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May 2010



Commander's Corner

LTG Keith M. Huber

Deputy Commander

U.S. Joint Forces Command

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FEATURES

Connecting the Battlespace

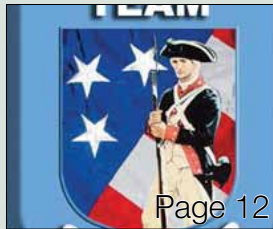
As part of the continued evolution of the Army's Force XXI Battle Command Brigade and Below (FBCB2) system, a DoD joint capabilities release (JCR) has set the stage for a new Joint Battle Command program (JBC-P) to provide seamless connectivity from FCS to Blue Force Tracking (BFT) and Joint Tactical Radio System (JTRS) field activities.



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Putting Warfighter First

Headquartered at Fort Belvoir, Virginia, U.S. Army Program Executive Office Soldier designs, develops, procures, fields, and sustains virtually everything soldiers wear or carry with one purpose: to develop and field the best equipment so that U.S. soldiers remain second to none.



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Rugged and Robust for Mission Must

DoD's present and near future rugged mounted vehicle and dismounted computing solutions are focusing on more energy efficient higher performance power technology using commercial-off-the-shelf and mainstream equipment repackaged to survive the battlefield environment.



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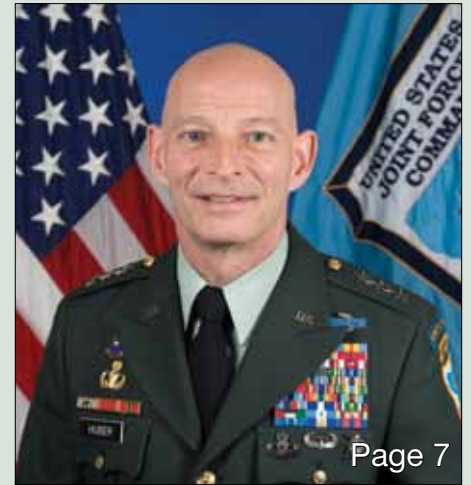
Increased Unmanned Presence

The latest in unmanned ground vehicle (UGV) and helicopter technologies are enabling enhanced intelligence collection and logistics capabilities in support of IED defeat, resupply, and critical situational awareness data delivery. Furthermore, Unmanned & Beyond discusses the three main vertical unmanned aerial systems, the A-160T and K-MAX in testing, and the Fire-X in current development.



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COMMANDER'S CORNER



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LTG Keith M. Huber

Deputy Commander
U.S. Joint Forces Command

EMERGING FORECAST: USASOC



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USASOC

The U.S. Army Special Operations Command (USASOC) provides our nation with unique, sophisticated tailored capabilities built around specially selected and well-trained soldiers with proven, mature decision-making and problem solving skills to operate in ambiguous, high-risk environments around the world.

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Editor's Perspective

As DoD continues to focus on security concerns within and outside the borders of Afghanistan, an emphasis on intelligence gathering and sharing is driving greater reliance on technologies supporting advanced C4ISR capabilities. With current challenges to communications and data networking, ground transportation, and FOB coordination, joint and coalition forces committed to Operation Enduring Freedom are benefiting from the infusion of enhanced tracking, positioning, and ruggedized computing assets.

Armor & Mobility's May issue gives readers get a first-hand look at just how this mission-critical equipment and intelligence is being coordinated through an in-depth interview with Deputy Commander Keith Huber, U.S. Joint Forces Command (JFCOM). Huber discusses JFCOM efforts to provide leadership for the joint services across a disjointed battlespace. From joint to on-point, A&M delves into the U.S. Army's ongoing transition from FCS to Force XXI Battle Command Brigade and Below (FBCB2) or Blue Force Tracking (BFT), as the service implements its new Joint Battle Command program (JBC-P). In support of JBC-P is the computing hardware that DoD is procuring, offering more robust mounted and dismounted wireless displays.

Rounding out May, this issue's Emerging Forecast investigates the world of special operations with a look at the U.S. Army Special Operations Command (USASOC) and its objectives for training 21st century soldiers. Also accompanying is a featured Industry Partner article discussing lifesaving ceramic and transparent armor product lines. And be sure not to miss A&M's recurring departments including Asymmetric Warfare Developments with a look at JIEDDO's work to support route clearance team (RCT) operations in theater using the vehicle optical sensor system (VOSS), along with an Unmanned & Beyond first hand look at the latest in unmanned aerial and ground technologies.

As always, feel free to contact me with any questions or comments.

Chadwick "Chad" Samuels

Editor, *Armor & Mobility*

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Letters to the Editor

Chad,

Saw a hard copy yesterday of the issue with ATEC's article in it and it looked great!

Showed to MG Nadeau this morning; he really liked it and was taking it with him to a senior leaders meeting in the Pentagon to show others.

Thanks for working with us to tell ATEC's BRAC story.

Tom Rheinlander

Director, Office of Public and

Congressional Affairs

US Army Test & Evaluation Command

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Chad,

The article entitled Emerging Forecast article "Extending Global Reach" in your March issue was well done. Thanks for forwarding a soft copy of the piece. I have seen *Armor & Mobility* on our conference table a number of times and consider your magazine to be a fine product.

R Beckwith

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Connecting the Battlespace

As part of the continued evolution of the Army's Force XXI Battle Command Brigade and Below (FBCB2) system, a DoD Joint Capabilities Release (JCR) version of FBCB2 has set the stage for a new Joint Battle Command-Platform program (JBC-P) to provide seamless connectivity from Brigade Combat Team Modernization to Blue Force Tracking (BFT) and Joint Tactical Radio System (JTRS) field activities.

By Chad Samuels
A&M Editor



The U.S. Army is pushing the evolution of its Force XXI Battle Command Brigade and Below (FBCB2) system, a command and control, communications and computers Intelligence (C4I) system that links communication devices, sensors, vehicles, rotary-wing aircraft and weapons platforms in a seamless digital network to provide a clear, continuous and common picture of the battlefield. Based around the satellite communications of BFT digital command and control and the line-of-sight communications of Joint Tactical Radio System (JTRS), newly adopted integration standards for Future Combat Systems (FCS) data are expediting the service's transition from FCS to BFT/JTRS under a new Joint Battle Command -Platform (JBC-P), the follow-on program to FBCB2.

JCR

A 2009 Joint Capabilities Release (JCR) out of FBCB2 is a step towards the creation of a new Joint Battle Command

Platform (JBC-P) network architecture that will encompass any and all of the Army's vehicles equipped with Blue Force Tracking (BFT), the satellite-based version of FBCB2, enabling critical data dissemination and communications at the brigade level and below with FCS-equipped vehicles. As part of the second increment of FBCB2, BFT systems are today being installed in up to 120,000 vehicles and 20,000 Marine Corps vehicles at a cost of roughly \$20,000 per vehicle. To date, the Army has fielded more than 50,000 FBCB2 systems and over 80,000 BFT systems.

The challenge for the Army has been in enabling BFT-equipped platforms to receive FCS data as the information must first be formatted to meet BFT standards. JBC-P is one of the most relevant pieces of kit today, Maj. Gen. Nickolas G. Justice, USA, the commanding general of the U.S. Army Research, Development and Engineering Command (RDECOM), says. He formerly served as the program executive officer for Program

Executive Office Command, Control and Communications Tactical (PEO C3T), where he was the JBC-P Milestone B decision authority. We are a ground-based force and everything we do, we do in the context of a map," he stated.

UNIFIED BATTLE COMMAND

The shared goal of the Army's FBCB2 and BFT programs is to deliver a digital battle command-and-control information system that will provide commanders and soldiers at tactical units, from the brigade level to the individual soldier, with access to real-time information, allowing for better command and control decision making and enhanced situational awareness, said Tom Plavcan, Acting FBCB2 Program Manager. The system needs to provide warfighters with the ability to gain global positioning system location information, to identify and track friendly and enemy combatants, to interface with terrestrial communication radios such as the single-channel ground and airborne radio system, and to access a satellite communications network.

With the Army's gradual, costly transition to an FCS-type networked force based on the next-generation software-programmable JTRS, the service was forced to continue purchasing legacy FBCB2 systems to fill the transition gap. During this decade-long period, the maturation of the FCS network brought about a renewed effort to get the FBCB2 and FCS networks talking to each other.

The Army wanted to see whether it can make FBCB2 gear do more of what FCS gear can do, without the hefty price tag, said Col. David Moore, project manager for Army Battle Command Systems, a Fort Monmouth unit that runs the development of several battlefield information-technology systems. The realization was that we had developed fundamentally different concepts of operations for the FCS force and would need new tactics, techniques and procedures to help units equipped with FBCB2 to operate together. By looking at how to structure data and send unique data items, for instance, we knew we could understand the data and allow a current force platform to discover it and consume it. To accomplish this, each network's architecture had to be examined to determine the friction points and areas of commonality.

Out of FBCB2 Increment 1, the new JCR incorporated significant enhancements for the user. These include Self Descriptive Situational Awareness (SDSA) which allows units to rapidly change task organization in the field to meet new mission requirements without the need for database configuration -- a limitation of the old FBCB2 system. The current BFT network, BFT1, has limited bandwidth and as a result it can take up to 5 minutes to refresh friendly force positions displayed on FBCB2 platforms. When JCR is fielded in 2011 with the new BFT-2 transceiver and network upgrade will exploit significantly greater bandwidth offered by the latest Inmarsat IV constellation, bringing data latency down to a matter of seconds.

HARDWARE KITTING

Awarded the first FBCB2 development contract in January 1995, Northrop Grumman Corporation has been on contract since 2004 to develop the JCR software. Northrop Grumman completed system segment acceptance testing and delivered JCR to the Army in September 2009. Based on a common set of core assets, NGC has been tasked to provide installation kits, cables and related hardware for FBCB2, making the system more modular, reusable, interoperable and easier to upgrade.

The JCR enhancements and added interoperability expand FBCB2 to a robust system that is orders of magnitude more capable than what is available to soldiers and Marines today, said Joe G. Taylor, Jr., vice president of the Ground Combat Systems operating unit within Northrop Grumman's Information Systems sector. The improvements in latency alone will make a tremendous difference on the battlefield.

New JCR features and functions include a commercial joint mapping tool kit; Type 1 encryption for relaying classified information; and an over-the-air self descriptive situational awareness (SDSA) capability.

SDSA will eliminate inflexible fixed databases -- one of the biggest complaints of the old system -- and allow FBCB2-equipped units to change task organizations in the field to meet new mission requirements, said Tom Plavcan, FBCB2 program manager, Ft. Monmouth, NJ. Future JCR releases will provide additional services including open office file transfers, image downloads, chat and instant messaging.

With SDSA and the high performance BFT2 network, the warfighter will receive a situational awareness display that bears a much closer resemblance to the reality on the ground in an area of interest, said Moore.

The installation kit contract modification, also awarded by CECOM, brings the ceiling of the current six-year contract to \$908 million. To date, the company has received 34 delivery orders under this indefinite delivery/indefinite quantity contract, which runs through March 2011. . Installation kits, called I kits, include the cables and auxiliary hardware needed to electrically and mechanically integrate the FBCB2 computer and BFT system with the host platform. The kitting is currently being installed into about 45 different military vehicles, including many of the new MRAP vehicles.

COMPUTING AND COMMUNICATIONS

Under the integration plan set out by the Pentagon's Joint Requirements Oversight Council, Army and Marine brigades and smaller units will use FBCB2, while brigades and larger units will use C2PC, said a senior industry official familiar with FBCB2. DRS Technologies DRS Tactical Systems unit delivered applique computer systems with multicore processors to the U.S. Army's FBCB2 Blue Force Tracking programs. The work



stems from a \$131 million contract award from the U.S. Army's Communications-Electronics Life Cycle Management Command (CELCMC) at Fort Monmouth, N.J.

The appliqué computer systems multicore processors offer increased memory and expansion capability, providing users with improved graphics processing, data handling, and system networking. The computer systems meet the Army's BFT requirements and are being installed on more than 40 types of U.S. Army and Marine Corps wheeled and tracked vehicles, at tactical operations centers and other command-post platforms.

This contract award is the largest order we've received from the U.S. Army to provide or upgrade our rugged tactical computers for their FBCB2/BFT programs, says Bill Guyan, president of DRS Technologies Tactical Computing strategic business unit.

The DRS FBCB2/BFT computer systems provide tactical units with GPS data and the abilities to track and decipher friends and foes via a combat identification system, to interface with terrestrial communication radios, and to access a satellite communications system.

The technology shift to multicore processor architectures such as seen with Intel, AMD, the PowerPC, and the Cell BE will bring significant increases in performance density for small rugged systems, said Guyan. Performance density is how much computational performance can be integrated into a given size, weight, and power (SWAP) footprint.

A producer of rugged tactical computers for the U.S. military, Elbit Systems of America has integrated radio-interfacing capabilities into its computer systems, enabling the computer to be plugged into a variety of available radios for data interface and BFT interaction. This capability is in use today in several U.S. Army and USMC programs where dismounted soldiers and Marines can transmit their location, provided by the integrated SAASM GPS system, to the rest of the network.

We have also provided system interface and middleware services that connect airborne assets to ground tactical FBCB2 networks, as well as producing systems that can allow the different legacy analog radio systems in use by the US Military today, including SINCGARS, to communicate together, said Bob Carpenter, executive director of business development, Elbit Systems of America. We are very focused on the idea of providing more capability for our warfighters by leveraging their existing assets in new ways.

Elbit offers C4I solutions that encapsulate robust sensor suite experience, armored vehicle systems integration, work with unmanned aerial vehicles (UAVs), international logistics, and avionics integration. To say FBCB2 provides fertile grounds for thinking on system possibilities is an understatement, said Carpenter. We feel we have a contribution to make in helping DoD analyze the possibilities of integrating several adjacent

programs into one cohesive system that they can manage and update on their own.

UNMANNED INTEGRATION

Within two years, the Army wants prototype hardware and software fixes that will allow the two networks to easily share voice and more kinds of data. Within five years, the two should be able to exchange live video from UAVs and other sensors.

Within 10 years, we hope to have full Unified Battle Command with a common, consistent suite of capability up from the soldier level to the command-post level with a unified architecture which does not exist now, said Eric Goodman, program manager of battle-command efforts for the Army's FCS program.

We are looking at the portability of it and what can be decoupled from the FCS suite of applications.

