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FALL 2023

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**MULTI-DOMAIN COMMAND
AND CONTROL EVOLUTION**

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GEN James Rainey
Commanding General
U.S. Army Futures Command
Austin, TX



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By Beth Reece

Cover: Stopping to check their displays and latest intelligence on the Nett Warrior system, Sgt. Ryan Bomze, Spc. Stephen House and Cpl. William Crichton of 1st Battalion, 35th Infantry Regiment, 1st Armored Division participate in Network Integration Evaluation 13.1. NIE 13.1 is the latest in a series of evaluations focused on increasing the Army's overall tactical network capabilities. (U.S. Army)

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ARMOR & MOBILITY

Armor & Mobility ISSN: 2151-190x



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COMBAT & CASUALTY CARE



INSIGHTS

The Fall edition of *Armor & Mobility (A&M)* takes a look at a future world being developed where split-second decisions on the battlefield will no longer be made at the risk of human miscalculation leading to preventable casualties. The technology of artificial intelligence/machine learning (AI/ML) promises to enable proactive command and control faster and more precisely than ever before. Mission data gathered by autonomous sensory capability will create resultant situational awareness only dreamed of today but required for victory on the battlefield of tomorrow.

In the 2023 annual Association of the United States Army (AUSA) edition of *A&M*, we hear from newly-installed Commanding General James Rainey, U.S. Army Futures Command (AFC), Austin, TX, on exciting efforts AFC is heading up regarding the transformative process of force modernization in attaining full preparedness to execute the future Multi-Domain Operations (MDO) fight. A large part of this preparedness is the strength of Joint Force Command, Control, Communications, Computers, Cyber, Intelligence, Surveillance, Reconnaissance (C5ISR) technology supporting an uncompromisable network anytime and anywhere the mission calls. From the days of line-of-sight dependent to advanced plug and play legacy compatible communications, the U.S. Army Program Executive Office for Command, Control, Computers- Tactical (PEO C3T), Aberdeen Proving Ground, MD, is facilitating the latest in network modernization through the implementation of Command Post Infrastructure Integration (CPI2) so the nation's combat fighting forces remain poised on an overmatch-promoting tactical network edge.

Without mobility, all the command and control (C2) in the world does a fighting force little good. The future of combat is likely to manifest in the form of large-scale combat operations (LSCO) which will require the availability of instantly accessible, real-time command and control projected to far reaches of the globe. In the process of fielding the latest in data-centric, networked Command and Control On The Move (C2 OTM) capability, Army PEO-C3T is building on proven command posts network node connectivity to enable greater reliability of common operating picture (COP) during sustained armored formation network (AFN) movements. In the heat of battle, there is no time for bridging C2 gaps in the network subject to mobility requirements of the mission. C2 OTM will enable the network to operate C2 gaps-free regardless of that movement reality.

Of course, without management of communications network infrastructure necessary to support the mission, there can be no mission success. In a candid interview with MG Robert Edmonson II, Commander, U.S. Army Communications-Electronics Command (CECOM) Aberdeen Proving Ground, MD, we collect perspective on the critical role that software, and the all-important sustainment of that software, plays in the facilitation of Army, Joint, and coalition operations connectivity through the presence of supply chain assurance. Dovetailing nicely with supply chain, the Defense Logistics Agency (DLA) is assisting in the improvement of depot-level reparability and a continued decrease in parts delivery delinquency which has plagued the Army in recent years. Don't miss this edition's Light Tactical Spotlight as the U.S. Marine Corps' replaces its Utility Task Vehicle (UTV) with the new Ultra-Light Tactical Vehicle or ULTV.

As always, we welcome any comments and thanks for your continued readership!

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INTEGRATING MACHINE LEARNING AT THE TACTICAL EDGE

The U.S. Army is planning to leverage Artificial Intelligence/Machine Learning (AI/ML) neural network-based algorithms to improve warfighter situational awareness in tactical vehicles. Integration of these complex algorithms into new and legacy architectures is a nuanced challenge to ensure accurate real-time performance and influence tactical decision-making.

By Jason Miller, U.S. Army Combat Capabilities Development Command C5ISR Center



The business of detecting threats is time critical and error-intolerant. As the Army's experts for Aided Target Recognition, DEVCOM's C5ISR Center has been maturing and integrating AI/ML algorithms since 2018 for capabilities that will improve the situational awareness and decision-making processes of warfighters in tactical vehicles. (DEVCOM)

As Artificial Intelligence/Machine Learning (AI/ML) continues to expand across all societal domains, it is understood that AI/ML capabilities can be matured with the intention of supporting a multitude of functions, ranging from system diagnostics monitoring for preventative maintenance to autonomous driving to nominating potential threats in complex environments. Currently, the objective of incorporating these capabilities into military platforms is to shorten and improve human decision making by condensing the vast amount of data available within a vehicle to digestible chunks.

While the vision is simple, the practical implications of using AI/ML algorithms to fix all these problems is far from solved. Legacy military platforms have been in service for many years -- sometimes decades -- and include components, sub-systems, and architectures that make straightforward and efficient processing upgrades very difficult. To effectively leverage these emerging AI/ML-based algorithms, the right data (including quality video, position, and time) needs to be available at the right place at the right time. Planning for this type of system is best considered early in the design phase to ensure that the architecture supports adequate data bandwidth and routing, power, and space allocation. An effective Aided Threat Detection and Recognition product, or AiTDR, requires integration with the platform sensors and connection to the system controller, which would be expected to host data from other critical subsystems resident on the vehicle.

STANDARD POINT OF EVOLUTION

Standardized interfaces, which define both required and optional parameters to enable the AI/ML capabilities have yet to be codified,

making each individual integration effort a unique challenge. For performant AiTDR algorithms, high resolution, low latency, full motion video (FMV) with metadata must be accessible to a capable processor, where more video feeds or higher neural network complexity necessitates larger processing and power demands. While it may be practical to place advanced processing at the edge, as close to the sensor as possible to minimize the data bandwidth requirements on the vehicle network, that placement will limit the ability of other sensor systems to leverage that processor, likely sacrificing the efficiency of central processing solutions. Tactical vehicles that include turrets have additional constraints such as slip-rings that will be constraining components when attempting to pass high bandwidth FMV between a turret and a vehicle hull. Emerging interface standards, such as C5ISR/EW Modular Open Suite of Standards (CMOSS) and CMOSS Mounted Form Factor (CMFF) aim to assist in defining data availability and form factors, but challenges remain with high dynamic range FMV.

It is crucial to understand the desired end-state of a capability designed to offset or aid in human tasking. Decisions such as, "Who is the end consumer of this data?" "What information needs presented?" or "What accuracy is required?" will shape the design and implementation. Emerging programs can leverage AiTDR capabilities for the purpose of autonomous search and track, where the algorithms are tightly coupled to the other platform subsystems and a system controller which choreographs how to scan, what to focus on, whether to enable other components, when and where to output data, and when to aggregate AiTDR nominations with disparate data. Once interwoven with the platform control, high levels of automation will ultimately be possible. Legacy platforms with predefined architectures and

hardware solutions would be expected to incorporate a less integrated AiTDR capability, where a stand-alone processor may be simply added between a sensor video feed and the User Interface to nominate potential targets for real-time manual interrogation. When designed properly, either level of integration is expected to be a significant advantage for future mounted formations.

