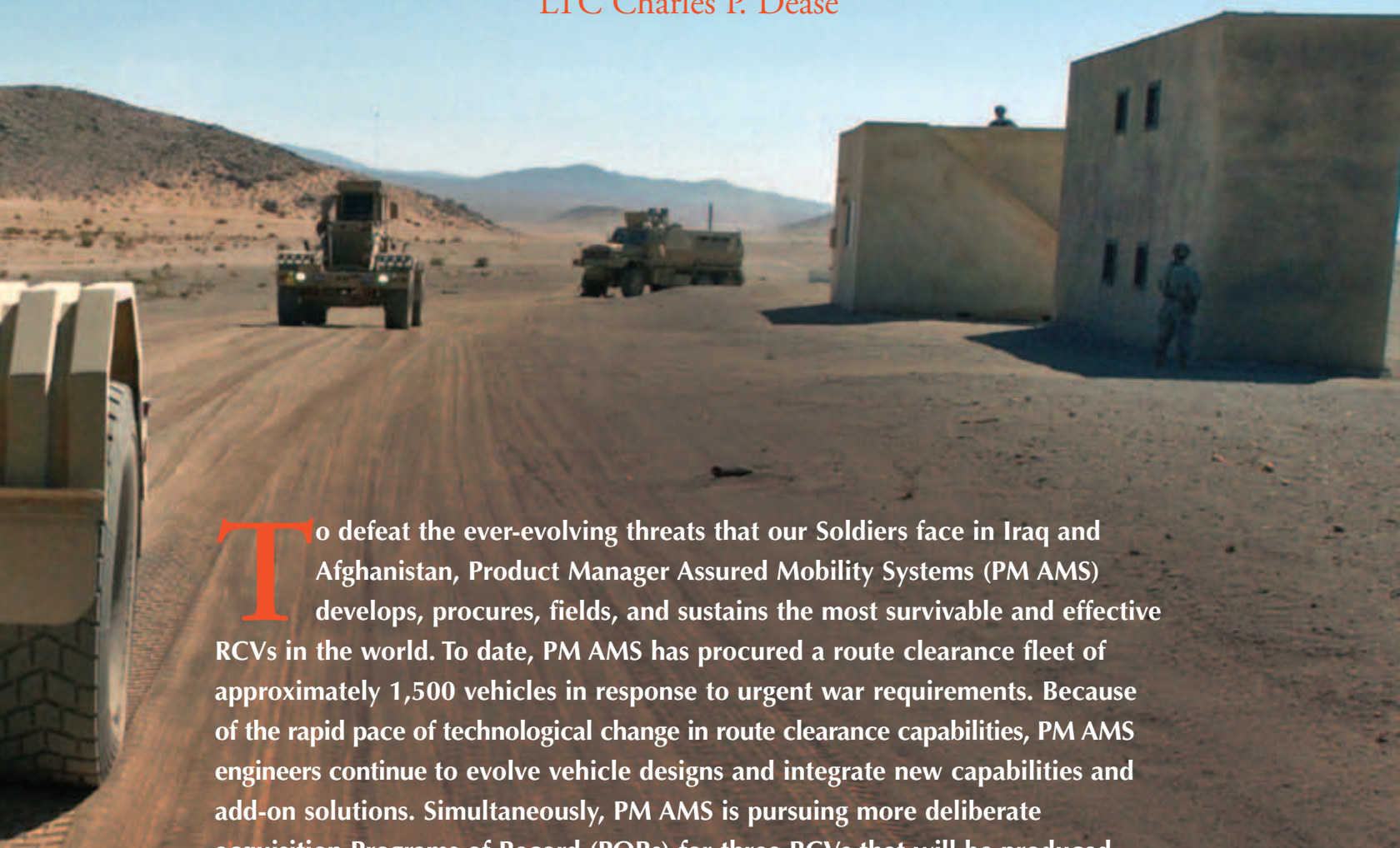
The CDT trains critical driver tasks in a virtual simulator, including scenarios such as driving on poor road conditions, weak bridges, and even combat-like conditions on a fixed, motion-based platform. The devices were developed by the U.S. Marine Corps Systems Command's PM Training Systems and the U.S. Army's Program Executive Office Simulation, Training, and Instrumentation.

Whether through training, procurement, and rapid fielding; CI; or refurbishing vehicles for new missions, Peterson emphasized that they are all working toward the same goal—providing survivable, effective vehicles for warfighters in the field. "The MRAP is still in the urgent fielding right now. So, really, we're focusing on making the vehicles survivable and relevant in Afghanistan," Peterson said. "There is no greater mission than devising ways to counter the IED threat."

**BARBARA HAMBY** is the Public Affairs Officer for the Joint MRAP Vehicle Program. She holds a B.S. in communications from Northern Arizona University.

# Route Clearance Vehicles (RCVs)—Fulfilling Simultaneous Missions While Detecting and Neutralizing Mines

LTC Charles P. Dease



**To defeat the ever-evolving threats that our Soldiers face in Iraq and Afghanistan, Product Manager Assured Mobility Systems (PM AMS) develops, procures, fields, and sustains the most survivable and effective RCVs in the world. To date, PM AMS has procured a route clearance fleet of approximately 1,500 vehicles in response to urgent war requirements. Because of the rapid pace of technological change in route clearance capabilities, PM AMS engineers continue to evolve vehicle designs and integrate new capabilities and add-on solutions. Simultaneously, PM AMS is pursuing more deliberate acquisition Programs of Record (PORs) for three RCVs that will be produced, tested, and fielded to engineer and explosive ordnance disposal (EOD) units. Delivering lifesaving solutions and support to Soldiers deployed to *Operations Enduring* and *Iraqi Freedom* remains the most important priority and is the passion that fuels PM AMS personnel daily.**

Combat engineers from the 323rd Combat Engineer Co. deploy two Husky vehicles outside a small mock town at the National Training Center, Fort Irwin, CA, as Soldiers from the 94th Military Police Co. clear the town of enemy forces. (U.S. Army photo by SGT Brent Powell, 300th Mobile Public Affairs Attachment.)

## Route Clearance an Urgent Need in Theater

As insurgencies took root in Iraq and Afghanistan, the use and lethality of mines and improvised explosive devices (IEDs) dramatically increased. Enemy employment tactics continue to evolve, and these explosive hazards have created an urgent need for RCVs, associated mine detection equipment, and other related capabilities to protect warfighters. PM AMS has always attempted to collaborate with other organizations, such as the Joint IED Defeat Organization, Army PM IED Defeat/Protect Force, and PM Countermine and EOD, while striving to field add-on capabilities.

In 2002, four Buffalo Mine Protected Clearance Vehicles were in operation clearing Bagram Airfield in Afghanistan. The vehicle's success at clearing mines made it the logical choice when IEDs emerged as a threat in Iraq. The Army rushed its sparse route clearance equipment to Iraq early in the war. To manage the work required to build a new automotive fleet, Dennis Haag, former Deputy PM AMS, led the effort in early 2005 to create the office that eventually became PM AMS under the Program Executive Office Combat Support and Combat Service Support.

## Developing RCVs for Modern Threats

With a small, handpicked team, Haag set to work on the daunting task of developing new vehicles to meet urgent needs for route clearance capabilities in the midst of fighting two wars. The team often worked 16 hours a day, 6–7 days a week, to deliver capabilities to deployed Soldiers needing route clearance capabilities.

An Army Buffalo, a specialized mine-clearing/anti-IED vehicle, conducts a route clearance mission. (U.S. Army photo by SGT Teddy Wade, 55th Signal Co.)

In December 2005, the PM AMS team repeatedly traveled to Iraq to see the vehicles, ask Soldiers how they were using them during operations, and take notes of Soldier responses. The Soldiers quickly realized that the PM AMS team could deliver a vehicle tailored to their requirements and fed them a stream of useful suggestions. Copious notes taken by Haag and his team were used to develop vehicles procured to support urgent war requirements and influenced POR vehicle requirements that were in development.

## Significant Survivability Upgrades in Theater

PM AMS' initial fleet contained only a handful of vehicles, so deploying every newly procured vehicle was a priority to meet the growing theater need. As a result, PM AMS engineers designed, fabricated, and tested vehicle upgrade prototypes and rushed to equip the RCV fleet with crew survivability upgrades. These included improved seats and seat belts, fire suppression systems, gunner platforms, gunner restraint systems, objective gunner protection kits, mine/IED rollers, rocket-propelled grenade and explosively formed penetrator protection kits, transparent armor (glass), and remote weapon stations. They also integrated command, control, communications, computer, intelligence, surveillance, and reconnaissance upgrades, such as situational awareness cameras, light kits, driver's vision enhancement, and Blue Force Tracker, to increase RCVs' capabilities and effectiveness.

The Panther is a command and control vehicle that is also designed to neutralize or defeat explosive hazards. (U.S. Army photo.)

## Sustainment in the Battlefield

The RCV fleet and its subsystems are new pieces of equipment fielded to theater to support Operational Needs Statement (ONS) requirements. The Army's logistics and sustainment infrastructure does not yet support the new equipment; therefore, to sustain the RCV fleet in theater, PM AMS covers the support gap with a refined Contractor Logistic Support (CLS) concept. CLS provides logistics, training, maintenance, and repair operations at a number of battlefield repair locations in Iraq and Afghanistan.

As requirements evolve, more Soldiers deploy to more locations, and the need for additional RCVs expands. This expansion, in concert with shifting

priorities from one theater to another, increases the organization's complexity. At present, PM AMS is responsible for life-cycle management of five different systems or vehicles and their variants, as follows:

- Husky Vehicle Mounted Mine Detection Systems—4 variants.
- Buffalo Mine Protected Clearance Vehicle—3 models.
- Panther Medium Mine Protected Vehicle—2 variants.
- Joint EOD Rapid Response Vehicle—2 variants.
- RG-31 Mine Protected Vehicle (Route Clearance Variant)—6 models.

While PM AMS continues supporting RCVs procured to support war requirements, it also works with U.S. Army Training and Doctrine Command proponents to develop the requirements for the three RCV systems: the Huskies, Buffalos, and Panthers. PM AMS has begun procuring and testing the three RCVs and has already fielded those that are POR-configured—albeit under urgent materiel release criteria—in support of current operations.

The Husky is extremely accurate in identifying a buried threat. It drives in front of convoys to detect suspected explosive hazards and marks them. The Buffalo is a specialized mine-clearing/anti-IED vehicle equipped with a distinctive hydraulic arm that interrogates suspected explosive hazards and clears them when necessary. The Panther is a command and control vehicle that is also designed to neutralize or defeat explosive hazards when necessary. Equipped with PackBot or Talon robots, route clearance or EOD teams can remotely deploy and operate them from a workstation protected under armor inside the Panther.

## Balancing ONS Requirements

As PM AMS continues to respond to ONS requirements, the organization has had to alter its schedules. In the midst of development or testing, ONS requirements continue to come in, requiring the organization to readjust accordingly. Originally, PM AMS' goal was to acquire and test all three vehicle systems at the same time and field the vehicles as a total package. However, this goal was modified to support operational needs and constantly changing requirements. One benefit to this revised goal is that problems within the ONS vehicles are being recognized and, in most cases, corrected before the vehicles are procured, tested, and fielded to Soldiers.

## PM AMS' Objectives

As the pace and intensity of PM AMS' three acquisition POR efforts increases, PM AMS must continue to provide multifaceted war requirements support to Soldiers performing route clearance missions in Iraq and Afghanistan. For example, as the Army draws down in Iraq, PM AMS is supporting this mission by removing select RCVs from the Iraq theater as requirements decrease, while concurrently surging route clearance and EOD vehicle assets into Afghanistan operations.

To acquire the number of RCV platforms needed to meet Army requirements in Afghanistan in a cost-effective manner, PM AMS initiated a harvesting program. The program removes ONS-procured RCVs and RG-33+ Mine Resistant Ambush Protected (MRAP) vehicles from operations. It then repairs and upgrades the RCVs to meet POR specifications and returns them to the RCV fleet. Additionally, PM AMS is simultaneously working to complete testing and all full materiel release requirements, which allows for fielding RCVs to units outside the two war theaters. The goal is to have all three programs begin fielding RCVs by 2011, a very aggressive schedule given all the requirements PM AMS must complete.

Though PM AMS' mission requirements are continually evolving to meet combatant commanders' needs and Army requirements, the organization's highest priority is providing deployed Soldiers with the lifesaving capabilities and support they need and deserve. The overarching goal is to balance the demands of fielding, repairing, and sustaining the RCV fleet. PM AMS' passion and commitment is to support warfighters and develop and integrate more effective equipment to detect and neutralize IEDs and other explosive threats.

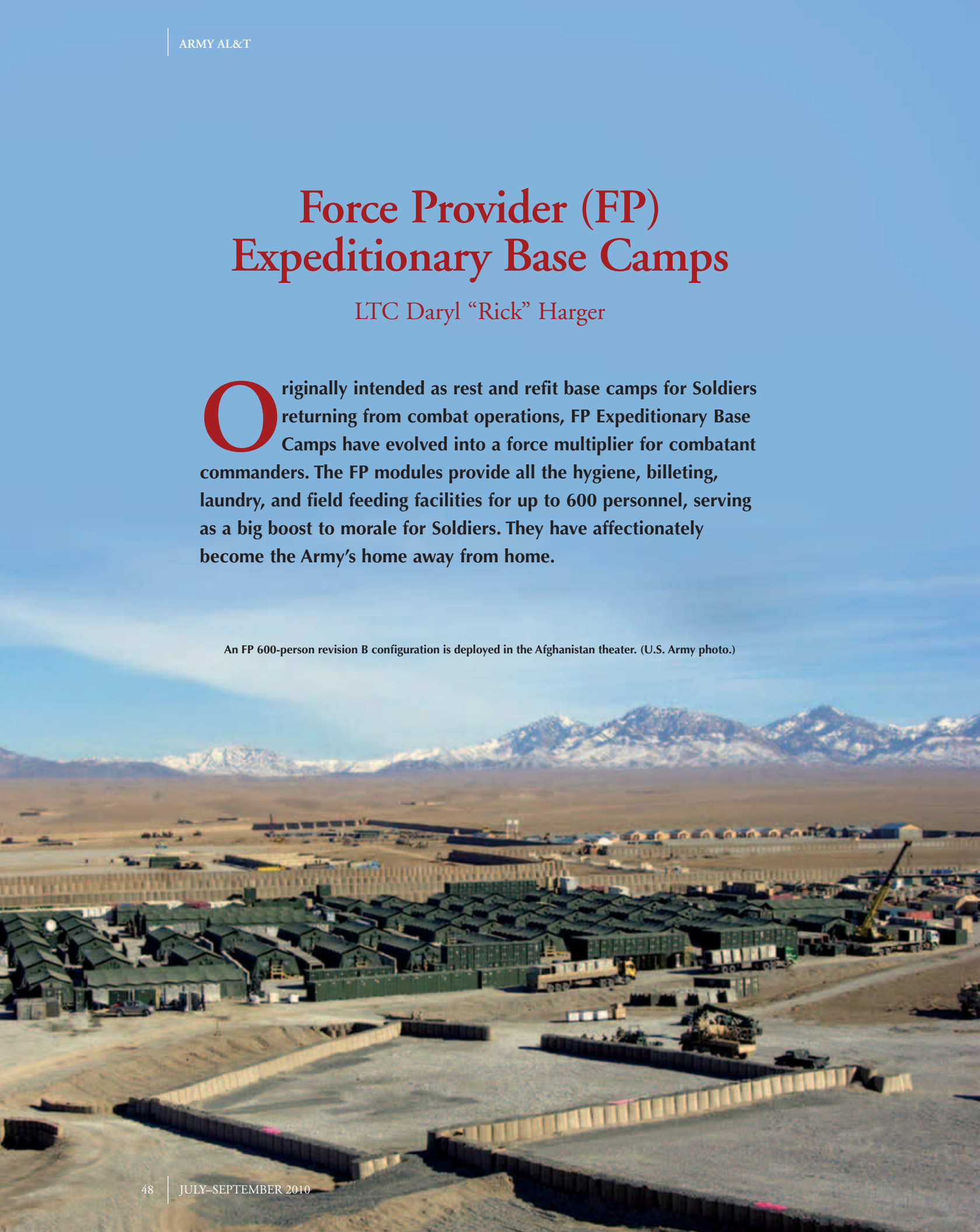
Army RG-31 MRAP vehicles are used on a mission to evaluate the progress of road construction. (U.S. Army photo by SGT Teddy Wade, 55th Signal Co.)

**LTC CHARLES P. DEASE** is the PM AMS. He holds a B.S. in business administration from Claflin College and an M.S. in acquisition and contract management from the Florida Institute of Technology. Dease is a graduate of the Command and General Staff College and the Defense Acquisition University's Program Manager Course. He is certified Level III in program management and Level I in contracting and is a U.S. Army Acquisition Corps member.

# Force Provider (FP) Expeditionary Base Camps

LTC Daryl "Rick" Harger

**Originally intended as rest and refit base camps for Soldiers returning from combat operations, FP Expeditionary Base Camps have evolved into a force multiplier for combatant commanders. The FP modules provide all the hygiene, billeting, laundry, and field feeding facilities for up to 600 personnel, serving as a big boost to morale for Soldiers. They have affectionately become the Army's home away from home.**



An FP 600-person revision B configuration is deployed in the Afghanistan theater. (U.S. Army photo.)

## Expeditionary Modules

Some key features that make recent revisions of FP modules expeditionary are that each 600-person module can be divided into four equal sub-modules; the use of an air-beam-supported Tent, Extendable, Modular Personnel (TEMPER) shelter; and triple container (TRICON)-based hygiene, laundry, and feeding systems. The four equal sub-modules enable the commander to deploy 150 personnel to four separate locations without sacrificing capabilities, enabling greater flexibility in deciding where to base combat power.