AHEAD

The JBC-P received its Milestone B approval in Fall 2009. Fielding is expected to begin in October 2010 with tests being conducted at the Central Technical Support Facility in Fort Hood, Texas. Initially, the JBC-P will be fielded to the Army, Army Special Forces and Marine Corps. Current efforts also include analyzing existing research by organizations such as the Office of Naval Research, Defense Advanced Research Projects Agency as well as conducting studies and participating in Department of the Army studies to address data networking.

The real challenge here is in the robustness and security posture of the data network and the information assurance requirements needed to secure data that both resides on the devices (i.e., data at rest) as well as data during transmission, said Plavcan. The integration of available technologies into a tactical network again, requires significant research and study. We must ensure smooth integration with not only existing tactical radios and networks, but also plan for future radio systems, such as the Joint Tactical Radio System (JTRS). Variables such as security and bandwidth are key to the success and utility of such a system.

The Navy and Air Force are considering the solution as well. A further capability enhancement provided by the JCR will be an upgrade to the BFT L-Band SATCOM network. This secures the network to SECRET level, thereby achieving compatibility with the terrestrial (SINCGARS/EPLRS) version of FBCB2. Led by a contract with Northrop Grumman, the upgrade is centered on the Programmable In-Line Encryption Device (PIED), which is slated to be fully integrated into both the FBCB2 platform and related network operations centers by 2015.



Bill Guyan
DRS VP of Business
Development

Commander's Corner

Laying a Joint Framework

The U.S. Joint Forces Command trains and deploys joint forces, analyzing and applying lessons learned, and overseeing development of joint capabilities in support of current operations and global contingencies.

Lieutenant General Huber, Deputy Commander, U.S. Joint Forces Command, assists the commander in overseeing the performance of U.S. Joint Forces Command, whose mission is to provide mission-ready, joint-capable forces and support the development and integration of joint, interagency, and multi-national capabilities to meet the present and future operational needs of the joint force.

A native of Springfield, Ohio, he has held numerous conventional duty assignments, including tours with the 7th and 10th Infantry Divisions as well as two tours in the 101st Airborne Division (Air Assault) as a company commander, battalion operations and brigade operations officer. During Operation Desert Storm, he was the chief of operations and later served as a battalion commander and director of civil military operations.

His joint duty unconventional warfare assignments include a tour as a Special Forces Operational Detachment team leader in Panama. He served two tours as a field advisor in Nicaragua and El Salvador, and as the chief of operations for the United Nations mission in Haiti. He commanded Joint Task Force Bravo in Honduras and then served as the executive officer to the commander of U.S. Southern Command (USSOUTHCOM).

As a general officer, he served as the director of operations of USSOUTHCOM, assistant division commander (operations) for the 10th Mountain Division (Light Infantry), deputy commanding general for 1st Army, commander of Task Force Falcon in Kosovo, chairman of the Inter-American Defense Board and director of the Inter-American Defense College in Washington, D.C. Most recently, he served as the commander of U.S. Army South.

He graduated from the U.S. Military Academy in 1975 with a bachelor of science degree. His subsequent military education includes the Infantry Officer Basic Course, the Armor Officer Advanced Course, the Army Command and General Staff College,



LTG Keith M. Huber
Deputy Commander
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the Armed Forces Staff College and the Army War College. He also earned a master of public administration from Golden State University in 1984.

He has earned the Combat Infantryman, Expert Infantryman, Master Parachutist, Special Operations Diving Supervisor, Air Assault and Joint Chiefs of Staff Identification badges, and Special Forces and Ranger.

LTG Huber was interviewed by A&M Editor Chad Samuels.

Q: Please talk about your role as Deputy Commander, U.S. Joint Forces Command.

A: Let me start by explaining our mission, which is unique among the 10 combatant commands. Our mission has three distinct components. First, we provide mission ready joint capable forces. This means we develop the right mix of service forces, ensure they are trained and ready to operate together as a joint unit, and provide them with the right capabilities to get the job done. Second, we develop and integrate capabilities that enable

not only our service branches to operate together, but also factor in our need to operate with multi-national partners, and other government and non-government organizations. And third, we meet both present and future operational needs of the joint force. To accomplish this, we must always strike a balance between supporting the fight today, and ensuring we place the right effort on developing the force for tomorrow's challenges.

Today, we are training and deploying joint forces, analyzing and applying lessons learned, and overseeing development of joint capabilities in response to our warfighting commanders' needs. We approach these activities with a sense of urgency to ensure our efforts prepare forces to adapt and evolve, enabling them to prevail in the current conflicts.

As the joint force provider, Joint Forces Command provides trained and ready forces to combatant commanders in support of current operations and global contingencies. During the past year, we responded to more than 390 rotational and emergent requests for forces from combatant commanders.

We look to the future through efforts like The Joint Operating Environment (JOE 2010) and concept development and experimentation. The JOE lays out a strategic framework and describes future operational environments joint forces may encounter. JOE 2010, released in March, includes sections on the global economic situation, radical ideologies and the proliferation of weapons of mass destruction and what this all might mean for future national security and defense planning. Our audience is joint force commanders and our goal is to encourage strategic dialogue among senior leaders. The purpose of the JOE is not to predict the future, but to suggest ways leaders might think about the future.

If the JOE is the problem statement for the future joint force, then the Capstone Concept for Joint Operations (CCJO) is the solution. The CCJO is the Chairman of the Joint Chiefs of Staff's statement for how the joint force will operate in the future threat environment described in the JOE. In the CCJO, as in other concepts, we work to define the military problem we are trying to solve.

Our concept development and experimentation efforts start with warfighter challenges. These real-world challenges are focus areas identified by combatant commanders and the services and sent up to DoD. Warfighter challenges are, by nature, complex. Often our first efforts are directed at defining the military problem we need to solve. In everything we do we work with combatant commanders, the services, and interagency and multinational partners. We deliver solutions that take different forms. In some cases we're looking at concepts or doctrine changes. With other projects, we deliver tools like check-lists, manpower models, or activity descriptions.

In all of these efforts—training, force provision, strategy, concept development—my role as the deputy commander is to ensure we have the right balance between support to current and future joint warfighters. There is no technical formula to provide that

information; simply put, our military leaders and our forces will need to be the most versatile in our nation's history and we will continue working to fulfill our mission to make them so.

Q: What are some of your command's biggest challenges? Biggest successes?

A: One of our biggest challenges is to understand with our service and combatant command partners where jointness begins. Is it at the joint force commander level? Is it down at the brigade? At the squad? If so, what about joint training? Where does that begin? Can we really have only service or component-level training without integrating joint objectives?

In today's distributed battlefield where young junior enlisted soldiers, sailors, airmen and Marines are called to deploy other service assets, we must ensure they have the right training and the systems they employ are interoperable. These are discussions I am engaged in every day.

Another related challenge is how do we coordinate and synchronize efforts to avoid redundancy across the Department of Defense (DOD)? In these times of constrained resources, we need to be careful that we don't build stovepipes of excellence. An example of this is Irregular Warfare. In March 2009, we published a vision for Irregular Warfare (IW) and established a set of goals and objectives to advance counterinsurgency, counter terrorism, and stability operations as capabilities as a core competency within the General Purpose Forces (GPF). Our Joint Irregular Warfare Center (JIWC) is the command's catalyst and driving force behind establishing IW as a core competency for the joint force. However, we're not alone in our IW efforts. Similar work is being done not only in DoD but in academia, industry, in other nations and in civilian agencies. How do we coordinate those efforts? How do we build communities of interest? How do we avoid redundancy? We're working across USJFCOM to build bridges across the services, service labs, industry, academia, civilian partners and with allies to harvest the best ideas on how to address this challenging form of warfare.

We face similar challenges in experimentation, in command and control, and lessons learned. What we can do is ensure the needs of joint warfighters are being met and help focus those efforts.

Q: What are some of the key challenges you see facing your command as DoD transitions its theater focus and prepares for an eventual force draw-down across the region?

A: Our J3/4, Air Force Brig. Gen. Robert Rowdy Yates, is engaged every day and working with service and component counterparts, the Joint Staff, and U.S. Central Command to ensure the prudent and orderly drawdown of forces in Iraq while simultaneously managing troop increases for Afghanistan. This may be the most critical and dangerous time in Iraq as we transition out of that country with reduced combat forces. The drawdown requires careful planning, close coordination and collaboration, all of which we are well-positioned to accomplish.



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Q: Please highlight/explain for readers USJFCOM's role as a joint force provider.

A: One of the missions we have is joint force provider. In this role, USJFCOM assists combatant and operational commanders plan and synchronize the deployment of forces to carry out the combatant commanders' strategy. Under the Global Force Management (GFM) process, once a combatant commander's request is validated by the Joint Staff, it is forwarded to planners in our Joint Deployment Center (JDC).

Our planners in the JDC remain busy sourcing requests for troops to Afghanistan, managing the drawdown of troops in Iraq, and responding to requests for forces for other global contingency missions like recent disaster relief efforts in Haiti. Our goal is to anticipate requirements and identify and account for personnel ahead of commanders' needs.

Understanding time constraints inherent in the GFM process, we increased our enabling capabilities so we can provide combatant commanders' joint deployable teams on short notice with capabilities in four critical areas - Operations, Plans, Information Superiority and Knowledge Management, and Logistics. Our joint teams deploy regularly enabling combatant commanders to establish joint task force headquarters in support of the full range

of military operations, from combat, security and reconstruction to humanitarian assistance and disaster relief operations. In Haiti, for example, we sent a team from our Joint Communications Support Element to provide command, control, communications and computer support. We also sent a team from our Joint Public Affairs Support Element. We've had other teams in Afghanistan, one supporting the stand up of the intermediate joint headquarters for Afghanistan's International Security Assistance Force (ISAF) in Kabul. The deployment to ISAF last August was the command's first major operational use of the Ready JEC package (RJP), a team of operators and planners with specific skills who are ready to deploy and are trained to establish a joint task force headquarters (JTF HQ).

Bottom line: USJFCOM continues to adapt and evolve to ensure we fully support U.S. operations around the world with forces and joint enabling capabilities on demand.

Q: From a joint global perspective, how is your command addressing the needs of the joint and coalition partners?

A: We are focused on the joint and coalition warfighter, so we continue to look for mutually beneficial engagements between NATO's Norfolk-based Allied Command Transformation and US

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Joint Forces Command. Our goal is to strengthen the Alliance and ensure no enemy on the battlefield ever finds a disconnect between our forces. Currently, we are engaged with Allied Command Transformation in efforts to improve training, lessons learned collection, concept development and command and control.

One of our core missions is to bring people, equipment, and technology together. Joint force commanders require robust command and control (C2) capabilities that enable agile decision-making and information flow from operational to tactical levels across today's global information domain. This domain encompasses cyberspace, all wired and wireless communications, and fixed and mobile warfighting customers, to include the networks that support them down to the tactical edge. Robust C2 implies a degree of reliability, redundancy, and agility necessary to operate effectively, both independently and with our coalition partners and allies, in degraded and/or austere conditions. Developing enhanced, robust C2 capabilities in the near-term requires adoption of an integrated C2 triad network approach - blending surface (including maritime), air, and space systems into a resilient network. We are working to develop an operational context for objective joint analysis, assessment and training, and common standards to verify operational effectiveness of information exchanges and interoperability.

As the command and control capability portfolio manager, we are responsible for leading a number of efforts across the C2 Joint Capability Area directly supporting establishment of an integrated C2 triad network. These integration efforts will enhance our wired and wireless cyberspace capabilities, while leveraging and creating cyberspace opportunities.

It's our role as CPM to ensure equipment each service or combatant commander brings to an operation is compatible. We work with the services and combatant commands to ensure it all happens and our military is ready to work and fight as a joint team. We take interoperability to another level by applying that same bias for action with our multinational and coalition partners.

One program where we specifically address interoperability is Empire Challenge. Empire Challenge 10 (EC 10) is an annual live, joint and coalition intelligence, surveillance and reconnaissance (ISR) interoperability demonstration sponsored by the Under Secretary of Defense for Intelligence (USD/I) that showcases emerging multi-intelligence ISR capabilities, and provides vital lessons learned to improve joint and combined ISR interoperability to support warfighters at the tactical edge. This demonstration focuses on near-term capabilities that can be delivered rapidly to Afghanistan. The primary goal is to provide solutions to challenges warfighters face in a multinational environment in the near-term.

This year we will host EC10 from July 26 - August 13 at Fort Huachuca, AZ, and Naval Air Weapons Center, China Lake, CA, with distributed locations at the Joint Intelligence Lab and Joint Systems Integration Center (JSIC) in Suffolk, VA; the Combined Air Operations Center-X at Langley Air Force Base,

Hampton, VA; service Distributed Common Ground/Surface System (DCGS) labs; coalition sites in the United Kingdom, Canada and Australia; and the NATO Consultation, Command and Control Agency (NC3A) in the Netherlands. Representatives from France, Germany, Italy, Netherlands, Norway and Spain are all participating at NC3A. Additionally, Finland will be participating at JSIC and New Zealand will be observing at Fort Huachuca.

We're working to include as many multi-national partners as are interested. The United States rarely will fight alone, and our allies and coalition partners play a key role across the full range of military operations, both today and in the future. We must continue to broaden and deepen relationships with capable security partners.

Q: How is your command working to foster greater cooperation on the joint and coalition fronts in terms of enhanced systems interoperability and force integration?

A: One way we foster greater cooperation is through the work of our Joint Fires Integration and Interoperability Team (JFIIT). JFIIT is a subordinate, functional command of ours, chartered with improving the integration, interoperability, and effectiveness of joint fires at the tactical level. Employing air-based joint fires, used properly will wreak havoc on our enemy forces. The decision to employ these joint air-based fires comes from leaders who understand that to be effective, these fires must be employed rapidly and precisely against the enemy while avoiding civilian casualties.

JFIIT takes a holistic approach to improving Joint fires by providing solutions that produce effective target acquisition, command and control, and interoperable firing systems, thereby reducing fratricide and collateral damage. The team's focus areas include joint intelligence, surveillance, and reconnaissance support to and joint air-to-ground fires integration with maneuver. It engages with the service and component commanders to ensure training is up to date and that we have established tactics, techniques and procedures (TTPs) in place so joint forces are interoperable and integrated. JFIIT regularly collaborates with: National Training Center Fort Irwin (NTC, Fort Irwin, CA); Air Combat Command (ACC); Joint Air Ground Operations Group (JAGOG, Nellis AFB, NV); Marine Aviation Weapons and Tactics Squadron (MAWTS); Training and Doctrine Command (TRADOC); 29 PALMS; our own Joint Warfighting Center (J7) and other elements to ensure U.S. airpower continues as one of the joint force's greatest asymmetric advantages over the enemy.