CENTER TARGETING GREATER SURVIVABILITY

The business of detecting threats is time critical and error-intolerant, as misses or incorrect nominations may impact warfighter survivability. Though there are many challenges and architectural decisions to consider, the U.S. Army Combat Capabilities Development Command's (DEVCOM) Command, Control, Communications, Computers, Cyber, Intelligence, Surveillance, Reconnaissance (C5ISR) Center located at Aberdeen Proving Ground, MD and Ft. Belvoir, VA, has been maturing and integrating these capabilities into being key concepts demonstrators since 2018. Through iterative design and testing, complex architectures have been built to distribute data from Electro-Optic/Infrared (EO/IR) sensors, gimbals, lasers, position, navigation, and timing (PNT), tactical networks, Graphical User Interfaces (GUI), etc. Through a deep understanding of how these neural networks function and what data is needed to perform the prescribed task, the C5ISR Center has established a template for Program Managers as well as industry partners to leverage when designing future system architectures or adapting legacy systems. Though the C5ISR Center has been successful in demonstrating a

high level of algorithm maturity and system integration into numerous complex Army priority exercises, adherence to Army standards has yet to be enforced. Final integrations of complaint algorithms will require network security controls, conformance with alternate processing and architectures standards, and unknown access to reliable networked information. These complicating factors are tempered slightly because of the requirement that a human must remain in (or at least on) the loop before using lethal methods to engage a target. A reduced probability of detection in an AiTDR system can be offset by having a human make the final call on target/no target.

As it pertains to algorithm performance upgrades, these can be achieved through multiple methods. One method aims to improve the performance of individual neural network components through the addition of new training, which results in an updated "weights" file. Trading this file does not change the complexity of the network, making for a simple -- and sometimes incremental -- software update. Unfortunately, algorithms are likely to start plateauing in performance, even when additional training data is incorporated, necessitating inclusion of more complex algorithm components into the pipeline to yield more significant performance gains. Without careful up-front planning, inclusion of additional algorithm processes may quickly expand beyond the size, weight, and power budget allotted to the AiTDR processor. If fusion processing across multiple detector networks is required to achieve the desired performance, the solution may not be practically implementable if allocations had not been made for enhanced capabilities. Due to the uncertainties of how AI/

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ML products will perform over their deployed lifetime, significant platform processing margin and advanced-planned architectures should be considered early in the design phase to ensure the ability to incorporate future enhancements.

Updating AiTDR algorithms may be achievable, but when satisfying specific performance requirements, it will be critical to ensure that the system still functions as expected when changes are made, necessitating a robust verification plan. If the AiTDR algorithm is updated and incorporates new functionality, downstream processing may be impacted, requiring additional coding and qualification of system software and user interfaces in order to leverage the new functions. As AI/ML technologies are transitioned from Research and Development to full-scale deployment, Program Managers are going to be challenged with both the integration of new capabilities as well as performance verifications if it is expected that algorithms are updated at a high tempo.

TAMING WHAT MAKES CAPABILITY TICK

As with all software, test and evaluation of AI/ML systems can be difficult, often requiring specific tools, expertise, and data. An inherent challenge to testing these AiTR systems is to not introduce biases into the evaluation processes and data. Therefore, independent sequestered data evaluation is considered the gold standard for evaluating AiTR algorithms and their expected performance in operationally relevant environments.

As part of C5ISR Center's role as the Army's AiTR experts, the center has stood up an evaluation lab that serves as the Army's "honest broker" when evaluating both Army and industry developed algorithms.

Many questions remain with respect to tactically deployed AI/ML, such as:

- What is satisfactory performance and how is compliance of the integrated solution verified?
- What level of controls should be exposed to user to adjust algorithm performance on the fly?
- How often should algorithms be updated in vehicles and what is the limitation of acceptable changes once a compliant solution is deployed?
- Should platforms fighting in the same formation have the same AiTDR capabilities?
- Should AiTDR algorithms be hosted on dedicated Line Replaceable Units or integrated into multi-purpose vehicle video processing electronics?

Though plenty of uncertainties remain, the Army understands one thing completely: AI/ML-based capabilities are here to stay.

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TARGETING FUTURE CONNECTIVITY WITH PRESENT CAPABILITY

The U.S. Army is employing maneuverable command posts as an evolutionary adaption in force readiness to meet the demands of a Multi-Domain Operations future.

By Kathryn Bailey, U.S. Army Program Executive Office Command, Control, Communications-Tactical



Soldiers with 1st Stryker Brigade Combat Team, 2nd Infantry Division (1-2 SBCT) conduct command post intelligence operations inside a M1087 Mobil Command Platform during the Command Post Integrated Infrastructure (CPI2) Limited User Test at Joint Base Lewis McChord in July 2023. CPI2 provides command and control on-the-move by integrating network and communications technologies into a variety of platforms as an alternative to traditional tent-based command posts. (PEO C3T)

Future conflicts will not look like those of the recent past, and neither will the command posts leading the fight.

To support large scale combat operations (LSCO) against peer and near-peer adversaries, the U.S. Army is modernizing and mobilizing the traditional, tent-based command post with on-the-move vehicle-based command posts integrated with network technology to allow units to displace and emplace in minutes versus hours. This movement, coupled with additional protective measures, will reduce heat, noise, visual and electronic signatures that turn traditional command posts into targets, with nowhere to hide.

To address the requirement for command post mobility, the Command Post Integrated Infrastructure (CPI2) program is integrating network and communications technologies into a variety of vehicle platforms, then fielding them incrementally to units for experimentation and feedback, which will inform future iterations.

“The conflict taking place in Europe continues to validate the need for mobile command posts,” said Lt. Col. Herb Gamble,

CPI2 product manager, under Program Executive Office Command, Control, Communications-Tactical. “Mobility significantly increases survivability, and it also provides the commander with the flexibility to command from anywhere in the fight.”

OVER INITIAL PROTOTYPE TEST HURDLES

Following operational assessments of CPI2’s first prototype with two infantry brigade combat teams and one division headquarters, developers and testers returned to one of the units, the 1st Stryker Brigade Combat Team, 2nd Infantry Division (1-2 SBCT) at Joint Base Lewis McChord, Washington, to conduct a Limited User Test (LUT), with production-ready platforms informed by the prototype feedback, this time with the unit’s 1st SBCT.

The LUT, conducted in August, required the unit to displace the command post, “jump” miles into the operational training area, and emplace the command post as quickly as possible to establish



Soldiers with 1st Stryker Brigade Combat Team, 2nd Infantry Division (1-2 SBCT) “jump” the command post during the Command Post Integrated Infrastructure Limited User Test in August 2023 at Joint Base Lewis McChord, Washington. The test required the forward and support vehicles to tear down, jump, and set up the command post miles into the operational environment to assess the time required to resume command and control once halted operating different modes of communication, including wireless, fiber optic, and cat cables. (PEO C3T)

communications. For this event the unit conducted two daytime jumps, one planned and one unannounced, and one at night to test their ability to jump the command post in response to simulated indirect enemy fire.

The integrated vehicle platforms, which formed the brigade main command post consisted of several M1085 Command Post Support Vehicles (CPSV-Small and CPSV-Medium) and M1087 Mobile Command Platforms (MCPs) to support a variety of command post functions, including the forward Tactical Command Post, Network Operations, Intelligence, Fires, Current Operations and Future Operations. Each MCP truck expands to create a fully operational command center for mission command components.

