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CONNECTING THE LAST TACTICAL MILE

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WIN-T Increment III
PM Tactical Radios
PM Network Enablers
PM Mission Command

PEO Corner

Mr. Gary Martin
Program Executive Officer
PEO Command, Control
and Communications- Tactical
Aberdeen Proving Ground, MD

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Next Level Net Ops

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By Larry Muzzelo

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Cover: Master Sgt Chris Thompson, chief joint terminal attack controller instructor, Ft. Carson, CO, deployed to the 704th Expeditionary Support Squadron, Al Udeid Air Base, Qatar, communicates via remotely-operated video enhanced receiver. (U.S. Army)

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Insights

While the country deepens its focus on the presidential races, time does not stand still for the nation's men and women in uniform. Continued terror threats at home and abroad, as well as conflicts in the Middle East and worries in East Asia, are pushing continued innovation in tactical communications to meet the needs of U.S. armed forces, including added power requirements to ensure these capabilities stay energized and in the fight.

The March 2016 issue of Armor & Mobility/DoD Power & Energy delves into a world of seamless, integrated networking that is taking U.S. Army and Joint tactical comms to the next level of command and control. The evolution of the trusted Warfighter Information Network-Tactical (WIN-T) is in current testing and evaluation of next increment (Inc III) network operations (NetOps). Added capabilities are expected to keep soldiers and commanders connected and synchronized better than ever before. An exclusive interview with the director and program managers from the Program Executive Office for Command, Control and Communications-Tactical (PEO-C3T) sheds light on efforts to field seamless connectivity through Network Integration Evaluation (NIE)-qualified, next-generation advances to tactical network capabilities. In short, soldiers will find more efficient and reliable comms, from initial contact establishment to final sign-off across Soldier Radio Waveform (SRW) on Joint Battle Command-Platform (JBC-P) in support of Common Operating Environment (COE) requirements addressed by Command Post of the Future (CPOF) web-enabled common user interface capabilities.

From hardware necessary to conduct communications to the software necessary to enable it and secure the airwaves, Army Communications-Electronics Command (CECOM), Aberdeen, MD, is seeing a shift in focus to commercial-off-the shelf (COTS) hardware running on DoD-developed software to streamline the integration of legacy and newer equipment previously incompatible. Deputy to the Commanding General Larry Muzzelo speaks to CECOM Software Assurance initiatives in bringing greater ease of cyber defense software installation and operation to squad and brigade level force structure more independent of centralized command and control than under previous battalion and higher-level command and control as in past operations.

On the power and energy front, the ever-present challenge of maintaining balance between energy availability and security continues to keep DoD energy engineers up at night. From lithium-ion batteries to solar farming to pack-based auxiliary power production, this issue of DoD P&E looks covers the gamut from individual field user to facility integration to fleet standardization.

As always, feel free to contact us with comments and suggestions!

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ARMY PREPARES TO TEST

ENHANCED NETWORK OPERATION TOOLS AT NIE 16.2

By Amy Walker, PEO C3T Public Affairs

To make it easier for Soldiers to manage the vast tactical communications network, the Army plans to operationally evaluate newly enhanced and simplified Network Operations (NetOps) tools during Network Integration Evaluation (NIE) 16.2 this spring.

The NetOps tool suite enables communications officers (S6s and G6s) and staff to provide a second set of eyes on the Army's tactical communications network, Warfighter Information Network-Tactical (WIN-T), ensuring Soldiers and Commanders remain connected, communicating, and synchronized.

"NetOps provides a picture of actual on-the-move network battlefield conditions at all times, so if there is any break in the communications it is known right away," said Sgt. First Class, Jason Gourlie, satellite communications (SATCOM) systems operator for the 101st Airborne Division, who supported recent NetOps testing. "Mission objectives can change at any given second and without proper communications, without that ability to reach back, there can be a delay in a Commander's on-the-spot battlefield decisions, which could [potentially] change the outcome of the mission or even cost lives."

The WIN-T network is the tactical transport mechanism that delivers high-speed, high-capacity voice, video and data communications at every echelon throughout theater. It supports Soldiers in the command post, in networked vehicles traversing the battlefield or even early entry paratroopers seizing a remote airfield. WIN-T is the tactical network backbone to which other networked communication systems and mission command applications need to connect in order to function effectively. The Army's suite of NetOps tools help Soldiers to configure, operate, monitor, troubleshoot and defend this immense network. The new NetOps enhancements simplify and increase visibility across the network to make these tasks easier, more efficient and effective.

The NetOps upgrades will be tested as part of the WIN-T Increment 3 Follow-on Operational Test (FOT), scheduled to be conducted during NIE 16.2 this spring at Fort Bliss, Texas, and White Sands Missile Range, N.M. As part of an extensive effort to reduce risk for the FOT, the Army tested the new NetOps improvements during the WIN-T Increment 3 Functional Qualification Test #3 (FQT3), supported by Soldiers from the 101st Airborne Division and 10th Mountain Division, at the contractor facility in Taunton, Mass. The contractor's in-plant test bed environment mirrored an operational WIN-T network environment using actual WIN-T Increment 2 equipment and vehicles. The Army will perform additional risk reduction testing at its own Emulation Test Bed at Aberdeen Proving Ground, Md., to further prepare for NIE 16.2. A successful test at the NIE will support the new NetOps software technical insertion into the WIN-T network, currently projected for fiscal year 2017.

"The Functional Qualification Test highlights the synergy between PM WIN-T, the Army Test and Evaluation Command (ATEC) and industry," said COL Greg Coile, project manager for WIN-T. "These three entities teamed early in the testing process to ensure that all the proper testing procedures and instrumentation were in place to increase efficiencies in time and cost by reducing risk for the operational test at NIE 16.2 this spring."

The Army tested new Network Operations (NetOps) enhancements during the Warfighter Information Network-Tactical Increment 3 (WIN-T Inc 3) Functional Qualification Test #3, in preparation for the WIN-T Inc 3 Follow-on Operational Test, scheduled to be conducted during Network Integration Evaluation 16.2 this spring. Soldiers from the 101st Airborne Division and 10th Mountain Division were trained on and supported the testing of the new NetOps enhancements. (Amy Walker, PEO C3T Public Affairs).

The new NetOps simplifications also improve defensive cyber visualization to help signal Soldiers more easily manage and protect the network. The WIN-T Inc 3 FQT3 included the implementation of Public Key Infrastructure (PKI) in the tactical formation. PKI supports the distribution and identification of public encryption keys, enabling users and systems to securely exchange data over networks and verify the identity of the person with whom they are communicating. It provides assured identity for personnel and non-personnel entities, and prevents unauthorized systems and services from connecting to the network. It also reduces system complexity by reducing the number of passwords needed to manage the network.

The Army continues to listen to Soldier feedback from theater, user juries and test events to make WIN-T NetOps, systems and user interfaces more intuitive and easier to operate. System simplification increases equipment and network "up-time" through the reduction of human error, while reducing task completion time and training requirements. Recent simplification improvements include enhancements to the troubleshooting and preventative maintenance tools that alert operators of potential network equipment problems.

"The biggest benefit [of the upgrades] is the increased usability piece of the NetOps tools and the enhancement of monitoring capabilities," said Chief Warrant Officer 3 Charles Coker, instructor at the Army's Cyber Center of Excellence. "It provides NetOps personnel with a robust software solution for better management of the network and it also allows Soldiers to probe into the network to troubleshoot connectivity issues. The user interface is easy to circumnavigate as the tools provide you step-by-step guidance towards planning, installing and managing your unit's tactical network. Now that we have that capability, planning, establishing and sustaining a tactical communications network for future missions is more easily attainable."

WIN-T NetOps provides the big picture of the network so communications officers and staff can better manage network resources, fix breaks in connectivity faster or even before they may happen, and improve network visibility to better defend the network against cyber-attacks. Going forward, the Army will continue to make NetOps more user-friendly, providing a consistent look and feel across the various WIN-T configuration items to minimize training impact and reduce Soldier burden.

"I have used the previous NetOps before and this version has gotten more powerful," said Sgt. First Class Jean Burgosdeleon, tactical command post platoon sergeant for the 101st Airborne Division. "It helps with quicker set up of equipment and adds more capability. The S6 shop can monitor your network and actually inform you when something goes down. When you are engaged with something else, it's like having a second set of eyes on your equipment. It is providing a [definite] edge."

Both the at-the-halt and on-the-move increments of WIN-T will share a common NetOps for more seamless interoperability, easy monitoring and a reduction in training requirements. The new NetOps software enhancements are also helping to pave the way for the convergence of the NetOps tools and management for both the upper tactical internet (WIN-T) and the lower tactical internet (radio networks). The goal of NetOps convergence is to provide one tool, or an easy to use integration of tools, into a single seamless delivery so that the S6 has one tool set to more easily see and manage the entirety of the network. The S6 will be able to see all the many facets of the network in one cohesive picture, said Lt. COL (P) Ward Roberts, product manager WIN-T Increment 3, which manages the WIN-T NetOps.

"As the Army continues to add more capability to the network to ensure Soldiers at every echelon remain connected and engaged, all of this technology, this unified network of capability, has to be managed," Roberts said. "By converging and simplifying NetOps across all those command posts, networked vehicles and radio networks, we gain power and a stronger foothold on the network and on our enemies." ■

Lead art: As part of Network Integration Evaluation 16.2 this spring, the Army plans to operationally evaluate newly enhanced and simplified Network Operations tools sets that make it easier for Soldiers to manage the vast tactical communications network that spans the battlefield. (U.S. Army)

ENABLING THE ARMY'S TACTICAL NETWORK

Armor & Mobility spoke recently with Stanley Niemiec, Project Lead for Network Enablers (PL Net E), part of the Army's Program Executive Office Command, Control and Communications-Tactical (PEO C3T). Seizing the mandate to deliver a tactical communications network that is simple for Soldiers to use but tough for adversaries to break, PL Net E is efficiently managing multiple programs that protect, connect, bond and streamline the Army's tactical network. Mr. Niemiec is charged with ensuring the security and fidelity of the information transmitted across the tactical network; simplifying warfighter and first responder network tasks and operations; and streamlining the delivery of common hardware, software and collaborative technology solutions to meet today's changing needs.

A&M: Can you give us an update on major initiatives within PL Net E?