The air-beam TEMPER shelters make setting up the billeting and administrative tents a snap, reducing the time it takes to establish an entire 600-person camp from what used to take weeks to just a few days. The tent's air-beams are inflated with an air compressor, which is similar to filling an automobile tire with air, taking less than 30 minutes to set up each tent. With the flooring and liner already integrated into the tent, the only thing left to do is hang lighting on pre-positioned straps, and the shelters are ready to be occupied.

The TRICON systems are shipped in their transportation configuration (8 feet by 8 feet by 6 ½ feet) and can be easily and quickly expanded into their operational footprint of a standard 20-foot International Organization for Standardization (ISO) container. When combined, these key features are quite impressive, boasting the ability to air transport all necessary equipment for a complete 150-person camp in a single C-17 aircraft. After reaching its final destination, the sub-module can be fully operational in less than 4 hours with a trained crew of eight personnel, providing quality latrine, shower, laundry, billeting, and feeding facilities for warfighters.

The FP program is managed out of the Army's Product Manager Force Sustainment Systems (PM FSS) office at the Natick Soldier Systems Center, Natick, MA. PM FSS has life-cycle management responsibility for products ranging from cargo aerial delivery equipment, to shelters and heaters, to field feeding and field services systems. PM FSS falls under the Project Manager Force Projection Office, which is part of the Program Executive Office Combat Support and Combat Service Support's (PEO CS&CSS') portfolio. PEO CS&CSS and Project Manager Force Projection are collocated in Warren, MI.

## FP Improvements

Even though FP has been touted as the Army's premier base camp, PM FSS continually seeks ways to increase capabilities while improving the living conditions for deployed Soldiers. A recent technological improvement that will be integrated into future FP modules is the addition of a Shower Water Reuse System (SWRS) capability. Similar to the technology used for the Army's Tactical Water Purification Unit, the SWRS makes up to 75 percent of the shower water used in a camp available for reuse. This will significantly reduce the logistics burden for FP base camps, considering that up to 20,000 gallons of water are used in daily camp operations to support 600 personnel.

Future improvements for FP modules include a Modular Ballistic Protection System (MBPS) and a waste remediation system. The MBPS is designed to provide the same protection achieved with the standard issue Kevlar helmet but applied to shelters and container systems. To provide protection for shelter inhabitants, MBPS panels are employed in a traditional TEMPER frame-supported tent, hung on the inside of the fabric, or as a standoff system supported by a separate structure. The panels can also be attached to the outside of standard ISO containers. A waste remediation system is undergoing a Foreign Comparative Test to determine if the technology is suitable for the Army's use. If the foreign technology proves to be a good fit, the system will further minimize the logistics burden on the base camp by reducing waste by up to 90 percent. An additional benefit is the decrease or possible elimination of potential force protection concerns whereby contracted personnel have to enter the camp perimeter to haul refuse away.

Older and new FP configurations sit in the Afghanistan theater. (U.S. Army photo.)

Other future improvements, though relatively early in their development cycle, will incorporate the latest technologies while considering the logistical burden placed on supporting camps. More efficient equipment and the more effective use of power generation will further ease the burden on resupplying fuel to base camps. Harnessing alternate sources of energy coupled with energy-efficient structures, such as shelters with increased insulation properties, will also mitigate the need for refueling base camps. All future efforts are aimed to reduce the two major resupply commodities of fuel and water while at the same time increasing capabilities for our Soldiers.

**LTC DARYL "RICK" HARGER** is the PM FSS under the management of Project Manager Force Projection, PEO CS&CSS. He holds a B.B.A. from the University of Alaska-Fairbanks, an M.S. in contract and acquisition management from the Naval Postgraduate School, and an M.S. in public administration from Central Michigan University. Harger is Level III certified in contracting and program management and is a U.S. Army Acquisition Corps member. He has served in staff and contracting officer positions in Germany and Afghanistan contracting commands.

# From the Source to Consumption—Operation $H_2O$ is Moving Full Steam Ahead

Ashley John and Kris Osborn

**The U.S. Army is fast-tracking Expeditionary Water Packing Systems (EWPS) to Iraq and Afghanistan, providing bottled water in theater for distribution to Soldiers. The systems are being delivered in response to an Operational Needs Statement from commanders in combat and are scheduled to arrive in Afghanistan by August 2010.**

**PFC Kashif McCormick, ROWPU operator with the 102nd Quartermaster Co., attaches hoses that direct raw water into the ROWPU where it is then purified and treated into potable water. (U.S. Army photo by SPC Michael Camacho.)**

It is essential for Soldiers to receive at least 1–3 gallons of water per day to prevent dehydration. If you add personal hygiene, combat meal preparation, and emergency medical treatment to the mix, a single Soldier may need up to six gallons of water per day.

The EWPS produces 1-liter bottles at forward operating bases and is designed to take bulk water from the Army's Hippo water storage tanks (2,000-gallon deployable water storage tanks designed to work in tandem with several mobile water purification systems). During the process, the water is checked periodically to ensure that it meets Army quality assurance standards.

"Purified water is placed in the Hippo and held for 12 hours, and is then pumped through additional filters to remove chlorine and improve taste. Preforms are loaded, heated, and expanded into 1-liter bottles. The bottles are then filled, capped by an automated system, palletized, and wrapped to await distribution," said LTC Dariel Mayfield, the Army's Product Manager Petroleum and Water Systems (PM PAWS). "Four times every 2 ½ hours, the water is checked to make sure it meets Army standards," added Bob Schulkins, Water Systems Acquisition Manager, PM PAWS.

The EWPS can reliably produce 600–700 1-liter bottles per hour. In theater, the EWPS is producing more than 500 bottles of water per hour and operates 6 days a week; that equates to more than 30,000 bottles per week per EWPS.

The Army's PAWS water systems—the 600 and 3,000 Reverse Osmosis Water Purification Units (ROWPUs), the Tactical Water Purification System, the Lightweight Water Purifier, and the EWPS—are being used for various missions worldwide. They are being used extensively in Afghanistan and Iraq to support *Operations Enduring* and *Iraqi Freedom*, as well as in the Haitian disaster relief effort. Additionally, these systems were invaluable assets to the Hurricane Katrina relief effort in 2005.

"Anytime there is a natural disaster, [Project Manager] Force Projection gets a call asking 'What can you give?' When disaster strikes, water is usually the first thing that is destroyed," said Project Manager Patricia Plotkowski.

## Potable $H_2O$—A Soldier's Necessity

All of the Army's water purification systems use RO as the primary method of treatment, and the purification systems work on the same basic principles. A raw water pump is used to draw water from any source, fresh or salt water. The water is delivered to the system where it enters the "pretreatment" filters. "This is where all of the suspended solids are removed," added Plotkowski.

From there, the water is delivered to a high-pressure pump where it is pressurized enough to overcome the osmotic pressure of the RO membranes and all of the dissolved solids are removed. If nuclear, biological, or chemical contaminants are present, the treated water enters a series of activated carbon and resin exchange filters, which work to remove those contaminants.

"After that, the water is delivered to a product water storage tank where calcium hypochlorite is added to disinfect the water. Enough disinfectant must be added to maintain a constant and adequate residual," said Schulkins.

The 2,000-gallon Hippo water storage tank works with several of the Army's water purification systems. (U.S. Army photo.)


The EWPS can reliably produce 600–700 1-liter bottles per hour. In theater, the EWPS produces more than 500 bottles of water per hour and operates 6 days a week. (U.S. Army photo.)

The Army's PM PAWS is revolutionizing the battlefield, providing the most critical necessity to our Soldiers.

The water is checked for quality assurance to ensure that it is potable and safe for Soldiers. Strict water quality is directed by the U.S. Army Public Health Command.

The initially deployed EWPS produced more than 1 million 1-liter bottles of water without any incidents of quality. "Soldiers in Iraq said the best thing the Army could have done was get [them] bottled water," added Mayfield.

Keeping our warfighters hydrated is imperative to the success of missions—both day-to-day operations and while in combat. The Army's PM PAWS is revolutionizing the battlefield, providing the most critical necessity to our Soldiers. PM PAWS is managed under the leadership of Project Manager Force Projection within Program Executive Office Combat Support and Combat Service Support (PEO CS&CSS).

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# Low-Cost Aerial Delivery Systems (LCADS) Provide Soldiers With Critical Supplies

Scott Martin

**The Army's LCADS program has received accolades from the operational community. This is due in large part to LCADS' decidedly low-tech approach to solving resupply challenges in the U.S. Central Command area of responsibility. To understand the LCADS program's achievements, consider the background and 20th century history of aerial resupply.**

**A USAF C-130 conducts an LCLA airdrop test at Rhine Luzon drop zone, Fort Bragg, NC. LCLA is a specialized subset and recent addition to the LCADS family. (U.S. Army photo by Jim Finney, U.S. Army Airborne and Special Operations Test Directorate.)**

LCADS Low-Velocity parachutes descend to the ground in Afghanistan after being airdropped by a C-17. (USAF photo by SSgt Angelita Lawrence.)

Although airdrop was not widespread in Vietnam, innovations such as the Low-Altitude Parachute Extraction System and other ad hoc creative systems came into existence there. These systems were developed in response to the threat of anti-aircraft fire, parachute supply availability, and the ability to meet airdrop accuracy requirements in a challenging mountainous jungle environment.

## Airdrop Challenges

In the wake of the 1990–1991 Gulf War, U.S. forces found themselves in a succession of humanitarian relief efforts. Not only did these humanitarian missions nearly wipe out the entire Army inventory of parachutes, the majority of the high-cost, durable equipment was never recovered. Most significant was *Operation Provide Promise* where 28,748 Container Delivery System (CDS) resupply bundles were dropped into Bosnia. Conservatively, that represents $80 million in current-year dollars of unrecovered equipment. Despite this experience, the Army still did not pursue a low-cost alternative until the worst-case scenario was realized.

Less than a decade later, *Operation Enduring Freedom* (*OEF*) represented the perfect storm. Aside from the sheer volume, the logistical challenges weighed heavy on the Soldiers trying to execute the mission. A year into *OEF*, the rigging facilities available in theater were meager at best. It was not feasible to conduct any parachute packing or repair work of any scale. Nearly all of the parachutes had to be contingency packed in CONUS and air-shipped to Afghanistan at considerable cost.

The return of the airdrop equipment from the forward operating bases (FOBs) being supplied by airdrop became another quandary. Referred to as retrograde, the theater hired local contractors to "truck" used parachutes back to the main operating base. This policy seemed the right thing to do. Unfortunately, more than 90 percent of the retrograded parachutes were damaged beyond economical repair and needed to be inspected, demilitarized, and turned into the Defense Reutilization and Marketing Office for accountability. Seeing the magnitude of this multifaceted problem, the Army established a formal requirement for a low-cost airdrop capability and looked to the acquisition community for a solution.

LCADS, when compared to legacy systems, has achieved a 50-percent cost reduction by using a simplified design that decreases manufacturing expense.

## Family of Low-Cost Air Items

The Army's Product Manager Force Sustainment Systems (PM FSS) Cargo Aerial Delivery Team, part of Project Manager Force Projection under the leadership of Program Executive Office Combat Support and Combat Service Support, responded to the requirement with a proposal for a family of low-cost air items. Using in-house designs, PM FSS tested and incrementally fielded the Low-Cost Container (LCC), Low-Cost High-Velocity (LCHV) parachute, and the Low-Cost Low-Velocity

(LCLV) parachute. Since fielding, the LCC, LCHV, and LCLV have gone from being alternative items to essentially supplanting the legacy equipment. This achievement can be attributed in part to the ability of the Integrated Logistics Supply Center (ILSC) to provide intensive item management of LCADS items, but also because of the exceptional advantages the ILSC offers to Soldiers.

One of the key and easily measurable advantages for the LCADS program is, of course, cost. LCADS, when compared to legacy systems, has achieved a 50-percent cost reduction by using a simplified design that decreases manufacturing expense. Additionally, it uses economical geotextiles (polypropylene) for its canopy fabric.

Part of the Army requirement for LCADS was the need for the parachutes to be prepacked by the manufacturer. Moreover, all LCADS products are regarded as one-time-use, expendable items. This was a major paradigm shift for the Army, as the Army doctrine now allows Soldiers to abandon the LCLV at the drop zone or FOB to be repurposed as shelters and other building materials.

## Further Improvements

Although the LCADS is a robust capability, the U.S. Army's Logistics Innovation Agency (LIA) recognized an opportunity to improve upon it. The LIA partnered with the U.S. Army Natick Soldier Research, Development, and Engineering Center to develop and rapidly field a Low-Cost Low-Altitude (LCLA) capability. The LCLA uses a scaled down LCADS parachute to create tactics and procedures that allow ultra-low drop altitudes. These low-altitude drops (150–300 feet above ground level) increased both aircraft survivability and drop accuracy.

Since transitioning to PM FSS as part of LCADS, LCLA has achieved Type Classification and Full-Rate Production approval, allowing it to continue down the path of becoming fully institutionalized as part of joint airdrop doctrine. To that end, the U.S. Transportation Command and U.S. Army Training and Doctrine Command have endorsed a priority effort to expand the LCLA capability with focus on two primary areas: increasing payload weights of the LCLA bundles and qualifying the system on the U.S. Air Force (USAF) C-130 fleet of aircraft.

The maximum an LCLA bundle can weigh is 1,000 pounds. The C-130 uses floor space on the ramp to conduct the LCLA airdrop while leaving the entire cargo compartment floor for other mission use. This allows the C-130 to conduct multiple objectives in a single sortie. The LCLA bundles are also more size appropriate for the platoon-sized teams conducting patrols or embedded in Afghan villages. The C-130 opens the door for more night airdrop to troops in need of emergency resupply as well.

**LCLA bundles are more size-appropriate for the platoon-sized teams conducting patrols or embedded in Afghan villages. (U.S. Army photo by SGT Gary Hawkins.)**

The entire LCADS family of items has proven to be an operational and cost-effective solution to the aerial resupply challenges faced by U.S. forces in *OEF*.

The entire LCADS family of items has proven to be an operational and cost-effective solution to the aerial resupply challenges faced by U.S. forces in *OEF*. PM FSS takes pride in the integrated product team effort that has carried the program to its current operational success. This level of success will be held as the standard while we pursue program enhancements during the continuous product improvement process to further simplify resupply for our combat forces.

**SCOTT MARTIN** is the PM FSS Project Leader for the LCADS program. He served on active duty as an Air Force Loadmaster, gaining 22 years of operational experience before his employment in the Army's acquisition workforce. Martin is Level II certified in program management.

# Full Spectrum Effects Package (FSEP)—Integrating the Latest Technologies for Total Operational Protection

Brett Grosshans and Jim Reinhold

***"Preserving noncombatant lives and dignity is central to mission accomplishment."***

***—Field Manual 3-24/Marine Corps Warfighting Publication 3-33.5, Counterinsurgency***

**As U.S. forces enter their ninth year of continuous combat, there is a renewed call to reduce civilian casualties and minimize damage to local infrastructure across the spectrum of conflict, from stability to counterinsurgency operations. Soldiers are looking for advanced capabilities to adequately discriminate between noncombatants and combatants and to take nonlethal actions from a standoff distance, while still maintaining total force protection.**

Members of the 3rd Platoon, 66th Military Police (MP) Co., prepare to test fire the .50-caliber machine gun on the new FSEP variant Stryker. There are two versions of this Stryker in Iraq, both being used by the MPs on security missions. (U.S. Army photo.)

To meet this warfighter requirement, the Army, as the lead service, was tasked to integrate a mission package that includes advanced nonlethal and lethal systems, kinetic and nonkinetic systems, and active protection capability aboard a light-armored vehicle. Through an incremental, rapid development approach across a range of DOD organizations, Soldiers now have a weapons system that enables them to engage an enemy force with multiple nonlethal and direct-fire lethal effects simultaneously.

The FSEP is a combined series of surveillance and detection systems and nonlethal and lethal engagement technologies mounted on an armored vehicle, currently the Stryker Infantry Carrier Vehicle (ICV). Flexible, immediate, and precise, FSEP provides a scalable response—from warning to discomfort to lethal attack—appropriate to the situation. Components include the Long Range Acoustic Hailing Device (AHD), Projectile Detection and Cueing (PDCue), infrared (IR) and visible sensors, and various optical distractor devices, including high-power white lights and laser light sources. The nonlethal weapons suite features the recently added 12-gauge shotgun and 66mm articulated launcher. Lethal force is provided by the .50-caliber machine gun that is standard on the Stryker ICV.

Soldiers of the 3rd Platoon, 66th MP Co., learn to calibrate the .50-caliber machine gun on the new FSEP Stryker. (U.S. Army photo.)

## Determination of Intent

When fighting a war in which the enemy does not wear a uniform, it is difficult for Soldiers to differentiate between noncombatants and combatants. Threat determination is one of the major concerns for Soldiers engaged in current combat operations characterized by counterinsurgency. While traditional rules of engagement tell Soldiers who they can use force against, they do not specify what those individuals look like.

Using escalation of force (EOF) tactics, Soldiers can better understand intent based on the conduct of potential adversaries. The use of EOF tactics for determination of intent works primarily because it uses nonlethal measures to put potential threats into situations where they must either comply with or disobey the Soldiers' commands. FSEP is the first integrated package of nonlethal and lethal capabilities to support EOF on the Stryker ICV.

The system's effectiveness is centered in its ability to distinguish between noncombatants and combatants, discern intent, and delay or deter hostile behavior in a variety of missions, while avoiding injury to noncombatants and mitigating collateral damage. FSEP gives U.S. forces the ability to conduct raids and provide route reconnaissance, crowd control, point defense, and convoy and force protection from a single vehicle.

CPT Paul Rothlisberger, 2nd Battalion, 30th Infantry Regiment, 4th Brigade Combat Team, 10th Mountain Division, Fort Polk, LA, was the first platoon leader to use these assets in a combat environment. "FSEP allows coalition forces to communicate their purpose or intent to the public. This level of mutual awareness can prevent

FSEP gives U.S. forces the ability to conduct raids and provide route reconnaissance, crowd control, point defense, and convoy and force protection from a single vehicle.