As the joint force provider, Joint Forces Command provides trained and ready forces to combatant commanders in support of current operations and global contingencies. During the past year, we responded to more than 390 rotational and emergent requests for forces from combatant commanders.

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Putting Warfighter First

The U.S. Army's Program Executive Office (PEO) Soldier, now in its eighth year of existence, is tasked with ensuring that all U.S. Army soldiers are equipped with the offensive and defensive equipment needed for mission success.

Submitted by PEO Soldier

Since its creation in 2002, Program Executive Office (PEO) Soldier, headquartered at Fort Belvoir, Virginia, PEO Soldier designs, develops, procures, fields, and sustains virtually everything the soldier wears or carries. PEO Soldier was created by the U.S. Army with one primary purpose: to develop the best equipment and field it as quickly as possible so that its soldiers remain second to none in missions that span the full spectrum of military operations.

As recent operations in Iraq and Afghanistan have vividly demonstrated, getting the right equipment to our military men and women is absolutely critical, said PEO Soldier Command Sergeant Major Bernard McPherson. By viewing the soldier as part of an integrated system, PEO Soldier ensures that the soldier and everything he or she wears or carries works together as an integrated system,

PEO Soldier manages an overall systematic design that benefits soldiers by enhancing their ability to accomplish individual and collective tasks, improving quality of life, building confidence, and saving lives. In this respect, PEO Soldier is at the vanguard of Army transformation.

RAPID FIELDING INITIATIVE (RFI)

PEO Soldier launched the Rapid Fielding Initiative (RFI) in 2002 to streamline the process for distributing equipment to deploying units and ensure that all soldiers regular Army, Guard, and Reserve were outfitted with the most advanced individual and unit equipment available, providing significant improvements to soldier combat effectiveness. To date, RFI has equipped nearly 1.5 million deploying soldiers.

RFI is a process. For the past six years, the RFI Directorate has provided state-of-the-art modernization items to deploying forces that enhance individual and small unit mobility, lethality, survivability, and the ability to operate in any environment. The program has equipped well over a million deploying soldiers.

Since inception, RFI has successfully matured and employed a centralized planning, materiel management, and distribution processes for a particular set of products. As we move forward we will be expanding the process for centralized planning, scheduling, and coordination to include all items in the PEO Soldier portfolio while decentralizing the processes for materiel management and fielding operations.

The current PEO Soldier organization includes four board-selected, Colonel-level Project Management (PM) Offices:

- PM Soldier Protection and Individual Equipment
- PM Soldier Sensors and Lasers
- PM Soldier Warrior
- PM Soldier Weapons

All of the products soldiers have received during previous RFI equipping events have been managed, developed and procured by these Project/Product Management Offices.

Fielding equipment is normally a PM responsibility, and the Army resourcing system is set up to ensure funding is available to meet equipment requirements. Our PMs are experts at getting the job done, said McPherson. In fact, PEO Soldier PMs have continued to field hundreds of thousands of items to the force in parallel with the RFI effort. Centrally managed distribution of

items on the RFI List was only initiated as a temporary measure to meet the speed and volume requirements for Operations Iraqi Freedom and Enduring Freedom.

Now it is time to put the distribution mission back in the PMs' hands, where it belongs, and use the Army's standard resourcing architecture to ensure long term success, said McPherson. PEO Soldier will continue to employ a centralized planning and scheduling approach to meet Army equipping demands.

In the past, the RFI Directorate used this process exclusively for synchronizing the delivery of items on the RFI List. The PEO is now reorganized to integrate the RFI Directorate and its processes into the Directorate of Logistics (G4). PEO Soldier G4 is now expanding the RFI process to synchronize fieldings for all items managed by the PMs. We have three objectives associated with this enterprise.

First, centralized scheduling is a critical step toward aligning Army programs with Army force generation (ARFORGEN) requirements. Second, synchronizing the delivery of all soldier system items into as few events as possible will go a long way toward reducing the overall impact on unit training schedules. And finally, conducting fewer fielding events per unit will help reduce the impact on local installation infrastructures by minimizing the number of times the Army asks to use civilian-operated facilities and other support items.

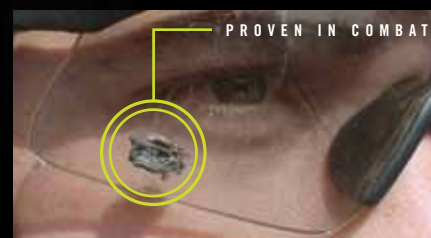
RFI has proven to be so successful that it demands to be taken to the next level, said McPherson. By taking the expertise and processes of the RFI and spreading it across the entire PEO Soldier portfolio, we can realize outstanding benefits not only to the Army but every individual soldier.



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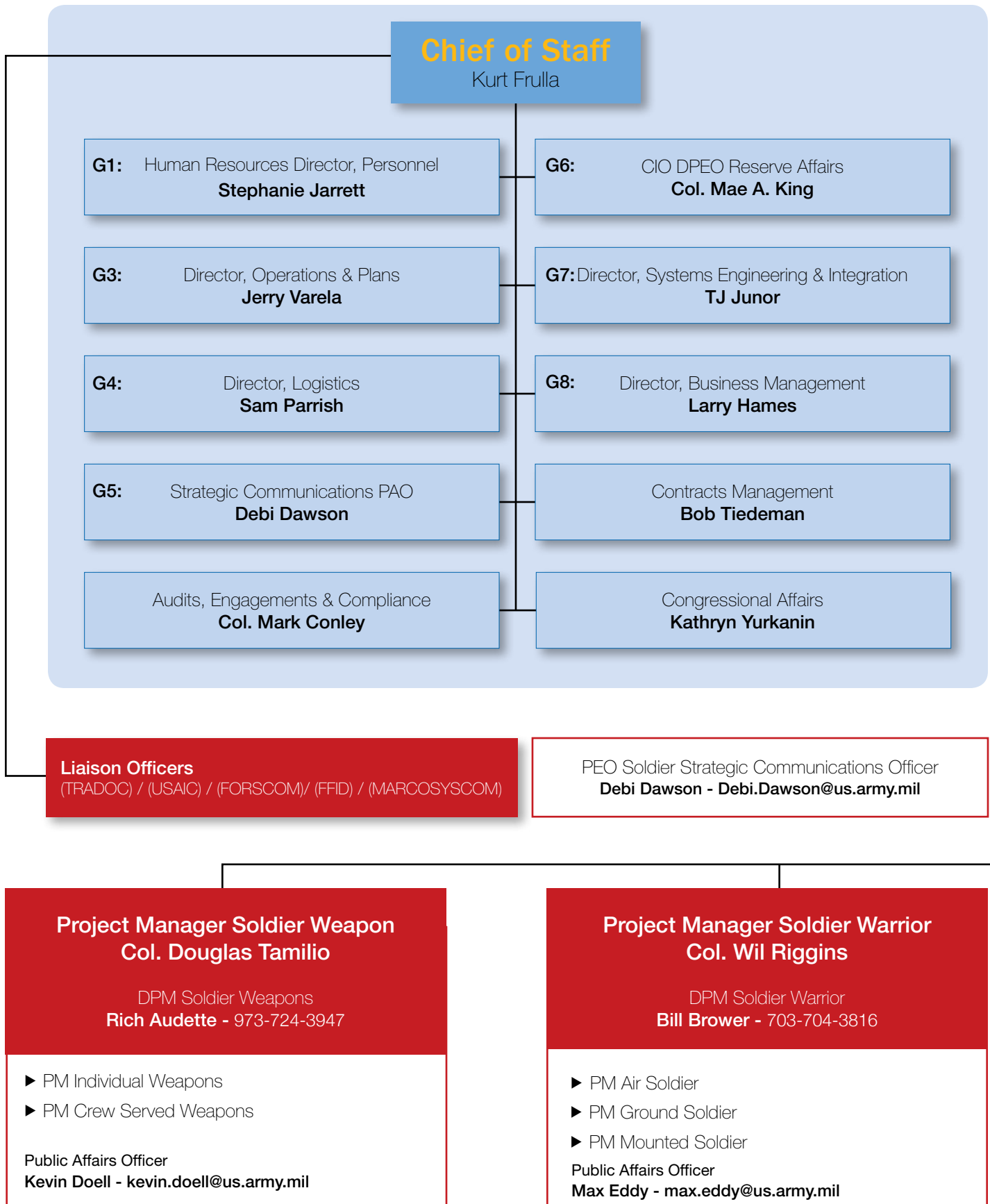


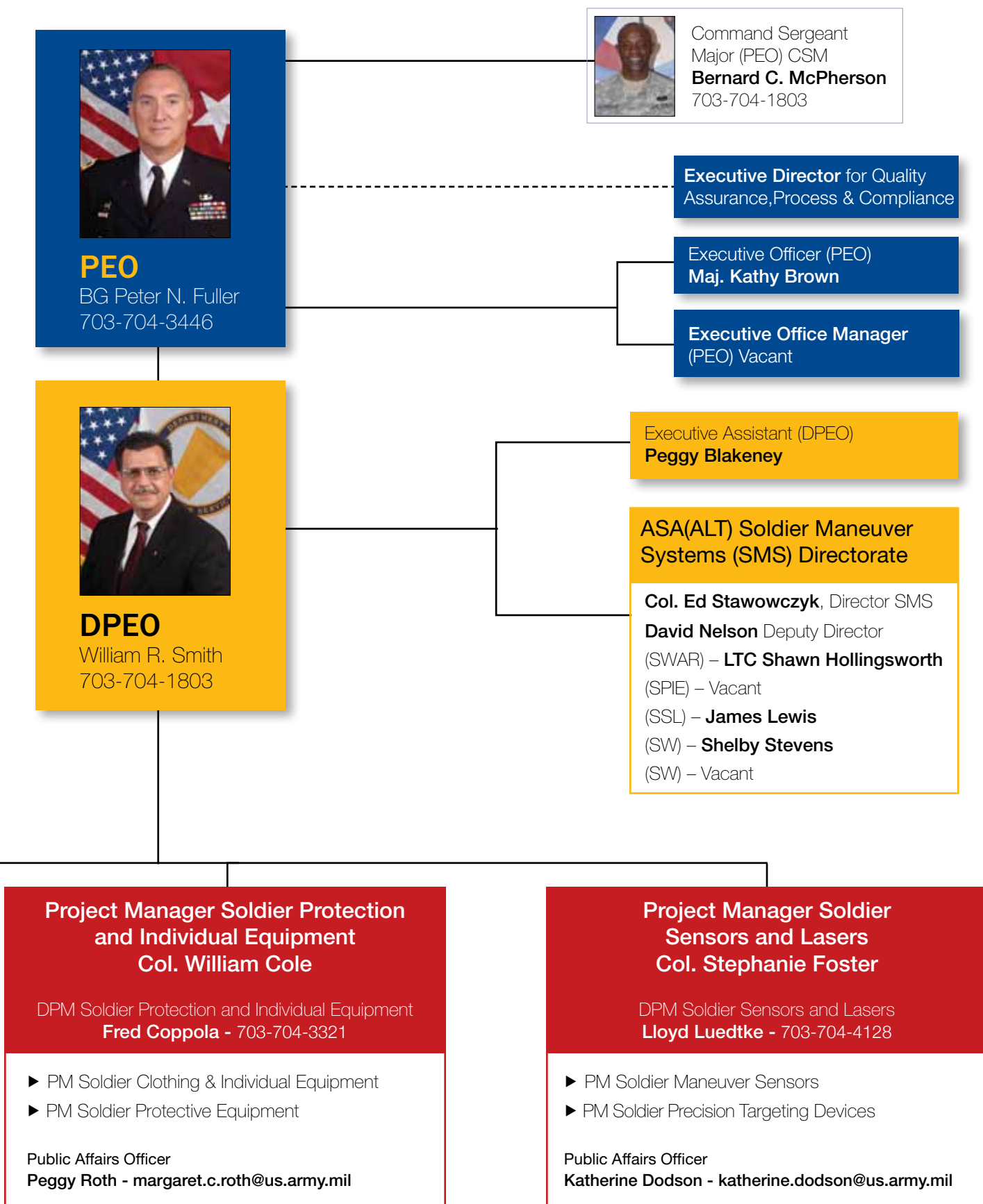
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PEO SOLDIER DEPUTY PROJECT MANAGEMENT (DPM) OFFICES

As part of the Deputy Program Executive Office (DPEO) of PEO Soldier, there are four Project Managers (PMs) responsible for nine Product Managers of soldier equipment and protection.

PM FOR SOLDIER PROTECTION AND INDIVIDUAL EQUIPMENT (SPIE)

PM SPIE develops and fields advanced Soldier protection products, comfortable uniforms to enhance mission effectiveness, and improved parachute systems. These products are designed to protect Soldiers and allow them to be effective in any operating environment.

Product Manager Soldier Clothing and Individual Equipment (PM SCIE) supports Soldiers in operational environments and improves their lethality, survivability, situational awareness, health, safety, mobility, and sustainability by providing safe, durable, and operationally effective individual and unit equipment.

Product Manager Soldier Protective Equipment (PM SPE) develops and fields state-of-the-art force protection equipment that defeats ballistic and fragmentation threats in theater. PM SPE provides superior body armor, helmets, and other gear that greatly reduce the threat of serious injury.

PM FOR SOLDIER SENSORS AND LASERS (SSL)

PM SSL provides soldiers with improved lethality, mobility, and survivability in all weather and visibility conditions. Soldier-borne sensors and lasers enhance the soldier's ability to see in all battlefield and lighting conditions, to acquire objects of military significance before the Soldier is detected, and to target threat objects accurately for engagement by soldiers or guided munitions. These systems provide critical, on-the-ground direct support to U.S. forces.

Product Manager Soldier Maneuver Sensors (PM SMS) provides Soldiers with products for enhanced vision, improved targeting, and greater lethality.

Product Manager Soldier Precision Targeting Devices (PM SPTD) develops and fields systems that accurately locate and designate targets for engagement with precision munitions.

PROJECT MANAGER SOLDIER WARRIOR (PM SWAR)

PM SWAR supports Soldiers through the acquisition of integrated Soldier system. Current systems include Land Warrior, Ground Soldier, Mounted Soldier, and Air Warrior. Project Manager Soldier Warrior develops and integrates components into complete systems designed to increase

combat effectiveness, decrease combat load, and improve mission flexibility.