Stanley Niemiec, Project Lead for Network Enablers (PL Net-E)

Niemiec: Under the Net E umbrella we have a consolidation and efficiency effort of bringing in various product offices that support or secure the tactical network as a whole across all the other program managers in the Army. As a result, our products support many initiatives. These include providing the security of the network through our communications security (COMSEC) capabilities and bringing up the codes required for COMSEC to function through our secure "keying" efforts. We also enable the interoperability of the network so our warfighters, vehicles, command posts and headquarters can talk to one another through our data products and initialization efforts. Through our Common Hardware Systems office we deliver commercial-off-the-shelf information technology (COTS IT) hardware that is used in vehicles and command posts. And when Soldiers are back at home station, we provide SharePoint and milSuite collaboration tools. In January, we also added to our portfolio the Vehicle Intercom System or VIS, found in tactical vehicles. So it's quite a range of capabilities and support we provide through Net E. In essence though, they all have one common theme – to serve as the enablers for the Army's tactical network.

A&M: You mentioned VIS is now part of your portfolio, what is on the immediate horizon for this system?

Niemiec: VIS just transitioned this month from PEO Enterprise Information Systems to PEO C3T and subsequently was assigned to PL Net E. With it comes two different systems, the VIC-3, which is in sustainment and fielded to more than 120,000 platforms and VIC-5, the newest intercom system. The biggest difference between the two is that the VIC-3 supports the legacy, non-data radios and the VIC-5 supports the Army's next generation of software-defined tactical radios and is backwards compatible with VIC-3. Each platform has its own requirements and we're still doing the research to understand those requirements. We have a lot of work to do, but immediately we are reaching out to all the platform PEOs to understand the requirements and as we get more information we'll be able to put together a full support and fielding plan. This program will be managed through our Common Hardware Systems Product Lead Office.

A&M: What capability is on the immediate horizon that has your attention?

Niemiec: One of the largest efforts that we're now heavily involved in is known as the Embedded Crypto Modernization Initiative or ECMI. This will incorporate a large population of various systems with embedded cryptography, including the Single Channel Ground and Airborne Radio Systems (SINCGARS), with more than 300,000 currently in the field and many integrated onto Army platforms. We are in the process of developing the Request for Proposal package for engineering solutions for the different radios that we'll need to modernize. But we know we'll need to upgrade the hardware that uses embedded cryptography so it is able to accept and utilize modern keys and we are up against a deadline to meet looming National Security Agency (NSA) established critical dates. While we are still in the planning stages we know we'll be working with the owners of the radios in addition to the program managers. We'll be going directly to units since a lot of these radios are currently in vehicles and work on a plan to swap out the radios with those that have been reset with the modern crypto chip and algorithm. This effort will allow Soldiers to continue to talk on secure net in the future and give them reset radios a little faster than originally planned.

A&M: What improvements to existing capabilities is Net E working on now?

Niemiec: Within our tactical network initialization and configuration program, which includes data products, we're

A Soldier programs a Simple Key Loader to allow radios to communicate securely. (U.S. Army)

focusing on streamlining and automating our process. Just recently we fielded our new Initialization Tool Suite (ITS) to the Eighth Army in Korea. This tool allows the Army's mission command and networked tools to communicate with each other and brings a simplified start up process, increased flexibility and the opportunity to make changes on the fly. So the process is getting faster. The process prior to ITS included sending out a preloaded disc and if revisions were needed, a new set of data products could take more than 16 weeks before delivery. Now Soldiers can make changes as needed without waiting. ITS is being fielded next to Army Europe and then to other bases worldwide.

Another new capability we're excited about is the Army's Key Management Infrastructure or KMI. This brings an automated way to download cryptographic key securely and over the air. This web-based storefront for delivery of keys replaces manual process and legacy equipment while protecting radios, tactical laptops and other comms systems from enemy interception.

Both ITS and KMI are reducing significant vulnerabilities by replacing the need to physically deliver data products and key to units, even when they are out on the battlefield. The impact will be large because it will take the man out of the middle, which will not only reduce time required to download new key but will save manpower and lives.

As we advance these new capabilities, we are also working on an effort to clean up old hardware across the COMSEC and Property Book Unit Supply Enhanced (PBUSE) accountability battlefield and replace it with upgraded equipment. Known as the Army-Wide Cryptographic Network Standardization (ACNS) initiative, we are leveraging $283 million worth of modernized equipment to replace 30,000 legacy End Cryptographic Units [ECU] through an accelerated fielding process. The ECUs have aging algorithms and are becoming too costly and logistically difficult to support, so we are doing the total life-cycle management which includes the user training, integration support, technical reach-back and demilitarization when it is no longer required.

A&M: Would you care to add anything else?

Niemiec: While a lot of what we do is in the background and seamless to the Soldiers, without it the tactical network doesn't function. When Net E was established in 2014, we worked to quickly establish not only the standard mission and vision for the new organization but to also organize for success so we can reduce complexity and give the Soldiers the tools they need to be more expeditionary and more effective. That's an ongoing goal that we in the Net E family look forward to carrying on as these initiatives continue to advance.

MULTI-PURPOSE IT COMMS

Federal Resources, a government contracting company located in Stevensville, MD, has recently been awarded a U.S. General Services Administration (GSA) Information Technology (IT) Schedule 70 contract. The IT Schedule 70 contract is a multiple award, indefinite delivery/ indefinite quantity (IDIQ) contract and is the largest, most widely used acquisition vehicle in the U.S. government offering a wide variety of information technology products, services, and solutions.

Partnering the IT Schedule 70 contract with their current GSA Schedule 84 contract for Total Solutions for Law Enforcement, Security, Facilities Management, Fire, Rescue, Clothing, Marine Craft and Emergency/Disaster Response, Federal Resources can now supply their customers with the latest technology available to them for all of their networking and communications needs.

"We understand the need for technology in the world today," says Federal Resources' CEO, Robert McWilliams, "and we are excited to provide government agencies and more specifically the war fighters, the tools needed to perform their mission at the highest level possible."

Federal Resources has increased both market penetration and product offerings every year through unique partnering with manufacturers like Airbus Defense and Space, Klas Technologies, Haivision, Engility and Sonus. The first offering on the GSA Schedule 70 contract is the Airbus Defense and Space's Ranger Flyaway Multi-Band Terminal, the Ranger 1000, complimented by an array of options.

"With the rise of terrorist threats in the United States, we strive to support the brave men and women who plan to track down these threats." exclaims McWilliams. "The addition of this contract enables us to further support them by offering not only the equipment, but the training and support needed."

More info: federalresources.com

PEO Corner

Connecting the Last Tactical Mile

Through a collaborative effort across the requirements, materiel and operational communities, the Army is improving the tactical network by fielding intuitive, expeditionary and secure capabilities to enhance leaders' situational awareness and provide operational flexibility.

Mr. Gary Martin

Program Executive Officer
PEO Command, Control and Communications-Tactical
Aberdeen Proving Ground, MD

For more than 30 years, Gary Martin has worked for various Army missions delivering information and communications technology that Soldiers need now and in the future.

As Program Executive Officer for Command, Control, Communications-Tactical (PEO C3T), Mr. Martin guides a workforce of more than 1,600 personnel who acquire, field and support the communications networks, radios, satellite systems and other hardware and software Soldiers require for information dominance on the battlefield. Mr. Martin took command of PEO C3T on June 2015.

Mr. Martin comes to PEO C3T after serving as the U.S. Army Communications-Electronics Command (CECOM) Deputy to the Commanding General, where he worked with the commander in the development and execution of organizational goals, objectives, and policies aimed at providing world-class, integrated Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) solutions to the Soldier.

From 2008 to 2011 Mr. Martin served as the Executive Director to the Commanding General of the U.S. Army Research, Development, and Engineering Command where he served as AMC Corporate Leader for technology generation, development and integration while implementing engineering policies and procedures, formulating and overseeing strategic planning and execution of approximately $2.5 billion annual investment in research, development and engineering programs.

Mr. Martin served on active duty as a Signal Corps Officer in the Satellite Communications Agency from May 1984 through May 1988. His military education includes the Program Manager's Course at the Defense Systems Management College, the Signal Officer's Basic Course, and the Radio Systems Officer Course.

He holds a Bachelor of Science Degree in Electrical Engineering from Norwich University and a Master of Science in Engineering Management from the University of Pennsylvania. Mr. Martin attended the Harvard Business School where he graduated from the Program for Management Development.

A&M asked Gary Martin, Program Executive Officer, Command, Control and Communications, PEO C3T, Aberdeen Proving Ground, MD, about current efforts to field seamless connectivity through Network Integration Evaluation (NIE)-qualified next-generation advances to tactical network capabilities.

Mr. Martin: Network modernization remains a key Army priority. We continue to deliver mission command capabilities to tactical and operational commanders to enable communications and networking solutions for dismounted, mounted, and command post operations. We are also enhancing the Global Response Force's ability to effectively communicate and execute mission command while enroute from home station to deployed locations

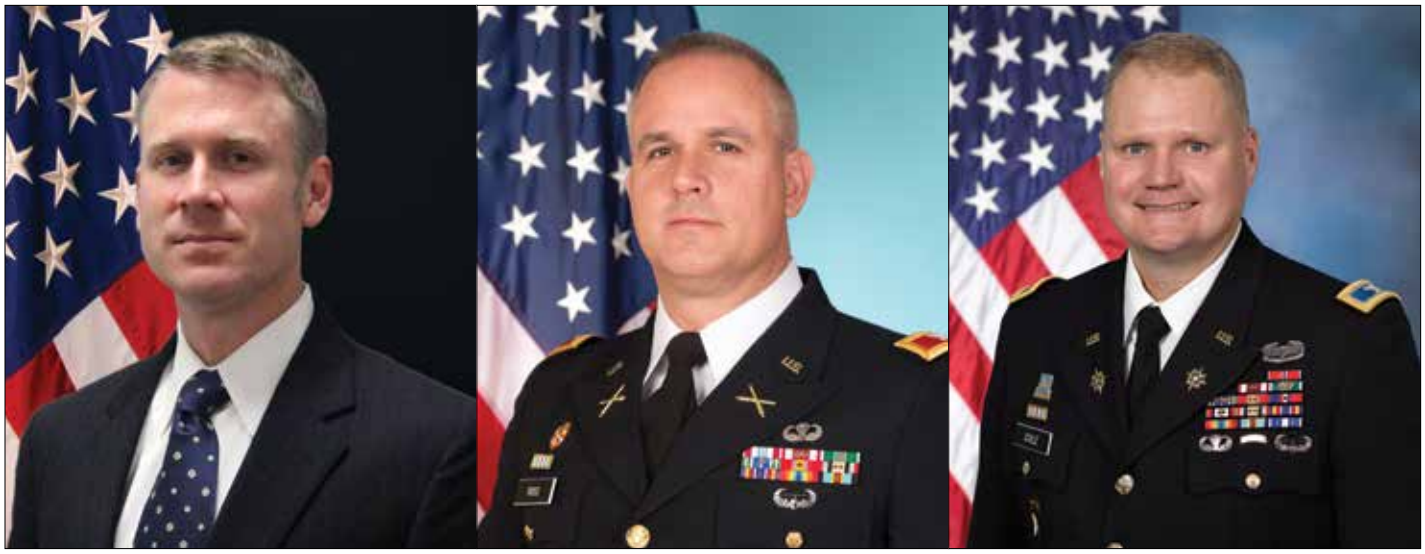
Soldiers, including LT COL Mark Henderson, product manager for Warfighter Information Network-Tactical (WIN-T) Increment 1 (left), work with Enroute Mission Command Capability (EMC2) onboard a C17 aircraft in flight during a Joint Forcible Entry exercise last December. EMC2 provides mission command, advanced communications and situational awareness while in flight to an objective. (Cpt. Lisa Beum, 1st BCT, 82nd ABN DIV, PAO)

around the world. Through a collaborative effort across the requirements, materiel and operational communities, the Army is improving the tactical network with efforts to make systems more intuitive, expeditionary and secure against cyber security threats. In Fiscal Year (FY) 2015, the Army delivered groundbreaking mobile connectivity to units in Afghanistan, networked Soldiers during the Ebola response in Africa, deployed satellite communications terminals in support of operational needs in Iraq and provided field support to units in Operation Atlantic Resolve.