Increment 2 allows Soldiers to take all possible measures to mitigate nonhostile injuries and collateral damage while still preserving total force protection.

unnecessary conflict. If the civilian population knows what we are doing in their town, there is less of an opportunity for an incident to arise out of confusion or mistaken intentions," said Rothlisberger, emphasizing the importance of EOF capabilities in stability and sustainment operations. "This level of transparency with the population sets conditions for leaders and Soldiers on the ground, making their job easier. In this way, FSEP is an enabler/force multiplier. It allows a commander to accomplish a task with fewer Soldiers on the ground."

## Incremental Evolution of FSEP

Multiple Operational Needs Statements from theater requested the capability to escalate force as needed using nonlethal to lethal measures. Developed in increments, FSEP is a cooperative effort between the U.S. Army Training and Doctrine Command (TRADOC) Army Capabilities Integration Center (ARCIC) Asymmetric Warfare Division, Fort Monroe, VA, and Project Manager Close Combat Systems (PM CCS), part of Program Executive Office (PEO) Ammunition, Picatinny Arsenal, NJ. PM Stryker Brigade Combat Team of PEO Ground Combat Services provided the maintenance and sustainment support of the three Stryker ICVs, as well as extensive technical, test, and logistical support during the development and fielding process. The Naval Surface Warfare Center, Dahlgren, VA, led the physical construction and integration of the system from inception.

FSEP Increment 1 was intended to demonstrate the technology integration and tactical application of the system. Capabilities included high-power lights and lasers for target designation and illumination, long-range AHD for communication, IR and visible sensors for exterior situational awareness (SA), and acoustic shot detection and slewing. Three Stryker platforms with the integrated capabilities were sent to theater in November 2007 for an operational assessment on the feasibility of a vehicle-mounted, integrated EOF capability. The platform viability proved significant, but more capabilities were needed.

## Shove Capability

Operational assessments on Increment 1 called for the addition of a "shove" capability to FSEP. Reports indicated that once individuals or crowds got within a certain distance of the vehicle, Soldiers needed the ability to stop them from advancing farther or make them retreat. The shove capability is the last step in a scalable response—shout, show, shove, shoot—before employing lethal force.

Increment 2 added a 12-gauge shotgun and a 66mm articulated launcher, firing nonlethal ammunition, to FSEP. Both weapons are fired remotely from within the vehicle and have slew capability. Soldiers are now aiming a weapon at the threat, even though that weapon fires nonlethal ammunition. If the adversary still advances on the Soldier, the next step is a weapon that can kill him or her. It is a clear determination of intent. Increment 2 nonlethal weapons supplement the .50-caliber machine gun that is standard on the Stryker ICV. Increment 2 allows Soldiers to take all possible measures to mitigate nonhostile injuries and collateral damage while still preserving total force protection.

Increment 2's success was the result of the coordinated efforts of multiple organizations and using lessons learned from U.S. Marine Corps (USMC) EOF efforts to expand upon the capabilities provided. Joint PEO Chemical Biological Defense/Joint Product Manager Reconnaissance and Platform Integration provided technical support and funding for development of the 66mm launcher system. The U.S. Army Armament Research, Development, and Engineering Center provided the technical support and documentation required to deploy the vehicles. The U.S. Army Test and Evaluation Center was responsible for the expedited testing and evaluation of the systems. In addition, user representatives from ARCIC and TRADOC Capabilities Manager Stryker played significant roles in the design, development, and fielding. Funding was provided by ARCIC and the Office of the Secretary of Defense. General Dynamics Ordnance and Tactical Systems developed an articulated 66mm launcher system, which was modified to meet FSEP requirements.

## 360-Degree SA

Increment 2 upgrades also added two daylight cameras for a total of 12 daylight cameras and 12 IR cameras, positioned on the front, back, and sides of the vehicle. All cameras are projected inside the vehicle on the operator's display. The cameras' dual-stream output allows for simultaneous live monitoring and high-resolution recording. These cameras provide complete SA around the vehicle with the hatches buttoned up, the original intent and capability of the vehicle.

The PDCue system is an acoustic gunfire detection system optimized for the detection, location, and rapid engagement of incoming fires/snipers. The

combination of acoustic and IR sensors permits detection by flash or sound, even while the vehicle is on the move. PDCue microphones are mounted at the four corners of the vehicle, providing 360-degree detection, day and night. Detected targets are displayed inside the vehicle on the operator's screen, with location provided in range, azimuth, and elevation. The .50-caliber machine gun then slews to the target and locks on, awaiting engagement.

The AHD produces a highly directional sound beam, allowing users to project warning tones and voice commands beyond small-arms engagement range. It is used to encourage compliance and avoid interference with the FSEP, helping Soldiers more effectively determine the intent of a person, crowd, or vehicle at a safe distance. Soldiers can use AHD to get an individual's or crowd's attention and give them instructions, such as ordering a crowd to disperse or asking the population to stay indoors as a convoy passes through town. "If they follow the instructions, it is an indication of nonhostile intent," explained Rothlisberger. "If they don't comply, it could be an indication of trouble." The Phraselator, a multiple-phrase translator, is included with the system, permitting the operator to select from a large list of prerecorded messages appropriate for the mission. The Phraselator can be connected to the AHD for projection of the messages.

**The rear nonlethal Remote Weapon Station was added to the Stryker ICV to support several FSEP components, including the long-range AHD, high-power white lights, and the 12-gauge shotgun. (U.S. Army photo.)**

FSEP also provides combat support capabilities currently needed by operational commanders without placing additional demands on existing resources.

FSEP also offers optical distractors and long-range illumination to facilitate reconnaissance, target location, and/or deterrence, including high-power white lights and laser light sources. When used properly, the devices offer Soldiers a variety of desirable nonlethal effects. For example, the green beam laser, used to get an individual's attention in Iraq, has proven very effective. Locals have learned that if you see a green laser, stop what you are doing.

## System Integration

The synergy provided by the suite of FSEP's nonlethal and lethal systems permits complete SA, as well as scalable EOF capabilities for the entire crew. This integration of multiple systems on one platform allows the commander to match the appropriate effect to the situation at hand, delivering immediate, tailored, and precise responses without the latency period inherent in requesting and coordinating external assets. FSEP also provides combat support capabilities currently needed by operational commanders without placing additional demands on existing resources. Capable of protecting itself from small arms, snipers, and other ambush teams, FSEP offers protection and improved SA to other vehicles and units operating in cooperation with it.

Against an enemy that employs asymmetric tactics, our forces must also be adaptive. The integration of multiple FSEP effects and the ability to employ compound nonlethal systems simultaneously makes it difficult for the enemy to adjust or adapt future tactics and techniques.

FSEP provides a new capability that broadens the Soldier's options for countering enemy actions and enabling maneuver, while contributing to total force protection. Its modular design supports integration on additional vehicles and expanded usage, particularly for route clearing, convoy protection, and other security missions. Although the operational environment may vary in future conflicts, U.S. forces will continue to be faced with tactical situations where a range of effects—from warning and persuasion, to discomfort and pain, to lethal engagement—will be required to meet the requirements of the battlefield.

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# The Capabilities of the Army Field Support Brigade's (AFSB's) Acquisition, Logistics, and Technology-Directorate (AL&T-D)

LTC Steven Van Riper

**When your unit is preparing to deploy, is deployed, or is in any other phase of the Army Force Generation process, terms such as Operational Needs Statement (ONS), Joint Urgent ONS (JUONS), Rapid Equipping Force (REF), Forward Operational Assessment (FOA), Operator New Equipment Training (OPNET), and Field Level Maintenance NET (FLMNET), become a part of your daily vernacular. What can you do to understand this strange collection of acronyms? What about the inevitable fieldings, sustainment, and support strategy requirements? Is there a person or organization to help you complete the tasks associated with coordinating and synchronizing these efforts?**

AFSBs round out the Materiel Enterprise at the operational level, providing tactical commanders logistical and sustainment support not typically provided by sustainment brigades or expeditionary sustainment commands. Here, a Fort Hood, TX, welder adds his skill to the Materiel Enterprise by repairing equipment undergoing field-level reset under the direction of ASC's 407th AFSB. (U.S. Army photo by Galen Putnam, ASC Public Affairs.)

The AFSB can help. AFSBs are assigned to the U.S. Army Sustainment Command (ASC) and perform a critical role as the U.S. Army Materiel Command's (AMC's) face to the field. They round out the Materiel Enterprise at the operational level, providing tactical commanders logistical and sustainment support not typically provided by sustainment brigades or expeditionary sustainment commands.

Each AFSB modified table of organization and equipment includes positions for one 51Z Acquisition Officer (O-5), one 51A Acquisition Officer (O-4), and one 51S Science and Technology (S&T) Officer (O-4). These three officers form the core of what is usually called the AL&T-D. This directorate's mission and core competencies vary from AFSB to AFSB depending on the operating environment, supported units, and command focus, but always include integration and synchronization with the Assistant Secretary of the Army for AL&T, program executive offices (PEOs), program managers (PMs), and warfighters to ensure that fielding, operational assessments, and other acquisition-centric activities are successful.

## ONS and JUONS

Each command has slightly different processes for compiling, staffing, and forwarding ONS and JUONS, but your AFSB (CONUS or OCONUS) can assist in determining if another ONS or JUONS already exists that describes your capability gap, if technology exists that can satisfy your requirements, and if your ONS or JUONS contains the critical elements for acceptance. ONS and JUONS efforts are usually assigned to the S&T Officer (51S) in the AFSB. Submitting a technically correct ONS or JUONS is a critical step and will eliminate stop-and-go staff delays that could prevent your unit from receiving necessary equipment. Although every effort will be made to satisfy an ONS or JUONS as quickly as possible, it can sometimes take weeks to receive equipment that satisfies your requirement. If your need is urgent, consider using the REF.

**The AFSB's AL&T-D coordinates to ensure that FSRs assist in acceptance inspections and final issue of the equipment. Here, FSR Justin Fluegel explains the launch procedures for the ScanEagle Unmanned Aerial Vehicle to SGT Matthew Hayes, Headquarters Battery, 1-10 Field Artillery Battalion, at Forward Operating Base (FOB) Delta, Iraq. (U.S. Army photo by SSG Brien Vorhees.)**

Submitting a technically correct ONS or JUONS is a critical step and will eliminate stop-and-go staff delays that could prevent your unit from receiving necessary equipment.

## REF

An alternative to the ONS or JUONS is the REF and its requirements tool: the Ten-Liner, a 10-line document. The REF, not to be confused with the Rapid Fielding Initiative, is an organization chartered to conduct pinpoint fieldings of critical equipment to deploying or deployed units to capture their very specific requirements. The S&T Officer can review the Ten-Liner and provide liaison with the REF.

After receiving the Ten-Liner, the REF will attempt to satisfy your requirements by using commercial-off-the-shelf (COTS) or modified COTS systems or equipment. REF involvement provides a potential solution in a much shorter time than the "normal" acquisition process. The REF may request your participation in an FOA to record end user comments pertaining to the equipment's effectiveness. To assist your unit during an REF fielding and FOA, the AL&T-D can continue to liaison with the REF team and can act as a collection point for the FOA questionnaires.

In some cases, an REF fielded item is transitioned into a program of record (POR). This can happen when the FOA is exceptionally favorable or when demand becomes so large that REF management and funding becomes inadequate. When this occurs, the program is assigned to a PM, provided a

bona fide funding line, and subjected to the administrative requirements of the formal acquisition process. If an REF initiative achieves POR status, the AL&T-D can complement PM activities by synchronizing the fielding plan with operational commitments and schedules.

The AL&T-D can provide vital input via normal staffing or through immediate communication to ensure unit fielding expectations and requirements are synchronized with the system's production rate, delivery schedule, and distribution plan.

## The Fielding Plan

From the gaining unit's perspective, the Fielding Plan is probably the most important component of the acquisition process. The gaining unit is really not interested in the challenges the PM faces with contracting, designing, producing, and delivering the new system. What the unit does care about is when it will be receiving the equipment and the quantity. Depending on processes within your higher headquarters and your assigned AFSB, the fielding plan may be a stand-alone document or distributed as an Operations Order (OPORD) or Fragmentary Order (FRAGO). Either way, the AL&T-D can provide vital input via normal staffing or through immediate communication to ensure unit fielding expectations and requirements are synchronized with the system's production rate, delivery schedule, and distribution plan. The AL&T-D will coordinate with appropriate higher headquarters staff sections and the PM to ensure essential elements of the fielding plan (schedules, issue locations, gaining unit responsibilities, and transportation requirements) are included in the instructions provided to the receiving unit.

Fieldings seldom involve single-point distribution from a fully equipped warehouse or deprocessing site. They typically include several geographically dispersed fielding sites, differing levels of infrastructure, and varying quantities for issue. The AL&T-D and the PM can manage these fielding nuances and greatly simplify the process for the gaining unit. Additionally, the AL&T-D can assist with asset visibility and property accountability, ensuring PMs comply with all Property Book Unit Supply Enhanced requirements for equipment issue and transfer. The AL&T-D can also coordinate to ensure Field Service Representatives (FSRs) are present to assist in acceptance inspections and final issue of the equipment. Leveraging the capabilities of the AL&T-D will ensure the fielding plan is synchronized with the unit's expectations and requirements.

John Arana (right), Staff Instructor II, Force Protection Industries Inc., teaches U.S. Navy PO2 Kevin Dixon, Provincial Reconstruction Team-Ghazni motor pool mechanic, FLMNET for the Mine Resistant Ambush Protected (MRAP) Cougar at FOB Ghazni, Afghanistan. (U.S. Air Force photo by TSgt Rebecca Corey.)

## NET

Second, if not equally important in terms of unit priorities, is NET. It seems obvious that NET, specifically OPNET or FLMNET, would be required as a unit receives new equipment, but some units do not synchronize NET with their daily tasks and battle rhythm. NET is an essential part of the fielding and must be done right the first time. Without NET, new equipment can easily become paper weights, motor pool "queens," or just labeled as "too hard to use" by Soldiers. The AL&T-D can ensure the NET is both efficient and effective by providing unit expectations, time available, and other unit-unique training requirements directly to the PM. The directorate can also provide the PM with unit training schedules or timelines that may necessitate changes to NET times and locations. The AL&T-D can verify that the NET plan is included in any OPORD or FRAGO that prescribes the fielding and will facilitate NET requirements, such as warehouse storage space, classroom coordination, housing, and instructor accountability. When conducting NET in a deployed environment, the AL&T-D can track instructor country clearance and call forward requests

Panther Medium MRAP Vehicles await preparation for NET and follow-on issue to Soldiers in Iraq. (U.S. Army photo courtesy of MAJ O'Neal A. Williams, 402nd AFSB S&T Officer.)

and arrange for housing and inter-/intra-theater transportation.

Challenges inevitably emerge during even the best planned NET events. The AL&T-D is capable of "running interference" with the PM to mitigate any problems that may arise. This unburdens the unit accepting the fielding and allows it to stay focused on the myriad of ongoing predeployment training activities that are no doubt occurring at the same time as the NET. Problems can be as trivial as a shortage of handouts or as serious as realizing the wrong software version is loaded into a new communications system. After a successful initial fielding and NET, the AL&T-D will begin working with your unit and PM to ensure an effective support strategy is implemented.

## The Support Strategy

If the Program Management Office (PMO) has done its homework, your new gear should either be fully supported by field-level maintenance and the Army supply system, come with FSRs as part of a Contractor Logistics Support (CLS) program, or have a combination of Army maintenance and FSR/CLS. If FSRs and CLS are involved, the AFSB can provide a great deal of assistance with tracking, managing, and general support of the FSRs and their unique tool and facility requirements. Since the AL&T-D is able to interface directly with your staff officers and the end user Soldiers, the support strategy will be tailored to your specific needs and operational environment. This interaction allows the AFSB to work with the PMO as the support strategy changes over time.

Leveraging the AFSB AL&T-D's capabilities will link your command with the Materiel Enterprise and enable successful AL&T activities.

The AL&T-D in the AFSB provides a unique service. Having a basic understanding of the core competencies of the AL&T-D will allow commanders and staff officers to maximize their ability to effectively state operational requirements, choose the best fielding and training plans, and ensure proper transition to sustainment operations.

Engage your AFSB as your battalion, brigade, or division is considering, or in the middle of, requirements generation, fieldings, or liaison with PEOs or PMs. Leveraging the AFSB AL&T-D's capabilities will link your command with the Materiel Enterprise and enable successful AL&T activities.

**LTC STEVEN VAN RIPER** serves in the 402nd AFSB as the Director of AL&T. He holds a B.S. in aeronautical engineering from Embry-Riddle Aeronautical University and an M.S. in aeronautical engineering from the Naval Postgraduate School. Van Riper is certified Level III in program management and Level II in systems planning, research, development, and engineering-systems engineering, and is a U.S. Army Acquisition Corps member.

# Army Field Support Brigades (AFSBs) and the U.S. Army Research, Development, and Engineering Command (RDECOM)—Strengthening the Materiel Enterprise

MAJ O'Neal A. Williams

**The Acquisition, Logistics, and Technology-Directorate (AL&T-D) has the unique mission to integrate and synchronize acquisition and technology support with accountability and sustainment in the 402nd AFSB's area of responsibility (AOR) (Iraq, Kuwait, and Qatar) in support of the Materiel Enterprise. Now that the theater is downsizing, the AL&T-D mission has expanded to synchronize technology insertion accountability during retrograde operations to prevent equipment loss or destruction. To accomplish this mission, AL&T-D has built strong partnerships with in-theater program managers (PMs), RDECOM Senior Command Representatives (SCRs), and the other Life Cycle Management Command (LCMC) representatives within the brigade. These partnerships strengthen the Materiel Enterprise and provide synergy among the LCMCs, RDECOM, and the 402nd AFSB.**

**The AL&T-D mission has expanded to synchronize technology insertion accountability during retrograde operations to prevent equipment loss or destruction. Here, SFC Robert G. Greeley, (right), 2nd Battalion (Bn), 401st AFSB, explains retrograde processes to SMA Kenneth Preston at Camp Arifjan, Kuwait. (U.S. Army photo by Luis A. Deya, 401st AFSB.)**

Within the 402nd AFSB, AL&T-D personnel work closely with the RDECOM SCR. The RDECOM SCR, who works in the brigade headquarters, is responsible for coordinating with all RDECOM agencies, laboratories, and centers, as well as collecting data on vehicles within theater for the parent agency, the U.S. Army Materiel Systems Analysis Activity. The 402nd AFSB Science Advisor complements the RDECOM SCR by leveraging his/her expertise through direct coordination with supported units on various technological challenges throughout theater. They work together to gather Soldiers' requirements and resolve many unforeseen issues with new technologies supporting the warfighter.