Product Manager Air Warrior (PM AW) integrates all aviation life support and mission equipment into an ensemble that improves the combat effectiveness of the Army aircrew member. This system leverages several joint service technology efforts to create a modular system that increases situational awareness and freedom of movement at the flight controls, enhances mobility to safely operate aircraft systems, reduces physiological stress, facilitates aircraft entry and exit, and provides survival gear in the event of a downed aircraft over land or water.

Product Manager Ground Soldier (PM GS) provides unprecedented situational awareness and battle command through the current system called Land Warrior (LW) and the future system Ground Soldier Ensemble (GSE). Digital imagery and GPS locations provided by LW/GSE enable thorough mission planning, ramp-side convoy briefings, and on-the-fly changes during missions for high-value targets (HVTs). LW/GSE allows teams, squads, and platoons to pinpoint the location of improvised explosive devices (IEDs), cells, or HVTs with improved speed and precision. LW/GSE enhances dismounted Soldiers survivability by rapidly disseminating locations of suspected enemy IEDs and snipers. LW/GSE also helps prevent fratricide by providing locations of mounted forces and dismounted Soldiers.

Product Manager Mounted Soldier System (PM MSS) extends digital capabilities to vehicle crew members, including commanders, drivers, and gunners.

PROJECT MANAGER SOLDIER WEAPONS (PM SW)

PM SW supports Soldiers through enhancement of current systems and development of next-generation weapons technology. It focuses on ensuring Soldiers are equipped with world-class weapon systems, ammunition, and associated target acquisition and fire-control products today and in the future.

Product Manager Crew Served Weapons (PM CSW) is responsible for research and development of current and future light to heavy machine guns, grenade launchers, small arms ammunition, remote weapons stations, and related target acquisition/fire control products.

Product Manager Individual Weapons (PM IW) is responsible for research and development of current and future rifles, carbines, pistols, shotguns, grenade launchers, small arms ammunition, and related target acquisition/fire control products.

For more information, visit <http://www.peosoldier.army.mil>

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JIEDDO: Technology to Detect IEDs, Clear Routes and Save Lives

As deployed U.S. Army and Marine Corps route clearance teams (RCTs) work to prevent improvised explosive device (IED) attacks on U.S. and Coalition vehicles in Afghanistan, the Joint IED Defeat Organization (JIEDDO), in its role as the Department of Defense's lead counter-IED entity, is dedicating all its resources towards supporting the Afghanistan surge.

ATTACK, DEFEAT, TRAIN

JIEDDO divides its counter-IED mission along three lines of operation: Attack the Network, Defeat the Device, and Train the Force. Under the Defeat the Device line of operation, JIEDDO funds, delivers and evaluates a number of devices, such as the Vehicle Optical Sensor System (VOSS), designed to enhance the effectiveness of route clearance teams and the safety of vehicle patrols and convoys.

The lessons learned from years of experience of countering IEDs in Iraq, and the unique threats identified by commanders in Afghanistan are being applied to aggressively develop and rapidly provide capabilities to Warfighters than enable and enhance their attack of IED networks.

CLEARING THE WAY

Comprised of combat engineers and explosive ordnance disposal (EOD) personnel, route clearance teams (RCTs) are used to clear natural or man-made obstacles restricting freedom of movement for U.S. forces, detect IEDs and thwart terrorist or insurgent ambushes that routinely employ IEDs.

Route clearance patrols were very effective in Iraq, explained JIEDDO's command sergeant major Todd Burnett. At the height of the IED surge in Iraq, we had a total of 84 route clearance teams. As part of the Afghanistan surge, we are increasing the number of route clearance teams in Afghanistan and significantly adding more surveillance ability.

One of the major challenges in Afghanistan is improving IED detection. According to Burnett, the found and cleared rate for IEDs in Afghanistan is 55 percent.

Among the challenges facing RCTs is the stand-off detection and confirmation of explosives and detection of buried IEDs or pressure initiation devices. The use of low metal content containers and switches (e.g. pressure plates) provides ongoing detection challenges as well as increase use of command wire IEDs. Additionally homemade explosives (HME) are becoming more prevalent in Afghanistan. The use of HME enables insurgents to build large new IEDs with low metal content.

JIEDDO's investments encompass technologies intended to directly detect an emplaced device and to detect signs of emplacement, either by coherent change detection or by identifying disturbed earth and other signatures. Detection of an underbelly IED must be completed before a ground vehicle enters the blast area or detonates the device. Therefore, automated threat identification capabilities are required in many operational scenarios.



SEEING THE THREAT

Proven effective in detecting buried or otherwise hidden roadside bombs in Iraq, the Vehicle Optics Sensor System (VOSS) is a key technology to enable RCTs in Afghanistan to stem the rise of resurgent Taliban IED attacks on U.S. and Coalition vehicles.

Originally funded and rapidly fielded by the organization as a commercial off-the-shelf solution, VOSS provides the Warfighter with stand-off detection capabilities while under the protection of armor. VOSS is used for detection of roadside and buried IEDs, locating trigger-men, and for surveillance of IED emplacement areas on the roads surrounding forward-operating bases, while proving to be an important situational awareness and force protection asset. The VOSS program is managed by Product Manager Countermine & EOD for the US Army, and a similar program (called 360 Degree Camera System) by Marine Corps Systems Command for the US Marine Corps.

VOSS is an invaluable tool to protect the Warfighter, but pretty complex from a technological angle, noted a JIEDDO training advisor. However, the controller is easy to operate, like a joystick. We've just added continuous zoom, making VOSS even easier.

Rising above a route on a 25-foot mast for a wide field of vision, VOSS is a vehicle-mounted gyro-stabilized camera with day-and-night capabilities to enhance vehicle crew situational awareness and allow operators to scan for IED indicators while on the move. VOSS is also capable of interrogating suspected devices from a safe, stand-off range at operational speeds or while stopped in a security halt.

Utilizing a remotely-controlled, high-resolution and zoom-capable triple sensor (daylight camera, night-vision camera, thermal-imaging camera), VOSS is capable of acquiring targets in nearly all battlefield light conditions.

The entire system is adaptable to most vehicle configurations, including the new M-ATV (MRAP All-Terrain Vehicle), and installation by a trained crew typically takes no more than ten hours. The versatility of VOSS plug-and-play architecture ensures that the system is readily available as new IED threat areas arise, and has the ability to share video with other vehicles in the RCTs. To date, JIEDDO has funded and fielded over 700 of these systems to RCTs in-theater.

In addition to VOSS, JIEDDO also provides RCTs with ground-penetrating radar and radio-jamming capabilities to detect IEDs and protect themselves from detonation attempts.



how



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Multipurpose ATV

VSE Corporation, a federal engineering and advanced technology services company, has introduced the creation of its new Land, Air & Sea Special Operations (LASSO) vehicle. The all-terrain vehicle offers full-time, six-wheel drive with a fully independent suspension, 9-inches of suspension travel, 12-inches of ground clearance and a payload capacity of 3,000 pounds--allowing for high capacity load carrying in hard-to-travel environments. The LASSO is designed to fit inside tilt-rotor aircraft and to meet military specifications which incorporate many standard HMMWV features.

We developed the LASSO with a keen eye towards serviceability, said VSE engineer and designer John Wasylyk. The entire power pack (engine, transmission and accessories) is mounted to a separate sub-frame that is located under the seats, and can be quickly and easily removed from the vehicle for service or replacement. A two-man team can have the entire power pack on the floor in an hour.

The LASSO vehicle has been demonstrated on the SORT (Severe Off-Road Track) course at the U.S. Marine Corps Base in Quantico, Virginia where it exceeded all expectations of base personnel, and Finite Element Analysis concludes that the vehicle meets requirements for Roll-Over Protection (SAE J2194).

For more info: John Wasylyk at jpwasylyk@vsecorp.com or 586-254-8973

Fire Retardant Foam

Team Wendy, a manufacturer of protective material and the sole authorized provider of ground combat helmet liner systems for the US Army and the Marine Corps, has added a new fire retardant (FR) formulation of Zorbium foam to its product offerings. The ZFR family of foams offers a new performance standard for the leading energy absorbent material and opens doors for new applications.

ZFR carries forward the best characteristics of our current Zorbium foam, said Scott Burk, Team Wendy CEO. Our goal was to achieve the requisite fire retardant standards, while maintaining the superior impact absorbent performance of the original material. The marriage of full FR compliance and impact performance will translate directly into other applications, such as military aviation seating and ground combat vehicle seating. Foam has been largely overlooked as a significant contributor to shock, vibration and blunt-impact mitigation in both standard and specialized seat products. Attaining this certification will afford even greater performance and, ultimately, fewer injuries.

Team Wendy's ZFR meets the testing requirements for the Federal Aviation Administration FAR 25.853 Appendix F part IFAA FAR 25.853 Part 1 and the standards for the Federal Motor Vehicle Safety Standard FMVSS 302.

For more info: Emily Mullins at emullins@teamwendy.com or 216-738-2518

Transparent Armor Layering

Huntsman International has introduced a new grade of optical aliphatic thermoplastic polyurethane (TPU) interlayer film for the manufacture of transparent armor being developed for new military vehicle windows.

KRYSTALFLEX PE505 film combines high hardness and medium modulus, creating a powerful union of flexibility and extreme toughness. These properties, combined with high adhesion to glass, ceramic, polycarbonate, acrylic and other substrates used for new transparent armor designs, lead to superior impact and ballistic properties in both high and low temperature operating environments.

Huntsman's KRYSTALFLEX optical aliphatic TPU interlayers have been widely used and are proven performers for the production of military vehicle transparent armor. First developed in the 1980s, we continue to innovate and provide improved products to meet industry requirements for higher performance in harsh environments says Mike Griffin, Product Manager for Huntsman's KRYSTALFLEX product line.

Combining these properties into one interlayer film gives the transparent armor manufacturers greater design flexibility to produce improved products with thinner design, lighter weight and higher ballistic properties to meet the new vehicle requirements. Transparent armor designs for military vehicles such as FMTV, M-ATV, MRAP and JLTV can all benefit from using the Krystalflex PE505 polyurethane interlayer technology.

For more info: Michael Griffin at Michael_L_Griffin@huntsman.com

Parachute Delivers Softer Landing

Airborne Systems, developer and manufacturer of troop parachute and aerial delivery systems, has announced the delivery to the US Army of the first full rate production T-11 advanced tactical troop parachute systems. This is a significant milestone in the full rate production contract.

The T-11 parachute system, designed by Airborne Systems is being fielded to replace the legacy T-10 parachute systems currently in service with the US Army. A recent Army study noted that the introduction of the T-11 parachute resulted in a 73% reduction in injuries and allowed for a carrying capacity of 400lb vs. 360lb when compared to the T10 parachute. The T-11 main canopy is a highly-modified and refined version of the cross/cruciform planform parachute, exploiting three of the most important characteristics of cross parachutes - inherent stability, inherent gentle opening and virtually no oscillation.

The T-11 has been jumped more than 3000 times at Fort Benning by the 75th Ranger Regiment, the first command to receive the T-11 parachute system under the Low Rate Initiation Production (LRIP) fielding.

For more info: www.airborne-sys.com

UAS Expands Wing

AAI Corporation, an operating unit of Textron Systems, has begun deliveries of the new extended wing kit for its Shadow Tactical Unmanned Aircraft Systems (TUAS). The U.S. Army has ordered 100 extended wing kits for distribution to Army and Marine Corps units.

With this enhancement, the Shadow aircraft's wingspan increases from 14 to 20 feet, size of the aircraft's fuel cell, and aircraft endurance from six to nearly nine hours.

The redesigned wing also includes hard points for external stores. This modification dramatically increases the Shadow aircraft's mission flexibility in theater, allowing it to gather and disseminate electro-optical and infrared full-motion video as well as metadata with its standard payload, and additional payloads.

For more info: www.textronsystems.com

Abrams Tech Support

General Dynamics Land Systems (GDLS) has been awarded \$37 million for Abrams Tank Systems Technical Support (STS) by the U.S. Army TACOM Lifecycle Management Command of Warren, MI.

The award will fund engineering studies on Abrams main battle tanks to identify improvements and replace obsolete parts to maintain the tanks at high operational readiness rates. The work will

be performed by existing GDLS personnel in Sterling Heights, MI., expected to be completed by Dec. 19, 2011.

GDLS plays an integral role in the U.S. Army's core vehicle programs, including the Abrams tank (M1A2 SEP upgrade and AIM), Stryker infantry combat vehicle and Fox NBC reconnaissance vehicle, and in its modernization plan.

For more info: www.gdls.com.

Armor Light for Flight

The U.S. Army Applied Aviation Technology Directorate has awarded Lockheed Martin Corporation (LMCo) a \$1.5 million contract that continues development of the Kinetic Energy Net (KEN) armor design. KEN is a modular composite armor system developed by Lockheed Martin that is lighter than current aircraft armor, but offers comparable protection.

Kinetic Energy Net is a new direction in armor that doesn't trade weight for strength, said Glenn Miller, vice president of Technical Operations and Applied Research at Lockheed Martin Missiles and Fire Control. Aircrews operate in some of the most exposed places on the battlefield, but due to weight constraints, users don't have as much armor protection as they'd like. We developed KEN armor so it can also be integrated directly into the aircraft structure instead of attaching plates to the fuselage, which adds weight.

Tests have confirmed that the KEN system offers more protection than steel plates, and it has a significant weight advantage. Additionally, Lockheed Martin realized a 13 percent reduction in weight against advanced ceramic and composite armor designs. The company's goal in the next phase of the program is to cut total weight by over 40 percent, without losing protective capability.

Lockheed Martin will further improve KEN armor performance by incorporating new forms of advanced ballistic materials and experimental strike faces. Future efforts may see armor applications transition from air vehicles to ground vehicles and even ground structures requiring lightweight ballistic protection.

For more info: www.lockheedmartin.com

Rugged and Robust for Mission Must

The U.S. Army's present and near future rugged mounted vehicle computing solution is focused on more energy efficient higher performance computing power technology using commercial-off-the-shelf and mainstream computing and networking equipment repackaged to survive the battlefield environment.

By Chad Samuels, A&M Editor



Rugged computers for mounted military operations have for the past decade and a half been using installation kits with isolation to prevent damage to the computer and components. Typical test scenarios involve the use of sealed air condition cases with solid state drives and incorporated isolation/shock mounted and vehicles with air-conditioned equipment racks. Currently, with solid-state drive (SSD) technology available, testing is also performed with shock-mounted racks and equipment trays.