“When we talk about the time needed to take over the battle, we are referring to the time it takes to park the forward vehicles and set up communications to resume command and control,” said Maj. Rob Wickham, assistant product manager for CPI2. “Units can establish communications via wireless, fiber optic, or cat five cable to communicate from the CPSVs to the MCPs. The larger vehicles with expanding shelters take a little longer, but we’re still talking about far less time than erecting a traditional tented command post.”

MULTI-MISSION NETWORK CONNECTIVITY

The Army anticipates future command post vehicle platforms will have multiple methods of connecting to the network via an automatic Primary Alternative Contingency Emergency Plan, Wickham said.

Leading the jump as part of the TAC was the CPSV-Small,

accompanied by one MCP, although the commander has the flexibility to configure the TAC at his discretion. Both the CPSV vehicles provide the communications link between the entire command post and outside the command post to subordinate battalions, sister brigades, division headquarters, or to the tactical network via satellite.

“The [mobile command post] is easy to tear down and put back up, allowing us to get into the battle rhythm and stay connected during the battle,” said Spec. Cristian Flores, signal support systems specialist, 1-2 SBCT. “The fast set up and tear down is key on the battlefield.”

Prior to the LUT, the 1-2 SBCT worked closely with their network operations team during the event’s validation exercise at the end of July, where they conducted a practice command post jump.

“With safety in mind, we are [diligently packing up during displacement] to ensure that everything’s going to be in its proper pace and readily available whenever we get into place and take the fight,” said Chief Warrant Officer 3 Ryan Webb, who serves as the unit’s information services technician.

Webb and the unit’s communications officer, or S6, supported by Army subject matter experts oversaw the integration of the Unified Voice Management System (UVMS), which is integrated into all of the vehicle platforms.

The UVMS pulls Voice Over Internet Protocol, and Tactical Satellite, High Frequency and FM radio communications into a single user interface so that Soldiers don’t need multiple handsets for each radio or multiple laptops for voice communications.

LOOKING TOWARD FULL INTEGRATION

Test results and Solider feedback from the CPI2 LUT will validate the current CPI2 design, inform future design changes and provide data required to move into a limited rate production for the next increment. Future CPI2 increments will improve on current design and integrate more types of vehicles at additional echelons.

“The 1-2 Stryker Brigade has been going through a lot of force modernization,” Webb said. “This is another step to ensure the unit will to be more mobile...and to have a smaller footprint so we can be expeditionary and reduce our RF [radio frequency] signatures [to better hide] from the enemy.”

In addition to aligning technologies, the Army is also adapting training, doctrine, personnel, and other key areas to the future vision of a more mobile and survivable command post. Together, these efforts will foster readiness, interoperability and adaptability.



A Soldier with 1st Stryker Brigade Combat Team, 2nd Infantry Division (1-2 SBCT) attaches an antenna to one of the Mobile Command Platforms (MCP) during the Command Post Integrated Infrastructure (CPI2) Limited User Test at Joint Base Lewis McChord, Washington. The MCP is one of the command post function support vehicle platforms to enable command and control on the move. (PEO C3T)

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- This allows the Army Corps, Division, and Brigade to maintain a rapid, robust, and reliable command post



DEFEATING ADVERSARIAL TACTICS WITH SUPERIOR OPERATIONAL FLEXIBILITY

Elbit America, a division of Elbit Systems, Inc., is working closely with the U.S. Army to ensure current and next-generation Soldiers are equipped regardless of enemy or operational environment.

By Brad Reeves, C4I Business Segment Director, Elbit America



A U.S. Army CPI2 M1087 Mission Command Platform (MCP) produced by Elbit System of America and fielded to the 1st Stryker Brigade Combat Team, 2nd Infantry Division. Elbit America has delivered 25 MCPs and CPSVs to date and is under contract to deliver 24 more through July 2024. (Elbit America)

The years-long NATO-led Peacekeeping Operation was winding down when the Eastern-backed Adversary suddenly resumed hostilities with its neighbor. To help bolster the Western-allied host nation's defense, a United States Army Stryker Brigade Combat Team (SBCT) was swiftly deployed to the region. The introduction of the highly mobile and lethal formation significantly impacted the Adversary's ability to advance its offensive operations.

Seeing their offense stalled, the Adversary changed tactics to focus on a perceived weakness of the SBCT formation. Rather than concentrate its efforts on a direct engagement of the SBCT's battalion formations, the Adversary instead deployed small teams of Special Operations Forces (SOF) to disrupt the U.S. command and control (C2). Using unconventional tactics, the adversary fixated on finding and destroying C2 nodes. The Adversary assumed these to be softer targets, easily neutralized due to their lack of maneuverability. Without effective command and control, the adversary hoped that U.S. forces would shift from offense to defense, and lose the initiative.

REVOLUTION IN BATTLESPACE COMMAND & CONTROL

To the Adversary's surprise, the SBCT was equipped with the U.S. Army's modernized battlefield C2 solution – the Command Post Integrated Infrastructure (CPI2). The CPI2 solution is composed of vehicle-mounted Mission Command Platforms (MCPs) and Command Post Support Vehicles (CPSVs)

The CPI2 solution is a result of the U.S. Army's assessment that legacy tent-based headquarters (HQ) are too large, too static, and vulnerable to surveillance, detection, and attack. The SBCT is just one of many formations and HQ from corps to battalion, to receive the mobile command post solution. Upon insertion, the Adversary SOF teams reported the SBCT was employing mobile command vehicles rather than the tents for its C2 operations. While the CPI2 is mobile, the enemy still assumed that the CPI2 and MCPs hosting the battle staff functions would remain vulnerable. This assumption proved to be invalid.

Able to keep up with the maneuver elements, and with rapid emplacement and displacement times, the CPI2 solution kept headquarters operations one step-ahead of the Adversary's ability to find, fix, track, target, and engage the brigade and battalion C2 nodes. Each set of CPI2 vehicles included truck-mounted shelters and CPSV – essentially server rooms on wheels. The CPI2 platforms can be up and running in hours rather than days, as the legacy tent-based command posts had required.

DIFFUSING SYSTEM THREAT VULNERABILITY

An additional benefit to the SBCT is that CPI2 provided the capability to be tactically decentralized. Clustered C2 operations were extremely susceptible to catastrophic destruction as entire nodes could be destroyed at once; dispersion enhances survivability.

During the operation, a forward deployed Observation Post (OP) visually detected a small drone approaching the vicinity of the SBCT HQ. The OP immediately alerted brigade HQ and, in accordance with established battle drills, the SBCT executed a displacement to a previously identified alternate location. What had taken a legacy tent-based Command Post (CP) hours to execute was completed in minutes. This mobility contributed to the increased survivability of the CP by avoiding the potential of inbound artillery or other munitions.

The SBCT's only CPI2 vehicle casualty during the operation was caused by a traffic accident when Brigade's Main CP CPSV was damaged and its mobility beyond repair. With the vehicle inoperable, but the command post servers and various communications devices still intact, the unit was quickly able to create a makeshift Main CP CPSV from an MCP due to the standardization of the design and components throughout all the CPI2 platforms.