The 402nd AFSB Science Advisor complements the RDECOM SCR by leveraging his/her expertise through direct coordination with supported units on various technological challenges throughout theater.

## Collaboration Example

One example of RDECOM-AFSB collaboration was the assistance of an Engineer Co. (Stryker), Fort Lewis, WA, to develop a lighting kit that provided better visibility during nighttime route-clearance missions. Once this capability gap was identified, the RDECOM SCR and 402nd AFSB Science Advisor worked quickly to meet these Soldiers' requirement. In conjunction with developing a design, they also submitted a request for information (RFI) to both RDECOM HQ and PM Stryker to assist with an Army-funded lighting system. Using the 402nd welding shop, the two men provided the welding team with diagrams and templates to build the new Stryker lighting bracket set. These light brackets were designed to support an existing lighting system used by the Engineer Co. The engineers are using these brackets on a limited basis until PM Stryker develops a lighting kit that addresses the unit's requirements.

Subsequently, during a video teleconference (VTC) with RDECOM HQ, 402nd AFSB's Science Advisor informed the group that the lighting brackets had been created and distributed to the Engineer Co. in *Operation Iraqi Freedom*. Since the 402nd AFSB had previously developed the light bracket prototypes for Stryker vehicles with and without slat armor, Task Force Paladin Liaison Officer-*Operation Enduring Freedom* (*OEF*), who was also on the VTC, requested 402nd AFSB's assistance for developing a better Stryker lighting system for units in *OEF*. The following day, the RDECOM SCR e-mailed the engineering drawings and shipped prototype brackets directly to the 401st AFSB (*OEF*) for fabrication and distribution to Task Force Paladin. RDECOM is prepared to produce more light brackets to support the demand from both theaters.

## Further Partnerships

This AFSB and RDECOM partnership is further enhanced through the support provided to RDECOM's Science and Technology (S&T) Assistance Team (STAT). The 402nd AFSB has an agreement with RDECOM to support the STAT with life support (housing, use of vehicles, accountability, computers, phones, etc.) and office space. Not only does the brigade administratively support the STAT, the AFSB also supports the team with its mission to assist the warfighter in articulating its requirements to HQDA, RDECOM's labs/centers, and the Assistant Secretary of the Army for AL&T (ASAALT) community.

The brigade assists the team's operations through the brigade's Science Advisor. Together, with the S&T Acquisition Corps Advisor (STACA), they canvas the entire Iraqi theater addressing Soldiers' RFIs, challenges, and improvements from the company, brigade, and division level. This group of highly trained individuals also fields questions and accepts challenges from other services, delivering solutions to the warfighter faster and across all phases of an operation.


**SGT Doron Q. Ransom (left) and PFC Barrett L. Listenbee, inspectors with 249th Quartermaster Co., 2nd Bn, 402nd AFSB, inspect and wrap equipment at the Joint Base Balad, Iraq, Redistribution Property Assistance Team yard. (U.S. Army photo by Summer Barkley, 402nd AFSB.)**

BLSTs provide the AFSB Science Advisor the reach capability to gather requirements from all combat units on the battlefield through sustainment and maintenance channels. Here, CW4 Darren L. Cook (left), BLST Chief for the 172nd Infantry Brigade (Bde), works with SFC Earl B. Jones, 9th Engineer Bn, 172nd Infantry Bde S4 Noncommissioned Officer-in-Charge, and SGT Julie R. Buchun, 9th Engineer Bn S4 Clerk, to ensure the 172nd's equipment is ready for reset in preparation for future deployment. (U.S. Army photo by Summer Barkley, 402nd AFSB.)

How does a science coterie cover an entire theater to address technology issues? The answer is not as complicated as one may think. The AFSB Science Advisor, STACA, Corps Science Advisor, and STAT cover specific areas on the battlefield, and each has specific responsibilities. On special occasions, each officer has the ability to cover one another's AOR when necessary.

The AFSB Science Advisor has the responsibility to gather requirements through Logistic Support Elements and the Brigade Logistic Support Teams (BLSTs). These logistic elements provide the Science Advisor the reach capability to gather requirements from all combat units on the battlefield through sustainment and maintenance channels. The STAT is embedded in the division HQ, which gives it direct access to divisional units. Its reach goes further than just division; on the STAT, there is a medical advisor who is able to gather requirements from all medical facilities in theater. Lastly, the Corps Science Advisor and STACA work closely together to field requirements and direct those requirements through corps leadership for approval with command emphasis. Although they both reside in corps HQs, they have differing roles.

The AFSB also supports the team with its mission to assist the warfighter in articulating its requirements to HQDA, RDECOM's labs/centers, and the ASAALT community.

Since the Corps Science Advisor (typically residing in the C-3/J-3 Force Management Directorate) can interface directly with the corps commander and corps staff sections, he/she has the "horsepower" to influence the efforts of external supporting agencies, such as the Rapid Equipping Force, U.S. Army Test and Evaluation Command, and S&T agencies (RDECOM HQ and research and development centers). The Corps Science Advisor is also the focal point for all divisional requirements, as the STAT has access to only one division. With all these moving pieces, there needs to be an element to unify the efforts.

The STACA is the unifying agent that provides synergy to all S&T efforts in theater. Since he/she is on the corps staff, the STACA organizes requirements from the STAT, Corps Science Advisor, and the AFSB Science Advisor. This allows for synchronization of effort and reduces redundancy in submitting Operational Needs Statements, formal RFIs, and other requirements documents.

The coordination, level of commitment to Soldiers, and consistent dialogue between key RDECOM agencies and organizations, STAT, STACA, Science Advisors, PMs, AFSBs, and ASAALT demonstrate how the Materiel Enterprise is leveraged to support the warfighter in the field. From the AFSBs to RDECOM to PMs, these entities have forged an alliance that converts Soldiers' requirements into materiel solutions, thus increasing their survivability, lethality, and mobility on the battlefield.

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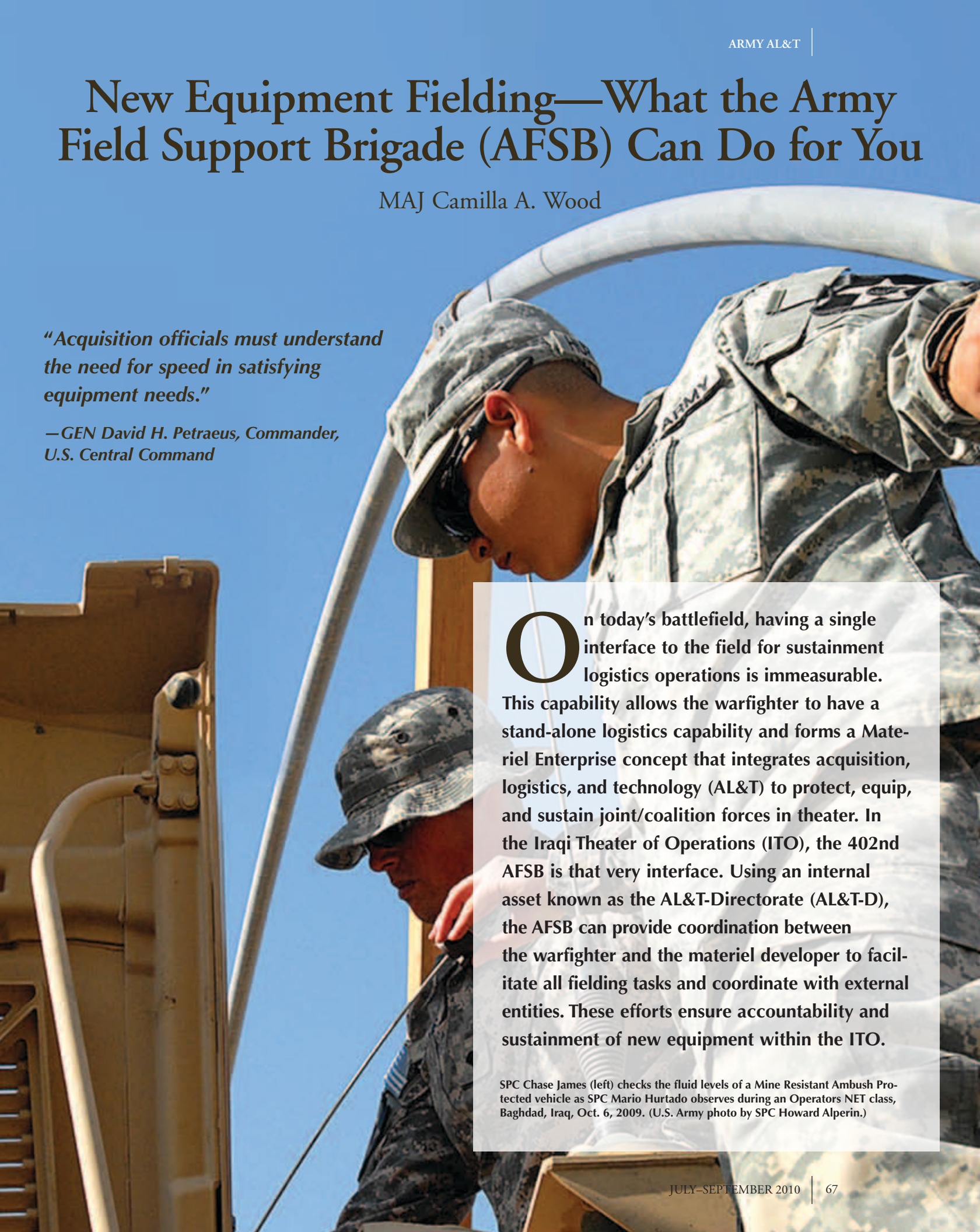
# New Equipment Fielding—What the Army Field Support Brigade (AFSB) Can Do for You

MAJ Camilla A. Wood

*"Acquisition officials must understand the need for speed in satisfying equipment needs."*

*—GEN David H. Petraeus, Commander, U.S. Central Command*



On today's battlefield, having a single interface to the field for sustainment logistics operations is immeasurable. This capability allows the warfighter to have a stand-alone logistics capability and forms a Materiel Enterprise concept that integrates acquisition, logistics, and technology (AL&T) to protect, equip, and sustain joint/coalition forces in theater. In the Iraqi Theater of Operations (ITO), the 402nd AFSB is that very interface. Using an internal asset known as the AL&T-Directorate (AL&T-D), the AFSB can provide coordination between the warfighter and the materiel developer to facilitate all fielding tasks and coordinate with external entities. These efforts ensure accountability and sustainment of new equipment within the ITO.

SPC Chase James (left) checks the fluid levels of a Mine Resistant Ambush Protected vehicle as SPC Mario Hurtado observes during an Operators NET class, Baghdad, Iraq, Oct. 6, 2009. (U.S. Army photo by SPC Howard Alperin.)

One of the AL&T-D's primary responsibilities is to support the integration and accountability of newly fielded equipment. These efforts have many moving pieces, including planning and coordination for life support, facilities, communications, shipping/receiving of equipment, personnel support, and sustainment planning. AL&T-D's abilities not only provide U.S. Forces-Iraq (USF-I) a substantial benefit, but also provide the program executive office (PEO)/program manager (PM) a "no cost" initial entry point for essential fielding coordination.

CWO4 Darren L. Cook (left), BLST Chief for the 172nd Infantry Brigade (Bde), works with SFC Wendoly D. Portillo, 172nd Infantry Bde PBO Noncommissioned Officer-in-Charge, and CWO2 Tuajuanna N. Jones, 172nd Infantry Bde Property Book Officer, as the unit resets equipment in preparation for future deployment. (U.S. Army photo by Summer Barkley, 402nd AFSB.)

## The Beginning

Coordination for all fieldings within theater begins and ends with the USF-I J3 Force Modernization Division and its direct coordination with the U.S. divisions (USDs) to ensure appropriate coordination in support of the warfighter mission. Fielding coordination is initiated with the Notification of Intent, by the PM, to field in the ITO. This action triggers subsequent planning meetings that include USF-I, the Assistant Secretary of the Army for AL&T Liaison Officer, and AFSB AL&T-D. Once planning begins, several key tasks and common issues arise (see Figure 1 on Page 69). Through the use of the AFSB, the PEO/PM can support the overall intent: to meet the warfighting commanders' requirements while filling resource gaps with the receipt and retention of essential assets.

## Pre-Execution Documentation

Within the fielding process, essential pre-execution documentation is necessary for a successful fielding. This documentation includes a Technology Development Plan (TDP), which is provided by the PM to ensure essential fielding information is available; a Memorandum of Notification, where the specific fielding requirements are outlined; and a distribution plan that provides a picture and description of the system being fielded, a fielding plan summary (including sustainment), and the prioritized unit/division distribution. Once this information is provided, a fielding schedule is determined and coordinated among the various USDs.

## Accountability

Accountability of Theater-Provided Equipment (TPE) is managed by the Theater Property Book Office (TPBO). In the 402nd AFSB, the TPBO Cell is collocated with the 2nd Battalion (Bn) and includes a chief warrant officer as the Accountable Officer, a government civilian employee appointed as Deputy Accountable Officer, and additional contracted Property Book and Unit Supply Enhanced (PBUSE) technicians. There are 13 TPB teams in the ITO supporting units with TPE property accountability. All TPE must be documented on the TPB, and PMs are required to establish a hand receipt account within PBUSE. Before equipment is brought into theater, it is imperative that PMs populate equipment to be fielded into PBUSE using derivative unit identification codes. The TPBO is a tremendous asset and can provide a list of unit TPB accounts, a sample *Department of the Army Form 3161 Lateral Transfer*, and a point of contact (POC) list of all TPB offices in the country. The relationship between the warfighter and AFSB provides the PEO/PM timely and manageable accountability of fielded equipment, thus supporting their ability to execute schedule and cost requirements flawlessly (per *402nd AFSB AL&T External Standard Operating Procedure* (*SOP*), July 31, 2007).

Using an internal asset known as the AL&T-D, the AFSB can provide coordination between the warfighter and the materiel developer to facilitate all fielding tasks and coordinate with external entities.

## Execution Support

Support availability during the fielding process is always the number one priority for many PM offices. The questions most PMs want answered are about the life support and resources available to their theater representatives. Understanding that many times resources can be the driving force for success or failure of a particular fielding, the AFSB can provide coordinated support to various areas, such as life support, facilities, equipment, shipping and receiving, and personnel transportation (per *402nd AFSB AL&T External SOP*, July 31, 2007).

The PM may ask, "How will my personnel be supported?" The AFSB staff is available to coordinate for life support and housing on Forward Operating Bases (FOBs) where there is a permanent AFSB footprint. Existing housing is provided for short duration projects with small numbers of people, as space is available. For large or long-term projects where requirements exceed available space, the AFSB can coordinate housing in support of the PEO/PM. Once large or long-term project coordination is completed, the project sponsor (PEO/PM), based on theater fiscal policies, may be responsible for purchasing the housing units identified. These housing units will be managed by the AFSB and are available for reallocation/reassignment following project completion. On FOBs where the AFSB does not have a permanent footprint, the AFSB has established Logistics Support Elements (LSEs) and Brigade Logistics Support Teams (BLSTs) that are responsible for life-support coordination with the tenant operational unit or mayor's cell.

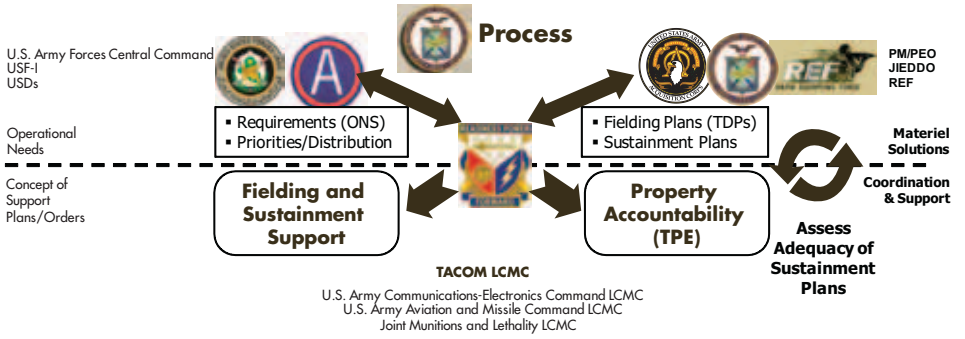
The PM may also inquire, "Where will my personnel work?" The AFSB also coordinates facilities for installation fielding missions throughout theater. The AFSB leverages existing facilities to meet mission requirements, to the maximum extent possible, at no cost to the project sponsor (PEO/PM). The AFSB can coordinate for land acquisition and facility construction if existing facilities are not available or do not meet mission requirements. Based on theater fiscal policies, the project sponsor (PEO/PM) may be responsible for providing funding.

> The relationship between the warfighter and AFSB provides the PEO/PM timely and manageable accountability of fielded equipment, thus supporting their ability to execute schedule and cost requirements flawlessly.

The PM may question, "With whom do I coordinate to ensure receipt of equipment as it comes into theater?" Equipment shipping and receiving is an important part of the fielding process. As equipment is processed into theater, it is imperative that it is tracked down to the lowest command level. Transportation Control Number/Radio Frequency Identification tags allow the AFSB to track and identify equipment locations, as the equipment is being processed into theater. AFSB personnel can coordinate shipping, receiving, and temporary storage of equipment that is used for fielding, upgrade, or sustainment operations within theater. This support is easily managed where the AFSB has a permanent footprint. For locations where an AFSB footprint is not established, the AFSB can coordinate necessary logistics support.