All Army rugged mounted computers or hardware go through tracked and wheeled vehicle vibration profiles testing, said Dr. Ashok Jain, Product Director, Common Hardware Systems, U.S. Army PEO C3T, Ft. Monmouth, NJ. All vibration profiles employed during testing are worst case scenarios for each vehicle platform intended for use with rugged mounted computers. The configuration of each rugged computer used for vibration testing conforms to vehicle installation kitting while under normal operating mode.

No ROTATION, MORE DURATION

The introduction of solid state (SSD) computing as an alternative to legacy disk drive systems has effectively addressed DoD's need for computers that generate less internal heat to have to dissipate, helping them last longer. With no moving drive, sand and dirt particles that normally cause problems for moving drive computers is less of an issue.

With moving drive computing, users would have to know the vibrational characteristics of the vehicles that they would be used in, said Dr. Jain. In many cases, isolation kitting was not appropriate or approved for particular mounted scenarios.

With solid state computing, barriers to vehicle installation are being eliminated as the computing hardware is more sustainable and reliable under particular vibrational conditions.

NETWORK READY

Today's solid state computers are not as dependent on large server connectivity because with greater data storage capacities, there is less need for server access.

With less dependency on server access, network certifications for current computing technology is less involved, said Dr. Jain. If you are less dependent on the network, you are less restricted by network protocol. With the introduction of IPV6 network regulation, greater network integration is enabling better data sharing which, in turn, is being sped up by solid state computing that is more self-sufficient and maintainable.

The Army uses Internet Protocol version 6 (IPv6) robust and global-ready network, SWaP (Size Weight and Power), software compatibility with commercial-off-the-shelf proven computing technology, and an integrated enterprise network that disseminates information rapidly to warfighters.

With global-ready networking a reality on the commercial level, defense intelligence and communications needs are driving the integration of this capability at lower and lower levels so that brigades and battalion-level data sharing can be as effective as is needed by upper level command echelons dependent on their data, said Dr. Jain.

IN CHARGE

Power solutions for solid state computing enable greater usage of in-vehicle DC input power supply with AC input to the hardware. From the vehicle to the adapter and the adapter to the computer, said Dr. Jain. With the rugged environment of Afghanistan and Iraq, extreme temperatures and lack of battery re-charge availability, power could be down for days at a time.

As certain situations demand that power adapters be recharged under cover of night without light sources, previous disk drive computing required longer, more frequent charge times which could delay mission operations. With solid state, computers are charged by DC power directly from vehicle engines as they are being used, requiring less down time for recharging.

LOGISTICAL CHALLENGE

Many computers are designed for a single mission application. As a result, logistics is challenged by the transport, service, and repair of multiple platforms, as well as their peripherals and power sources. To reduce this logistical logjam and to simplify operations, DoD is demanding interoperability from mobile computers. This has presented a challenge for many developers, who are invested in their proprietary systems.

AMREL, who has supplied the well-known ROCKY rugged computers to the military for many years, has come up with a new technology that allows for interoperability. At first, it had nothing to do with interoperability, explains Magnus Pyk, AMREL's Director of Engineering. We were approached by a UGV (Unmanned Ground Vehicle) manufacturer, who wanted to expand the range of their OCU (Operator Control Unit).

Integrating radio systems directly into the OCU increases the noise-to-signal ratio, leading to shorter operating ranges. Tethering a peripheral radio significantly increases the OCU's footprint. AMREL developed an alternative of integrating the radio into a module that is shielded from electronic emissions, which is then integrated into the computer's device bay. Since modules have plug-and-play connectivity and are field-expedient swappable, one computer can operate many applications.

The U.S. Army Tank Automotive Research, Development and Engineering Center (TARDEC) and III Corp successfully tested this technology at Ft. Hood's Robotic Rodeo. Under the trademark of Flexpedient, AMREL is integrating this patented technology into many of their rugged, mobile platforms. Currently, modules for biometrics, unmanned control, sensor management, and target acquisition have been developed.

MOUNTED COMPUTING

Today's warfighters require vehicle-borne computing platforms for use within combat vehicles. U.S. Army and Marine Corps personnel are relying on rugged computers for increased situational awareness and command-and-control capabilities in the field.

To help address DoD needs for rugged mounted computing, DRS Technologies has recently introduced its JV-5 ultra-rugged vehicle computing and display systems, many of which are currently being installed on more than 40 types of U.S. Army and Marine Corps wheeled and tracked vehicles. DRS engineers are delivering the vehicle computing systems based on a roughly \$98.3 million contract from the Army's Communications and Electronics Command, Life Cycle Management Command at Fort Monmouth, N.J., as part of the Force XXI Battle Command, Brigade, and Below (FBCB2) and Blue Force Tracking (BFT) programs.

The JV-5 is composed of four line-replaceable units: the processor unit, display unit, rugged hard disk drive, and rugged keyboard unit, said Bill Guyan, DRS vice president of business development. This system provides a 1.66 GHz Dual Core processor, 2 gigabytes of RAM, and a 160-gigabyte hard drive connected to a rugged sunlight-readable 12.1-inch display with a 5-wire touch screen.

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The Army is currently looking at whether JV-5 could handle parts of the system of systems common operating environment (SOSCOE) as part of its upgraded FBCB2/Blue Force Tracking system. In addition, the service is exploring ways elements of JV-5 can be integrated with FCS Integrated Computer System.

A primary supplier of in-vehicle computing systems to the military, Dell Corporation offers complete and customized solutions including military in-vehicle mounting. The XFR mounted laptop computer is currently mounted in military command vehicles, HUMVEES, and other ground tactical platforms. Dell offers both touch and non-touch screen models, rubberized and chiclet keyboards, backlit keyboards, and more to give choices in how to best input data.

Our Latitude E6400 XFR is in its second-generation of Fully-Rugged Laptops that meet MIL-SPEC 810G and are IP65 rated, said Scott Morris, Dell Rugged Mobility Solutions. The XFR exceeds the operational temperature range up to 145 degrees Fahrenheit. Dell also has a semi-rugged offering that meets the necessary environmental MIL-SPEC such as, vibration, humidity, altitude and ingress protection for dust.

The Dell XFR is roughly 8.5 lbs and packs greater performance into its units than others offering the same form factor. The XFR, ATG, and E6400 all use the same chipset and components. This is a huge advantage allowing customer to buy and build software on less expensive commercial grade systems, then port them over to a semi-rugged or fully rugged system, Morris added.

Sixnet Corporation is addressing the military market with a set of Ethernet switches that have been designed and certified to meet full military standards. These standards address heat, vibration, etc under MIL-STD-810F, said Scott Killian, Worldwide Director, Presale Solutions, Sixnet. The products also meet the full electrical specifications detailed in MIL-STD-461E and MIL-STD-1275F for the power supply. Sixnet switches have been designed to address both fast Ethernet networks and Gigabit networks. Sixnet offers both unmanaged and managed switches to

support a wide range of opportunities for in vehicle use.

DISMOUNTED AND HANDHELD

The Army's dismounted solution for the ground soldier is focusing on more rugged and lightweight hand-held devices using commercial-off-the-shelf mobile application operating systems with security enhancements and mobile networking technology. The tradeoff between the size, weight, capabilities and computing power of current computing solutions on the market today causes soldiers to pause when buying in to decisions to deploy and use rugged, hand-held computers.

The devices are more rugged, less weight, and less pricy, said Dr. Jain. They are offering higher performance and more advanced technology in a smaller package; SWaP (Size, Weight and Power) reduction. Many handheld computing devices being used by the Army are the size of iPhones and iPads with more enhanced capabilities that can be utilized across an all encompassing communications touch, video, and voice network secured for better command and control, communications/intelligence sharing, and threat awareness.

In 2010, Panasonic Solutions Company has introduced the next line of Toughbook rugged laptop computers built to address mobile computing needs. In addressing newly modified DoD-issued MIL-STD-810G certifications for military computing, with specific requirements for meeting common mobile computing challenges such as resistance to water or ingress protection, foreign particulates, thermal or heat dissipation and shock or vibration, Panasonic recently announced its latest offering, the H1 Field. The Toughbook H1 line of tablet handheld PCs has opened up a wide range of uses for the warfighter, including in-theater medical, vehicle, aircraft and weapon system maintenance, and numerous other mobile applications where a ruggedized, ergonomic tablet can be useful.

The Toughbook H1 Field tablet computer incorporates the latest in reinforced solid-state drive computing,

using Intel Atom Z540 processor technology within a magnesium alloy chassis and sealed all-weather design including textured polycarbonate coating, making it even more rugged, said Fed deGastynne, a federal business development manager with Panasonic Solutions Company. The platform also addresses a DoD requirement for size and weight reductions for current dismounted military computing and offers advanced sunlight viewability, CAC/SMART card readability and hot-swappable rechargeable battery power for continuous or extended use.

Two of the primary advances in Panasonic dismounted computing are in helping users deal with viewing screens in sunlight glare and ingress protection. To neutralize sunlight viewability issues, Panasonic employs circular polarization technology to disperse light rays as they hit the monitor display surface, minimizing the amount of reflective glare the user experiences. A bright LED backlight is used in combination with the circular polarization capability to counter the effects of sunlight on the screen by brightening the display content.

With a main killer of mobile computers, disk or solid-state drive, being dust and particulate build-up within the chassis leading to decreased performance and parts failure, Panasonic's Toughbook H1 Field tablet computers offer users a completely sealed, high ingress protection-rated platform able to endure typical airborne particulate and contact with water short of complete immersion, said Kyp Walls, director of product management, Panasonic Solutions Company. This impregnability helps the computing platform maintain its heat dissipation properties by keeping key components free of foreign matter.



GammaTech Computer Corporation, a manufacturer of portable notebook computers including ruggedized computing solutions for the U.S. military, introduced its Durabook D14RM unmounted notebook in September 2009 which includes multiple security features such as TPM, finger print, and a smart card reader. The D14RM accomplishes this with weight

and dimensions similar to commercial notebooks allowing warfighters ease of use when mounted or unmounted.

GammaTech developed the D14RM that is focused on the military 810G specification for drop and shock, said Charlie Cruser, vice president of sales / government division, GammaTech. To meet the needs of soldiers in the field, the D14RM was designed with extra protection to guard against accidental concussion and protection against liquid spills and dust.

PALM-SIZED COMPUTING

Elbit Systems of America designed and produced the original rugged tactical PDA in conjunction with the US Army and Hewlett Packard. The system is able to be fielded as a basic device, but be upgraded through the addition of a modular back by loosening four quick connectors.

Our warfighting customers can

literally change the functionality of their handheld computers in the field by attaching a back that has SAASM, a TACLINK interface, SATCOM, Biometrics or almost any other capability, said Bob Carpenter, executive director of business development, Elbit Systems of America.

With this compatibility, we can design new back functionality on-demand to address emerging requirements.

By maintaining backward compatibility in successive generations of its front or computing hardware, Elbit upgrades computing performance by replacing the older computer front with a newer model, saving the investment DoD makes in the sensor, navigation and communication system components. The company has applied this approach to its vehicle computer systems, as well as other handheld and

dismountable systems.

General Dynamics Itronix took critical requirements for rugged military handheld computing into consideration when the division of General Dynamics C4 Systems developed ultra-mobile MR-1. This small form factor computing device was designed to fit in the soldiers pockets and weighs just over two pounds, but runs a powerful Intel processor and chipset that supports the most graphic intensive of applications.



Bob Carpenter
Elbit Systems of America

Hitting the mark on all of these factors is critical as no warfighter wants to add an 8 lb+ computer to a pack that can weigh over 80 lbs, said Pat White, vice president of Strategic Marketing for General Dynamics Itronix. They certainly cannot afford to have a computer that skimps on Input/Output (I/O) options

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and processing capabilities given the types of graphics intensive applications that are used, like blue force tracking.

The Mobile Computing Solution Division of Trimble, a provider of satellite-based navigation, positioning, and communication data products, is currently supplying three types of ruggedized portable devices, the Recon and the Nomad rugged handheld computers, and the Yuma rugged tablet computer, to the U.S. Army to assist in meeting its handheld computing needs.

Trimble's Nomad handheld computer is designed for all-day operation in extreme outdoor and industrial environments. Battery testing yielded over 12 hours of operation with Bluetooth and 802.11 both enabled and with the screen backlight at 50 percent brightness. Maximum battery life is approximately 25 hours.

The Yuma rugged tablet features Microsoft Windows 7 Professional, two geotag enabled cameras, integrated Wi-Fi, Bluetooth, GPS and a seven-inch sunlight-readable touchscreen display. The Yuma, Nomad and Recon are expandable and can be used with a variety of peripheral devices to support a broad

Computing Power at Arms Length

L-3 Ruggedized Command & Control Solutions (RCCS) has introduced the Lightweight Wearable Data Terminal (LWDT) - a small, lightweight soldier-wearable computer system for remote and rugged military environments. The LWDT consists of a base computer and a wrist-mounted display unit. This product is in the process of being released for user feedback and is currently being tested by the U.S. Army Special Operations Command.

Through incorporation of a wearable computer and associated wrist-mounted display, the war fighter has greater flexibility, ease of operation and hands-free mobility, thus increasing operational effectiveness. This system provides a touch screen (with gloved-hand interface) compatible with optional captive stylus input. The LWDT supports an internal SiRF Star III commercial GPS chipset as well as NMEA, SiRFBINARY and AI3/F protocols.

On-the-move situational awareness is provided through the soldier-configurable display to provide required tools in a timely manner, such as Blue Force Tracking, airborne video feeds and Command and Control tasking and messaging. With regard to power, the LWDT offers extended battery life and auxiliary operation through two externally mounted long-life and rechargeable Lithium Ion Batteries (3.5 - 6.5hrs), wherein either battery can be removed for hot swap replacement in the field.

Our forward-looking design for the LWDT wearable computer system allows RCCS to rapidly reconfigure the system with customer-defined capabilities and performance improvements, such as incorporation of Rover data and Organic LED (OLED) display technology in the future, said John Schulz, operations director and site manager at RCCS.

range of mobile computing applications.

We engineer our mobile computing products to a military standard 810F (MIL-STD-810F or greater), which includes the specifications for drops, vibrations, temperature, dust, and moisture, said Rob Davis, Marketing and Sales Director for Trimble's Mobile Computing Solutions Division. In addition, we really push the battery life in our products, and pack as much battery capacity into every unit as we can. Soldiers can expect a full days battery life for the Recon and Nomad handhelds under most conditions. Battery life on the Yuma tablet, using the extended batteries, is typically 7-8 hours.

RESISTING THE ELEMENTS



Post-mission, many vehicles are simply and quickly sprayed down with a hose, so the ability for mobile computers to withstand the impact of a hose and varying degrees of water while mounted as a system, is key. The General Dynamics Itronix GD8000 notebook is designed from the inside out and is capable of withstanding water ingress while operating and coupled to the dock.