Now, in FY 2016, the Program Executive Office for Command, Control and Communications-Tactical (PEO C3T), which is responsible for fielding the Army's tactical network, is delivering network upgrades through Capability Set Fielding and Unit Set Fielding to 79 Active, Reserve and National Guard units. Acting on user feedback from both operational deployments and operational exercises, we continue to enhance the expeditionary network by integrating new technology, implementing home station mission command training practices and streamlining fielding efforts to make the network less complex, scalable and more simplistic to operate. As we continue to field capabilities to the Army and work to ensure our network enables an expeditionary force, we will further improve the integration of various network components to simplify the tasks that Soldiers must take to maintain the tactical network.

As we simultaneously equip today's force and improve capabilities for the next generation Soldier, we must not forget about sustainment. The importance of cross command collaboration is imperative as we take sustainment strategies into consideration earlier in the lifecycle process. Focusing on improved security patching, software assurance, software licensing and field support, we know that decisions made by project managers early in program development can significantly impact what happens in sustainment. By taking a holistic approach to weapons systems development and working closely with our partners in the Army Materiel Command, Forces Command, and Army Cyber Command, we can deliver the most effective, sustainable and secure network for our Soldiers.

On the following page, the project managers for PEO C3T's portfolios discuss what capabilities we're fielding now, how they are evolving to meet future needs and what is next on the tactical front. COL Gregory Coile, Project Manager for Warfighter Information Network-Tactical (PM WIN-T), COL James Ross, PM Tactical Radios (PM TR) and Mr. Robert Tisch, PM Mission Command (PM MC) discuss the latest technology coming out of PEO C3T. Together, these capabilities (and those that Mr. Stan Niemiec, Project Lead Network Enablers, discusses on page 5) form the Army's tactical network.



Mr. Robert Tisch, PM Mission Command (PM MC)

COL James Ross, PM Tactical Radios (PM TR)

COL Gregory Coile, PM Warfighter Information Network-Tactical (PM WIN-T)

PMs Focus

A&M recently spoke with COL Gregory Coile, Project Manager (PM) for Warfighter Information Network-Tactical (PM WIN-T), COL James Ross, PM Tactical Radios (PM TR) and Mr. Robert Tisch, PM Mission Command (PM MC) regarding the latest capabilities being fielded by PEO C3T.

A&M: Why is the Army evolving capabilities to meet the needs of a more expeditionary force?

Mr. Tisch: User feedback from theater and operational exercises still indicate that we must make the network less complex for the user. We are working with the Army community to provide a 'tool kit' of network connectivity solutions and mission command applications. But they must be intuitive and easy to use. We know it's impractical to ask our Soldiers to adjust to one user experience at home station, another while en route to a mission and another once deployed. At PM MC, we are in the process of moving to one, intuitive user interface across the command post and mounted environments. This will imitate what we have at our homes or in our offices – when we move from a desktop computer, to iPad, to Smartphone. And as the Army continues to advance its Common Operating Environment (COE), which delivers an operating system similar to a Smartphone with applications riding on it and providing capabilities, it will help accelerate this concept simplifying the user experience.

COL Ross: The technology we're working on today will enable unprecedented capability for the next-generation Soldier. But we must also focus on lightweight, mobile and adaptable capabilities. Our radios must meet the needs of the expeditionary force. This means they must be able to operate in the network wherever the Soldier may be deployed. This presents enormous challenges in terms of interoperability, security and support to the mission. We are addressing all of these challenges so that what we field will enhance the performance of the Soldier in the network. We are looking at not only the size, weight and power of our radios, but also the ability to remain cyber secure, easy to operate and have the ability to increase capabilities more quickly.

COL Coile: The Army's regionally aligned force must be able to rapidly deploy, communicate and share situational awareness anytime, anywhere, at every echelon and every stage of operations. Some of our new WIN-T capabilities are providing communication and situational awareness for the Global Response Force (GRF) of the XVIII Airborne Corps for early entry operations. We are also evolving and simplifying network command posts operations to increase speed of maneuver and operational flexibility. And we are continuing to improve both increments of the WIN-T tactical communications network, which enable mission command, advanced communications and situational awareness from the enterprise all the way down to the company level, and even to the platoon level through WIN-T Increment 2 capability that extends FM radio nets. The WIN-T program's advanced communications capabilities enable scalable expeditionary networking and directly support the Army's push for uninterrupted mission command at every stage of operation.

A&M: Specifically what technologies are enabling this expeditionary focus?

COL Coile: The GRF supports unique and often dangerous early entry missions, and because they are first in, they need as much situational awareness as possible. While en route to an objective on board a C17 aircraft, our new Enroute Mission Command Capability (EMC2) provides advanced mission command and plane-to-plane and plane-to-ground network communications to these units while in flight. The capability transforms the aircraft into a flying Command Post. It enables commanders to conduct mission command and continue planning the fight en route, and it provides paratroopers with a comprehensive understanding of the potential challenges waiting for them on the drop zone. Then, once over the objective, paratroopers can jump with light-weight, portable satellite terminals, called Transportable Tactical Command Communications (T2C2), so they can remain connected to the network and the rest of the force as soon as boots hit the ground. T2C2 comes in a jumpable "lite" version as well as

an air-droppable heavy version when more bandwidth is required for follow-on company-sized units.

COL Ross: Within PM TR, our radios today are more like cell phones. They are always communicating. We're moving from the point-to-point or line-of-sight combat net radio solutions to networking radios that use secure, high-bandwidth waveforms to send voice, data, images and video – even past obstacles such as buildings and beyond-line-of-sight. This will change how the dismounted Soldier shares information. We have already fielded many Rifleman and Manpack radios and they are changing the way we operate. The Rifleman acts as its own router, allowing information to be transmitted up and down the communications chain, and into the network backbone provided by WIN-T, using the Soldier Radio Waveform (SRW). It's lightweight, rugged, handheld and can link with the Nett Warrior to enable Soldiers to send messages and access mission-related data, while on foot. The Manpack also operates SRW and enhances current comms capabilities by connecting small units in austere environments to exchange voice and data information with higher headquarters – all while not relying on a fixed infrastructure. And the Mid-tier Networking Vehicular Radio (MNVR) will pull together many of the SRW sub-nets and utilize the high-bandwidth Wideband Networking Waveform (WNW) to seamlessly tie the lower tier to the upper tier. This will connect Soldiers at all levels. Using these radios, Soldiers can send text messages to report enemy locations, request medical help, track unit readiness and call for fires.

Mr. Tisch: Last year we began fielding the Army's next-gen situational awareness and friendly force tracking capability, Joint Battle Command-Platform (JBC-P). Built on Soldier feedback, JBC-P offers a new level of intuitiveness, enabling Soldiers to pinpoint friendly forces, track enemy forces and identify hazards such as improvised explosive devices on a user friendly, Google Earth-like digital map that populates throughout the brigade in near real-time. Already fielded to the 2nd Brigade Combat Team, 3rd Infantry Division, JBC-P will soon field to elements of the 10th Mountain and 25th Infantry Divisions. This technology is transforming the way lower echelons communicate and navigate on the battlefield, but it is also easy to operate with capabilities such as chat rooms. JBC-P also serves as the foundation for the Mounted Computing Environment, or MCE, which will deliver Android-based warfighting apps as part of the COE.

A&M: How are these technologies evolving to be more agile as well as more intuitive to operate?

COL Ross: It's all about reducing the burden on Soldiers. So we are listening to Soldier feedback and applying lessons learned. We are

always looking for ways to reduce the size, weight and power (SWaP) of our radios. This doesn't just come down to the size of the radio itself, but the batteries and antennas Soldiers have to carry. It's about making it easier to use and operate for the Soldier and reducing complexity. We want Soldiers to have confidence in our systems so they operate them effectively. We must effectively train our soldiers, on all network equipment, not just our radios. And that training needs to start in the schoolhouse. This enables confidence in our equipment as Soldiers see value in what it provides them. Without that confidence they start to think that the equipment is no longer enhancing their mission because they don't understand it. And then they may stop using it or using alternatives. What we provide are extremely powerful pieces of equipment that enable the Soldier to communicate wherever and whenever they need.

Mr. Tisch: The Army is working to bring simplicity to the Command Post. Right now there are too many wires, too many standalone systems. So we're looking at how we can better consolidate. A focus within PM MC is on separating functional warfighting applications from the infrastructure, combining common services and synchronizing data. Mission command capabilities must be integrated so we deliver a unified user experience from garrison to foxhole. Part of this will come through the Command Post Computing Environment, part of the Army's COE. By providing apps that ride on common software, we can ask our vendors to put interoperability upfront. We are working to standardize maps, messaging and icons across multiple systems to reduce the training burden on the Soldier. For example, we are taking the Command Post of the Future (CPOF), the Army's primary system for viewing and showing the common operating picture, and moving into a web-based system. Initially, we will field Command Web in 2017, providing an engineering warfighting functionality and simple web-based tool, then we will transition the full capability of CPOF to the web environment with TacApps, which delivers a standard common user interface across capabilities with an intuitive Android-based, Google-like design. In essence, CPOF, one of the first technologies to transition acetate map information into a digitized format for information sharing in Iraq and Afghanistan is now setting the stage for moving to a web-based "apps" environment.