Unable to disrupt the SBCT's command and control operations and stem the unit's effective maneuver operations, the Adversary eventually lost all its tactical momentum and combat power. The Adversary was eventually forced to withdraw within its own borders and hostilities were ended. Long sought regional stability was achieved.



A fielded U.S. Army M1087 MCP during a recent unit exercise. (U.S. Army photo)

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FACILITATING TECHNOLOGICAL ENHANCEMENT TO SUPPORT TRANSFORMATIVE MODERNIZATION

General James E. Rainey is the commanding general of the United States Army Futures Command (AFC), a post he assumed in October of 2022. AFC is responsible for transforming the Army to ensure war-winning future readiness and is focused on three overarching priorities: prioritizing people, designing the Army of 2040, and delivering the Army of 2030. Rainey commissioned as an infantry officer in the Army upon graduating from Eastern Kentucky University in 1987. He has served in a variety of command and leadership positions, from platoon leader to division commander. His most recent roles include Deputy Chief of Staff, G-3/5/7, at Headquarters Department of the Army and Commanding General, U.S. Army Combined Arms Center and Fort Leavenworth, Kansas. Rainey holds masters' degrees in Advanced Military Arts and Science and Public Administration from the School of Advanced Military Studies and Troy University, respectively.



GEN James Rainey

Commanding General
Army Futures Command
Austin, TX

Armor & Mobility had the opportunity to speak with General James Rainey, Commanding General, Army Futures Command (AFC), since his installment in October 2022, regarding the command's focus heading into 2024 and beyond. With Army modernization a continuing transformative process helping to prepare the nation's fighting force for future Multi-Domain Operations (MDO), AFC will remain a leading driver of readiness across the Joint Force.

A&M: What is Army Futures Command's greatest responsibility and how does the organization achieve it?

GEN Rainey: Army Futures Command (AFC) is accountable for transforming the Army to ensure war-winning future readiness. Transformation is future readiness, which is what AFC is accountable for. Transformation matters. While modernization is important, it is only a component of transformation. Modernization gets you better equipment, but better equipment without leaders, without the ability to train on it effectively, without the right organization, without soldiers and noncommissioned officers that know how to employ it, it is not going to amount to much. Transformation is about adding war fighting capability inside of our formations, which is why AFC exists, but we cannot do it alone. It is a team effort across the Army. All aspects of the team must be excellent in terms of organization and execution to achieve success. We are the best Army in the world now, and that being true many years into the future is why Army Futures Command exists.

A&M: There has been an increased emphasis on – and discussion around – the Army's work studying and preparing for the Future Operational Environment (FOE). What can you share about this effort?

GEN Rainey: The future operating environment is most important if you are trying to transform the Army. Trying to build the future Army without an understanding of the operating environment would be a fool's errand. It is not only the enemy you have to consider, it is the pacing challenge, but also an estimate of what technology is going to be like 20 to 30 years from now. More importantly, what are the implications of that new technology on future warfare? You also must consider demographics, geopolitical implications, and urbanization. For example, we need a different kind of Army with different capabilities based on the clear trend that people are moving to cities. It is a holistic understanding of what we think that future operating environment will be like.

At the same time, predicting the future is hard, and we have a responsibility to predict the FOE as accurately as we can, so we can anticipate what we got wrong before our enemies do and adapt to it faster than they do. This is why the FOE is so important and why it is a major effort at Army Futures Command. The effort is a living document,

a running estimate, that adapts and keeps pace with the rapidly changing world we live in.

A&M: We understand the future operating environment will likely be characterized by rapid, high-tech, and dispersed warfare. In what other ways do you see future warfare changing?

GEN Rainey: We are in a period of rapid change; however, there are certain aspects of warfare that do not change. War is a contest of wills between human beings, meaning that people are always going to be the most important factor. That will never change. Land is also a decisive domain because it is where the cities are, where people live. All our capabilities as a joint force are dependent on the control of land. Even space starts and stops on land. So, a lot is not changing. Also, we are a values-based military and will abide by the law of armed conflict, which has significant implications on the future Army. That will not change.

What is changing is that we are at the most disruptive point when it comes to technology since at least before World War II. We are in a period of disruption in terms of scale and speed, and the battlefield is becoming more transparent. We will need to operate under continuous observation and contact, whether that is visual, electromagnetic, or with social media, which has significant implications. The enemy will also understand this and be able to observe us. Technology favors the defense because it is easier to integrate when you are not moving, meaning defenses are getting stronger while the offensive is becoming more difficult and costly because of technology. Technology is increasing the punishment of unskilled warfighters and untrained units, and simultaneously providing new opportunities for commanders who understand and master the implication of that technology.

A&M: What do you anticipate will be the Army's greatest advantage moving forward?

GEN Rainey: The Army's greatest advantage moving forward is the same as it is now—our people. The Army is an all-volunteer force, and our NCO Corps is a national treasure. Our leaders, both in terms of quality and quantity, that we put into our formations, as well as our commanders, the men and women who lead those formations, plus the amount of training and education they receive over time that transforms them into battalion and brigade and division commanders—that is all key when it comes to the Army's greatest advantage. The second advantage is maneuver warfare. As you know, we do not participate in attrition warfare; we do not sacrifice men and women. Instead, we understand the art of all arms maneuver and practice it ruthlessly in our training. The combination of our people and the ability to maneuver, underpinned by ruthless training, make up the advantages we have now and moving forward.

A&M: What are the biggest challenges you see the Army facing in the years to come?

GEN Rainey: The biggest challenge is developing the ability to adapt and understanding that we will not always be able to predict the future accurately. Technology is changing at an unprecedented pace. Even if we make accurate predictions, so will some of our enemies, and furthermore, some enemies will change their behavior based on how we are adapting and changing. This means we must learn to adapt faster than our enemies do. Another challenge is endurance. We have a standing Army, and even with our best efforts to avoid attrition warfare,

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U.S. Soldiers assigned to 2nd Battalion, 20th Field Artillery Regiment, work with the Autonomous Multi-Domain Launcher (AML), on a Palletized Load System (PLS) using a Remote Interface Unit (RIU) as a part of Project Convergence 22 at Fort Irwin, California, Oct. 31, 2022. Project Convergence 22 experimentation incorporates technologies and concepts from all services and from multinational partners, including in the areas of autonomy, augmented reality, tactical communications, advanced manufacturing, unmanned aerial systems and long-range fires. (U.S. Army photo by SPC Collin S. MacKown)

we still would have a tough fight when you are talking about conflict between superpowers. We will prevail, but we must anticipate conflicts will not be short. Everything from the individual soldier's resiliency and the ability to endure the horror of war will test our endurance. So being able to adapt and keep up with the demands of warfare will be challenges moving forward.

A&M: What are some updates you can offer on the Army's efforts to design Army 2040?

GEN Rainey: While it is a little early to offer concrete updates, it begins with an Army warfighting concept. We have a good draft product of the concept and will spend time analyzing, experimenting, and adapting it. We will have a professional dialogue and put the draft concept through the rigor of professional discussions and outside consultation. Our hope is that we can share the first version of the new Army concept by the fall of 2024.

A&M: Project Convergence has been a major AFC effort the past few years. What has changed? What can we expect this year at CAPSTONE 4? And what is the way ahead for Project Convergence?