This is a critical differentiator for the GD8000, said General Dynamics Itronix Product Manager Amy Tupler. Its ability to be hosed-down while docked demonstrates the attention to detail that is emphasized during the computers design and development. We call it purpose-built design.

Outdoor viewing of computer displays has been challenge for mobile users who have typically addressed the problem by amping up display brightness and contrast which quickly drains battery power. DynaVue technology, developed by General Dynamics Itronix, leverages enhanced contrast ratios and polarization techniques to meets MIL-STD 3009, the U.S. military's high ambient-light viewability specification.

In terms of night operations, the GD8000 also offers several ergonomic keyboard options and stealth mode to ensure the user is not illuminated at night by either the keyboard lights, keyboard tapping, auditory sounds, or display. The white keyboard with high contrast black letters and low level NiteVue options are popular among the warfighting community. Both allow usability in very low level lighting conditions while keeping users relatively concealed.

contact@tacticaldefensemedia.com

Increasing Unmanned Presence

Advancements in technology and wartime requirements are driving the demand for unmanned ground vehicles.

By Paul Broussard
A&M staff writer



Unmanned ground vehicle (UGV) technology is being shaped by a confluence of events. While enhancements to these vehicles are being driven by technological innovation, these systems are also evolving through their expanding role in two combat theaters of operation—providing invaluable lessons learned for the government/industry development teams and system operators.

‘ROBOTS IN COMBAT IS THE NORM AND THEY CONTINUE TO PROLIFERATE.’

U.S. ground forces in Afghanistan and Iraq continue to face a long list of daily operational challenges including long and dangerous missions over varying terrain in hostile environments. While the department continues to invest billions of dollars to provide add-on armor kits for legacy ground vehicles, and deliver new and upgraded models of MRAPs to the two theaters, improvised explosive devices (IEDs) and other asymmetric threats continue to inflict significant numbers of deaths and injuries to vehicle crews and their passengers.

UGVs capable of supporting missions throughout the spectrum of ground operations, are seen as one way to selectively remove crews and passengers from vehicles on the battlefield, and thereby reducing injury and loss of life. The DoD/industry team is making incremental progress in delivering these vehicles to the operators.

Marine Corps Lieutenant Colonel Dave Thompson, project manager, Robotic Systems Joint Project Office, told A&M that the department's growing fleets of UGVs are primarily being used in the maneuver and maneuver support roles by the Army and Marine engineer teams, and all of the services and coalition partners' EOD teams. While the sizes vary from around 30 pounds for the Mini-EOD to over a ton for the MV-4, the services demand for unmanned systems is increasing as their benefits are proven over and over again, he added.

The employment of these UGVs in the two war zones has produced important lessons learned including the call for more power, lighter weight, better lifting capacity and greater quantities.

We're working on improvements for the currently fielded robots and have other robots in the wings that will satisfy a lot of these demands in the near term and all of them in the long term, he added.

While Thompson was unable to discuss specific UGV limitations that U.S. forces have experienced, he pointed out the terrain in

Afghanistan has presented many new challenges for the robot operators—lessons that the industry team is responding to as will be described later.

The first of which is getting the robots to where they need to be, he said. While Iraq's road systems are well established and usually allow an easy approach to the robot's objective area, Afghanistan's terrain has demanded that the department field robots that the soldiers and Marines can carry with them on dismounted patrol. They have that now and are using it to great success (but they want more, of course). The line-of-sight issue is exacerbated by the variety of terrain in Operation Enduring Freedom, but some of our radio technology improvements have mitigated the impact. We are doing our best to react to the warfighters' needs and incorporating the lessons learned from OIF and OEF into the robots we're planning to buy in the near term and long term, he said.

One important takeaway for industry from the department's

UGV employment in Iraq and Afghanistan is the systems' lessons learned are specific to those two theaters—and should serve as only one data point along the development roadmap. Thompson cautioned, However, we can never forget that our robots may eventually be used in a jungle environment or in the surf zone, so that makes our job in the acquisition community that much more interesting.

And it is the expanded use of UGVs which is helping to integrate them into the culture, and tactics, techniques and procedures of ground operations.

Thompson pointed out, The greatest benefit from the lessons learned in theater that I'm seeing is the day-to-day comfort with robotics that is being built. While it used to be the exception to find someone who had interacted with a robot on the battlefield, it is now becoming common. He concluded, The benefits are clearly evident to everyone from the man on point to the commander in the chain-of-command. Having robots in combat is now the norm and they continue to proliferate.



Lt Col Dave Thompson,
USMC

LARGER PLATFORMS

Oshkosh Defense, John Deere, and RC Rover are among the industry teams eyeing the department's insatiable appetite for UGVs.

While Oshkosh Defense's UGV applications are still in developmental stages, the company has successfully demonstrated fully autonomous capabilities with its TerraMax autonomous vehicle system since 2003. A key design strategy allows the Terramax to

be a kit that could be applied to any military vehicle. John Beck, chief engineer of unmanned systems for Oshkosh Corporation's Advanced Products Engineering division, pointed out that Oshkosh vehicles such as the USMC Medium Tactical Vehicle Replacement (MTVR) and U.S. Army Palletized Load System (PLS) enabled with the TerraMax system have performed countless test missions without human intervention, constituting thousands of miles in varying terrain and weather conditions.

TerraMax-equipped unmanned ground vehicles (UGV) have attained average speeds in off-road environments of greater than 20 mph (peaks up to 53 mph) on many of the longer missions. We have received financial rewards for the development of leading UGV technologies through the DARPA demonstrations and performed under contract for feasibility studies, Beck noted.

For its part, John Deere does not have a UGV program of record but its heritage product portfolio is incrementally gaining the capabilities of these vehicle systems. Some of the UGV technology building blocks have been refined for more than a decade and originate in agriculture and other business areas. When you look at the agricultural, construction and forestry-type environments, we've been involved in robotics for 15-plus years, pointed out Mark Bodwell, group manager for business development, Military Affairs, John Deere. Specific competencies gained through the company's diverse customer base include auto-steering and other basic robotic skills, and GPS correction and placement of materials.

The company is blending these technology advancements with lessons learned from U.S. operations in Iraq and Afghanistan, into the R-Gator utility vehicle which was introduced in 2005. The R-Gator evolved from the company's proven M-Gator military vehicle platform which, on its own merits, has been prominently fielded throughout the department.

In late 2009, the latest R-Gator model was introduced. The vehicle design integrated the ground warfare community's lessons learned from the Afghan theater including how to transit on very rudimentary roads and trails. This R-Gator was fielded with an independent, 4-wheel suspension, improved ground clearance (11 inches), higher ground speed in manual operation (up to 35mph) and other enhancements.

The vehicle's curbside weight (approximately 1,600 lbs) and other characteristics make this a much more agile vehicle for off-road missions when compared to different MRAP and other DoD vehicles.

In addition to the man-drivable feature, the R-Gator has three other options: teach and playback (to record and follow up to six paths); tele-operational (similar to operating a remote control car); and fully autonomous. This last option is where you can set GPS waypoints and the machine will go off and execute autonomously, said Bodwell.

SQUAD-LEVEL SUPPORT

Lockheed Martin Missiles and Fire Control is developing its new Squad Mission Support System (SMSS), leveraging robotic technologies for future robotic weapons systems. SMSS has successfully participated in two U.S. Army evaluations at Fort Benning. The first was Army Expeditionary Warrior Experiment, Spiral E in November-December of 2008. The second was a

Military Utility Assessment conducted in August 2009. As part of these two efforts, the SMSS was awarded three government safety releases to be operated by and around soldiers, in both remote control and autonomous modes. The SMSS is scheduled for advanced user testing in Afghanistan in 2010.

Funded entirely by Lockheed Martin as an independent research and development project, SMSS will provide manned and unmanned transport and logistical support light and early entry forces, in particular of the U.S. Army and U.S. Marine Corps.

The SMSS is a robotic platform based on a turbo-diesel powered, high mobility six wheel all-terrain vehicle (ATV) capable of carrying 1,000 pounds (453 kg) of payload. Current platforms are utilizing a commercial platform converted for a surrogate SMSS vehicle. Future versions will utilize specially designed platforms, optimized for the SMSS mission.

The SMSS will decrease the amount of time a warfighter has to spend in controlling robotic systems by providing vehicles with a greater perception of their surroundings on the battlefield, said James Gribschaw, director - Combat Maneuver Systems at Lockheed Martin Missiles and Fire Control. Combining perception with extraordinary mobility will allow vehicles to follow the warfighter, without remote control commands, across any terrain, ensuring the payload the robotic system is carrying is available.

SMSS was first developed in 2006 to support a TARDEC contract. The first versions possessed primitive waypoint following, had no navigation sensors and required a human operator onboard for safety purposes. Over time, successive SMSS variants eliminated the need for a human onboard, and have been given enhanced capabilities for autonomous navigation, behaviors and obstacle avoidance without direct remote control. SMSS is also being evaluated for firefighting, first responder, power generation, and logistic duties which can take advantage of its ever growing autonomous capabilities.

In all modes, SMSS autonomously avoids obstacles and people, said Gribschaw. If confused, SMSS sends a message to the operator, requesting assistance. Control hand-over between controller units is easily accomplished, permitting units to send the SMSS back and forth for resupply missions, for example, he added.

The SMSS operator control unit consists of a vest containing the computer, batteries and antenna, and a control/display unit. As desired, the unit may be carried in the standard modular lightweight load-carrying equipment (MOLLE) system.

SOLVING TECHNOLOGY HURDLES

Some of the vexing challenges of operating a UGV in an autonomous, and even a tele-operational mode, are obstacle detection and obstacle avoidance.

Oshkosh and John Deere are actively engaged in developing solutions to these and other technology hurdles.

Oshkosh is extending developed capabilities with respect to perception and autonomous behaviors required to operate safely in a tactical environment for applications such as convoy/logistics missions and route clearance.



Mark Bodwell
John Deere

A convoy consisting of unmanned vehicles can serve as a force multiplier, enabling a single operator riding in a protected escort vehicle at safe standoff distance, to supervise the operation of multiple vehicles in a coordinated manner. In this scenario, Beck pointed out. These unmanned logistics vehicles have the capability of maintaining an established vehicle separation, effectively eliminating the slinky affect when accelerating or decelerating, enabling tighter formation for greater security, improved efficiency and reduced accidents. They also have the capability to operate for extended periods of time, day or night, and in dust-laden environments without fatigue or loss of awareness, but most importantly if the UGV is destroyed by an IED, our warfighter lives to see another day.

To overcome the challenges of obstacle detection and obstacle avoidance, John Deere mounted two forward looking and one rear-looking laser range sensors on R-Gator to help avoid positive obstacles (person, vehicles and other material) and negative obstacles (ditch, cliff or other feature). We have the ability to read obstacles as small as a brick or as large as a building, added Bodwell. These and other on-board sensors help the autonomous vehicle think about options when it encounters an obstacle: slow down, go around or over the obstacle, or take other actions.

MAN PORTABLE SYSTEMS

Man portable UGVs have been the U.S. DoD's platform of choice to keep operators out of harm's way during mine countermeasures operations, IED tasks, close quarter surveillance, and other missions. RC Rover's Rev9 family of UGVs represents one group of state-of-the-art vehicles in this class.

The Rev9 vehicle line ranges between 35-52 lbs in weight including payload and in the ready-for-operation mode. Anything lighter than 30 lbs has proven unstable for severe tactical usage, while heavier than 60 lbs has proven to be an excess burden for man-portability and limiting maneuverability, Amir Sepahban, founder and CEO, told A&M.

While lighter than other unmanned UGV siblings in the department's growing inventory, the Rev9 is no lightweight in an operational mode. The vehicle can be field-upgraded to reach speeds of up to 38 miles/hr while slowing to maneuverable accuracy of one linear inch per minute at the same time. This is a first in the industry, said Sepahban.

EXPANDING THE MISSION ENVELOPE FOR SMALL AND LARGE VEHICLES

RC Rover is also completing some cutting edge work in exploring the frontiers of UGV size and utility.

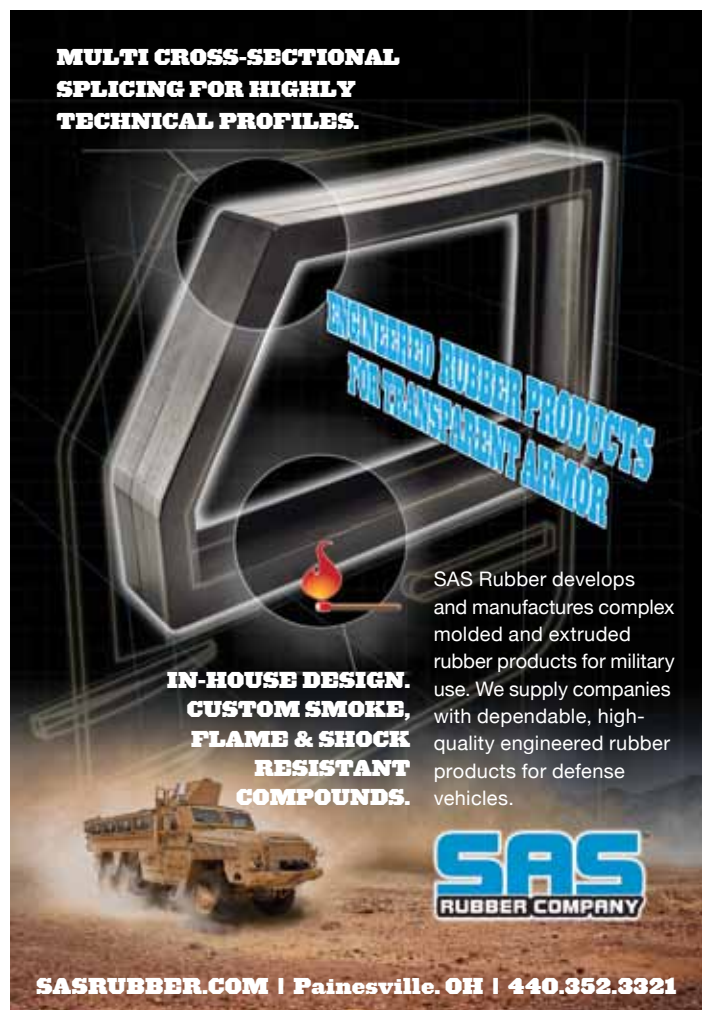
One internal R&D project consisted of a Rev9-18 carrying a micro-Rev9 (5-in x 4-in x 1-in). The micro-Rev9 was operated by the Rev9 Commander software but was limited to Bluetooth connectivity. Sepahban explained the command and control of the micro-Rev9. The micro-Rev9 was carried under the belly of full-scale cousin, the Rev9-18 and was released when access to tighter space was required. A micro-wireless cam was installed onboard the micro-Rev9 and both Bluetooth operation and visual tasks were bridged through full-scale Rev9 through the micro-version. In this manner we were able to launch a tiny product at a distance of over 500 ft to allow for further surveillance of tight spaces ahead.