Finally, the PM will need to know, "What type of transportation support is available as personnel travel throughout theater in support of an upcoming fielding?" Personnel supporting a U.S. Army Materiel Command (AMC) mission (fielding, training, sustainment, or liaison visits) can contact the AMC liaison desk upon arrival at Ali Al Salem,

**FIGURE 1. NEW EQUIPMENT FIELDINGS**




**KEY TASKS**

- Identify new fielding efforts (Joint Improvised Explosive Device Defeat Organization (JIEDDO), Rapid Equipping Force (REF), PM/PEO)
- Assess adequacy of sustainment plans
- Identify/plan support requirements
  - Accountability (TPE)
  - Facilities
  - Equipment
  - Life support
  - Contractor Logistics Support (CLS) Management
  - Transportation
  - Range support
- Develop Concept of Support Plans
- Develop/publish fielding support and sustainment orders (fragmentation orders (FRAGOs))

**COMMON ISSUES**

- Transition: Operational Needs Statement (ONS) Requirements → Program of Record
- Transition: REF/JIEDDO → Long-term sustainment
- New Armywide process: New equipment → TPE property book
- Space availability in country for facilities, staging, storage (surge and closures)
- Requirements to solutions flow: ONS → New fielding (relief in place/transfer of authority, time lags)
- Integration of equipping efforts
  - Coordination with platform PMs
  - 'Redundant efforts'

Kuwait, to coordinate transportation into theater. In the 402nd AFSB, there are two Emergency Operations Centers in Iraq—one in Baghdad (Victory Base Complex) and one at Joint Base Balad—and both provide movement assistance. In addition, the administrative support personnel within the LSEs and BLSTs can arrange transportation to the various FOB locations once personnel are in theater.

## New Equipment Training (NET)

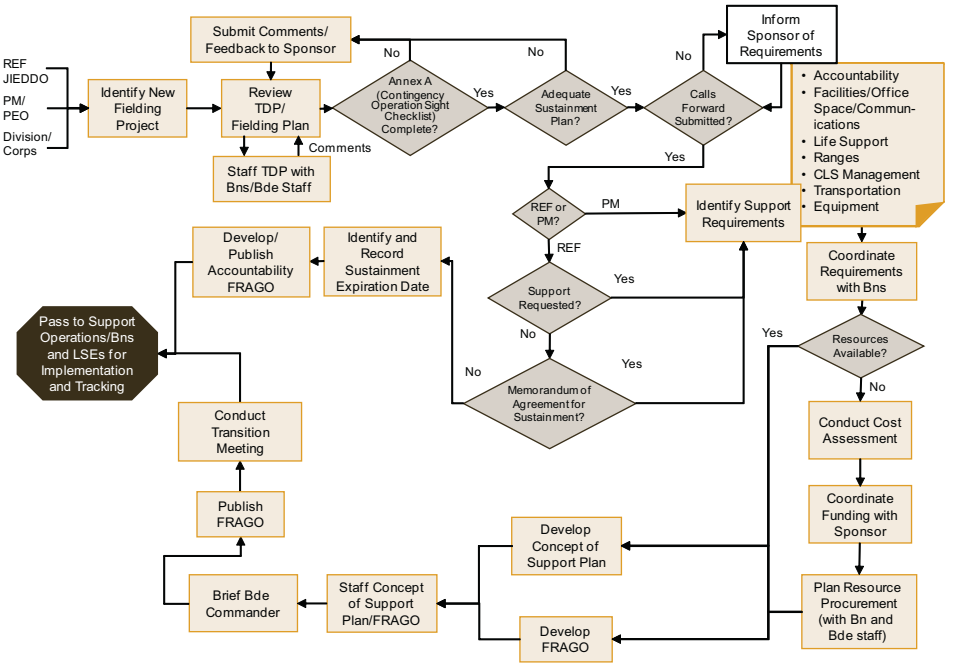
Before equipment is officially signed over to a unit, NET must be conducted in conjunction with the materiel fielding. NET is the responsibility of the appropriate PEO/PM and allows for the transfer of equipment use and support requirement knowledge from the material developer to the users, trainers, and maintainers of new Army equipment. The PEO/PM NET teams can coordinate with the AFSB to arrange NET support to the gaining units for both operation and maintenance training. NET teams are attached to the AFSB for personnel accountability, tactical logistics (including movement), life support, and integration into the local force protection/security plan (per *Field Manual 4-93.41, AFSB Operations*, Feb. 25, 2009).

## Transition to Sustainment

Sustainment support should be an integral part of any fielding process. With the assistance of the AFSB, PEO/PMs can leverage existing maintenance and sustainment contract vehicles when planning for long-term sustainment. In many instances, limited depot-level repair capabilities exist at several of the Forward Repair Activities, and it can be very beneficial to plan for limited depot-level sustainment in theater rather than having to transport all items requiring depot-level repair back to CONUS. The AFSB is an essential asset that can assist in coordinating long-term sustainment support with the Life Cycle Management Commands (LCMCs). Additionally, the AFSB provides personnel that function as contracting officer representatives to provide in-country operational oversight of sustainment contracts and field service representatives (per *402nd AFSB AL&T External SOP*, July 31, 2007).

LTC Robert Miceli, Chief, AL&T-D, 404th AFSB, said, "We are combat multipliers on the battlefield today and value-added assets for the PEO/PM community from within AMC." The AFSB provides a multitude of support capabilities to the PEO/PM. The extensive process involved in the execution of fielding an individual piece of equipment (see Figure 2) requires a systematic approach that includes everything from accountability, fielding coordination, and sustainment requirements. This type of knowledge and expertise provides the PEO/PM, the warfighter, and USF-I a combined "one-stop shop," ensuring subject matter experts and fielding POCs are available to provide essential answers to the "who, what, when, where, and how."

**FIGURE 2. TYPICAL NEW EQUIPMENT FIELDING PROCESS**




NET is the responsibility of the appropriate PEO/PM and allows for the transfer of equipment use and support requirement knowledge from the material developer to the users, trainers, and maintainers of new Army equipment.

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# Tactical Basics for Assistant Program Managers (APMs)

LTC Steven Van Riper

**Highly complex programs, now commonplace in the acquisition environment, are capable of delivering a knockout punch to even experienced APMs. These programs are usually backed by a juggernaut of time-sensitive funding, immature technology, and an unforgiving schedule. How can program executive officers (PEOs) and project managers help you? What can be done to set the conditions for success? What can you do to help yourself?**

SSG Calvin Esslinger scans a ridgeline near Combat Outpost Munoz in the Paktika province of Afghanistan, Nov. 15, 2009. Regular interaction with contractors and program support agencies is the acquisition equivalent to OPs/LPs, providing management insight and collaborative solutions to common programmatic challenges. (U.S. Army photo by SSG Andrew Smith.)

There are no easy answers to these questions, but APMs can draw parallels to tactical basics learned as company grade officers. Five tactical basics that relate well to acquisition operations are:

- Fire support to always include supporting artillery.
- Intelligence oversight.
- Observation posts and listening posts (OPs/LPs) for early warning.
- Adequate reserves.
- Operation with appropriate tactical mass.

APMs can draw parallels learned as tactical commanders to effectively manage their projects. Here, SGT Trent A. Ogden, a tactical commander with 301st Chemical Co., and interpreter Ashur Elisha discuss security measures in Baghdad, Iraq. (U.S. Army photo by SGT John Stimac.)

Transforming these tactical basics into acquisition-centric terminology enables the APM to:

- Employ project manager top cover and PEO oversight.
- Obtain program and contractor-specific situational awareness (SA).
- Interact directly with the contractor and program support agencies.
- Possess adequate fiscal and schedule reserves.
- Build a right-sized workforce with the right skill sets.

## Employ Project Manager Top Cover and PEO Oversight

In many tactical situations, fire support can dramatically alter events on the battlefield. In an acquisition environment, the APM can employ project manager top cover and PEO oversight to the same effect. Sometimes even the best managerial skill, leadership, and personal commitment are not enough to avoid setbacks. As an APM, you must be prepared for the inevitable negative events that will happen in one (if not all) of your programs. Developing a rapport with your project manager can greatly mitigate these realized risks. Quickly notifying your project manager of problems and then engaging in hasty problem solving can yield several viable courses of action. This cooperation ensures your project manager is a key stakeholder in the program. APMs should also strive to provide information to PEOs so they can intervene, if required.

Work with your project manager to schedule periodic office calls or program reviews with your PEO to ensure he or she has oversight on your program's identified risk areas. PEOs are often extremely busy and don't have enough time to "drill down" into each program in their portfolio. Selecting the right information to provide the PEO is challenging and should be done in close coordination with your project manager. Preparation for PEO-level meetings is time well spent and will pay dividends as your program moves forward.

## Obtain Program and Contractor-Specific SA

Tactical commanders require intelligence oversight to visualize upcoming engagements, predict the enemy's behavior, and plan for future actions. Similarly, APMs who obtain program and contractor-specific SA will benefit from widened program perspectives and effective contract and contractor management.

Every program has specific focus areas. These areas can range from Earned Value Management metrics to performance of a problematic circuit card assembly. In some cases, APMs incorrectly assess these areas of emphasis based on a narrow perspective. APMs must be able to view these specific areas of emphasis from the government's perspective and through the eyes of the contractor. These unique, but complementary, viewpoints increase SA by enabling a reflective assessment of the areas of emphasis. As a bonus, these reflective assessments often reveal previously invisible program nuances.

APMs must also be familiar with their contractor's business rules, business processes, and personnel management. Having a basic understanding of these three areas is vital for effective contract and contractor management and results in a more accurate prediction of contractor behavior. Because contractor personnel management is often a source of acute friction in many programs, ensure your contract includes the appropriate clauses to enforce personnel stability.

## Interact Directly With the Contractor and Program Support Agencies

APMs can also greatly enhance their SA by interacting directly with the contractor and program support agencies. Employing OPs/LPs have undoubtedly provided commanders at all levels reaction time and maneuver space. Regular interaction with contractors and program support agencies (e.g., the Defense Contract Management Agency (DCMA), Defense Contract Audit Agency (DCAA), etc.) is the acquisition equivalent to OPs/LPs, providing management insight and collaborative solutions to common programmatic challenges.

It seems obvious that direct interaction with the contractor would result in management insight, but many APMs fail to recognize the importance of engaging with their contractor counterparts. APMs should be granted unfettered access to their contractor counterparts. Although formal weekly teleconferences, monthly in-progress reviews, and quarterly program reviews should be the norm, interchanges should also include informal meetings and working group sessions. Collaboration should become more frequent during critical program events.

Sometimes APMs distance themselves from other government agencies because it is perceived that any collaboration, beyond what is required by law, will consume valuable time (and, therefore, funding). Certainly, unscheduled U.S. Army Test and Evaluation Command, DCMA, and DCAA requirements can adversely affect any program, but early inclusion of these agencies as program stakeholders can enhance required relationships and mitigate the negative effects of unscheduled intervention. Interaction and collaborative problem solving usually requires additional time and money, forcing the APM to request access to his/her fiscal and schedule reserves.

## Possess Adequate Fiscal and Schedule Reserves

Adequate reserves allow a commander to take decisive action when his/her forces are overmatched. Adequate fiscal and schedule reserves allow an APM to offset developmental shortfalls, understand test and evaluation anomalies, and compensate for production problems. Although not strictly authorized, fiscal reserves of 3–4 percent of total budget are common. Ensure you are funded with the right "type" of money in the right years.

More funding is usually not effective unless it is accompanied by more time. Building a schedule reserve is an art and a science. APMs should look to experienced acquisition professionals within their project manager shop, examine similar programs, and obtain guidance from their PEOs and project managers as they develop schedule reserves. Similar to employment of the tactical reserve, knowing when to employ fiscal and schedule reserves is one of the most important recommendations the APM can make. Just as tactical commanders must carefully consider the impacts of employing their reserves, APMs must carefully assess the risks of using fiscal and schedule reserves. Although the ability to deftly employ fiscal and schedule reserves is important, nothing is as critical as the program management office (PMO) workforce.

## Build a Right-Sized Workforce With the Right Skill Sets

Appropriate tactical mass is essential to the commander striving for operational environment superiority. In comparison, building a right-sized workforce with the right skill sets is critical for program success. In many cases, more people do not equal better performance. APMs must be prepared to objectively evaluate workforce requirements and provide direct feedback to their project managers. This candid assessment may result in reorganizing the workforce or modifying relationships with external agencies such as DCMA or DCAA. Even if your PMO is optimally staffed, having employees with the wrong skill sets can be a detriment to your operation.

The right skill sets are a key aspect of any workforce and are especially important to the APM. Employees, both government and contractor, must possess the basic skills to accomplish their assigned duties and responsibilities, but must also be capable of working in integrated process teams and working groups, possibly outside their individual comfort zones. APMs should be prepared to sponsor training or allow the workforce to attend resident courses to expand their skill sets. It may be inconvenient to have one of your employees in class or attending training for 1 or 2 months, but it will be much more difficult (for the APM and employee) to "learn as you go" during a 3–5 year acquisition effort.

CPT Steven Belford, project manager for the 225th Engineer Brigade, briefs a DOD contractor during the final inspection before Maya Road in Baghdad opens to military and Iraqi civilian traffic. (U.S. Army photo by LTC Patrick Simon.)

Many other tactical concepts can be transformed into acquisition-related task program management methods. The five discussed in this article provide a solid base for APMs faced with greater responsibility and increasingly complex duties. Employing these APM tactical basics does not ensure program success, but keeping these concepts in mind will allow you to keep your boss informed, develop mitigation plans, prioritize your efforts, and maximize your limited time.

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# Acquisition as a Polarity—The Case for Both Rapid and Deliberate Acquisition

COL Jeffrey J. Mockensturm

**In the science fiction thriller "The Matrix," the main characters, Neo and Trinity, prepare for a mission by requesting "guns … lots of guns." Neo conveys this requirement using a mobile phone to call an operator who performs a quick computer search. With a few strokes of the keyboard, the operator instantly supplies Neo and Trinity with thousands of firearms of various makes and models, availing them of an entire arsenal tailored to their mission.**

A majority of our best modernization ideas start with Soldiers in the field. Soldiers let us know what the issues are, and we often find rapid acquisition solutions among COTS and MOTS products. Here, a Soldier at Aberdeen Test Center, MD, aims an XM-25 weapon system. (U.S. Army photo.)

Today's Soldiers face fast-changing and dynamic threats every bit as dangerous as those in "The Matrix." The question isn't whether the Army's acquisition capability should be comparable to that depicted in the movie—it *is* fiction, after all. But should the Army consider "The Matrix" as a futuristic vision for speed in equipping the force? How rapid can acquisition reasonably get? Better yet, lacking an operator to dial up an arsenal, where do we get materiel to rapidly equip our force in the future?

Getting Soldiers the right materiel immediately is essential in today's modern battlefield. Here, SGT Tim Failor, 4th Battalion, 9th Infantry Regiment, wears the Land Warrior system as he conducts operations in Sulah ad Dihn province, Iraq. (U.S. Army photo by CPT Richard Ybarra.)

## Evolving Acquisition

As it turns out, a majority of our best modernization ideas start with Soldiers in the field. Soldiers let us know what the issues are, and we often find "rapid" acquisition solutions among commercial-off-the-shelf (COTS) and military-off-the-shelf (MOTS) products. Much of the underlying technology is derived from traditional, deliberate Army acquisition programs as part of the venerable, yet often maligned, *DoD 5000* process. This process addresses the full acquisition life cycle—requirements development, technology maturation, engineering development, system integration, testing, and, ultimately, fielding—thereby providing a stable and long-term approach that supports development of emerging technologies and their application to our most demanding military requirements. Simply put, rapid solutions that come "off the shelf" require a proactive, forward-thinking means of getting "on the shelf" in the first place. As acquisition professionals, we have to concern ourselves not just with pulling solutions *off* the shelves, but in stocking the shelves, too.

Deputy Secretary of Defense William J. Lynn III recently explained to the World Affairs Council that, "DOD is doing more to fight the wars in Iraq and Afghanistan while still preparing for future conflicts. Past strategy did not pay enough attention to current conflicts, and DOD has changed the balance toward fighting today's wars." However, he explained, "The military must be ready to face these challenges and still maintain the capabilities to take on peer competitors. … Changing the way the acquisition process works is an important part of funding the capabilities to handle future threats."

## Acquisition in Today's Warfare

Our Soldiers are engaged in the most unpredictable environment in history. The attacks of Sept. 11, 2001, ushered in an era of persistent conflict defined by a sustained terrorism threat here at home, as well as asymmetric wars and counterinsurgencies in both Iraq and Afghanistan. Improvised explosive devices and indirect threats have replaced conventional warfare on the battlefield. While an adaptable enemy is availing itself of the latest COTS technologies, we in the acquisition community struggle with how to best maintain Soldiers' decisive edge. We know that getting Soldiers the right materiel immediately is essential. Whether it's the combat ensemble chosen by Neo and Trinity in "The Matrix" or Small Arms Protective Inserts (plates incorporated into our Individual Body Armor) that have saved countless lives in our current fight, speed is often the key to both saving lives and achieving mission success.

But in an era of persistent conflict, the Army's acquisition processes are increasingly focused on meeting immediate warfighter needs (IWNs) as opposed to longer term, deliberate acquisition solutions. The predominant "Big A" acquisition model used to equip our forces for pre-Sept. 11, Cold War-era warfare tends to be insufficiently agile for emergent and dynamic requirements. When research, development, testing, and fielding are conducted in the methodical and deliberate manner intrinsic to "Big A," equipment often does not reach the warfighter for decades, if at all. Given the current

Equipping our Soldiers for the wars of today and tomorrow requires that we view and manage deliberate and rapid acquisition as co-dependent solutions.