GEN Rainey: Project Convergence (PC) is one of the highest priorities of Army Futures Command. It centers around continuous learning and experimentation and is an Army-hosted, Joint endeavor. PC started as a once-a-year event, and we had successes with that format, but we have learned that it can be complicated. We spent a significant amount of time collecting data and analyzing what we learned and



observed. We were spending about a year collecting data, then spending 90 days figuring out what we learned, which made it a tight turn. We also realized we could not afford to wait every 12 months to run an experiment, so we adapted Project Convergence into a persistent experimentation campaign.

We have also gone out to our Army component commands, our joint teammates in Europe and especially in the Indo-Pacific, where they are already doing major exercises that are funded and have forces laid against, in the actual theater where we would be fighting.

We have transitioned to about 10-12 events every year and are continuously learning and then spiraling up to execute a capstone event. We have created learning objectives, and the commanders have training objectives, with both being embedded in every major operation. So, we are not slowing down in terms of learning, but instead, accelerating in the amount of learning and committing to plan a capstone that has great learning objectives and is coordinated.

The next capstone will have two parts, with a joint focus, including an Army-focused ground warfare component. We will primarily focus on command and control warfighting functions, offensive and defensive fires, sustainment, and contested logistics. It will also focus on the harsh realities of ground warfare and what that will look like in the future, with things like human machine integration and joint forcible entry, and urban operations in mind.

Project Convergence will remain a persistent experimentation program, and we will continue operating it as a joint experiment, with multinational participants and observers.

MOBILITY: CORNERSTONE OF SURVIVABILITY

The U.S. Army is modernizing and reimagining Command and Control On The Move (C2 OTM) battlefield capabilities, key to force protection and lethality during future large scale combat operations.

By Amy Walker, Project Manager Tactical Network, U.S. Army Program Executive Office Command, Control, Communications-Tactical



The second phase of the Army's Armored Formation Network On-The-Move (OTM) Pilot is currently planned for fiscal year (FY) 2024. In the photo: During the first phase of the pilot, 1st Lt. T. J. Allen, the communications and network officer assigned to the 6th Squadron, 8th Cavalry Regiment, 2nd Armored Brigade Combat Team, 3rd Infantry Division, communicates with the brigade headquarters from inside his network-integrated tracked vehicle at a remote location at Fort Stewart, Georgia in February 2022. (U.S. Army photo by Amy Walker, Project Manager Tactical Network, PEO C3T)

Mobility is a crucial element of survivability in any future conflict. This is especially true for the Command and Control On The Move (C2 OTM) that commanders need to make and execute rapid informed decisions.

The Army's data-centric network of 2030 will arm commanders with resilient secure OTM network connectivity to enable uninterrupted data exchange, C2, a single common operating picture and enhanced situational awareness.

"In large scale combat operations (LSCO) against a near-peer adversary, it must be assumed that static C2 network nodes will be threatened," said COL Stuart McMillan, Project Manager Tactical Network, Program Executive Office for Command, Control, Communications-Tactical (PEO C3T). "C2 On The Move is critical to survivability and lethality, enabling the commander to be present at the decisive point on the battlefield, whether physically or digitally."

FACILITATING FORCE PROJECTION

The Army is delivering its network of 2030 with a focus on division dominance to support LSCO, while laying groundwork for Army 2040 designs. These efforts include increasing maneuver speed and survivability through C2 OTM and mobile command posts. The Army is also reducing network complexity at lower echelons and delivering the right capability at the right echelon, enabling unburdened maneuver units to focus on the fight with increased agility, while higher headquarters take on the complexity of network planning and management.

"We need to deliver a more simple, more flexible, and more agile network," said Mark Kitz, PEO C3T, during TechNet Augusta conference in Aug. "We have to build agility [into our programs] from the ground up and embrace the fact that the needs of our network are going to change over time."

PEO C3T, N-CFT and other Army stakeholders are delivering

disruptive C2 OTM capabilities through several continually evolving network mobility and vehicle integration efforts, such as making command posts more mobile and integrating OTM network capability into armored formations.

“Our formations are calling for C2 on-the-move: more agile, with more capability,” said MG Jeth Rey, commander, Network Cross Functional Team (N-CFT), Army Futures Command, during TechNet. “Every single day our world is changing. We’re going to focus, drill in and reimagine what C2 on-the-move is and get to the end state of what it is going to look like in the future.”

Considerations for C2 node survivability include mobility, resiliency, dispersion, electromagnetic signature and size, weight, power (SWAP). Amid constantly changing and complex operational landscapes, OTM network capability will also provide the flexibility for commanders to fight disaggregated or collected regardless of geographic or mission constraints.

“As we look at different types of vehicles, the one thing we need is to be agile,” said COL Terry Tillis, who currently serves as the 1st Infantry Division Deputy Commander-Maneuver, during the Army’s most recent technical exchange meeting with industry. “We need to be survivable. It’s [about] getting dispersed, distributed and decentralized. [It’s about] getting smaller...But you can’t lose the functionality piece, so to get survivable you [also] have to think about how to [retain] the vital warfighting functions in the command post.”

In a previous assignment, Tillis served as Commander, 2nd Armored Brigade Combat Team, 3rd Infantry Division, the operational unit for the first phase of the Army’s Armored Formation OTM Network Pilot in fiscal year (FY) 2022.

C2 OTM APPLICATION IN ARMORED FORMATIONS

To retain battlefield advantage against increasingly capable adversaries, mobile robust real-time communication and data exchange will be critical for armored formation commanders to make swift informed decisions on the front lines of future LSCO. In support, PEO C3T and Army stakeholders are setting the stage for the second phase of the Armored Formation Network (AFN) OTM Pilot, currently planned for FY 2024. During the pilot, the service will further evaluate new and emerging commercial OTM line-of-sight and beyond-line-of-sight network transport and baseband technologies to be integrated onto select armored vehicles.

The AFN OTM network design will reduce SWaP to accommodate the armored vehicle space limitation. The equipment set will also be modular and standardized, enabling systems to be integrated across various platforms for OTM upper tactical transport network communications and C2. Because of the modularity, units will be able to quickly install, replace, or add components that pertain to their particular missions sets.

“Modernized modular vehicle-based network equipment that can be integrated on multiple platforms will reduce command post complexity, footprint and set-up/tear down times, and further increase the agility and operational flexibility of the force,” McMillan said. “This commonality also increases efficiencies from a supply and logistics standpoint.”

The second phase of the brigade and battalion-centric AFN OTM Pilot will inform decisions on the integration of new technologies on Stryker, Armored Multi-Purpose Vehicles, and Joint Light Tactical Vehicles. However, for the pilot itself, the Army may integrate systems on legacy platforms that are more readily available and less disruptive to unit operations. The AFN OTM Pilot will inform and recommend a

family of OTM solutions. The Army can then select capabilities from the available options to meet the requirements of each echelon.

COMMAND POSTS OTM

Supporting the Army’s command post modernization effort to make command posts more mobile and survivable, Command Post Integrated Infrastructure (CPI2) provides several vehicle-based command post variants that replace static tent-based command post infrastructures.

In August, the Army leveraged the 1-2 Stryker Brigade Combat Team for a CPI2 Limited User Test (LUT) at Joint Base Lewis-McChord, Washington. The CPI2 LUT, with continued critical Soldier feedback, will validate today’s capabilities and help inform the next increment of the evolving capability.