RC Rover has also demonstrated the versatility and utility of man-portable UGVs in evolving missions. In one project the company designed a dock-station and custom built a four propeller, self-leveling UAV to launch from the UGV. The initial UAV had a slightly larger footprint than the Rev9 and was suspended five inches atop the UGV. A testing regimen, which included 7 out of 10 successful landings, encouraged RC Rover to scale down the size of its UAV to improve the landing features and the overall UGV/UAV footprint.

Based on its efforts, Sepahban concluded that size holds no barriers when it comes to UGV or UAV usability. He added, While the smaller UGVs are limited to overcoming obstacles, they serve great purpose for site survey on manageable terrain.

The R-Gator's progress also continues to expand the mission envelope of UGVs. At the 2010 AUSA winter symposium, the company introduced the EZY-Lift capability allowing the vehicle to embark, transport and debark smaller EOD UGVs and similar loads. We can take the smaller ground robots up to our tray, lift it autonomously into the back of the R-Gator, it has a 1,400 lb capacity. We can take the smaller bots and deliver those to an urban site to where they want to clear buildings with them. They can then extend their communications range using the R-Gator to clear the buildings. We'll do a perimeter security [tour] around the village, go back, pick them up and return to homebase, explained Bodwell.

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Going No-man Vertical

As DoD explores the advantages offered by autonomous unmanned helicopters, the joint services are targeting two platforms in particular to fill an operational need.

By Chad Samuels, A&M Editor

Northrop Grumman Corporation and Bell Helicopter, a Textron Company, have announced the product of a joint effort to address DoD's needs for a heavier lift, longer range capability in unmanned helicopter technology. Called Fire-X, the medium-range vertical unmanned aerial system (VUAS) will enable warfighters to keep tabs on their enemies for longer periods of time, communicate more easily with their commanders, and deliver more cargo to more remote locations than possible by any other existing VUAS platform. An integration of the unmanned systems architecture developed in the U.S. Navy's MQ-8B Fire Scout program with Bell Helicopter's 407 helicopter airframe, Fire-X represents Northrop Grumman's entry in an anticipated competition by the U.S. Navy in 2011 to demonstrate a new medium-range UAS.

The new rugged, high-capacity UAS, based on the four-blade, single-engine design of the Bell 407 helicopter, will incorporate Fire Scout's modular, field-proven architecture that accommodates a variety of intelligence, surveillance and reconnaissance (ISR) and communications payloads. Its modular architecture will support rapid integration, test and deployment for missions that demand larger payloads (up to 3000 pounds), longer endurance (more than 14 hours) and robust cargo hauling (up to 2646 pounds external). The VUAS will be compatible with ISR capabilities such as electro-optical/infrared (EO/IR), synthetic aperture radar (SAR), communications relay, signal intelligence (SIGINT), electronics intelligence (ELINT), and multi-intelligence (Multi-Int) sensors for real-time targeting.

Fire-X delivers what military planners want, and what warfighters need: a reliable, low-cost vertical unmanned system that's versatile enough to support the diverse ISR, cargo, and communications requirements of land and sea forces, while being rugged and persistent enough to stay in the fight until the mission is complete," said Gene Fraser, sector vice president and general manager, Advanced Programs and Technology Division, Northrop Grumman Aerospace Systems.

Fire-X design will enable the VUAS to operate with nearly any type of current or future military standards-based control segment such as in situations where shipboard controllers act as field commanders using the Navy's Tactical Control Station (TCS) to direct the U.S. Army's field-proven One System(R) ground control station. This joint service flexibility and field-reconfigurable design will support ISR, cargo and/or specialized communications missions on land and sea. Fire-X will also have the ability to unman or optionally man a manned helicopter by replacing the in-vehicle pilot with the appropriate avionics, software and ground control station to accurately and reliably duplicate the behavior and performance of the air vehicle.

Fire-X will illustrate how a marriage of manned and unmanned technologies can increase the capability, reduce the risks, and extend the utility of commercially-available helicopters," said Jeff Lowinger, executive vice president for engineering, Bell Helicopter.

Aside from developing targets for the Navy's MQ-8B using Fire Scout's unmanned systems architecture, Fire-X will also provide targeting for the Army's MQ-5A Hunter fixed wing UAS and Northrop Grumman's new line of scalable Bat(TM) unmanned aircraft systems. Fire-X's first flight is expected by the end of CY2010.



HUMMING ALONG

Developed as part of a U.S. Department of Defense effort to develop a helicopter UAV that could stay in the air for over twelve hours at a time, the Boeing A160T has a 2,500-pound payload capacity and features a unique optimum-speed-rotor

technology that significantly improves overall performance efficiency by adjusting the rotor's speed at different altitudes, gross weights and cruise speeds. The autonomous unmanned aircraft, measuring 35 feet long with a 36-foot rotor diameter, has hovered at 20,000 feet and cruised at more than 140 knots. In recent test simulation, Boeing demonstrated that the A160T is able to carry 1,250-pound sling loads over two 150-nautical-mile round trips, with the A160T operating autonomously on a pre-programmed mission.

The A160T's payload-carrying capability includes 32 ft³ of internal volume, 12 kW of power, static mast for above-rotor payloads like SATCOM, and structural hard points for externally fitted pods, both centerline and on stub wings. The UAV demonstrated 18.7 hours endurance carrying a 300 pound payload and landed with over 90 minutes of fuel remaining, 15 May 2008 a world endurance record.

Our architecture separates command and control from mission communication duties which allows for easier integration of new mission payload communication requirements without disrupting vehicle operation," said Vic Sweberg, director of Unmanned Aerial Systems for Boeing Military Aircraft.

The A160T benefits from a very light weight all composite structure and a 50% fuel to empty weight fraction. Coupled with the proven Pratt Whitney 207D turboshaft powerplant, the vertical unmanned aerial system (VUAS) has an exceptional power to weight ratio compared to most other unmanned helicopters and is optimized for multi-mission roles where range, endurance, and altitude are also considerations to just maximizing lift capabilities.

A160T range and endurance rivals that of a fixed wing combined with the flexibility of a rotorcraft, offering multi-mission capability in a single platform," said Sweberg.

Payloads can be changed out according to the immediate need: one mission could be a 12-14 hour reconnaissance mission, then the next could be a contingency mission hauling 500 pounds of emergency supplies to a maneuvering unit on a remote ridge top, and then the next could be hauling 2500 pounds of supplies to a forward-operating base.

OVER THE THREAT

Aerial defeat of IED and other asymmetric threats involves the heavy use of Ground Moving Target Indicator (GMTI) type radars. The problem with this radar technology is that it requires very slow speeds or ground stationary to be effective in detecting and tracking dismounts. To address this, DoD has been looking for a VUAS capability to enable holistic visualization of ground targets. This capability is becoming more relevant as IED threats, and other asymmetric threats, are more and more being waged by persons on foot rather than in vehicles.

The A160T offers the ability to hover greatly increases the effectiveness of most GMTI and other dismount and change

detection sensor systems, primarily because less complicated stitching software processing is required than that for moving sensors, said Sweberg. In targeting an area, persistent stare is far better than having to orbit and area and stitch together imaging.

Boeing has begun production of the A160T Hummingbird on a new assembly line at the plant in Mesa, Ariz., where it builds the AH-64D Apache helicopter. It's a big step forward for the program, absolutely, said Ernie Wattam, A160T program manager. We've been demonstrating what the A160T can do over the last few years, and now we're showing our ability to make this production aircraft.



To THE MAX

The Unmanned K-MAX, a heavy-haul unmanned helicopter developed by Kaman Aerospace in partnership with Lockheed Martin, utilizes the Lockheed Martin mission management system and other Lockheed Martin developed technologies to translate the ground operator's wishes into viable mission plans and provides any necessary guidance while the craft is in the air. A ground control station operator interfaces with the K-MAX as necessary. The system was recently demonstrated to the Marine Corps Warfighting Lab at Dugway Proving Ground from January 23–29, 2010.

The Unmanned System performed operationally representative cargo resupply scenarios, and each time the system delivered as promised, said Sal Bordonaro, President, Kaman Helicopters, a division of Kaman Aerospace Corporation. This capability gives the Marine Corps a proven unmanned power lifter to bring vital cargo to troops on the battlefield without the need for ground vehicles and manned helicopters.

ROTOR VARIATION

The K-MAX helicopter uses an intermeshing, servo flap controlled rotor system that eliminates the need for a tail rotor and allows all of the power generated by the engine to turn the main rotors. The two intermeshed rotors, which rotate in opposite directions, greatly increase the craft's lift capabilities.

In fact, such design provides a one-to-one lift ratio so the K-MAX can carry up to 6,000 pounds (more than its own weight). This design also improves the vehicle's stability in high altitude and hot environment conditions and significantly reduces the noise signature of the craft.

Performance attributes shown during the demonstration at Dugway Proving Ground included hovering at 12,000 ft. with a 1,500-pound sling load; delivering 3,000 pounds of cargo well within the six-hour required timeframe to a forward operating base (two 150 nm round-trip flights); remotely controlling flight and a precision load delivery by a ground-based operator in both day and night conditions; uploading a new mission plan to the aircraft's mission management system during flight; and the ability to carry and precisely deliver multiple loads using the four-hook carousel system.

The K-MAX helicopters currently deployed commercially were designed, built, tested and certified for the external lift mission, and they have successfully flown over 250,000 hours with greater than 98% availability and required less than two man-hours per flight hour to maintain. The external lift mission is very demanding on the helicopter, and the operating history of the K-MAX has proven that its design is robust and reliable. The U.S. Marine Corps is considering using the unmanned K-MAX helicopter to carry essential supplies to isolated areas in Afghanistan that can only be reached by air, or delivery paths by ground that have proved too risky. K-MAX has flown the Unmanned K-MAX nearly 400 hours in the autonomous mode since 2007. The demonstration fulfilled an \$860,000 U.S. Marine Corps contract awarded to K-MAX manufacturer Kaman Aerospace in August 2009.



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Restructuring Around Core Strength: People

As part of the approved 2005 BRAC Recommendations, Ft. Knox, KY is expanding and consolidating to accommodate new and former personnel, transitioning various elements of its human resources and training departments while bringing key reserve units home to meet current Army readiness requirements.

Col. Jeffrey S. Ogden, Deputy Garrison Commander -Transformation for Fort Knox was interviewed by A&M Editor Chad Samuels.

A&M: What does BRAC transformation look like at Fort Knox?

Ogden: The realignment process began when Congress passed the Base Realignment and Closure law in 2005.

BRAC 2005 brings the Army Accessions Command, Cadet Command, the Human Resources Command, the 3rd Brigade Combat Team 1st Infantry Division, the 3rd Sustainment Command, 84th Training Command (Army Reserve), 70th Division (Army Reserve), Army Reserve Readiness Training Center (ARRTC) and 100th Division (Army Reserve) as well as other Army units to Fort Knox by September 15, 2011.

The Armor School will relocate to Fort Benning, Ga. and join the Infantry School to become part of the Maneuver Center of Excellence.

The Human Resources Command, the Army's military personnel command, will consolidate its offices from St. Louis, MO, Indianapolis, IN, and Alexandria, VA, to Fort Knox. This move will integrate the personnel management for Active and Reserve Army soldiers at one location.

The Human Resource Center of Excellence (HRCoE) will also include the Army's Accessions Command with responsibility for Army Recruiting Command and the Army Cadet Command.

The HRCoE will be responsible for all Army soldiers from their initial recruitment or ROTC through retirement and their benefits beyond retirement.

The Commanding General of US Army Accessions Command will be the lead agency of the HRCoE, and the future senior commander of Fort Knox.

A&M: What has Fort Knox been doing to prepare?

Ogden: On Fort Knox, there is much activity toward our transition. In addition to the new buildings for office space and operations, there are a host of construction projects. We are busy widening and improving our road infrastructure, updating utilities, playgrounds and fitness centers, renovated a brand-new high school, and a opened a new gas station with shoppette.

The Human Resource Center of Excellence will be housed in an



Artist rendering of the 883,000 square-foot complex that will house the Human Resource Center of Excellence. The complex will be named in honor of LTG Timothy J. Maude, who died in the Sept. 11, 2001 attack on the Pentagon.

883,000 square foot complex that is scheduled to be ready for occupancy in June 2010. The complex will be named in honor a LTG Timothy J. Maude, who died in the Sept. 11, 2001 attack on the Pentagon.

The Maude Complex includes six interconnected buildings in a chevron design layout to include over 4,400 office spaces and 3,765 parking spaces. The project has been built to achieve LEED Silver design standards using recycled and renewable materials with energy reduction levels to meet requirements. The facilities for the 3rd Brigade Combat Team, 1st Infantry Division are complete and being occupied. Several buildings, including a Brigade Headquarters and Annex, Company Operation Facilities, two barracks facilities, and a dining hall were constructed to accommodate the deployable unit.

A&M: How is the realignment affecting the local economy?

Ogden: The realignment is generating construction jobs as we build the Human Resource Center of Excellence and with more permanent parties moving to the area, Fort Knox expects its employees to have a positive economic impact on the local economies, generating tax revenues and sales. Members of the local community can expect new residents who will bring a need for more infrastructure in education, transportation and housing.

For more information, visit <http://www.knox.army.mil/>

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The Quiet Professionals

The U.S. Army Special Operations Command (USASOC) is the largest member of DoD's special operations community, structured and trained for joint and coalition operations to meet threats across the spectrum of conflict worldwide.

By USASOC Public Affairs

The Quiet Professionals of the U.S. Army Special Operations Command (USASOC) have been operating at the forefront of the War on Terror since the attacks of Sept. 11, 2001 and continue to make great contributions worldwide. The operations tempo for Army special operations forces has never been greater, and is not likely to decrease in the near future.

CORE PERSONNEL

Fort Bragg, N.C. is home to a large portion of the Army's special operations units and personnel. Of about 27,000 personnel serving within USASOC, a little more than 10,000 men and women are located here, assigned to USASOC headquarters and multiple subordinate commands.