As conflict persists and the acquisition community escalates its usage of rapid equipping to meet emerging requirements, we must be careful not to neglect the deliberate process that produces so many of the off-the-shelf technologies that rapid acquisition relies on.

operations tempo, we have shifted to more "little a" rapid acquisition, fielding larger quantities of COTS and MOTS technologies and seeking more agile acquisition strategies.

So why not simply make "Big A" acquisition more like "little a" acquisition, i.e., make the deliberate processes leaner and faster? This has been tried, and acquisition reform initiatives continuously focus on improving the responsiveness of deliberate acquisition; much remains that can and is being done to improve deliberate processes (many Lean Six Sigma initiatives focus on speeding up "Big A"). But these efforts to speed up deliberate processes tend to ignore fundamental differences between rapid and deliberate acquisition. Deliberate acquisition attempts to develop and produce a capability that does not yet exist—something that's never been done before and often with less-than-fully-mature technologies. Rapid acquisition essentially harvests mature capabilities that already exist, figuratively "sitting on the shelf."

## Acquisition as a Polarity

While very different in approach, it would be a mistake to treat these methodologies as "either-or"—independent, opposing, or unrelated. Equipping our Soldiers for the wars of today and tomorrow requires that we view and manage deliberate and rapid acquisition as co-dependent solutions. We can do this by viewing acquisition as a polarity. A polarity is defined as a chronic issue or problem that does not have a single right answer but rather two, co-dependent solutions. A polarity occurs when there is more than one correct solution to improving an ongoing situation. Unlike problems, polarities need to be managed, not solved. The potential positive synergy that can be attained between two poles is depicted on the polarity map by upward spiraling arrows coming from the two poles (see Figure on Page 77). Sustained, over-focus on one pole or fighting between the poles feeds a vicious cycle, represented by the arrows pointing down. Each solution represents one of a polarity's two poles.

*Polarity Management*, a model taught by internationally renowned organizational expert and thought leader Dr. Barry Johnson, first recognizes and then manages polarities so that the interdependence between the two solutions is exploited to produce consistently positive results. Good leadership empowers both poles and seeks to maximize their respective upsides; poor leadership places too much focus on one pole to the neglect of the other, exacerbating the problem.

Using this framework, we can better understand the two interdependent poles: deliberate acquisition (Big A) and rapid acquisition (little a) (see Figure). Over time, both types of acquisition offer solutions to meet our Soldiers' needs. The interdependence between them is exemplified by the recent rapid fielding of armor for high-mobility multipurpose wheeled vehicles. The armor was fielded quickly because the requirement for advanced armor protection technologies had been anticipated years before and developed through a long-term cycle (ostensibly, "put on the shelf for future use"). By the time it was needed for rapid application, the technology was already mature. The former Future Combat Systems (FCS) program (now Brigade Combat Team (BCT) Modernization), another deliberate acquisition, also demonstrates the symbiotic relationship between the two poles. Although FCS has not succeeded as an integrated system-of-systems (SoS), the underlying engineering and development cultivated through long-term, deliberate processes have produced technology spin outs

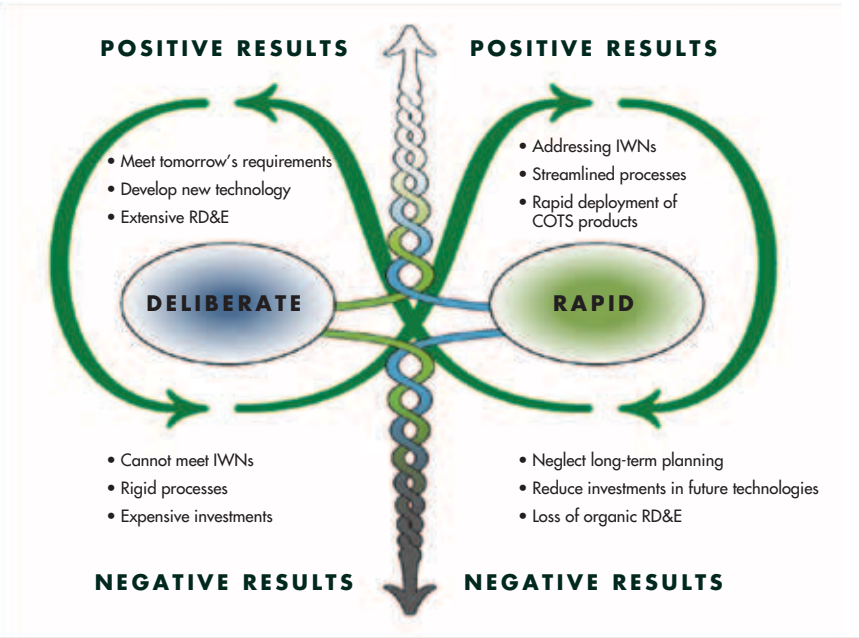
**If the appropriate investments in R&D are not made today, 20 years from now the military-specific products needed to meet urgent warfighter requirements will be at risk. Here, a 2nd Infantry Division Soldier prepares to deploy the Raven to assess atmospherics in Falahat, Iraq, Feb. 12, 2010. (U.S. Army photo by SPC Venessa Hernandez.)**

that have been modified and rapidly applied to the Current Force, and will provide breakthrough capabilities for the Future Force.

The desired outcome of managing the acquisition polarity is our ability to effectively equip our forces now, as well as in the future. To manage this polarity, we need to identify warning signals, or trip wires, to alert us when we move too far toward either of the poles, or neglect its opposite. Perhaps we can see such a warning in the challenges we faced with FCS integration; much of the underlying FCS technology has significant merit, but we encountered challenges with systems integration. In an era of "little a" acquisition that is dominated by COTS technology, we have allowed some atrophy in systems engineering expertise. Additional warning signs of "Big A" atrophy may include diminished organic research, development, and engineering (RD&E) capabilities; incomplete or ineffective transition of programs of record; inability to successfully transition future, emerging technologies; and challenges with long-term planning and portfolio integration.

## Future of Acquisition

Until we have instantaneous fielding capability comparable to that in "The Matrix," acquisition must be responsive to operational changes *and* continue to develop long-term, systemic solutions, particularly in military-specific technologies such as armor, propulsion, ballistics, and lethality. As conflict persists and the acquisition community escalates its usage of rapid equipping to meet emerging requirements, we must be careful not to neglect the deliberate process that produces so many of the off-the-shelf technologies that rapid acquisition relies on. If the appropriate investments in research and development (R&D) are not made today, 20 years from now the military-specific products needed to meet urgent warfighter requirements will be at risk. Of course, certain technologies, such as communications equipment and outdoor gear, will always be readily available in the commercial marketplace for fielding. However, advanced, "hard-to-touch" technology without civilian applications, such as body armor, vehicle armor, advanced explosives, and armor-piercing ammunition, will not.




We must actively manage the polarity between deliberate and rapid acquisition to maximize the advantages and minimize the disadvantages of this co-dependency.

Like Neo's immediate assembly of combat kits, the advanced SoS that miraculously come together at the last minute on the battlefields we face would not exist were it not for decades of planning, R&D, and testing—products of our enduring, deliberate development processes. When viewing this process up close, it is clear that these systems are not miracles at all but the products of a complex, methodical, and deliberate acquisition process. Because we cannot predict the next operational environment, we must posture ourselves to rapidly respond both now and in the future. We must actively manage the polarity between deliberate and rapid acquisition to maximize the advantages and minimize the disadvantages of this co-dependency. And, we must also remember that tomorrow's Mine Resistant Ambush Protected vehicle-like success depends on technology investments today.

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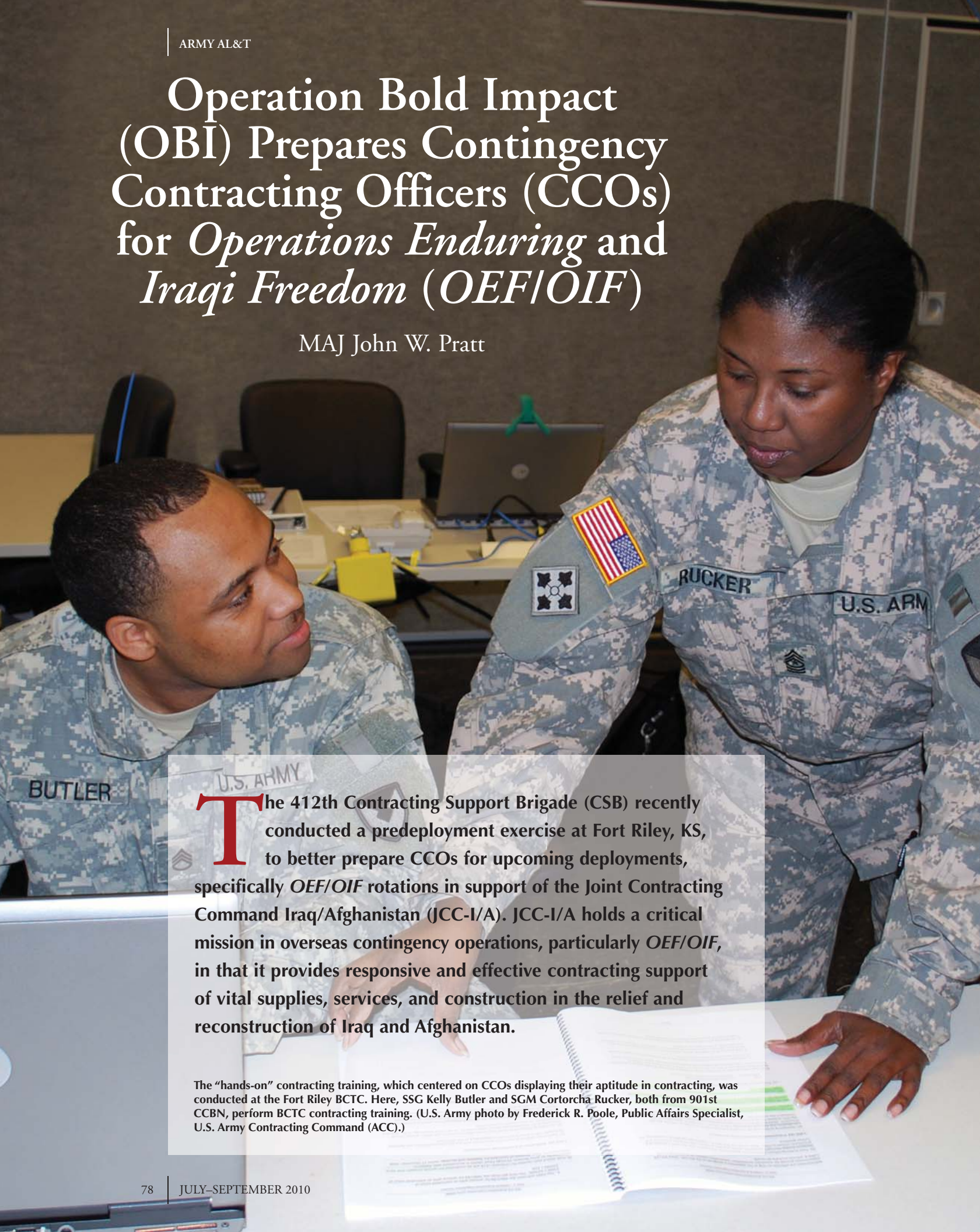
# Operation Bold Impact (OBI) Prepares Contingency Contracting Officers (CCOs) for *Operations Enduring* and *Iraqi Freedom* (*OEF/OIF*)

MAJ John W. Pratt




**The 412th Contracting Support Brigade (CSB) recently conducted a predeployment exercise at Fort Riley, KS, to better prepare CCOs for upcoming deployments, specifically *OEF/OIF* rotations in support of the Joint Contracting Command Iraq/Afghanistan (JCC-I/A). JCC-I/A holds a critical mission in overseas contingency operations, particularly *OEF/OIF*, in that it provides responsive and effective contracting support of vital supplies, services, and construction in the relief and reconstruction of Iraq and Afghanistan.**

The "hands-on" contracting training, which centered on CCOs displaying their aptitude in contracting, was conducted at the Fort Riley BCTC. Here, SSG Kelly Butler and SGM Cortorcha Rucker, both from 901st CCBN, perform BCTC contracting training. (U.S. Army photo by Frederick R. Poole, Public Affairs Specialist, U.S. Army Contracting Command (ACC).)

As the newest CSB with the largest contingent of CCOs in the U.S. Army Expeditionary Contracting Command (ECC), an essential 412th CSB task was to ensure the readiness of its CCOs and their ability to deploy fully prepared to provide contracting support from the start. COL Jeff Morris, 412th CSB Commander, shared his guidance and the intrinsic need for brigade-level predeployment training of its CCOs. Morris looked to the 901st Contingency Contracting Battalion (CCBN) to develop a realistic training event that prepared Soldiers for deployment into theater as members of JCC-I/A. Although that is a relatively simple mission statement, it carried a lot of implied tasks. At the very top level, there is the requirement to provide the latest training on critical warrior tasks they will need in theater, as well as mission-specific contract training. "Although I have no doubt that any of the battalions could have excelled in this effort, I gave the mission to LTC Tonie Jackson because he is the senior battalion commander today," Morris stated.

Jackson, Commander, 901st CCBN, Fort Hood, TX, and his staff had recently redeployed from *OEF/OIF*. Assigned to JCC-I/A, Jackson and his staff possessed the most up-to-date knowledge of the changes and trends in requirements for *OEF/OIF*. Upon his return, Jackson realized that there was a need to change the way contracting support was conducted both at home and when deployed. His vision for the changes was in "Bold Shift," the initial transformation concept that evolved and subsequently led to the creation and implementation of the Contingency Contracting Exercise, later named OBI. OBI was the 412th CSB's showcase comprehensive predeployment exercise for all deploying CCOs in support of JCC-I/A's mission. Jackson stated, "There needs to be a change in the way contracting support is conducted. Bold Shift is a dramatic change in how we conduct contracting support to the warfighters. This is a paradigm shift from the way we used to train our CCOs and how we support warfighters prior to and during deployments."

**The MSTC was one training aid that provided CCOs very realistic training in a simulation environment. Left to right: SFC Doug Collins, 902nd CCBN; MAJ Jim Clift, 901st CCBN; LTC Tonie Jackson, 901st CCBN; and SFC James Illes, 412th CSB, train using the MSTC. (U.S. Army photo by Gale Lynne Smith, Public Affairs Specialist, ACC.)**

OBI helped prepare 30 CCOs from across the ECC for the upcoming deployment rotations to gain confidence in their ability to conduct their wartime mission and validate their competency in 51C Soldier's Manual of Common Tasks (SMCT), as well as a number of Abbreviated Warrior Trainings (AWTs) with an emphasis on Theater-Specific Individual Readiness Training (TSIRT). SFC Wanda Knight, 410th CSB, went to the predeployment exercise with the expectation "to learn more about the contracting aspects of the deployment arena and to get a refresher on my medical skills, to make sure that I'm able to take care of myself and help my battle buddy."

Experienced CCOs, such as SFC James Illes, who for the last 2 years has served on the 412th CSB staff, sought to get an update on current changes in contracting as well as reinforce his warrior tasks. "For me, this is more of a refresher," said Illes. "I've been working on the brigade staff for the past couple of years, so this will basically reinforce my medical readiness as far as being able to save a fellow Soldier's life, and also reinforce any contracting changes that came about. … So in keeping up with the local changes in policy and contract clauses and things of that nature, this is really going to be training in epic proportion for me and the other CCOs who are training here with us."

OBI was the 412th CSB's showcase comprehensive predeployment exercise for all deploying CCOs in support of JCC-I/A's mission.

## Training

The initial 4 days of OBI training focused on maintaining basic soldiering skills, specifically on critical warrior skills that all Soldiers must know and obtain a certain level of proficiency, especially in a deployed environment. The AWT/TSIRT training included 25 core warrior tasks and 10 battle drills. These intrinsic tasks were the same that any Soldier, regardless of occupational specialty, would receive before a deployment. Normal equipment assigned to CCOs does not facilitate being able to practice many of the warrior task training required of Soldiers. In an effort to fill the void and lack of organic equipment, the use of simulators was the best tool to do the job. Simulators provided realistic training and met a variety of warrior task trainings. The training was then tailored to the specific warrior task that CCOs must know and practice to prepare them for deployment. Additionally, the various simulation centers on Fort Riley were key components supporting the execution of OBI's AWT/TSIRT portion.

> Having the onsite experts reviewing contracts and giving immediate feedback to CCOs was invaluable to CCO contracting training.

The use of the High-mobility multipurpose wheeled vehicle Egress Assistance Trainer, Engagement Skills Trainer, Reconfigurable Vehicle Simulator (RVS), and Medical Simulation Training Center (MSTC) systems were all key tools that aided in training on warrior tasks. These training aids provide very realistic training in a simulation environment, mimicking what Soldiers would experience in combat just as if they were in Iraq or Afghanistan.

The second portion of OBI centered on CCOs displaying their aptitude in contracting. The "hands-on" contracting training was conducted at the Fort Riley Battle Command Training Center (BCTC). Scott Fellows of the 1st Infantry Division and his staff were instrumental in supporting OBI. Morris commended the BCTC and the level of support given to the 412th CSB. "The warrior task training support SGM Cortorcha Rucker coordinated from the BCTC and Fort Riley was simply outstanding," he said. "It was state-of-the-art training, and our Soldiers received the same quality as a brigade combat team Soldier deploying."

The BCTC duplicated a typical contracting environment that most CCOs will deploy to in either Iraq or Afghanistan. CCOs were tested on their ability to operate in a forward deployed environment on many required 51C SMCT contracting-specific tasks. The 36 individual contracting tasks are the building blocks of a CCO. CCOs were


SFC Eric Sears, 900th CCBN, uses the RVS trainer, a key tool that aids in training on warrior tasks. (U.S. Army photo by Gale Lynne Smith, Public Affairs Specialist, ACC.)