INTEGRATION/REDUCED SWAP/OPEN STANDARDS

In addition to C2 OTM support, the Army is also executing other vehicle integration efforts to support the Army of 2030, including the continually evolving Integrated Tactical Network (ITN) and the Command, Control, Communications, Computers, Cyber, Intelligence, Surveillance, Reconnaissance/Electronic Warfare (C5ISR/EW) Modular Open Suite of Standards (CMOSS).

ITN delivers an episodic tactical network that provides expeditionary, mobile, simple-to-use and hardened capabilities at brigade and below, and it is currently scaling up to support division network solutions for Army 2030 priority units. This year, the Army delivered the first vehicle-based ITN capability to the 2nd Cavalry Regiment, enabling networked communications between the command post, integrated Stryker vehicle platforms and dismounted troops.

ITN provides a simplified, independent, mobile network solution that is available down to the small-unit dismounted leader to facilitate mission command, situational awareness and air-to-ground integration. It incorporates the Army’s current tactical network environment (applications, devices, gateways, and network transport) with commercial components and transport capabilities. ITN technologies enable communications through multiple security enclaves for a network that is more secure and resilient by offering units multiple network communication pathways when faced with contested or congested communications environments.

As modernized equipment continues to be integrated onto vehicles, the Army will address the SWaP concerns of different platforms and utilize open standards as much as possible. The CMOSS solution aides in both of these requirements. It enables the Army to insert cards -- each embedded with networked capabilities such as Positioning, Navigation and Timing (PNT), mission command applications, or radio waveforms -- into a common ruggedized chassis inside a tactical vehicle. This approach provides a plug-and-play alternative to custom-installing and upgrading individual communications systems, with significant SWaP savings. CMOSS is a standard, however, the CMOSS Mounted Form Factor (CMFF) will be the Army’s program of record to deliver capability based on those standards beginning in FY25. It features a “Universal A-Kit,” which provides platforms with one or more standard chassis that are already plumbed for power, networks and radio frequency distribution.

EVER-MAGNIFYING NETWORK RESILIENCY

The Army continues to enhance network resiliency by providing

numerous network communication pathways for strong Primary, Alternate, Contingency and Emergency (PACE) communications plans. Emerging commercial High-throughput/Low Latency (HT/LL) multi-orbit satellite communications capability – such as Low Earth Orbit (LEO), Medium Earth Orbit (MEO), and High-Throughput Geographic Earth Orbit (GEO) satellite capability -- and multiple line-of-sight capabilities such as HT radio mesh networks, will be critical to the PACE plans of the future network of 2030 and beyond.

The Army S&T community together with Project Manager Tactical Network are developing a Next Generation Tactical Terminal (NGTT), with at-the-halt and on-the-move variants, which will enable resilient network connectivity and C2 with a reduced number of systems. NGTT leverages emerging HT/LL LEO and MEO constellation providers and current and future GEO constellations, as well as multiple frequency bands, with a single terminal. If one link goes down, Soldiers won't have to change bands or change out any hardware; switching to different transport options is automatic and seamless to the user. Instead of having a separate terminal to support each different constellation, as is the case currently, NGTT combines all of these capabilities into one system, significantly reducing SWaP burdens.

“Survivability in disrupted network communications environments requires network resiliency,” said John Anglin, Technical Management Division Chief, Project Manager Tactical Network. “Transport diversity is essential, with the ability to leverage multi-transport options, multi-orbits and multi-bands, simultaneously, enabling uninterrupted data exchange from corps and division to the edge of the fight.”

CONTINUAL NETWORK EVOLUTION

“The Army’s momentum continues in the delivery of transport agnostic network capabilities, data-centricity, a modern Zero Trust security architecture, and cyber and electromagnetic activity (CEMA) dominance in support of the Army of 2030 and 2040 designs,” Rey said.

Looking forward, to ensure commanders have the data they need to make rapid informed decisions for LSCO, enhanced network mobility will include local, cloud or hybrid-cloud hosted access to data services and applications tailored for manipulation in a variety of environments. Additionally, to remain survivable, future C2 OTM capability will need to outperform peer advanced technologies, such as artificial intelligence and machine learning, quantum computing, sensing, encryption, decryption, and navigation.

“We are invested in these challenges today, pursuing the improvement of mobility and survivability with a depth and breadth of diverse, yet cohesive, C2 on-the-move capabilities,” McMillan said. “Through persistent Soldier touchpoints and experimentation efforts, we are integrating emerging industry technologies and novel capabilities into current and near-term programs, focusing on open standards to simplify and speed future integration. We have to be forward thinking and open to revolutionary capabilities yet to emerge.”



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MAXIMIZING MISSION READINESS THROUGH SOFTWARE SUSTAINMENT

MG Robert L. Edmonson II is the 17th commander of the U.S. Army Communications-Electronics Command (CECOM). As the commanding general for a 9,000-person, global command and the senior commander of a 28,000-person military base, he serves as the Army's Command, Control, Computers, Communication, Cyber, Intelligence, Surveillance, and Reconnaissance (C5ISR) and medical materiel integrator. He received his commission in 1991 from Frostburg State University and holds a B.S. in business marketing, as well as a Master of Science Administration in information resource management from Central Michigan University, and an M.S. in national security strategy from the National Defense University. CECOM sustains and delivers C5ISR readiness for American Soldiers; CECOM's global team equips and empowers Soldiers in all aspects of C5ISR, every minute of every day.



MG Robert L. Edmonson II

Commander

U.S. Army Communications-Electronics Command
Aberdeen Proving Ground, MD

A&M recently sat down with U.S. Army Communications-Electronics Command (CECOM) commander, MG Robert Edmonson II, to talk about the Army sustainment enterprise and the critical role that software and cybersecurity play on the 21st century battlefield.

A&M: Why is Army software and sustainment so critical?

MG Edmonson: The increased lethality of future battlefields makes sustainment more critical than ever. With the Army's growing reliance on technology and computers, software plays an essential role in our success or failure. As software operates more and more of the advanced equipment Soldiers need to complete the mission, it is imperative that we ensure our software is constantly updated to protect against the latest cyber threats. When you look at cyber vulnerability in the Army, the widest growing attack surface is the tactical side. This is no surprise considering the numerous Soldiers with varying equipment spread across many units with administration at a relatively low-level echelon.

Challenges in supporting software can limit cyber readiness and put American and allied lives in danger. Sustaining the software used by complex military cyber-dependent systems such as vehicles, radars, and radios is essential for safeguarding our troops and assets. It's important for Army leaders to understand how critical their software readiness is to effectively prepare their units to survive, sustain and win future conflicts. At the root of it all, sustainment is the key to longevity. By sustaining our equipment – both hardware and software – we ensure that we remain ready now and well into the future.

As the premier Army sustainment enterprise, the U.S. Army Materiel Command (AMC) and its subordinate command, CECOM, have adapted their strategies for Army hardware and software sustain-

ment to support the fight of today and tomorrow through the AMC ecosystem.

A&M: What is the Army Materiel Command ecosystem

MG Edmonson: How our diverse Army systems interact with and depend on one another in the Army's Organic Industrial Base, through private industry, and across the global supply chain is known as the AMC ecosystem. In other words, AMC is a single face to the field that synchronizes materiel Readiness, for both hardware and software, among its organizations and executes tactical logistics for the Army. Maintaining that stable supply chain not only for critical hardware platforms and parts, but also for software updates and cyber patches, is vitally important to readiness.