Reaching its 20th year of service last December, the command trains, organizes, and equips Army Special Operations Forces units capable of conducting global Special Operations missions. Army Special Operations Forces units perform a variety of missions, including special reconnaissance, psychological operations, civil affairs, unconventional warfare, foreign internal defense, direct action, counterterrorism, and counterinsurgency.

USASOC soldiers employ warfighting skills ranging from exceptional individual tactical skills, to the most advanced and demanding collective combat capabilities, to skills requiring an advanced appreciation of human behavior. USASOC soldiers and units frequently employ both innovative technology as well as primitive solutions to accomplish their missions.

On any given day elements of three of the five active-



A Ranger squad keeps watch during a night-time raid in Iraq. Army Rangers are some of the most formidable and lethal fighters on the modern battlefield, especially in close-quarters battle. Their advanced training in urban operations helps them remain a cutting-edge fighting force capable of quick, devastating strikes on enemies of the U.S. and its allies. (Photo courtesy USASOC)

duty special forces groups, units from the two National Guard Special Forces groups, one Ranger battalion, about 36 special operations aircraft, and more than 35 civil affairs teams and 35 psychological operations teams and sustainment brigade logistics units are deployed around the world. Although only about five percent of our Army, USASOC is the largest of the service components that make up U.S. Special Operations Command, and provides about 70 percent of the special operations personnel in U.S. Central Command theater.

OPERATIONS FOCUS

For those in USASOC, the operations tempo is fast. Operating around the world, often behind the lines, in some of the most remote and hostile regions on the planet, USASOC currently has Soldiers deployed on more than 100 missions in nearly 60 countries. Despite the rapid pace, morale and job satisfaction have seldom been greater.

Combined with some of the best equipment and training of any military force in the world, USASOC has never lost sight that the key to winning the fight is the quality of its Soldiers. Now, the

single largest airborne command in the Army, the majority of Army special operations soldiers are specifically assessed and selected to meet the demanding requirements of specific formations.

Following successful selection, USASOC soldiers undergo comprehensive and demanding training programs that prepare them for assignments within the operational units. After nearly

a decade of war, USASOC ranks are as experienced and well seasoned as they have ever been. USASOC has a backbone of impeccably trained, seasoned noncommissioned officers who take quiet, professional pride in executing missions with excellence, honor and valor.

Increasing the size and capability of Army special operations forces continues to be the command's highest priority. Special operations personnel, skills and training are in great demand. In his agenda for defense, President Barack Obama stated, We must build up our special operations forces, civil affairs, information operations and other units and capabilities. To sustain the force and ensure that we have the depth to provide better predictability for deployments and stability for their families, the force must grow. To that end, USASOC units are experiencing growth and associated reorganization to meet current and future requirements worldwide.

SEVEN TRIBES

USASOC comprises seven principle units. Included in these seven tribes are the U.S. Army John F. Kennedy Special Warfare Center and School; the U.S. Army Special Forces Command; the 4th Psychological Operations Group; 95th Civil

Affairs Brigade and 528th Sustainment Brigade; all located at Fort Bragg. The 75th Ranger Regiment, headquartered at Fort Benning, Ga., and the 160th Special Operations Aviation Regiment, headquartered at Fort Campbell, Ky., round out the remaining principle units.

The command also provides oversight of two Army National Guard special forces groups in coordination with the National Guard Bureau and state adjutants general, the 19th Special Forces Group located in Draper, Utah, and the 20th SF Group out of Birmingham, Ala.

EDUCATION AND TRAINING

The U.S. Army John F. Kennedy Special Warfare Center and School, USASOC's special operations university, is responsible for selecting, training and educating special operations forces, as well as leader development. The school teaches more than 10,000 students in more than 60 different courses each year.

The Center and School's 1st Special Warfare Training Group conducts a variety of special operations training including the qualification courses for special forces, civil affairs and psychological operations as well as advanced capabilities



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such as advanced urban combat, military freefall parachuting and combat diving. It is also home to the David K. Thuma Noncommissioned Officer Academy and the Special Forces Warrant Officer Institute.

The Special Warfare Medical Group is the heart of special operations medical training. As such, it is responsible for all U.S. military special operations forces combat medical training including Army Rangers, Army civil affairs medics, and Navy corpsmen.

WARRIOR DIPLOMATS

Bestowing the Green Beret upon Special Forces at Fort Bragg in 1961, President John F. Kennedy called the distinctive headgear a symbol of excellence, a badge of courage, a mark of distinction in the fight for freedom. That standard of excellence continues to distinguish those who have earned the Special Forces tab.

Created in 1952, the U.S. Special Forces take their lineage from several World War II organizations, namely the First Special Services Force (the Devil's Brigade), the Alamo Scouts and, in particular, the famous Office of Strategic Services.

Within U.S. Army Special Forces Command (USASFC), two of those five Special Forces groups, the 3rd and 7th, are stationed at Fort Bragg. The 7th, however, is slated to relocate to Eglin AFB, Fla. in 2011 as a result of Base Realignment and Closure.

USASFC unconventional warfare capabilities provide a viable military option for a variety of operational taskings, making it the U.S. military's leading unconventional warfare force. In high demand for their adaptability, cultural acumen, language and specialty skills, special forces soldiers take great pride in their official motto, *De Oppresso Liber*, a Latin phrase meaning, *To Liberate the Oppressed*. This refers to the purpose of their core, unconventional warfare mission: to liberate oppressed peoples from hostile occupation or tyrannical regimes.

LIVING LEGACY

The 75th Ranger Regiment is the world's premier special operations light infantry force. They are masters of commando-like operations including raids, seizing and securing key objectives such as airfields and other direct action operations.

Rangers take great pride in a fighting legacy with roots back to the French and Indian wars when Roger's Rangers fought on America's frontiers. Rangers fought throughout the European theater during World War II, and conducted deep penetration attacks against the Japanese in the China-Burma-India theater.

Rangers have played a vital role in Korea, Vietnam, Grenada, Panama, Kosovo and Somalia. Throughout their long history, Rangers have thrived in tough environments, taking the fight to

the enemy as their motto *Rangers Lead the Way* implies.

Ranger training, at night and in adverse conditions, encompasses arctic, jungle, desert and mountain operations, as well as amphibious instruction.

PLUS OR MINUS THIRTY SECONDS

The 160th Special Operations Aviation Regiment (SOAR) is home to the world's best helicopter pilots and one of the most heavily committed SOF units in the U.S. military. Throughout its history, the Night Stalkers of the 160th SOAR have compiled an unparalleled track record of successfully inserting and exfiltrating special operations personnel. Special operations forces have come to rely on the plus or minus 30 seconds guarantee of the world-class aviators from the 160th SOAR. Tight-knit and proud, the members of this Army special operations unit live up to their motto: *Night Stalkers Never Quit*.

WORDS CONQUER

The 4th Psychological Operations Group (PSYOP) is the active Army's only psychological operations element. The 1,300-member Fort Bragg unit, slated to grow to about 2,300 troops by the year 2011, has six regionally aligned battalions that include cultural experts and linguists who understand political, ethnic and religious subtleties. The 4th POG designs messages for foreign audiences using TV, radio and print, as well as the internet.

You will find PSYOP troops at many overseas locations to assist U.S. and foreign governments, militaries and civilian populations. Their activities use nonviolent means in often-violent environments. Persuading rather than compelling physically, they rely on logic and emotion to promote specific attitudes or behaviors favorable to U.S. objectives.

ADVISE, SUPPORT, STABILIZE

From a little more than 400 personnel just a few years ago, the 95th Civil Affairs Brigade now consists of four battalions, and there are already tentative plans to activate a fifth battalion. The brigade bridges the gap between civil populations and the U.S. military to address conditions that promote instability and exploitation by extremists. Civil affairs teams deploy worldwide, building ties with the local residents, identifying civil vulnerabilities and finding creative solutions to problems. To accomplish the mission, the 95th CA Soldiers are language trained; culturally sensitive negotiators who understand the complicated web of relationships, and can operate in remote and austere conditions.

From the Philippines to Pakistan, from Mali to Colombia, Afghanistan and Iraq, the Army's only active duty civil affairs brigade is engaged around the world in more than 20 countries at any given time, operating alongside other special operations forces and U.S. government agencies, soldiers of the 95th support combatant commanders, and U.S. ambassadors

through the Civil Military Support Element. Sometimes in a military uniform and other times with a beard, 95th CA Soldiers work closely at the local level with tribal elders, the regional level with governors and military leaders and at the national level with host nation officials.

UNRIVALED SUPPORT

In December 2008, Fort Bragg's Special Operations Support Brigade was reflagged as the 528th Sustainment Brigade. As the Army's only airborne sustainment brigade, nearly a third of the 528th is deployed somewhere in the world on any given day, providing critical sustainment support to special operations units. The 528th also has the Army's only air transport medical team designed to provide critical care aboard fixed winged aircraft. Whether at the top of a mountain, or the edge of a map, the 528th Sustainment Brigade is likely there ensuring special operations units have what they need.

WITHOUT EQUAL

The performance and contributions of Army special operations forces in U.S. Central Command theater of operations and around the world have been nothing short of magnificent. Whether in

Iraq and Afghanistan, the Philippines, Trans-Sahara Africa or wherever friends and partners find themselves challenged by the forces of disintegration, oppression and extremism, Army special operations forces from across USASOC formations are unquestionably among America's most relevant solutions to the threats our nation faces.

Thousands of successful operations spanning the past 8 1/2 years have not been without severe sacrifice and cost to our soldiers and families. At the time of this writing, 252 USASOC soldiers have made the ultimate sacrifice for our country and around 2,100 more have been wounded. Our thoughts and prayers remain with our Gold Star families and with these heroes. Rest assured, USASOC soldiers remain resolute in their focus on mission success and supporting our nation's fight in the War on Terror. The command's motto, *Sine Pari*, or without equal, captures the spirit of its personnel and our commitment to maintaining the world's finest ground special operations force.

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JULY 2010

Commander's Corner

MG Brooks L. Bash

Director of Operations, U.S. Air Force Air Mobility Command

Feature Stories

Expeditionary Operations: Joint Integration

As part of DoD's Joint Operational Concepts, the U.S. Army and Marine Corps are relying on greater interdependence in providing combatant commanders with joint armored transport, tactical and operational capabilities to support the simultaneous deployment, and sustainment of assets within an integrated, distribution system.

Ground Soldier System: Infantry-level C4

The Ground Soldier System (GSS), a third evolution of the U.S. Army's Land Warrior (LW) and centerpiece of the Future Force Warrior (FFW) program, will offer warfighters enhanced situational awareness, communications, and targeting capabilities within state-of-the-art body armor packaging.

Recurring Highlights

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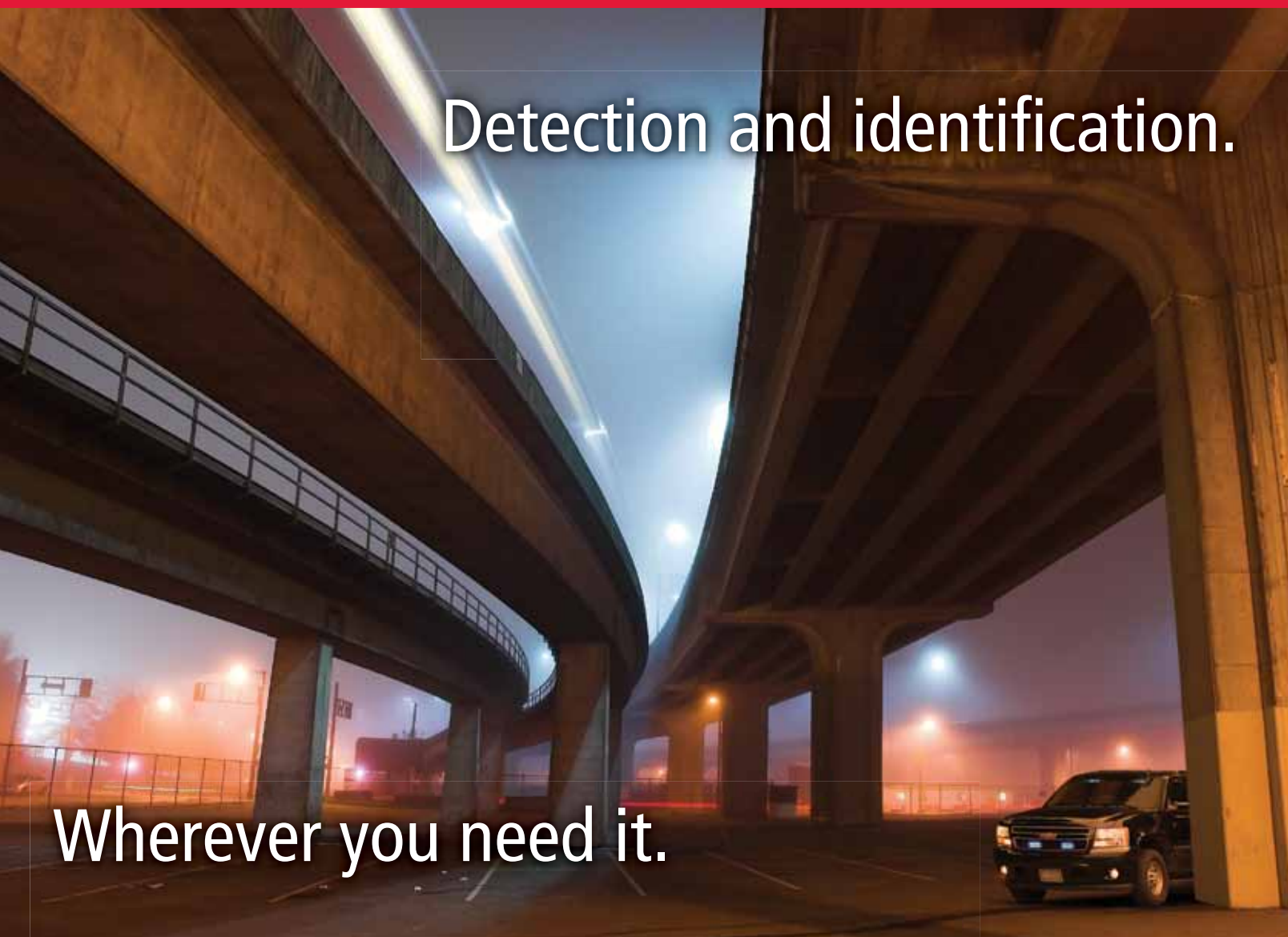
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