COL Coile: Previous and current enhancements to the mobile WIN-T Increment 2 network were designed to improve system reliability, simplicity and usability. We are also enhancing and simplifying WIN-T Network Operations (NetOps) to make it easier for communications officers to manage the vast network, with new upgrades to be evaluated at NIE 16.2. Other ongoing WIN-T Increment 2 enhancements support the unique transport and expeditionary requirements of airborne units. We reduced SWaP requirements of the WIN-T Increment 2 Tactical Communications Node (TCN) and the Network Operations and Security Center (NOSC) to enable us to integrate these configuration items onto HMMWV platforms vs the larger platforms they are integrated onto now. We are also introducing the WIN-T Increment 2 Rapid Vehicle Provisioning System (RVPS), which will be evaluated at NIE 16.2. This capability configures and installs needed software into each of a brigade's approximately 70 networked vehicles to significantly reduce install time and increasing speed of maneuver and operational tempo. We continue to listen to Soldier feedback from deployments to theater, NIEs and other operational training exercises to find out what we can do to provide Soldiers with the best network capability possible.

The Manpack Radio is the Army's first networking radio that provides two channels for communication, serving as a critical bridge in the Army network connecting Soldiers at the company level and below with real-time voice and data. It can be mounted inside tactical vehicles or carried dismounted and provides beyond line-of-sight connectivity through multiple waveforms, improving the ability for Soldiers to communicate despite obstacles such as buildings and difficult terrain. (U.S. Army)

A Warfighter Information Network-Tactical Increment 2 vehicle during Network Integration Evaluation (NIE) 16.1 at Ft. Bliss, Texas. Through the NIE process, the Army has integrated, validated and refined network capabilities and technologies that provide improved mission command and network connectivity from the command post to vehicles on-the-move to the dismounted Soldier. (Amy Walker, PEO C3T Public Affairs)

WATT A DIFFERENCE

P3Solar manufactures flexible solar panels using solar cells commonly referred to as CIGS (Copper Indium Gallium Selenide). The technology offers advantages over competing thin-film solar material due to the high efficiency of CIGS, a wide spectral response resulting in excellent low light behavior, and a demonstrated field history in portable charging.

First developed for the U.S. Marine Corps (USMC), the introduction of the P3 (Portable Power Pack) led to a subsequent contract with the U.S. Army Communications-Electronics Command (CECOM) to develop the P3-55 watt solar charger for the Bren-Tronics Soldier Photovoltaic Portable Power Pack (SP4). The SP4 evolved into the Rucksack Enhanced Portable Power System (REPPS) which includes P3 flexible, foldable solar chargers.

In 2008, the Marine Corp awarded the Solar Portable Alternative Communications Energy System (SPACES I) contract to Iris Technologies which developed a kit using two P3-62w solar chargers. In 2012, the USMC awarded Iris Technologies a follow on contract for SPACES II (next generation) which included two P3-62w solar chargers per kit.

P3Solar products have the best power to weight ratio in the industry at over 40 watts per pound. The flexible, foldable panels are smaller, lighter and charge more efficiently than other thin-film products. P3Solar produces a line of P3 products ranging in output from 20-125 watts. Rollable solar chargers are also available in 21, 90, and 200 watt configurations.

More info: p3solar.com

The P3-60w, Multicam weighs 1.5lbs and delivers up to 60 watts of power to recharge military radio batteries including; BB-2590/U (SINCGARS, AN/PRC-117), AN/PRC-148 (MBITR), and AN/PRC-152 (Falcon III) to name a few. (P3Solar)

FROM NODES TO NETWORKS

Armor & Mobility highlights tactical communications by examining the U.S. Army's newest capabilities in that arena. In particular, we look at two specific types of communication technology, Warfighter Information Network-Tactical (WIN-T), and Network Enablers (Net-E) and how a robust, expeditionary network can provide operational flexibility and increase situational awareness. Above all, both communication networks are part of the Army's Program Executive Office Command, Control and Communications-Tactical (PEO-C3T).

WIN-T contains a new tool suite, Network Operations (NetOps) that allows communications officers and their staff to carefully scrutinize the Army's tactical communication network, and works to ensure Soldiers and Commanders are connected, synchronized and in constant communication.

Net-E efficiently manages several programs that protect, connect and streamline the Army's tactical network. Of note is the constant need to ensure security and fidelity of information transmitted via the tactical network, warfighter simplification and making sure software and collaborative technology is up-to-date to meet today's ever-changing needs.

INDUSTRY SPOTLIGHT

GD MISSION SYSTEMS

WIN-T – Relevant, timely, actionable - supporting the Soldier's mission

As the prime contractor for the Warfighter Information Network-Tactical (WIN-T), General Dynamics Mission Systems (GDMS) is partnering with PEO C3T on WIN-T Increment 3, which will continually build on and improve the WIN-T network. This ensures the network keeps pace with advancements in technology and security while providing Soldiers with a simplified user experience and access to a common operating picture based on timely, relevant and actionable information.

A key aspect of Increment 3 is the network operations or "NetOps" suite of tools that enables communications officers to better monitor the WIN-T network while providing for improved training and ease of use. And as threats within cyberspace continue to evolve and grow, NetOps helps ensure the entire WIN-T network remains secure with seamless upgrades and network encryption.

Increment 3 will also expand the reach of the WIN-T network to provide a fully mobile and flexible tactical networking capability needed to support a highly dispersed force over isolated areas. This is especially important as the Army transitions to a faster, leaner force to handle future threats and missions across the globe.

Increment 3 will take the latest NetOps features to NIE 16.2 this spring as a System Under Test, which will serve as the FOT&E for the program. These NetOps enhancements will be provided as a technical insertion to the WIN-T network for fielding and support in 2017.

More info: gdmissionsystems.com

OTTO

The OTTO Earphone Kit with SureFire Patented EarLock® Retention Rings and Noise-Reducing Filters allows users to use a remote speaker microphone and hear normal sounds, yet be protected from loud impulse noises, such as gunshots or explosions. Closing the switch on the filter reduces ambient noise by up to 21dB, which can help in situations with loud crowd noise.

The OTTO Earphone Kit comes complete with a 3.5mm or 2.5mm plug, and SureFire earpieces in either small, medium, or large. An earpiece replacement kit is also available.

More info: ottoexcellence.com

AR WORLD

Troops in the field need to maintain constant communications. They need to exchange information and access streaming video in real-time. But they also need to be able to move quickly and easily. It's critical that they have powerful, durable amplifiers that are also lightweight and mobile. That's just what they get with AR Modular RF's AR-20 Booster Amplifier. The AR-20 provides 20 watts of power enabling radio sets to double or triple their range in especially difficult terrain. The AR-20 is lightweight with a low profile to allow the soldier to easily carry it into battle. This booster amplifier comes with an internal LNA, co-site filtering and it supports legacy and modern networking waveforms.

More info: arww-modularrf.com

NORTHROP GRUMMAN

Northrop Grumman has been perfecting military software defined radios (SDRs) for the past 30 years. The sophisticated systems in the company's Freedom family provide standard flexibility that essentially changes personalities based on mission needs but also includes necessary fault detection and fault isolation intelligence to quickly recognize battle damage and reconfigure all channels to maintain high-priority functions and ensure mission success. The multi-function, multi-channel architecture with high-fidelity RF filters allows all channels to meet performance specifications regardless of waveform or channel proximity.

From the high-end, modular 17-channel SDR to the scalable, extensible 2-channel SDR, the Freedom family ensures persistent communications of military tactical networks, Northrop Grumman's solutions provide the connectivity and collaborative capability to get the job done.

More info: northropgrumman.com/Capabilities/SDRs

INDUSTRY SPOTLIGHT

PERKINS

Perkins Technical Services, Inc. (PTS) is proud to support our troops by providing Power Supply Docking Station (PSDS) to the warfighter. PTS PSDS offers a power mobility solution to warfighters enabling dismounted tactical radio usage away from onboard charging stations while maintaining sustained operability within minutes from any AC/DC power source. Simply put, PTS PSDS provide immediate AC power to tactical radios worldwide, anywhere AC power is available. PTS PSDS provides the ability to use tactical radios in fixed and semi-fixed environments without batteries or dead-lined vehicles using AC or DC power in a continuous, reliable and cost effective fashion. PSDS provides operational effectiveness by eliminating radio downtime while establishing communications within minutes after deploying the PSDS system.

In today's military, the Army has continual requirements to communicate over the Tactical Network from fixed and semi-fixed sites dismounted from vehicles. PTS created an innovative solution to their problem by developing a lightweight, reliable, ergonomic small footprint system which allows tactical Receiver/Transmitters to be mounted and powered using any alternating current (AC) power grid. This becomes an invaluable component of Tactical Operations Centers. PTS PSDS incorporates a built-in high fidelity speaker removing the need for additional cables and external speakers. PTS PSDS have 9 pin DIN connectors (one for each radio) which connect directly to TOCNET. PTS PSDS is extremely easy to install. Simply plug your configured radio into the base, lock it down with clamps, attach the cables and power on.

Designed to meet differing deployment requirements, PTS offers 11 different PSDS supporting Harris, Raytheon and SINCGARS tactical radios; these systems support 24/7/365 radio operations to deployed troops. Located in Huntsville, Alabama, PTS has been in business for over 20 years providing PSDS systems to the Army, Navy, Marines and The National Guard. PTS can be contacted at sales@pts-inc.com or 256-539-6787.

More info: pts-inc.com

C-AT

AMCVISTM vehicle intercom systems have been fielded by the U.S. Army, Air Force, and Marine Corps SOF communities since 1995. All AMCVIS generations have focused on five critical criteria of SOF operators and 2016 funding constraints: reliability in open vehicles, transportability between vehicles, compatibility with legacy and new generation SOF vehicles, scalable from 3 to 10 operators, and low initial/sustainment costs.

As SOF vehicle designs and operator tactics have evolved, the U.S. made, COTS available AMCVIS rapidly adapted to maintain its relevance to the SOF community. AMCVIS configurations have successfully addressed all mission-specific iterations of the GMV, ITV, ULCV, and HMMWV in which they are utilized.

The intercom system supports simultaneous voice communications for up to ten squad members, and includes interfaces for two LOS/BLOS/SATCOM radios. An AMCVIS option, which can be enabled on demand in the field, "bridges" LOS radio users to the vehicle's BLOS/SATCOM radio.