OBI changed the way that the Army trains CCOs by giving them the opportunity to receive a firsthand look at what capabilities they possess and how they can apply the contracting skills they have learned thus far.

divided into teams of four, duplicating that of a modular Contingency Contracting Team (CCT). CCOs were tested on their ability to execute an acquisition strategy, prepare a contracting plan, and award contracts based on actual requirements from warfighters. Mentors, who were former Regional Contracting Center Chiefs, were assigned to each team to monitor and provide guidance throughout the exercise. The heart of the contracting portion was the White Cell, exercise controllers that managed nearly all aspects of OBI contracting training. From issuing requirements to responding to CCO inquiries, the White Cell carried the role of many key players that a CCO would normally interact with in JCC-I/A, from the customers and vendors to the Principal Assistant Responsible for Contracting-Iraq/Afghanistan (PARC-I/A) staff.

## Programs and Tools

To ensure the realism of CCO contracting training, incorporating the use of the Procurement Desktop-Defense (PD2) program, a subprogram of the Standard Procurement System (SPS), was a key factor for CCOs in understanding the overall contracting process. Dan Stock, former JCC-I/A SPS administrator, ensured that the software was installed properly for all participating CCO deployment computer notebooks and that the PD2 program was executed smoothly. PD2 is the fundamental instrument for contracting officers operating in theater. Input of requirements, contract award, and contract administration are all done using the PD2 network. The realism was enhanced by the use of actual contracts from theater and processing them through PD2 as a training tool at the BCTC. The CCOs were given a realistic example of what kind of requirements are coming out of theater and how they are processed via automation.

An excellent tool to review CCO contracts and ensure that they were producing sound contracts was the Procurement Management Review (PMR) audit, which maintained the realism of OBI and simulated a deployed environment. PMRs are necessary tools that are designed to provide reviews of contracting elements to assist CCOs with improving operational contracting efficiency and effectiveness. The PMR is designed to provide CCOs with onsite assistance and training. The 412th CSB solicited the help of Paul Kennedy, former JCC-I/A Policy and Strategic Sourcing, and U.S. Air Force COL Roger Westermeyer, former JCC-I/A PARC-I, to collectively provide expertise in reviewing CCO contracts and conduct an abbreviated PMR. Having the onsite experts reviewing contracts and giving immediate feedback to CCOs was invaluable to CCO contracting training. This PMR took the contracting training to higher levels than any previous training the Army has been able to offer CCOs before deployment.

## OBI's Purpose

CCOs must be prepared to do their wartime mission immediately versus subjecting to any lag time associated with "ramp-up" learning once a CCO arrives in theater. OBI serves as a foundation and model for future predeployment training and preparing CCOs to deploy. Morris summed up his future for OBI: "We have to institutionalize this training. We need to capture the things that work and find ways to replicate them while improving on those areas where we can improve. Part of the way we will make this better is by expanding the number of participants to include members of the reserve component and the Air Force while also including more Soldiers from the 412th and ECC. We may be able to get more Air Force participation as mentors so our Soldiers are better prepared for the joint environment. I think that we are going to see a much more confident Soldier ready to start performing on day one in JCC-I/A."

OBI changed the way that the Army trains CCOs by giving them the opportunity to receive a firsthand look at what capabilities they possess and how they can apply the contracting skills they have learned thus far. OBI should be written as a required event for all CCOs before deployment as it serves as a culminating event where CCOs take all they have learned in school and on-the-job at their respective Mission Installation Contracting Command locations or contracting center locations. To be able to actively practice what is learned and receive real-time feedback on individual CCO performance in a realistic environment just before deployment is invaluable to the contracting community and the warfighter CCOs' support.

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# U.S. Army Corps of Engineers (USACE) Recovery Project Presented at International Workshop

James D. Bartha and Keith F. Snider

**Procurement professionals and academics from 19 nations gathered in Lisbon, Portugal, Nov. 15–18, 2009, for the 4th International Research Study of Public Procurement (IRSPP). IRSPP's purpose is to develop international comparative procurement benchmarks and enhance the body of knowledge in government procurement. Focusing on the global economic crisis, the workshop featured presentations on procurement's contributions in the different nations' responses to the crisis, including detailed case studies documenting those contributions and their effectiveness. This article describes the U.S. presentation and some preliminary conclusions from the workshop.**

A container ship is docked at the Port of Oakland, CA, earlier this year. In 2008, 1,928 vessels of this type passed through the nation's fifth busiest container port carrying cargo valued at $33 billion. (Photo by Brandon Beach, USACE San Francisco District.)

## Background: *American Recovery and Reinvestment Act* (*ARRA*)

The authors' presentation of the U.S. case focused on procurement's role in the execution of the *ARAA*. Signed into law by President Barack Obama in February 2009, *ARRA* provides for a variety of stimulus measures with a potential value of almost $790 billion. It is intended to provide quick and effective stimulus for the economy by injecting financial resources into key sectors. Elements of *ARRA* include direct cash payments, tax credits and benefits for both individuals and firms, funds for state and local governments to maintain essential health and education programs, and investments in infrastructure.

Procurement plays a key role in *ARRA*, since grants and contracts are the principal means by which the *ARRA* funds will be obligated. *ARRA* gives preference to so-called "shovel-ready" projects; that is, activities that can be started and completed expeditiously. According to Office of Management and Budget (OMB) guidance, agencies must ensure that public funds are expended responsibly and in a transparent manner to further job creation, economic recovery, and other purposes of the *ARRA*.

## The Port of Oakland Project

Since the USACE executes a significant number of construction and infrastructure projects, it provided an excellent example of an *ARRA* project for presentation at the Lisbon workshop. The specific project, accomplished by the USACE's San Francisco, CA, District of the South Pacific Division, entailed the acceleration of existing interrelated projects to improve the Port of Oakland—the second largest port on the West Coast and the fifth largest container port in the Nation—and restore environmentally sensitive wetlands near Hamilton Airfield several miles north of Oakland.

The deepening project increased the channel depth of the Oakland Harbor and Port berths from 42 feet to 50 feet. At this new depth, the port can accommodate much larger vessels, including a new generation of very large "post-panamax" ships. It also allows for container ships to increase loads by 60 percent.

Approximately 3 million cubic yards of sediment dredged for this project contributed to environmental enhancement and wetland habitat at Hamilton Airfield. The Hamilton Wetlands Restoration Project, currently USACE's largest restoration project with nearly 2,500 acres of wetlands restoration, holds more than 24 million cubic yards of beneficial reuse dredge material. Endangered species that will derive protection from this portion of the project include the clapper rail and the salt marsh harvest mouse. Without this portion of the project, the dredged materials would have to be transported to a disposal location well out in the Pacific Ocean with substantially higher costs and increased risks (technical, environmental, safety, etc.) in several areas.

The project began in 2006 and was originally scheduled to be completed no earlier than December 2011, assuming the project was fully funded. By applying *ARRA* funds to this "bucket-ready" project, it was modified to accelerate its completion date to January 2010. According to the contractor, a substantial number of jobs were thus saved, and the project was successfully completed months ahead of schedule, thereby allowing for a more rapid realization of the economic benefits of the harbor improvements.

Key individuals work on the Oakland-Hamilton contract. From left to right: York So, Civil Engineer, Cost Engineering Section; Bick Lee, Civil Engineering Tech, Cost Engineering Section; James Garror, Contract Specialist, Contracting Division; Al Paniccia, Project Manager, Programs and Project Management Division; and Dave Doak, Project Manager, Programs and Project Management Division. (Photo by Brandon Beach, USACE San Francisco District.)

In terms of accomplishing *ARRA* objectives, three major elements of the USACE response are evident in this project:

- Procurement spending (injecting capital into the private sector).
- Improved transportation infrastructure.
- Secondary economic benefits (e.g., growth of San Francisco Bay area commerce).

## Challenges and Successes in Execution

The project was initiated in 2006 when the USACE project manager organized a 2-day teambuilding session that included all major

Six million cubic yards of dredged material were used to restore 188 acres at the Port of Oakland. This new shallow-water habitat is called the Middle Harbor Enhancement Area. (Photo by Brandon Beach, USACE San Francisco District.)

stakeholders—the contractors; federal, state, and local agencies (including environmental agencies); Port of Oakland authorities; and, of course, the cognizant San Francisco District Contracting Office. Participants report that this session set the stage for effective communication and collaboration among all stakeholders throughout the project. In particular, when the contract was modified to accelerate the project, this change was facilitated by the excellent lines of communication already present in the project.

Major project challenges included:

- Large number of diverse stakeholders.
- Complexity inherent in managing a "dual-use" project.
- Significant extent of required permitting.
- Limited availability of dredging equipment on the West Coast, along with increased risk of mechanical failures with high-volume use of limited equipment.

In particular, the complexity of the project and the large number of diverse stakeholders meant that success would be complex and nuanced. Each stakeholder would judge success differently. For example, the contractor would judge factors such as profit and market share; conservation groups would examine the quality of the wetlands restoration; the environmental agencies would judge compliance with its regulations, and so on. Further, the contributions of the project to the larger objectives of *ARRA* would remain yet determined in terms of their economic benefits.

For the San Francisco District Contracting Office, significant challenges were negotiating, awarding, and managing the contract with limited staffing and without disruption to previously planned work. The USACE is, like most federal agencies, always challenged to recruit and retain professional procurement staff members. Very challenging contract negotiations were required, as the overall project included both a negotiated requirement and a competitive invitation for bid process, in addition to negotiating the contract to advance the dredging schedule. A final major challenge was expediting a high-priority contract with new rules, procedures, and reporting requirements demanded by *ARRA*.

In the face of these challenges, the contracting office was able to implement contract changes to accelerate the project within only 100 days of *ARRA* enactment and only 3 weeks after the change was requested, in spite of the increased workload (160 percent) imposed by all *ARRA* demands. This indicates a substantial degree of flexibility, responsiveness, and agility on the contracting office's part. It also indicates the importance and wisdom of including contracting leaders in the original teambuilding session at the outset of the project. Without such involvement, it's likely that the *ARRA* acceleration could not have occurred as quickly and effectively as it did.

## Lessons Learned

A few key lessons emerged in this case study. First, teambuilding and the early involvement of all stakeholders, including contracting leaders, appears to have been an important factor in implementing project and contract changes in response to *ARRA* funding. Second, the flexibility and responsiveness of the San Francisco District Contracting Office indicates that its personnel are well-trained and experienced in adapting to unforeseen contingencies. This illustrates the importance of continued organizational investments in professionalizing activities such as education, training, and continuous learning. Finally, the importance of selecting a contractor with a proven track record of successful past performance in the relevant domain cannot be overstated.

## Implications for Policy and Practice

At the IRSPP workshop, the authors proposed at least three areas in which this case may influence policy and practice. First, the case points out the importance of viewing the procurement function as a strategic function in public organizations in terms of promoting larger public policies and objectives. Organizational leaders should consider acknowledging this strategic role by, for example, giving senior contracting officers a larger voice in organizational strategic management processes. Second, the case reveals the importance of investing in professionalizing

An aerial view of the Hamilton Wetlands Restoration Project site is shown here. (Photo courtesy of Mark DeFeo.)

activities for procurement personnel. Organizational policies and practices should explicitly reflect those investments. Finally, the case stresses the importance of flexibility and a "contingency mindset" on the part of public procurement leaders. Professional development activities should inculcate and promote such a mindset, and policies and practices should exploit it to further organizational ends.

## Emerging IRSPP Workshop Findings

While detailed comparative analysis of all the cases presented at the Lisbon workshop is only beginning, a few preliminary results have emerged. One important finding concerned the issue of whether a nation chose to relax procurement rules as a means to speed up or increase the number of stimulus obligations. Several workshop attendees reported that, in their countries, rules had indeed been relaxed. Examples include increasing acquisition thresholds for simplified procurements or eliminating so-called "2-envelope" sealed bid processes (where one envelope contains the technical proposal and the other envelope contains the price) in favor of sole-source or directed procurements. Relaxation of rules such as these can increase the risk of procurement abuses.

The U.S. was one of the few countries represented at IRSPP in which procurement rules not only haven't been relaxed, but indeed, in some respects, were made more stringent under *ARRA*. *ARRA* includes a number of measures intended to ensure accountability and transparency of the uses and distribution of funds. OMB's implementing guidance provides several actions required for *ARRA*-funded grants and contracts that are beyond standard practice. Most significantly, OMB stresses the need for "heightened management attention" to mitigate risks and, at the same time, satisfy *ARRA* objectives. OMB recommends "additional oversight mechanisms" or, at a minimum, "the evaluation and demonstration that existing monitoring and oversight mechanisms are adequate," as well as the need for effective agency internal control mechanisms. Other procedural changes are related to *ARRA*-unique reporting requirements—for example, the publicizing of a contractual action as a "recovery" action and the tracking of obligated and expended *ARRA* funds.

That the USACE could successfully execute the Port of Oakland project is evidence that relaxation of procurement rules is not necessary for achieving stimulus objectives, even under very complex circumstances. The case demonstrates the benefits of having a well-trained, motivated, and flexible professional workforce that can further national economic policies, while at the same time maintaining high levels of transparency and accountability.

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LEAN SIX SIGMA/BUSINESS TRANSFORMATION


CCWS interns discuss changes to intern training plans after the LSS project was completed. (Photo courtesy of the CCWS PO.)

# Lean Six Sigma (LSS)—Intern Training Standardization Throughout Program Executive Office Missiles and Space (PEO M&S)

Misty Glover

**Based on estimates by the National Defense Industrial Association, over the next 5 years, nearly 50 percent of the acquisition workforce will be eligible for retirement. Replacing the depleted federal acquisition workforce is a top priority, as well as a daunting challenge, for many agencies. PEO M&S is no exception. Within the next 5 years, 45 percent of PEO M&S core personnel will be retirement eligible. To mitigate this strategic challenge, core business management interns were brought onboard to help fill the gap of retiring personnel. This quick transition to inexperienced personnel created disparity in the levels of expertise within the workforce, raising concerns about the organization's ability to meet its mission requirements. In an attempt to replace the vast knowledge of personnel retiring with 30-plus years of acquisition service, each intern was assigned training courses and provided on-the-job training (OJT). However, this individual approach to intern training resulted in additional challenges due to training variation, inconsistency, and irregularity.**

## Training Discrepancies

Each intern was graduating from his/her respective internship with various levels of knowledge based on individual training courses, OJT, and rotations completed, at times lacking required competencies to adequately perform journeyman duties. While great opportunities to learn and excel were available, not all interns were given equal access to attend training courses, learn from experienced personnel, and/or rotate through organizations and divisions within the PEO. This lack of standardization resulted in frustration and lowered expectations among senior leadership, interns, and specialists/analysts.

As one of the first PEO M&S intern graduates, I feel strongly that interns should be given equal opportunities for training, OJT, and rotations. Today's interns will soon be leading the acquisition workforce and managing complex weapon systems. Because of the numerous issues surrounding this particular area, an LSS project was initiated. LSS provided an opportunity to make a difference in the PEO M&S intern training program.

LSS is an initiative and set of tools that empowers individuals to look at processes through a different viewpoint in hopes of improving effectiveness and efficiency. When people hear "LSS", they typically think manufacturing and production; however, LSS may also be used in the transactional, administrative environment. LSS emphasizes customer satisfaction, a culture of continuous improvement, the search for root causes, and comprehensive employee involvement. LSS uses the five phases of define, measure, analyze, improve, and control. Throughout each phase, tools are used with the end result being an improved process with increased effectiveness and efficiencies.

## Intern Training Standardization

The Intern Training Process Improvement LSS Black Belt Project problem was defined as follows: "Interns graduate from the PEO M&S intern program with various levels of knowledge and lacking required competencies." The objective was to develop a meaningful and successful intern training program that ensures all interns graduate with required competencies. The standardization of the training plan would reduce variation and time spent working/staffing the plan and minimize time spent in unnecessary training and rotations. Cost avoidance was projected in training/registration and associated costs and amount of time spent developing future training plans.

CCWS former and current business management interns, from left to right, are Misty Glover, Cheree Hastings, Elois Powell, Corrie Hughes, Regeana Williams, Lacey Harrison, Robert Weaver, Kalie Meadows, Kara Light, Karen Carden, and Josie Hampton, standing behind the new Javelin statue at PEO M&S. (Photo courtesy of the CCWS PO.)

Dual sponsorship for this black belt project consisted of the Close Combat Weapon System Project Office (CCWS PO) Business Manager and the PEO M&S Business Manager. The process improvement team included representatives from PEO M&S staff and POs with assistance from the U.S. Army Acquisition Support Center and other organizations. Since a majority of the team had experienced the problems firsthand, they were willing to go the extra mile to see a change in the process. Additionally, several of the team members were familiar with LSS, permitting the use of more advanced tools.

For data collection and root cause analysis, surveys were sent to individuals ranging from newly hired interns to senior business managers to gain a better understanding of the required competencies. Data was also collected from the team to determine why intern training plans varied so greatly among the PEO POs. Data was compiled and box plots were developed, depicting ratings of training courses, rotations, and curriculum to help interns meet required competencies.

Data was analyzed to determine acceptance range, based on box plots and team input. This acceptance range determined exactly which training courses and rotations would be mandatory for interns, based upon course curriculum and required competencies for each series. The root causes of the problem were identified through the analyze process. Root causes were defined as intern training plans including training only, unnecessary training and rotations, and/or lack of training and rotations to gain the required competencies.

Based upon acceptance range and root causes, intern training plans were developed for the positions of 1102 Contract Specialist, 1515 Operations Research Analyst, 0343 Program Analyst with Financial Management emphasis, and 0343 Program Analyst with Review and

Analysis emphasis. The training plan curriculum was analyzed to determine the optimal combination of training courses, rotations, and OJT to expose interns to the appropriate curriculum to gain the required competencies. Critical voice-of-customer requirements were met by developing a standardized, consistent training plan that leads to Level II certification. While interns will be unable to apply for Level II certification because of the experience requirement, they will complete all the training requirements during the internship.