When thinking critically about the global supply chain and sustainment, it's important to understand that neither hardware nor software exist in a vacuum. They are in a symbiotic relationship that requires balance and recognition of their interdependency. Currently, the AMC ecosystem supports this balance as the premier Army sustainment enterprise for both hardware and software in the field. Army

Field Sustainment Brigades, Army Field Sustainment Battalions, and CECOM Logistics Assistance Representatives are globally positioned to provide sustainment for hardware and software systems that have transitioned to AMC to sustain. Because of this, Soldiers are accustomed to receiving hardware and software support from AMC in garrison, as well as when deployed.

Unfortunately, there are few operators inside the signal community, limited to mostly leaders at the O-6 level or above, who have worked in the AMC ecosystem and who fully understand sustainment processes, the dependency on the global supply chain for hardware and software, and which Soldiers are trained on which systems and tasks. This has led to an unfortunate knowledge gap that CECOM intends to close through education and teamwork.

In addition, as part of its effort to modernize quickly, the Army is also using more Commercial Off the Shelf Technologies (COTS) and non-Program of Record (POR) systems, as they can be fielded more rapidly. Unlike traditional PORs, which transition to AMC to sustain after being fielded by Program Executive Offices (PEOs), the responsibility to provide support to these non-POR systems remains with the PEOs.

There is a similar knowledge gap among Army leaders about this transition-to-sustainment process and where their units need to go for support for COTS and non-POR systems. While these processes are helpful for bringing new capabilities to the battlefield quickly, in order to maintain a stable supply chain, the Army must continue to sustain its POR equipment and should avoid a “buy and throw away” mentality that relies too heavily on COTS and non-POR platforms.

Today, we are focused on engaging with units and commanders to help them better understand these complexities of the sustainment enterprise. We are also refining our processes to ensure that when units request system support, these requests are validated and routed to the proper parties to help, whether that’s CECOM or the PEO.

A&M: What does CECOM’s Software Engineering Center provide to Army software sustainment?

MG Edmonson: The CECOM Software Engineering Center (SEC) is the Army and AMC’s premier Center of Industrial and Technical Excellence (CITE) for C5ISR system software maintenance. Its unique capabilities including software availability and patch automation services, software installation services, software identification and reporting, software assurance, software licensing, and many other modern software development practices.

Currently, the SEC is focused on engineering and creating Soldier tools in concert with software practices that reflect the Army’s Cyber Readiness Framework. Specifically, it is making software updates to the field as quick and easy as possible through an end-to-end software pipeline. It also uses its organic software capability and the Army’s established logistics systems, such as Equipment Status Reporting, Unit Status Reporting, and Modification Management Information System to enable units to report, track and account for software readiness. Commanders need to be aware of the software readiness and cybersecurity of their units, and SEC is focused on improving that awareness and accountability.

SEC also operates the CECOM Software Repository, which is a one-stop-shop for the Army software community to access updates and cyber patches quickly and easily for more than 70 C5ISR systems, instead of waiting for physical delivery on CDs. SEC also provides software sustainment, which includes maintaining the cyber posture

and fixing software defects, for more than 80 C5ISR systems transitioned to AMC for postproduction software support. Everything SEC does helps to ensure our AMC ecosystem is fully synchronized with global supply chain operations.

A&M: Where is Army software sustainment headed in the future?

MG Edmonson: Today, the Army is transitioning to a new model for software, known as Continuous Integration/Continuous Delivery (CI/CD), which is intended to improve responsiveness to rapidly evolving software requirements.

That means traditional sustainment functions, including maintaining the cyber posture of systems and fixing software defects, will still be required to ensure the longevity of the system and the hardware on which it runs. The Army has organic software expertise within the AMC ecosystem that it should continue to leverage, especially given the synergies between hardware and software and AMC’s extensive capabilities in sustaining both.

Our organic software expertise will also be needed in the future, because as software gets more complex, so do the potential challenges Soldiers may experience. In fact, we are already seeing this shift today. Of the software tickets CECOM received in FY23, 79% are at the staff sergeant or E6 level or above to repair. That being said, complexity is our reality. A great example of this is vehicle maintenance. Changing a tire is not a very challenging task, and many vehicle owners can do it themselves. Changing the vehicle’s brake pads, however, is a bit more complex, and requires the person performing the task to have a higher skillset and knowledge base. Software is currently at the “changing brake pads,” level, while it would be preferable to be at the “changing a tire” level. And, as we move into the future, the complexity of software is only going to increase. To maintain the tactical advantage, these tickets will need to be resolved in the field where they arose, rather than being moved to division level for resolution. The best solution, then, will be integrating software engineers in the field with Soldiers to ensure the anomalies can be resolved as they arise.

Moving forward, we also must acknowledge that the technical and operational environments in which our forces serve are also evolving. Software is becoming increasingly critical to readiness. As a result, Army C5ISR capabilities must include a long-term approach that ensures a software/hardware design total system concept. In other words, systems must be designed to incorporate anticipated changes in interoperability, adaptability, and user interfaces that remain intuitive and effective in providing the intended system capabilities.

A&M: Any final thoughts?

MG Edmonson: Software sustainment is critically important as the Army modernizes, and it will only continue to become more important in the future. Our Soldiers and our ability to fight and win will depend on cyber-secure and sustained software and hardware.

The AMC ecosystem, with software sustainment as an integral component, has a profound impact on Army materiel readiness around the globe. CECOM’s SEC, specifically, remains poised to continue being the center of excellence when it comes to software security and support for the warfighter. Every day, the work that we do directly impacts mission readiness and is vital to those who wear the cloth of this nation and our allies.

TARGETING PARTS READINESS TO MITIGATE EQUIPMENT DOWNTIME

The Defense Logistics Agency (DLA) and U.S. Army leaders are discussing readiness issues on parts availability for depot-reparable equipment critical to re-supply in global ally partnering.

By Beth Reece, Defense Logistics Agency



U.S. Army soldiers conduct M2A3 Bradley Fighting Vehicle live-fire qualification at Pabrade Training Area, Lithuania, August 2023. The demand for parts is up for the Bradley Fighting Vehicle according to Army officials. (Photo by U.S. Army Sgt. Cesar Salazar Jr.)

Ninety percent supply availability equals 10 percent failure," said Deputy Commanding General Lt. Gen. Chris Mohan, U.S. Army Materiel Command (AMC), during the Army/Defense Logistics Agency Day in Huntsville, Alabama this past July.

"The thing I would challenge us to do is really peel back the onion on that supply availability and make sure we're not just tagging ourselves with a high number and high fiving," Mohan said.

The recent daylong meeting allowed DLA and Army leaders to share details on the status of Army and defense working capital funds, as well as updates on topics like depot-level reparable contracting and delinquent deliveries.

RAMPING UP THE OBSOLESCENCE FIGHT

DLA Director Vice Adm. Michelle Skubic echoed Mohan's emphasis on readiness, adding that she and Gen. Charles Hamilton, AMC's commanding general, had spoken



Gen. Charles Hamilton



Vice Adm. Michelle Skubic

about the need for additional contracting and obligation authorities to address readiness issues.

Skubic highlighted the agency's effort to help the Army dispose of a vehicle fleet faster than normal, when there was a need to divest rapidly, as proof that together the two organizations can achieve what seems impossible.