A small, gloved hand friendly controller provides each operator with intuitive control of the intercom and radio(s) volume, separate P-T-T for the intercom and radio(s), and selection of which radio to "key" and transmit the individual operator's voice. This personal controller can be clipped to the user's load-bearing vest, allowing it to be readily accessible the user, without distracting their situational awareness in a hostile environment.

The limited capacity of a GMV, ITV or ULCV to power radios and other electronics is addressed by the AMCVIS; when equipped for nine operators, the AMCVIS shipset draws less than 400mA@12V.

NSNs have been assigned; units are available through GSA Advantage contract GS-07F-0653N; AMCVIS is not subject to ITAR.

More info: c-at.com/AMCVIS

INDUSTRY SPOTLIGHT

SILYNX

Silynx communications continues to lead the way in size, ergonomics, and capabilities of its in-ear communications systems. The disruptively small and lightweight Silynx CLARUS PTT in-ear headset system has always been available at a price point under $1,000. With impulse and steady-state noise protection, hear-thru for 360° situational awareness, single or dual communications connections, plug and play simplicity, and an array of available adaptors and wireless accessories, CLARUS offers a unique combination of modularity, reliability, and affordability. Configured with the dual-comms splitter, adaptors for radio or intercom system, and paired with the MWPTT (Micro Wireless PTT), the CLARUS provides high-quality combat-proven hearing protection and communications capabilities.

More info: silynxcom.com

SUSTAINING THREAT-LEVEL READINESS

The U.S. Army's Communications-Electronics Command (CECOM) is charged with the lifecycle sustainment and readiness of Army tactical system software, including its cyber security posture.

By Larry Muzzelo, Deputy to the Commanding General, U.S. Army Communications-Electronics Command (CECOM)

As part of U.S. Army Materiel Command (AMC), U.S. Army Communications- Electronics Command (CECOM) is a life cycle management command with over 13,000 trusted professionals across the globe. Serving as a "one-stop shop" for all of the warfighter's C4ISR needs, CECOM's overall mission is to provide, integrate and sustain readiness to enable unified land operations. CECOM has five major subordinate commands: The Software Engineering Center performs software sustainment of C4ISR systems, to include delivering security patches for fielded tactical systems; the Logistics Readiness Center focuses on field support, training, supply, and maintenance aspects primarily from a hardware perspective; Tobyhanna Army Depot provides maintenance, manufacturing, integration, logistical support and fielded repair to C4ISR systems worldwide; the Information Systems Engineering Command provides system engineering, installation and integration for post, camp and station networks; and the Central Technical and Support Facility conducts Army Interoperability Certification (AIC) testing on behalf of the Army's CIO G6.

Cyber Sustainment

Aberdeen Proving Ground (APG), where CECOM is headquartered, supports five major cyberspace functions:

- Analysis
- Development
- Acquisition
- Testing
- Sustainment

CECOM's role falls within the Sustainment portion of the overall cyberspace mission responsibilities within a program's Acquisition lifecycle. Once the Program Executive Office/Program Managers (PEO/PMs) field a capability and it is in production for a year or so, it's our responsibility to maintain the hardware and software for that product and ensure the supply system is responsive to hardware repair demands. CECOM's sustainment and logistics mission is a critical enabler in supporting soldiers and joint service personnel to ensure their C4ISR systems and the capability provided is operationally ready.

Across the DoD we are seeing a paradigm shift in C4ISR systems in that there's been an exponential growth in the use of software as well as a greater reliance on using commercial off the shelf (COTS) hardware and software within the Army's tactical communications systems. The Single Channel Ground and Airborne Radio System (SINGCARS) is a good example of how hardware used to drive the capabilities within the Army. Today, it is software that enables tactical radio systems while relying on commercial-off-the-shelf (COTS) hardware rather than hardware specifically developed for the Army. In today's Army, the Handheld, Manpack and Small Form Fit (HMS) Rifleman Radio and Manpack demonstrates how software is transforming tactical communications capability. Similarly, the Warfighter Information Network-Tactical (WIN-T), a weapon system that provides tactical networking capabilities essential for combat operations, is enabled mostly by integrating commercial software into the weapon system platform.

From a CECOM perspective, one of our key roles in sustaining software readiness is performing information assurance vulnerability alert (IAVA) patching of

Soldiers monitor a command and control common operating picture during a joint exercise. (CECOM)

C4ISR systems. Most consumers are familiar with the process of, for example, Microsoft and Apple sending notifications and updates to patch their software. We get the same notifications or alerts to patch the COTS software we have integrated into our weapon systems. It is critical for the Army to patch the software to maintain robust protection levels.

The Army's process in pushing patches has typically been accomplished in a manual fashion, sending physical media to the field which was cumbersome, costly and difficult to get positive confirmation that the appropriate patches have been installed; this requires soldiers to manually install software from a CD. In today's high tech environment, that's a non-starter. As a result, we are presently shifting our processes to be more responsive, timely and efficient.

We're working collaboratively with PEO Command, Control, Communications-Tactical (C3T), PEO Intelligence Electronic Warfare and Sensors (IEWS), Network Enterprise Technology Command (NETCOM) and FORSCOM while leveraging the Network Enterprise Centers (NEC) at post, camp and station as the facilitator for connectivity in order to download these patches. These efforts have shown a vast improvement of the delivery of patches to tactical systems through an electronic means. Soldiers are leveraging this capability to reduce the fairly significant burden a unit would normally have to undergo for them to individually patch these systems. Our biggest focus will be in making this process shift from physical to electronic patch installation as completely transparent and seamless as possible from a tactical unit's perspective.

Some of this work is going on at Ft. Bragg and Ft. Campbell, with a pilot program currently scheduled to happen in Germany this month. This initiative is not only beneficial to us, but also to the Soldier, as it greatly reduces the security risk of our tactical Army networks and systems. Addressing the growing cyber security threat through an effective and timely security patching process is a win-win for everyone. Our end goal is that through the use of a common portal, tactical units will have the ability to download the appropriate electronic file rather than a physical medium CD to perform a particular mission on the fly without having to rely on pre-mission patching to ensure network security.

Software Assurance

As I previously mentioned, the U.S. Army, and DoD in general, has experienced an exponential growth in the software capability

A Soldier provides command and control input with unit members in a joint operations center. (CECOM)

within our weapons systems. This growth has increased our ability to quickly introduce new capabilities through software updates rather than long-term and more costly hardware development efforts. However, with this paradigm shift we need to ensure we understand any vulnerability that may be inserted, through the software, into our systems and networks prior to fielding software. Years ago, our process was manually inspecting code – that is no longer practical. Due to the rapid growth of our software capabilities, our processes have not fully evolved to review software code for security flaws prior to fielding.

Here at APG, and in partnership with the PEO C3T, PEO IEWS and the Communications Electronics Research Development and Engineering Center (CERDEC), we are evolving our software assurance processes to understand and ensure the integrity of our software, from a security perspective, prior to fielding to the user. We believe this process is required before any software release is fielded. We need to fully understand the security vulnerabilities of the code we intend to field and make corrections to address those identified vulnerabilities before we deploy it, not after the fact. This is all about fielding the most robust, secure code possible.

CECOM is today using a suite of automated tools that identifies vulnerabilities of software that our customers and partners provide to us for assessment. As we mature our software assurance process, we realize that no single tool is the magic bullet. It's more about finding the right combination of tools so we can assess the software code in both static (when not running) and dynamic (when running) environments. Our focus is on increasing capacity

U.S. Army armored vehicles convoy through a mountainous area of Afghanistan during Operation Enduring Freedom. (CECOM)

and shortening the assessment timelines in order to better support all of our customers' needs. Improving our Software assurance is the best solution to field secure software.

Interoperability Certification

Another key responsibility of CECOM, through its Central Technical Support Facility (CTSF), is to conduct Army Interoperability Certification (AIC) and Configuration Management (CM) on behalf of HQDA CIO G6 to all LandWarNet/Mission Command (LWN/MC) systems/software baselines. AIC testing is executed in support of the CIO G6's Title 40 authority. CTSF is the Army's singular location and sole capability for C4ISR System of Systems interoperability testing for Title 40 certification. This testing confirms interoperability within/between Army tactical networks and systems prior to delivery to field units. This speaks volumes to how we ensure system-to-system interoperability to include backward compatibility across legacy and newer platforms.

Personnel Training

Perhaps the single largest protection envelope to ensuring network and system software security is personnel training and certification. One of CECOM's primary capabilities is to constantly address new equipment training perspectives on behalf of the PEO/PMs and unit commanders. We do this through the provision of signal universities at a number of installations nationwide. These facilities are charged with the training of soldiers on behalf of the ACOMs, and where cyber training is involved, CECOM facilitates certified technical hacking, malware analysis, and general network operability and vulnerability readiness. CECOM also trains DoD cyber protection teams prior to them going through their certification process. This workforce element is key to both the tactical and sustainment sides of the cyber defense execution and readiness missions from the PEO/PMs fielded capabilities to the life cycle management of those systems at the CECOM level. In cases where commanders need to execute a mission, there can't be a delay to determine if a network is or isn't secure since networks don't tend to tell you when they are about to be attacked.

Communications Security

From a cyber-defense perspective, another important element that comes into play is communications security (COMSEC). Within CECOM, the Communications Security Logistics Agency (a component of LRC) is responsible for managing all the COMSEC equipment and COMSEC accounts within the Army. COMSEC is an integral part of cyber security that often gets overlooked. One tends to think of network integrity rather than data integrity when thinking of cyber defense. As much as the firewalls that protect networks and applications, COMSEC devices and keys that encrypt specific data are an essential part of successful cyber defense. Without data security, communications between networks can more easily be compromised.

For 2016 and beyond, some primary CECOM objectives:

- Scale out IAVA patching to the Army through our partnership with FORSCOM, NETCOM, and the PEOs
- Increase our Software Assurance capacity
- Ensure that Communications Security is part of the cyberspace defense narrative
- Bring needed cybersecurity training to our customers

Determining how we measure software operational readiness and the cyber security posture of systems will remain a challenge for us. Measuring operational availability is typically viewed from a hardware-centric perspective– the paradigm shift to software will revolutionize our systems and the capability they bring through the interconnectivity of integrated networks such as WIN-T, Rifleman Radio, MNVR and HMS Manpack. This paradigm shift also challenges us to adapt our processes. At CECOM, we know we must adapt to provide sustainment support to software intensive tactical systems.