Intern training is primarily OJT, supplemented by appropriate formal classroom instruction in designated courses and selected readings and correspondence courses. OJT provides for the acquisition of necessary knowledge, skills, and understanding of the designated career field. The mandatory rotational training within the intern's assigned organization gives the intern specific knowledge of each area within his/her organization through hands-on training. The mandatory rotational training in the other related organizations provides the intern with an orientation of all of the functions of resource management to acquire an understanding of relationships with other business management organizational elements.

After meeting regulatory and qualification requirements as stated in the plan, the intern is eligible for promotion to the GS-12 level. After completion of all phases of training, he/she is able to perform business operations analysis duties in the area assigned at the specialist (journeyman) level with only guidance and supervision normally provided to a full-performance analyst at the same grade. The intern can also apply knowledge and acquired skills in work situations requiring independent judgment and personal responsibility for completing total projects or major portions of projects.

Training begins with the PEO M&S New Employee Orientation. After these 5 hours of general orientation, the intern gains a working knowledge of Army acquisition organizations, the training and development plan, and the most important aspects of civilian personnel administration. The intern should acquire knowledge of the organization, function, and mission of the business management arena. The orientation and training provides background for the intern to become an effective workforce member. Financial management interns then follow a 3-year planned track of courses and OJT that includes rotational assignments. The intern's progress throughout this training program is evaluated semi-annually the first year, then annually for the second and third years.

Although the training plans are standardized across the PEO, the schedule is designed so that reasonable adjustments are allowed to meet the individual intern's needs. For example, when a learning objective is met in a reduced time, the balance of hours is devoted to other related productive assignments within that division. Electives or individual Defense Acquisition University courses can supplement to best fit the intern's career path. Additionally, in the event changes are made to certification requirements for the position held, the intern training plan is updated accordingly.

## Results

The training plans were approved by PEO M&S. The PEO M&S Training and Career Manager is responsible for maintaining the intern training plans, which are posted to the PEO M&S Intranet for easy retrieval. The standardization of the training plans reduces variation and time spent working/staffing the plan, and minimizes time spent in unnecessary training and rotations. The financial benefits reflect cost avoidance, which is forecasted to occur in the time spent developing future training plans. Cost avoidance also occurs with the intern's time spent in OJT (rather than "unnecessary" training and rotations). The total cost avoidance is projected at approximately $25,500 per plan.

As a result of the project, intern training plans were standardized for program analysts with emphasis in financial management and review and analysis, operations research analysts, and contract specialists. The improved intern training program has been in implementation at PEO M&S since summer 2009. Incoming interns are placed on an appropriate intern training plan. Feedback, thus far, is favorable by interns, supervisors, and business managers. Supervisors and interns have found the standardized plan extremely beneficial, knowing the plan is equivalent to others within the PEO. The suggested training/rotation road map schedule included in the training plan provides a smooth transition to the Individual Development Plan and the overall internship plan. Standardized training plans also allow a quicker, simpler process for hiring interns, eliminating the time required to prepare an intern plan.

Through the use of lean tools and the LSS program, PEO M&S now has a standardized, integrated intern training program, resulting in an overall more efficient and effective workforce. This improved process and program is just one way LSS can make a difference in the way the Army acquisition workforce operates.

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# From the Acquisition Support Center Director

This summer brings the retirement of U.S. Army Acquisition Support Center (USAASC) Deputy Director COL Brian C. Winters after more than 26 years of military service. Since he assumed the position in August 2007, his accomplishments, leadership, and the goals he set for this organization have brought a new standard for acquisition career development. I consider myself truly blessed to have had such a superb, efficient, and trustworthy officer as part of our team. Following in COL Winters' footsteps will be COL Bill Boruff. A recent U.S. Army War College graduate, COL Boruff has served in numerous acquisition positions since 1995. Most recently, he served as the Commander, Defense Contract Management Agency (DCMA), Combat Vehicles BAE, York, PA. While serving there, he deployed to Iraq as Commander, DCMA Northern Iraq, October 2007–July 2008. He brings essential knowledge and expertise to the job and our expectations for his success run high.

## Acquisition Growth

Last year, the Secretary of Defense announced his intent to grow the defense acquisition workforce 15 percent by FY15. As part of the Secretary's growth strategy initiative, the Army acquisition workforce is projected to grow by approximately 4,000 personnel associated with the DOD initiative to rebalance the workforce through insourcing. The balance of the growth—1,885—is pursued through new government civilian hires to Army acquisition workforce roles. To ensure proper vetting within the Army acquisition community, the Army established an Acquisition Workforce Growth Task Force that has been actively planning and deploying initiatives that support the defense acquisition workforce growth strategy. Acquisition workforce size is a function of the force planning process that reflects deliberate enterprise decisions from balancing total mission needs and available resources, including budget. While the Army has significant efforts underway to increase the size and improve the quality of its acquisition workforce, we operate under the constraint that "quantity is important, but quality is paramount." Task Force efforts have been finalized and details have been vetted within the functional communities. The growth details by acquisition organization, functional expertise, and FY for hires will be added to the growth strategy. The path ahead will continue using the *Section 852* Defense Acquisition Workforce Development Fund to assist the process.

## USAASC Human Resources (HR) Summit

The 2010 USAASC HR Summit, held March 23–25, 2010, at the Fort Belvoir, VA, Officers Club, was an HR forum with both civilian and military representatives from activities within the Direct Reporting Unit (DRU). Topics included insourcing, delegations, teleworking, *Section 852* workforce growth, regionalization, the Defense Civilian Acquisition Workforce Demonstration Project, and other Army programs and policies concerning HR. The summit was very successful in meeting our outcomes of:

- Providing the latest information on HR issues.
- Creating an open discussion/working environment among the program executive offices and USAASC on numerous topics germane to their HR functions and operations.
- Sharing and discussing lessons learned about policies, programs, and issues directly affecting the activities within the DRU.

We look forward to more HR summits in the years to come.

## Delegations of Civilian Personnel Authorities

The Assistant Secretary of the Army for Manpower and Reserve Affairs is responsible for the delegation of various personnel authorities to Army Commands, Army Service Component Commands, DRUs, and the Administrative Assistant to the Secretary of the Army (AASA) with authority to redelegate through command channels to commanders of independent field activities. The AASA maintains the authority to redelegate the authorities to HQDA Principal Officials. Within the past year, the AASA has delegated the following authorities:

- Voluntary early retirement authority/voluntary separation incentive.
- Expedited hiring authority for acquisition positions.
- Recruitment, relocation, retention, and enhanced retention incentives.

The AASA is working on the delegation of approximately 60 additional authorities. For more information, contact Garet McKimmie at (703) 805-1015/DSN 655-1015 or **garet.mckimmie@us.army.mil**.

## Army Acquisition Center of Excellence (AACoE)

In January 2010, the establishment of the AACoE in Huntsville, AL, was announced by LTG N. Ross Thompson III, then-Principal Military Deputy to the Assistant Secretary of the Army for Acquisition, Logistics, and Technology (AL&T). AACoE will consolidate Army institutional training, education, and career development courses for the AL&T Workforce in one centralized area, offering increased student interaction with senior military and civilian leaders. As part of this effort, the FA51 Intermediate Qualification Course (IQC), hosted by the Institute for Advanced Technology at the University of Texas-Austin, will move to Huntsville and integrate into an AACoE in continued partnership with the College of Professional and Continuing Education, Huntsville, and the Defense Acquisition University (DAU) South Region. The AACoE will improve the effectiveness of our leader development while increasing acquisition synergy and reducing costs. Recently, the course was expanded to include civilian Competitive

Development Group and noncommissioned officer acquisition workforce members. Graduation is essential for assuming positions of greater responsibility. The first FA51 IQC in Huntsville will begin in January 2011.

### U.S. Army Acquisition Corps (AAC) Annual Awards Ceremony

There are some acquisition workforce members whose performance and contributions to the warfighter set them apart from their peers. These extraordinary people will be recognized for their achievements at the AAC Annual Awards Ceremony on Sunday, Oct. 24, 2010. I invite all AL&T Workforce members to join us in recognizing the significant accomplishments and achievements of these acquisition excellence contributors. For more information, contact Marti Giella at (703) 645-7653 or **usaasc.events@conus.army.mil**.

### Farewell to Retiring USAASC Professionals, DAU President

It is with bittersweet recognition and extreme gratitude that I say goodbye to three USAASC acquisition professionals: Wanda Meisner, Mary McHale, and Cynthia Hermes. Meisner served as the Chief, Force Structures and Manpower Division, and her accomplishments included supervising, coaching, and mentoring a team of government and contractor professionals in developing and presenting the annual Military Acquisition Position List review and the Principal Military Deputy Command Review. Since December 2006, McHale served as the Acquisition Proponency Branch Chief. Among other responsibilities, she analyzed and identified Army acquisition workforce competency, skills, size, structure, and grade distribution requirements. Hermes is retiring as the *Army AL&T* Magazine and *Army AL&T Online* Editor-in-Chief. She has worked on the magazine staff for 12 years and has contributed extensively to the magazine's continual success. Collectively, these three professionals retire after achieving more than 100 years of successful federal service! Their hard work and dedication in supporting the AL&T Workforce will be sorely missed, but their contributions will influence the way we do business for many years to come. I wish them a healthy and happy retirement.

In closing, DAU President Frank Anderson Jr. brings another retirement from the acquisition community this season. Anderson initiated and successfully led the most comprehensive reengineering of DAU defense acquisition workforce training since its establishment as the Defense Systems Management College in 1971. Under Anderson's tenure, DAU was elevated to an internationally recognized corporate university, winning numerous awards from various civilian and military academias. Anderson's leadership and his devotion to the DOD acquisition workforce set the standard for future acquisition career development leaders. I wish him well in all his future endeavors.

**Craig A. Spisak**
Director, U.S. Army Acquisition Support Center

## Contracting Community Highlights

When one hears the term "acquisition reform," his/her initial response may be to say or think, "not again, been there, done that—and we still don't have it right." Today, our approach to acquisition reform is holistic, encompassing which technologies we use, what weapon systems we buy, funding stability, and the business operations that underlie the whole process. The President and Congress have provided the guidance and legislation to address areas that need reform and improved efficiency in meeting these major problems. We have all heard that the problems start with the process when we establish the requirements for new weapon systems. Specifically, many times we establish requirements that are at the far limit of the technological boundaries. We seek exotic and unproven solutions to warfighting needs, i.e., the bells and whistles that entice. Sometimes these can lead to breakthrough developments, but more often, the result is a disappointing initial performance followed by cost and schedule overruns to correct those performance failures. Then, we repeat the cycle several times before eventually delivering a weapon system late, over budget, and still not at the performance levels that we originally wanted.

To address the issue of "requirements creep," we will create Configuration Steering Boards that were endorsed by the *FY09 National Defense Authorization Act* (*Weapon Systems Acquisition Reform Act of 2009*). These boards provide a mechanism to preclude destabilizing requirement changes and match requirements with mature technology. Program managers will employ this forum to control requirement changes and seek moderation of requirements that become drivers of excess cost in system design.

Additionally, we will employ several initiatives to align profitability with performance. Most contract fee structures, e.g., incentive fees, will be tied to contractor performance. The use of award fee contracts will be restricted to those situations where more objective measures do not exist. We will also rigorously examine service contract strategies to ensure an alignment of fees earned and services provided, and eliminate the use of unpriced contractual actions, whenever possible. Finally, we will ensure that the use of multiyear contracts is limited to instances when real, substantial savings are accrued to the taxpayer.

Army acquisition and contracting are not easy, but enormously complex and large, undertakings. Acquisition reform is similarly

complex and challenging. Since the end of World War II, there have been nearly 130 studies of acquisition reform. Many very smart people have tried and met limited success, but that should not be a deterrent for us to continue to seek better ways to conduct our mission. We need to move forward and continue to improve our acquisition workforce, procurement and acquisition processes, and business operations. We must communicate with our industry partners in an open manner that clearly articulates our requirements and expectations and demonstrates our commitment to a program through stable funding. We must support the tough-minded approach to acquisition reform that has been set forth by Secretary of Defense (SECDEF) Robert M. Gates and Deputy SECDEF William J. Lynn III to make difficult strategic and programmatic decisions and provide disciplined and effective oversight. At each step of the process, we must allow for critical examination of our operations to identify strengths we can amplify and recognize weaknesses we can resolve. Only through this proactive thinking can we meet our objectives and realize the full potential of our vision of serving those who serve.

**Edward M. Harrington**
Deputy Assistant Secretary of the Army (Procurement)

## 40mm Cartridge Family Systems Contract Awards Support Small Businesses

*Julie A. Seaba and Jake M. Adrian*

In February 2010, the U.S. Army Contracting Command-Rock Island Contracting Center (RICC) made two 100-percent small business set-aside contract awards with a total program ceiling of $3.8 billion. The awards were for the 40mm cartridge family systems on behalf of Program Executive Office Ammunition (PEO Ammo) and Project Management Office Maneuver Ammunition Systems (PMO MAS).

### 40mm Cartridge Family Systems

The 40mm cartridge family systems is composed of many types of 40mm tactical and training ammunition supplied to the U.S. Army, U.S. Navy (USN), U.S. Marine Corps (USMC), U.S. Air Force (USAF), and foreign military sales. Some of the rounds include:

- M385A1 Practice Cartridge—only for practice and proof testing weapons.
- M430A1 High-Explosive Dual Purpose (HEDP) Cartridge—for anti-armor and anti-personnel.
- M918 Target Practice—to simulate the M430A1.
- M433 HEDP Cartridge—for anti-armor and anti-personnel.
- M583A1 White Star Parachute Cartridge—for illumination and signaling.
- M992 Infrared Illuminant Cartridge—to enhance nighttime operational capabilities.
- M585 White Star Cluster Cartridge—illumination and signaling round designed for less weight and bulk than comparable hand-held signals.
- M661 Green Star Parachute Cluster Cartridge—for illumination and signaling.
- M662 Red Star Parachute Cartridge—for illumination and signaling.

### Acquisition Milestones

An integrated product team (IPT)—consisting of RICC; the U.S. Army Joint Munitions Command; the U.S. Army Research, Development, and Engineering Command; PEO Ammo; and PMO MAS—was formed in January 2008. The U.S. Army Sustainment Command's (ASC's) small business and legal offices provided matrix support. In July 2008, a Sources Sought Notice was issued on Army Single Face to Industry and Federal Business Opportunities. The IPT conducted an industry day and then issued a draft request for proposal (RFP) in March 2009. The formal RFP was issued in June 2009, evaluations were conducted from August 2009–January 2010, and awards were made in February 2010.

### Acquisition Challenges

The IPT faced many challenges during the acquisition. First, the estimated value of the acquisition required an Office of the Secretary of Defense Peer Review, a stringent cross-agency assessment of the acquisition from presolicitation to contract award. Second, the IPT had to develop and write custom contract language that required the contractors to procure and maintain the weapons used to test the rounds. Under prior 40mm cartridge family systems acquisitions, the weapons were provided as government-furnished equipment. Finally,

M430A1 M918 M385A1 M781 M433 M583A1 M585 M661 M662 M992

**The 40mm cartridge family systems tactical and training ammunition are supplied to the Army, USN, USMC, and USAF. (U.S. Army photo by Jack Crowley, PMO MAS.)**

Soldiers from the 443rd Transportation Co. fire an MK-19 automatic grenade launcher, sending 40mm training projectile grenades down range at Camp Atterbury, IN. (U.S. Army photo by SPC John Crosby.)

the IPT had to develop the economic price adjustment (EPA) requirements.

## Small Business Awards

There were two systems contracts awarded, one to AMTEC Corp. and one to DSE Inc. Both contractors are considered small businesses, and the combined award was $56 million with a potential to grow to $3.8 billion if all options are exercised in full. Each contract is for a base period with five option periods, is firm-fixed-price (FFP), and contains EPA clauses for aluminum, steel, and zinc.

The 40mm cartridge family systems acquisition was a 100-percent small business set-aside. It represents 68.7 percent of ASC's small business FY10 projected total dollar awards. It also represents 9.8 percent of ASC's 15 percent goal of total FY10 U.S. business base dollar awards to small businesses.

## Additional Small Business Awards

RICC had previously awarded contracts for components supporting the 40mm cartridge family systems. The M385A1 Projectile Assembly is a component for the M385A1 Practice Cartridge, and the M918 Projectile Assembly is a component for the M918 Target Practice. Both projectile assemblies are provided as government-furnished material under the 40mm systems contracts. The procurements for the projectile assemblies were restricted to 8(a) set-aside. The resultant contracts were FFP with EPA for a base period and four option periods. Avasar Corp. and GTI Systems Inc. received contracts for the M385A1 Projectile Assembly valued at $8.1 million combined (including base and option periods). Elite CNC Machining Inc. and GTI Systems Inc. received contracts for the M918 Projectile Assembly valued at $30.5 million combined (including base and option periods). These procurements represent 31.9 percent of ASC's small disadvantaged business FY10 projected total dollar awards. They also represent 1.2 percent of ASC's 3.8 percent goal of total FY10 U.S. business base dollar awards to small disadvantaged businesses.

Looking ahead, RICC continues to partner with its supported commands to achieve the Army's small business goals.

*Julie A. Seaba is an RICC Load, Assembly, and Pack 40mm Contracting Officer (KO). She has 30 years of contracting experience and is certified Level III in contracting.*

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U.S. Army Acquisition Corps

# Annual Awards Ceremony 10

## SAVE THE DATE

Sunday, October 24, 2010

Acquisition, Logistics, and Technology Continuous Process Improvement Award

Acquisition, Logistics, and Technology Contracting Noncommissioned Officer Award

Army Acquisition Excellence Award

Army Life Cycle Logistician of the Year Award

Department of the Army Research and Development Laboratory of the Year Awards

Project and Product Manager and Acquisition Director of the Year Award

Secretary of the Army Awards for Excellence in Contracting

**ARMY ACQUISITION, LOGISTICS & TECHNOLOGY**
**ISSN 0892-8657**

DEPARTMENT OF THE ARMY
ARMY AL&T
9900 BELVOIR RD SUITE 101
FT BELVOIR, VA 22060-5567

**http://asc.army.mil**

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