"There's probably no stronger logistics bond because of the breadth and scope of the Army around the globe and DLA's critical support of you in accomplishing your missions," she said.

Mohan said he sees no decrease in demands for his service, especially as it focuses on responsibilities to deliver capabilities to partners and allies. The need for parts for the M777 Howitzer, for example, is up 1,000 percent over the last year, he said. The demand is also up for parts for the M2 Bradley Fighting Vehicle.

Items needed for aging weapons systems are often the hardest and most expensive to procure, and Marion Whicker, executive deputy to the AMC commanding general, said the Army and DLA must work together in



Soldiers load a 155mm artillery round into an M777 Howitzer using a ramming staff during Exercise Northern Strike 23 at Camp Grayling, Michigan, August 2023. The Army says the need for M777 Howitzer parts is up 1,000 percent over the last year. (Photo by U.S. Army Staff Sgt. Nicholas Oposnow)

pushing original equipment manufacturers to help find solutions.

“We’ve just been letting the obsolescence issue fall onto our plates,” she said. “At a minimum, we’ve got to get the tech data.”

Hamilton described AMC and DLA’s credibility as extremely high within the Defense Department “because we can deliver in most cases.” DLA earned its reputation for quickly, effectively supporting warfighters during operations in Iraq and Afghanistan, he continued, and now both organizations must work with industry to further strengthen capabilities.

TARGETING INVESTMENTS AHEAD OF THE GAME

“We’ve got to break down the barriers and let industry know about the right investments they can make so they can get to the capacity we want,” Hamilton said.

He also warned the group of the dangers of contested logistics in which adversaries strike targets such as logisticians and planners supporting operations away from the battlefield.

Skubic said DLA has a role in protecting against contested logistics.

“It’s about the work we’re doing behind the scenes and continuing to be transparent with each other and holding each other accountable, remembering that we – with industry – are the greatest strategic

deterrent to our adversaries as they ponder taking us on,” she said.

Skubic added that auditability remains critically important, and the agency has a robust, step-by-step plan to achieve it.

“We know we’re part of your audit journey. We have to get our audit right for you to get your audit right, and we’re not taking that lightly,” Skubic emphasized.





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EXPANDING THE MULTI-MISSION CAPABILITIES ENVELOPE

Jennifer Moore, MBA, PMP, currently serves as the Program Manager for Light Tactical Vehicles within Logistics Combat Element Systems, Marine Corps Systems Command. She provides program management leadership for all efforts within the light tactical fleet, including the family of Ultra-Light Tactical Vehicles, family of Joint Light Tactical Vehicles, High Mobility Multipurpose Wheeled Vehicles, and Light Tactical Trailers. Prior to her civil service career, she held various roles in information technology and project management at Hewlett Packard for 15 years. She completed her education at the University of North Carolina Wilmington and American Military University, and holds several certifications from the Program Management Institute, Defense Acquisition University and National Defense University. Ms. Moore has received the Navy Meritorious Civilian Service award during her federal service career. Outside work, she enjoys off-roading, camping, and biking with her husband.



Jennifer Moore

Program Manager Light Tactical Vehicles
Marine Corps Systems Command

Armor & Mobility spoke recently with Jennifer Moore, PM LTV, Marine Corps Systems Command (MARCORSYSCOM), regarding the Corps' replacement for its Utility Task Vehicle (UTV) and the myriad capabilities its new Ultra-Light Tactical Vehicle (ULTV) will bring to global Marine Air-Ground Task Force (MAGTF) operations.

MARCORSYSCOM serves as the Department of the Navy's systems command for Marine Corps ground weapon and information technology system programs in order to equip and sustain Marine forces with full-spectrum capabilities. The Program Manager for Light Tactical Vehicles develops, acquires, produces, fields, and sustains safe, reliable, effective and supportable light tactical vehicles and trailer systems for Marine Corps operation worldwide.

A&M: What are some main capabilities a new ULTV will bring over and above the UTV in support of the Joint Concept for Contested Logistics and Expeditionary Advanced Base Operations?

Moore: The Ultra-Light Tactical Vehicle (ULTV) is a modular, off-road utility vehicle that can be quickly configured to provide logistical support for infantry units performing casualty evacuation, command and control, and electronic warfare missions. Like its predecessor, the Utility Task Vehicle (UTV), the ULTV can be used during operations in an anti-access/area denial environment where currently fielded ground mobility platforms may be unsuitable due to size, weight, and transportability.

The ULTV brings several key capabilities over and above the traditional UTV to support the Joint Concept for Contested Logistics and Expeditionary Advanced Base Operations:

- **Increased Durability:** The ULTV is designed to withstand harsh and contested environments, providing increased reliability during logistics and base operations in challenging terrains.
- **Expanded Payload Capacity:** The ULTV features increased payload and capacity, allowing it to transport more equipment and supplies, thereby increasing the overall operational flexibility and efficiency.
- **Improved Mobility:** With advanced suspension systems, larger tires with run flat capabilities, and enhanced power-to-weight ratios, the ULTV offers superior off-road mobility compared to the UTV, enabling it to traverse rough terrain and access remote areas more effectively.
- **Integrated C4ISR Systems:** The ULTV incorporates Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) systems, enhancing situational awareness and enabling seamless communication between units during operations.
- **Multi-Mission Capabilities:** The ULTV is adaptable to various mission requirements, making it a versatile platform for carrying out logistics tasks and reconnaissance missions during expeditionary advanced base operations.



U.S. Marines drive the Ultra Light Tactical Vehicle (ULTV) during an operational new equipment training at Marine Corps Base Camp Pendleton, CA in July 2023. The ULTV is a modular, off-road utility vehicle which can be configured to provide logistical support to the Fleet Marine Force, perform casualty evacuation, command and control, and electronic warfare missions. Marine Corps Systems Command's Program Manager for Light Tactical Vehicles started fielding the ULTV to Marines in June 2023. (U.S. Marine Corps photo by Sgt. Nicolas Atehortua)

A&M: From a current design capabilities perspective, how does the ULTV compare with SOCOM's Light Tactical All-Terrain Vehicle (LTATV) but go beyond with kitting add-ons while remaining air transportable?

Moore: The ULTV is a partnered acquisition program with USSOCOM. While the Marine Corps Systems Command cannot speak to SOCOM's LTATV, here are some specific features of the USMC ULTV:

- **Air Transportability:** The ULTV remains air transportable by MV-22 Osprey and CH-53 E/K aircraft. The ULTV can be quickly deployed to different operational theaters by military aircraft, providing a valuable advantage in expeditionary scenarios.
- **Increased Payload Capacity:** The ULTV features an expanded payload capacity, allowing it to carry more equipment and supplies in one deployment, reducing the need for multiple trips or additional logistical support.

- **Advanced Technology Integration:** The ULTV incorporates the latest advancements in automotive technology, materials, and ergonomics, resulting in improved performance, durability, and overall operational effectiveness.
- **Scalability and Adaptability:** The ULTV's modular design not only enables the integration of kitting add-ons but also facilitates future technology insertion, ensuring that the vehicle can adapt to evolving mission requirements and technological advancements.

A&M: What is the initial slated delivery/fielding for ULTV?

Moore: Marine Corps Systems Command's Program Manager for Light Tactical Vehicles started fielding ULTVs to Marines at I MEF in June 2023.

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