Overall, CECOM is poised to contribute significantly to the Army's Cybersecurity, Sustainment and Readiness efforts through our current initiatives that are being executed by our outstanding and professional leadership and workforce around the globe. ■

Special Ops Computing

As computer-use charges across the battlefield, LiquidCool Solutions challenged itself to develop a high-performance, ruggedized, fully functional computing system that significantly enhances combat capabilities. The result, Explorer 8, is a modular, go-anywhere, high performance, high reliability compute solution that overcomes harsh environment operating challenges with improved reliability and productivity.

Designed specifically for remote environments, using both the Intel Xeon processor and Intel Xeon Phi Coprocessor, the Explorer 8 provides efficient energy usage and improved scalability through modular design that expands computational capacity quickly. This modular approach also offers significantly lower initial capital costs with incremental, just-in-time expansion capability.

The RT-P is a compact purpose built computing device with a sealed enclosure ideal for harsh environment applications where other cooling methods fail. The rugged enclosure ensures waterproof I/O connectors, all electronics are protected from harsh environments, and it is fan-free for reliable, energy efficient and silent operation. The RT operates in environments ranging from 15 to 110 degrees F and reduces power to cool at the device level by 98 percent.

"The essential advantages LCS cooled computing technologies provide the U.S. military cannot be overstated," said Herb Zien, CEO, LiquidCool Solutions. "Where computing devices have given the U.S. military a degree of efficiency and effectiveness that has changed the way it operates at sea, in the air, and on the ground, LCS technologies will enable the military to perform with faster speed, greater reliability, and less risks than legacy technologies."

More info: liquidcoolsolutions.com

Waterproof Touch Screen

TRU-Vu Monitors has released a 17" touch screen in a waterproof panel-mount enclosure. The VMWTRPM-17C-SS is ideal for use in wash-down environments or anywhere a flush-mount touch screen must function in a wet environment.

The new VMWTRPM-17C-SS provides a cost-effective solution for process monitoring, system interface and machine control in challenging environments. It features a 17" screen, 1280 x 1029 resolution, 5-wire resistive touch screen, VGA and DVI inputs, and a NEMA4X waterproof stainless steel panel-mount enclosure. Also available with a 1,000-nit brightness panel, for use in direct, bright sunlight.). The VMWTRPM-17C-SS is perfectly suited for use in industrial plants, military systems and vehicles, amusement parks, museums, industrial machinery, security systems and marine systems.

More info: tru-vumonitors.com

Rotary Jet Engine

LiquidPiston, Inc., a developer of advanced combustion engine technology, announced that the company has entered into an agreement totaling $991,557 with the U.S. Defense Advanced Research Projects Agency (DARPA). LiquidPiston will use the funds to advance the development of its highly efficient, power-dense rotary internal combustion engine for portable and small-engine applications.

Under this agreement, LiquidPiston's primary objective is to demonstrate a pathway towards a rotary JP-8 fueled engine that has the potential to reduce fuel consumption by 50% and to increase power density by threefold compared to today's conventional heavy-fuel piston engines. JP-8, or Jet Propellant 8, is a kerosene-based jet fuel used widely by the U.S. military.

Dr. Nikolay Shkolnik, LiquidPiston's Founder and CTO, and Co-Principal Investigator of this DARPA effort, explained: "Today's diesel/JP-8 engines and generators are extremely heavy. For example, a typical 3kW heavy-fuel generator weighs over 300 pounds, requiring six people to move it around. LiquidPiston's engine technology may enable a JP-8 generator of similar output weighing less than 30 pounds that could fit in a backpack."

Additionally, increasing military engine power density could enable lighter, more compact equipment designs, further enhancing operational range and payload capabilities.

More info: liquidpiston.com

New Body Armor

Propper's line of armor includes the 4PV Platform, Concealable Vests, Tactical Vests, Hard and Soft Armor Inserts, Helmets, and Tactical Accessories. The company recently introduced its 4PV (Four Panel Vest) technology in body armored protection. Four independent panels articulate to provide unparalleled mobility and protection. This easy to size platform provides a fully modular, highly adaptable and comfortable system that users want to wear.

Setting a new standard in women's vest comfort and protection, the 4PV-FEM offers a four panel system that articulates with the wearer's body. This new design molds to fit around the female form better than a traditional two piece vest without bunching, billowing, or scooping on the chest and neck.

More info: propper.com

Stored Energy: >14.5KV when charged to 28VDC

Mounted Power Management

The Tecate Group in San Diego, CA, has developed a highly ruggedized ultracapacitor based Vehicle System Back-up Power Module. This 32.4v module provides rapid power at the point of demand, for such applications as Fire Suppression, Voltage Hold-up and Peak Power management. There is demand from both the MRAP and MMPV vehicles. The product can be designed to meet MIL-DTL-62545C.

The Backup Power Module (BPM) supports US Army vehicle automatic fire extinguishing systems (AFES). The BPM will supply sufficient power to enable normal AFES operation long enough for vehicle crew to be rescued in scenarios where vehicle power is suddenly lost. Tecate has numerous modules in field test across various platforms.

More info: tecate.com

Multi-Mission Gear

Furious Tactical is a multifaceted company that specializes in tactical apparel, combat gear and various accessories for today's warfighter or local law enforcement. The company was founded in 2014 by CEO Hal Bray who envisioned a multilayered organization that would focus on providing strategic materials to military and LE personnel. Bray had the marketing and customer service experience, but needed someone who had actually fought on the ground. Aaron Pierce, a career firefighter/EMT, former Army sniper instructor and combat veteran, and also a longtime friend of Bray's, was the other half of the equation and together the two men set out to create something real, bringing both their backgrounds to the fore. The premise that the company prides itself on is field testing, reviewing and gaining input from others that have used specific gear or apparel so that only the most reliable products are marketed. The other side of the company relies on experienced, educated and progressive instructors that stay ahead of the tactical curve by providing the most current and effective training available.

Furious' inventory line includes various weapons cases, medical, assault and hydration packs, holsters, flashlights, carrier vests, flashlights, rechargeable battery packs, goggles and even clothing for men and women. The goal of Furious is to guarantee their products, service, and training are the best in the industry. And one area in particular it wants to focus on is threat assessment service for corporations in regards to active shooter scenarios. And high-level tactical training being offered to the civilian community, as well as training of local, state, and federal law enforcement is a priority of Furious Tactical.

More info: furioustactical.com

MAINTAINING ENERGY AVAILABILITY AND SECURITY

DoD Power & Energy (P&E) magazine spoke recently with Mrs. Julie Simmons, Lithium Battery Safety Expert, Naval Surface Warfare Center Carderock Division, Bethesda, MD, regarding efforts to field high-energy lithium-ion battery technology across the Department of the Navy.

DoD P&E: Please speak to your position at Naval Surface Warfare Center, and the overall mission.

Simmons: NSWC Carderock Division, among many other functions, is one of two Navy lithium battery test and evaluation labs capable of executing abusive safety tests. Our technical experts subject lithium primary (non-rechargeable) and lithium secondary (rechargeable) batteries to abusive conditions to ensure they are safe in the hands of Sailors and Marines under all conditions. Our sister Warfare Center, NSWC Crane Division, executes a similar mission and also manages the in-service engineering of fleet-deployed batteries.

DoD P&E: What are some of the programs NSWC is working on in regards to the second-gen batteries and how are the prototypes working?

Simmons: The growth in usage of lithium-ion batteries in applications phones/tablets, hover-boards, power tools, and the automotive industry very much mirrors the growth the Navy has seen for military applications. Lithium-ion batteries now support Navy and Marine Corps missions on the ground, in the air, on the surface, and under the sea. The advancements in capability of lithium batteries from the 1990s and early 2000s to today have made them safer, more affordable, and more capable of supporting a range of applications.

One area on the cusp of being fielded is the second-generation advanced lithium "NATO 6T" batteries. The "6T" is a standard format for lead acid batteries used in pairs to power nearly every ground combat vehicle. This makes it one of the most commonly purchased batteries in the Department of Defense.

Lithium-ion 6T prototype batteries under evaluation today are beginning to show the performance and safety characteristics

necessary for putting them in the hands of warfighters, and industry is working aggressively to make these systems affordable. The U.S. Army Tank Automotive Research, Development and Engineering Center (TARDEC) has played a large role in investing in this battery technology and is engaging with industry to advance implementation.

DoD P&E: Please speak to the advantages of new batteries in terms of energy efficiency and capability.

Simmons: These new battery systems in vehicles and other applications have the ability to double or triple the energy density of conventional storage systems and improve lifetime by 2-5 times. This gives these systems a tremendous lifecycle cost advantage to any military force fielding them, while enhancing mission effectiveness in many different domains.

DoD P&E: How has the feedback been from end users in trial runs for durability?

Simmons: The Department of the Navy is in the planning stages for upcoming demonstration exercises with large format lithium-ion rechargeable technologies.

DoD P&E: Has there been any partnering with industry to help develop these, or ensure longer-lasting capability?

Simmons: Industry has been working closely with many Army, Marine Corps, and Navy organizations over the past 10 years to advance the lithium-ion 6T to the point where it is rugged, affordable, and safe enough to be put in the hands of the warfighter.

DoD P&E: What specific combat vehicles do you see benefiting the most from these new batteries?

Simmons: For the lithium -ion 6T in particular, the majority of tactical military vehicles in all of the services could ultimately take advantage of the capabilities they have to offer. If industry can continue to reduce costs associated with producing the batteries, they will clearly be used in previously fielded platforms like the Marine Corps' Medium Tactical Vehicle Replacement (MTVR) 7-ton truck, and future platforms like the Joint Light Tactical Vehicle (JLTV), replacement for the High Mobility Multi-Wheeled Vehicle or HMMWV.

DoD P&E: Like many other technologies that began in the military and made their way to the civilian side, do you see this particular one running the same route given its promise?

Simmons: Although the lithium-ion 6T format as a final packaged system doesn't lend itself to being used in commercial vehicles, the internal cells and chemistry have the potential to be similar to those that could find their way into cars and trucks in the U.S. over the next 10 years.

DoD P&E: Where/how do you see energy evolving in regards to military use over the next 25 years?

Simmons: Energy storage is going to play an increasingly important role in enabling our future forces. Tactical vehicles will be hybridized with lithium-ion energy storage to enable silent watch capability while improving fuel economy. Unmanned air vehicles (UAVs) will be able to use a combination of photovoltaic panels with lightweight lithium-ion batteries in flight to enable persistent Intelligence, Surveillance and Reconnaissance (ISR). Unmanned underwater vehicles (UUVs) will be capable of performing an array of missions with increased durations. Future shipboard weapons systems being developed by the Office of Naval Research (ONR) like the Free Electron Laser (FEL) and Electromagnetic Railgun (EMRG) will be able to rely on lithium-ion batteries as an enabling technology. These advancements will be incremental but consistent over the next 25 years, and NSWC Carderock Division and NSWC Crane Division will ensure that they are safe and effective for field application.

BATTERY POWER EVOLUTION

By Kevin Hunter, P&E Editor

Dr. Dee Strand

Wildcat Discovery Technologies' business model is to help companies accelerate the commercialization of battery technologies, particularly lithium ion, with improved energy density, power, cycle performance and safety. "We have projects dedicated to the development of new materials, improved materials, or better combinations of materials to affect improvements in all of these areas," said Dr. Dee Strand, Chief Scientific Officer at Wildcat.

Density Equals Energy

To address energy density challenges, for example, the industry is looking for cathode materials that offer greater capacity and voltage, which directly affect the energy density of the battery. Alternatively, if anode capacity is increased, less anode material is required in the battery – leaving more volume available to fill with cathode which drives energy density up. "We work on brand new cathode materials, such as copper fluoride, a very high, energy dense material," noted Strand. "Only a few years ago, no one could get it to re-charge. So we looked at the fundamentals of copper fluoride to see how this material could be made re-chargeable, and Wildcat succeeded in demonstrating reversible cyclability." Wildcat is currently looking at ways to expand the cycle life out to several hundred cycles which would qualify it for lithium ion battery use in many electronic applications; and this is just one of many of their active projects.

Combinational Compositions

Wildcat uses a unique high throughput battery discovery workflow to accelerate research and development, enabling its scientists to explore large compositional spaces through the synthesis and testing of many combinations of materials. "If you take the elements like nickel, manganese, and cobalt (NMCs) in a range of ratios, and add other elements at low levels, you can quickly come up with hundreds of compositions that might improve performance within particular battery configurations," Strand pointed out. "The challenge here is that not all NMC combinations work effectively in all battery configurations, i.e., a higher nickel NMC needs a special electrolyte additive to work well or a lower nickel NMC needs a different electrolyte. This means those hundreds or even thousands of materials need to be tested against ten to twenty electrolytes before the most effective combinations are apparent. Without the ability to prepare and run many experiments in parallel, development of this type can take decades."

Any time you pack a lot of energy in a small space, there can be safety concerns. "Whether it be liquid fuel in a confined tank or lithium ion materials in a can or pouch, greater energy within requires better control of how that energy is dispersed," Strand noted. "You can accomplish the latter by better stabilizing

your cathode materials or by using more stable electrolytes to replace flammable organic solvents used in today's batteries."

Nearer term, Wildcat is working to develop more effective cathode coatings and electrolyte additives to improve stability. The company is working with battery materials that include layered oxide materials like NMC (nickel, manganese, cobalt). "If you change the ratios of these transition metals, mostly nickel content, and drive it to slightly higher voltage levels, you can get more capacity out of the material which enables higher battery energy density," indicated Strand. "Basically, we are taking existing materials in use today and mapping their composition in an attempt to maximize energy density. Of course, in doing this, there's sometimes a trade-off in loss of some cycle life and compromise in safety since more energy within a battery means greater energy to control."

A longer term solution is the use of solid electrolytes which have additional challenges like conductivity and manufacturability. Some of the solutions to these challenges include trying to find effective coatings to stabilize higher nickel content materials or the development of better electrolytes that work at higher voltage to improve cycle life and safety. "You may be working on electrolytes to enable higher energy density cathode materials safely, and we can help with that" said Strand.

More info: wildcatdiscovery.com

POWER TO SURVIVE

Patco Electronics LLC (PATCO) founded in 1992, manufactures leading edge rechargeable Lithium ION (Li-Ion), Nickel Cadmium (NiCd) and Nickel Metal Hydride (NiMH) battery packs, battery chargers and custom engineered power solutions. PATCO, a subsidiary of Technology Research Corporation, based in Clearwater Florida, began designing battery management systems for lead acid batteries and has advanced their product portfolio to include medium prismatic Lithium-Ion batteries and chargers. Through a proprietary method of control circuitry, PATCO's engineering group developed a technique of feeding back control information from the battery management chip to control a primary switching circuit producing the low voltage power for the battery. This approach eliminates much of the heat that would have to be dealt with by conventional approaches.

In 2012, PATCO completed the military standard testing of a new line of high capacity PB-2590 batteries, increasing the watt hour capacity of the BB-2590/U from 213 to 294 watt hours. This new line of batteries was designed and tested in full compliance with Mil-PRF-32383, Mil-PRF-32052, UN 38.8 and Mil-STD-810G. Additional features built into the battery electronics include a thermal management system that allows each battery to be fully discharged at a rate of 10 amps without any thermal shutdown, a cycle life of nearly double that of its predecessor and EMI protection that far exceeds the requirements of Mil-STD-461. To compliment the PB2590 battery, PATCO developed a line of smart level three chargers that will charge up to 24 batteries simultaneously.

More info: patcoelectronics.com

Installed solar panels and racking at Fort Stewart (Georgia Power)

Growing Solar Energy

The U.S. Army has stood up a new solar farm project at Ft. Stewart, GA, in an effort to test the impact renewable energy has on day-to-day operations.

By Richard Kidd, Deputy Assistant Secretary of the Army, Energy and Sustainability

The U.S. Army recently published the Energy Security and Sustainability (ES2) Strategy, which provides the Army with a strategic roadmap to foster a more adaptable and resilient force that is prepared for a future defined by complexity, uncertainty, and rapid change. The development of ES2 was partially informed by the best practices and lessons learned from the Net Zero Pilot Installations. The ES2 Strategy envisions a ready and resilient Army, strengthened by secure access to energy, water, and land resources—conditions which preserve future choice in our rapidly changing world. The objective is to enhance Army capabilities, readiness, and performance through effective system design and integration of resource considerations into behaviors and decision processes. The Army is evolving from a historic framework that viewed resource considerations as constraints on operational effectiveness, to a perspective that considers the critical role of energy, water, and land resources as mission enablers.

Utilizing the Sun

With ES2 as the driver, the U.S. Army Office of Energy initiatives (OEI), Fort Stewart, GA, the General Services Administration (GSA), Georgia Power and the Mission Installation and Contracting Command are working together to develop a 30-megawatt (MW) alternating current (AC) solar project at Fort Stewart. The installation is the largest Army installation east of the Mississippi River with 279,271 acres of land. As the home of the 3rd Infantry Division, Fort Stewart is the Army's premier power projection platform on the east coast. And its proximity to Hunter Army Airfield and the port in Savannah, as well as robust connections via road and rail, make Fort Stewart a vital part of our nation's defense.

This project will provide approximately 17 percent of the installation's annual electricity requirement. As the Deputy Assistant Secretary of the Army for Energy and Sustainability, I provide strategic leadership, policy guidance, program oversight and outreach for energy and sustainability throughout the Army enterprise to enhance current installation and operational capabilities, safeguard resources and preserve future options.

Under my leadership, the Office of Energy Initiatives (OEI) is the project development team for the Fort Stewart Large-Scale Renewable Energy Solar Project. The OEI strengthens Army energy security and sustainability by developing a comprehensive portfolio of cost-effective large-scale renewable energy projects that leverage private sector financing.

Energy Innovation

The large-scale renewable energy project at Fort Stewart is a part of the Army's commitment to the President of deploying one gigawatt of renewable energy by 2025. Currently, the Army is meeting approximately 35 percent of its 1 GW goal. The Army's large-scale renewable energy project portfolio includes about 350 MW of renewable energy; 46 MW in operation, about 105 MW in construction, about 202 MW in procurement.

The Fort Stewart project is expected to produce 30 MW of electricity, which will include over 133,000 solar panels and is on schedule to begin commercial operations in September 2016. Renewable energy produced on Army installations increases energy security, which is essential to mission effectiveness. Energy is key to everything the Army does. Energy supply shortfalls and power distribution failures, whether caused by acts of man or acts of nature, represent a strategic vulnerability – they increase the risk to our missions. As the cost of renewable energy comes

Solar material lay-down area at Fort Stewart (Georgia Power)

down, renewable energy projects become increasingly attractive for the Army. This project is part of the Army's plan to develop three, 30 MW AC solar projects, one each at Forts Benning, Gordon, and Stewart, and is collectively referred to as the "Georgia 3x30 Project". The Army is currently developing 14 large-scale renewable projects across our installations.

As the largest consumer of facility electricity in the federal government, the Army is in a central position to realize the benefits of a variety of technologies including solar, wind, natural gas, power storage, microgrids, etc. Solar energy is beneficial across the entire Army, and solar energy projects help the Army by cutting energy costs and building resiliency on our installations, while increasing the capabilities of tactical combat formations and outposts. The Army is strengthening energy security and sustainability at our installations by developing and executing cost-effective, large-scale renewable energy projects like Fort Stewart. With regards to civilian use, implementation of large-scale renewable projects allows utility companies to defer costly infrastructure upgrades, thus benefiting consumers by reducing rate increases. ■

MANAGING THE GRID

By Matt Baker, Col, USMC (Ret), Director Energy Programs, Fairlead Integrated

The Energy Security and Sustainability (ES2) Strategy reflects the Army's growing focus on energy. It is fair to say that all other branches in the Department of Defense and the rest of the federal government are equally focused on energy security, efficiency and resiliency; especially as they relate to environmental concerns. The 30 Megawatt project at Fort Stewart is clearly part of the solution going forward.

A problem remains – "How do you integrate sources of power like the utility grid, back up generators, and this solar power generation, with the grid locally, and off-installation distribution?" Put a different way, if the base were to lose power, the solar array could provide much needed back up during daylight, but what about at night? At Fairlead Integrated and Earl Energy, we believe the answer is to incorporate some form of battery storage capacity into the system with positive control.

Intelligent power management is the answer. Whether the system is designed for a tactical application that reduces the requirement for refueling runs in a combat situation or the mission gives resiliency in the event of a power outage to critical base infrastructure while integrating renewable energy sources that vastly reduce carbon footprint, energy security and sustainability are critically important going forward.

More info: Earlenergy.com

POWERING THE MARINE, ENABLING THE FORCE

By Capt. Anthony Ripley, S&T Lead
U.S. Marine Corps Expeditionary Energy Office

The overall mission of the Marine Corps Expeditionary Energy Office (E2O) is to "analyze, develop, and direct Marine Corps Energy Strategy in order to optimize expeditionary capabilities across all warfighting functions." We lead the Marine Corps' energy innovation in support of the warfighter, to increase the operational reach of the force and make Marines more effective on the battlefield.

As the Science and Technology (S&T) Lead for E2O, I assist the Director in accomplishing E20's mission, as well as drive the office toward meeting the Commandant's 2025 goal of enabling Marine Expeditionary Forces to "maneuver from the sea and sustain its C4I [command, control, communications, computers, and intelligence] and life support systems in place" with zero non-mobility fuel.

My position as E2O S&T Lead is multi-faceted. One of my main responsibilities is identifying technology solutions to close the (52) materiel gaps delineated in the Expeditionary Energy Water and Waste Initial Capabilities Document (E2W2 ICD). Gaps are a lack in capabilities or technologies needed to enable the Marine Corps to meet the Commandant's 2025 goal. Solutions to the material gaps will provide capabilities to extend the operational reach and self-sustainability of expeditionary forces.

Other responsibilities include interacting with industry to evaluate and analyze higher Commercial Off-The-Shelf (CoTS) Technology Readiness Level (TRL) technologies that have the potential to close gaps or provide disruptive capabilities. One example of our partnership with industry to find the best solutions to our tactical energy problems is the annual Expeditionary Energy Concepts (E2C) technology demonstration (formerly known as the Experimental Forward Operating Base or ExFOB). E2C is a process we use to identify, evaluate, and accelerate fielding of the best technologies industry has to offer and get those technologies into the hands of Marines.

When capabilities cannot be addressed with CoTS technologies and are very early TRL, we turn to the Office of Naval Research (ONR) to assist in technology development. I am also responsible for sitting on the ONR Future Naval Capability (FNC) Power and Energy (P&E) Pillar Working Group. The working group collaborates with many other organizations in order to identify Navy and Marine Corps P&E related gaps. Once the gaps are identified, ONR program managers create programs that develop nascent technologies to address these gaps.

A Marine prepares to test out the Lightning Pack during the Experimental Forward Operating Base (ExFOB) 2014 technology demonstration (now known as E2C). The pack converts normal walking movement into electrical power using a generator. (Photo by Lance Cpl. Kathy Nunez)

Joint Infantry Company Prototype (JIC-P)

Examples of technologies developed by ONR program managers in the Joint Infantry Company Prototype (JIC-P)are the kinetic energy harvesting backpack, the squad electric power network (SEPN), and the Individual Water Purification System (IWPS). Once the technologies were sufficiently developed, the services provided funds to develop the technologies further and test them in an operationally relevant environment.

The JIC-P is a 24-month joint effort between the Army and the Marine Corps, led by E2O, with the objective of lightening the load and reducing size, weight, and power requirements of dismounted systems. It will provide the Marine expeditionary rifle company with a unique, self-sustainable, capability set that enables dismounted multi-day operations in an austere environment while informing the Dismounted Forces Energy Requirements Integrated Product Team (DFER-IPT).

The JIC-P program includes a company concept of operation development, modeling, technology development, integration, and large scale testing and evaluation. The evaluation started small with an Army squad-sized evaluation with 2nd Platoon, Charlie Co., 2 BN, 27th Infantry, but will grow to include a side-by-side evaluation of 25 Vest Power Managers (VPM) and 25 Integrated Soldier Power and Data Systems (ISPDS) with 50 kinetic energy harvesting back packs, 50 kinetic energy-harvesting Knees, 50 lightweight photovoltaic panels and 100 conformal rechargeable batteries.

A side-by-side comparison of the Marine Corps VPM and the Army ISPDS will inform the joint community, play a crucial role in determining the future small unit power architecture for the Marine Corps, and inform the Army's Milestone C decision for the Small Unit Power Program. The side-by-side comparison effort will be accomplished through collaborative partnership between the Naval Surface Warfare Center Dahlgren (NSWCD), Natick Soldier Research and Development Engineering Center (NSRDEC), the Army, and the Marine Corps. The next step is to start testing the JIC-P with Marine Corps Forces at the platoon level. 3rd Marines will be running the JIC-P technologies through their paces during the Rim of the Pacific Exercise (RIMPAC) 2016 in Hawaii.

JIC-P Technology Development

The problem driving the technology development in the JIC-P is the unconstrained energy required on the battlefield. Marine infantry companies use more fuel than infantry battalions did 10 years ago.

Changes in the MAGTF include:

- 250% increase in radios
- 300% increase in IT/computers
- 200% increase in number of vehicles
- 75+% increase in vehicle weight
- 30% decrease in MPG across the tactical fleet

The concept of the JIC-P is a few years in the making. JIC-P technologies can find their roots at ONR. Each technology is the culmination of years of research and development. One of the products provided by ONR was the result of a FNC called the Squad Electric Power Network (SEPN); a power management system. The intent was to lighten the load of dismounted warfighters and address the burden of increasing power requirements of electronic devices on the battlefield.

The SEPN system was later incorporated into the Marine Austere Patrolling System (MAPS), which provided power management, production, and distribution, along with an individual water filtration capability; essentially providing power and water "on-the-move" for dismounted forces. Once the MAPS effort came to an end, E2O decided to incorporate kinetic energy harvesting into the system. The Director of E2O tasked me with executing a company-sized evaluation and exercise. However, E2O didn't have the funding needed to execute the program.

Knowing that lightening the load of dismounted warfighters is a Department of Defense problem, not just one for the Marine Corps, I began gathering stakeholders from the Army and other efforts already ongoing and analyzing where the overlap existed and how each effort could leverage the results of the others. After gathering support for the idea, I presented the JIC-P program to the Office of the Assistant Secretary of Defense (OASD) Operational Energy Plans and Programs (OEPP). OASD agreed to fund the idea and the JIC-P program was launched.

Advantages of the JIC-P for the Marine Corps

As the JIC-P system develops, and the system of systems is integrated, it will be tested and evaluated. Quantitative data will be collected through data loggers on the equipment and Marines and soldiers will provide qualitative feedback on the system—informing the services of unit level energy production capabilities and energy consumption requirements. As this process unfolds, the utility of the system will become more apparent. In the meantime, we can only speculate at the advantages the system will provide.

A typical dismounted Marine carries up to 20 pounds of batteries in addition to his combat load and requires three gallons of water a day in an arid environment, equating to just over 75 pounds of water on a 72-hour mission. By networking end-user electronic devices to a central battery and providing the capability to replenish energy and water on the battlefield, the hypothesis is dismounted warfighters can carry much less weight in batteries and water, by tapping into available energy and water.

For example, if Marines are conducting a foot mobile patrol, they can devices energy on-the-move with the backpack and knee harvesters. If they are in a static location they can harvest solar energy during the day. If they come across crippled vehicles, they can scavenge energy from the vehicle battery. The JIC-P system provides multiple options for collecting energy and sustaining dismounted forces in an austere environment.

JIC-P and the Future Fighting Force

The JIC-P is the culmination of many years of effort and collaboration between multiple organizations. The JIC-P system of energy harvesting coupled with power management and central energy storage are the key to increased energy sustainment. The technologies comprised in the JIC-P will increase mission time and the energy sustainment of dismounted warfighters. User evaluations are being conducted in Fiscal Year (FY) 2016 and FY 2017 to quantify JIC-P system impact.

While the technologies in the JIC-P may not solve all the problems of dismounted warfighters in their current form, the JIC-P will provide information vital to the development of future technology solutions that will be smaller, lighter, and require less power—increasing the operational reach and self-sustainment of the warfighter in an austere environment.

Of recent note, USMC E2O's Joint Infantry Company Prototype (JIC-P) Program was selected as a finalist in the Energy & Sustainability (Alternative Energy) Award Category for the 2016 Edison Awards with bronze, silver or gold determination to be made at the Edison Awards event in NYC on 21 April 2016. USMC E2O's JIC-P Program was also selected as a winner for the 2016 Business Intelligence Group (BIG) Innovation Awards. ■

POWER ON THE GO

By Lawrence Rome, PhD Founder, Chief Scientific Officer

When worn walking or running, Lightning Packs' (LP) electricity-generating backpacks can generate an average power of up to 35 W depending on payload, speed and gait. The Joint Infantry Company-Prototype (JIC-P) Kinetic Energy Harvesting Backpack evaluation will inform us about the daily energy generation budget (i.e., Watt-hours per day) when integrated over actual mission profiles.

The backpacks have two additional beneficial features: the ability to generate power even when troops are stationary and the likely reduction of joint injuries. When soldiers and Marines are stationary or encamped, each pack becomes an efficient generator capable of producing 25-50W by pumping the pack by hand. This power supplements the power generated during troop movements and in the case of emergency provides sufficient power to run a PRC 117G radio without a battery.

Ankle, knee and back injuries plague dismounted troops because even a 60 lb payload exerts a peak force up to 120 lb during walking and 180 lb during running. These large peaks are due to large accelerative forces. The patented suspension of LP's electricity-generating and ergonomic backpacks reduces these accelerative forces by 65-90% improving mobility and reducing the risk of musculoskeletal injuries.

More info: lightningpacks.com

CALENDAR OF EVENTS

Mar 15 – 16, 2016
6th Defense Renewables Summit
Arlington, VA
Infocastinc.com

Mar 15 – 17, 2016
Global Force Symposium & Exposition
Huntsville, AL
Ausa.org

Mar 18 – 19, 2016
FDX 2016
Louisville, KY
Firstdefenseexpo.org

Mar 21 – 23, 2016
Maritime Security 2016 East
Norfolk, VA
Maritimesecurityeast.com

Mar 21 – 23, 2016
Power Grid Resilience Summit
Philadelphia, PA
Powergridresilience.com

Mar 21 – 24, 2016
International Battery Expo
Ft. Lauderdale, FL
Internationalbatteryseminar.com

Mar 22 - 24, 2016
Preparedness, Emergency Response and Recovery
Orlando, FL
Perrc.org

Mar 22 – 23, 2016
Joint Civil & DoD CBRN Symposium
Alexandria, VA
Jointcbrn.dsigroup.org

Mar 29-30, 2016
DoD Unmanned Systems Summit
Alexandria, VA
Dsigroup.org

Mar 30 – April 1, 2016
Southwest Border Security Week
McAllen, TX
Bordersouthwest.com

Mar 30 – April 1, 2016
Unmanned Ground Systems
Detroit, MI
Unmannedgroundsystems.com

Mar 31 – April 1, 2016
CERDEC
Aberdeen Proving Ground, MD
Cerdec.army.mil

Apr 6 – 7, 2016
Marine South
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