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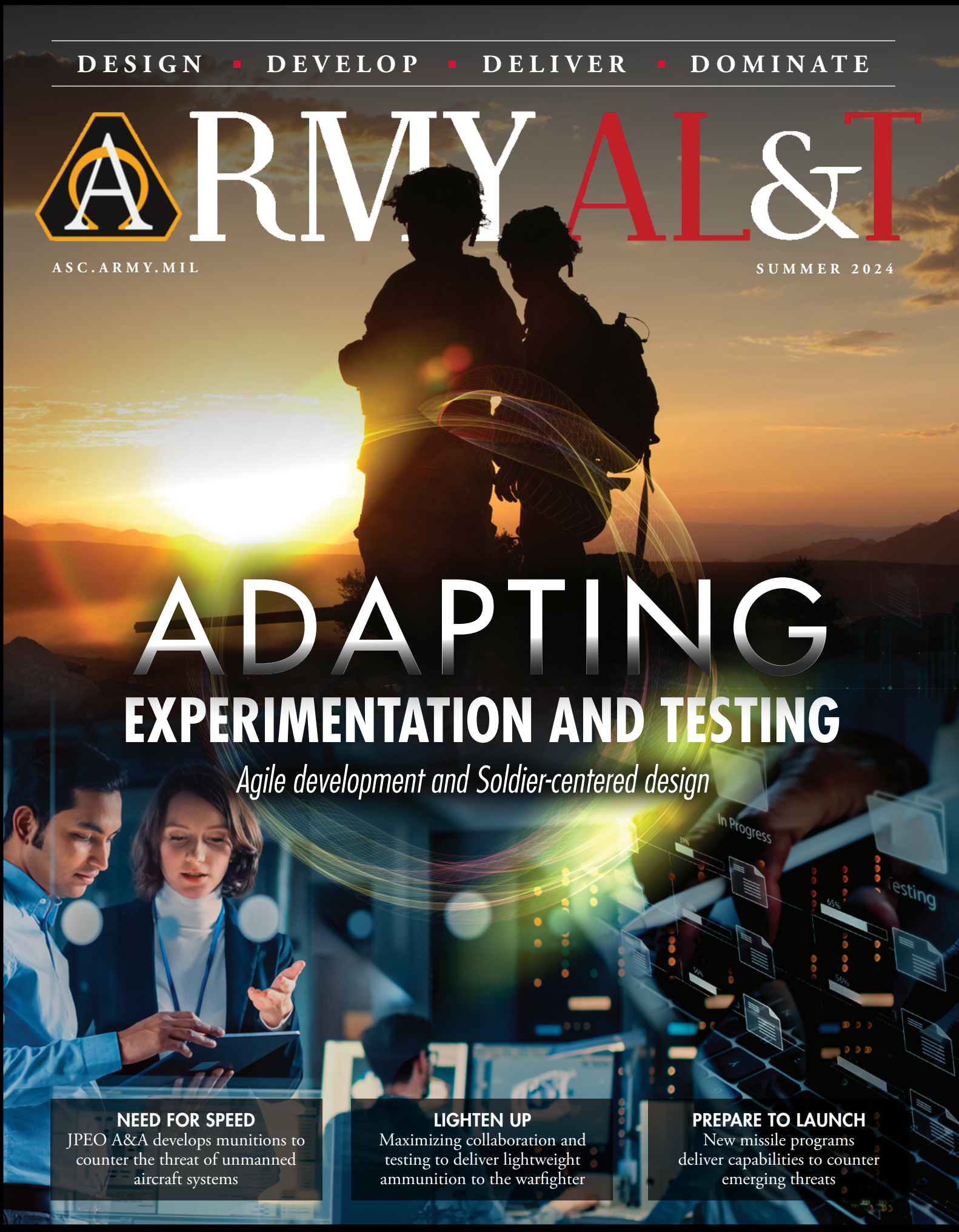

ADAPTING

EXPERIMENTATION AND TESTING

Agile development and Soldier-centered design

NEED FOR SPEED
JPEO A&A develops munitions to counter the threat of unmanned aircraft systems

LIGHTEN UP
Maximizing collaboration and testing to deliver lightweight ammunition to the warfighter

PREPARE TO LAUNCH
New missile programs deliver capabilities to counter emerging threats

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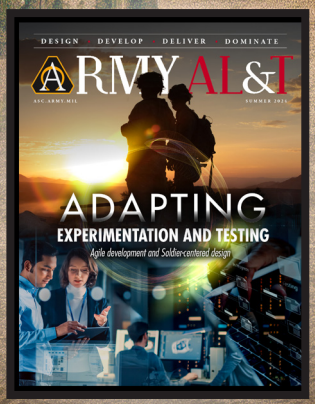

ON THE COVER

The Office of the Assistant Secretary of the Army for Acquisition, Logistics and Technology is adapting experimentation and testing, along with the Agile development methodology and Soldier-centered design concept, to improve processes and deliver product faster and better.

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From the Editor-in-Chief

As the world witnesses rapid technological advancements and shifting geopolitical landscapes, the Army's commitment to adaptation through experimentation and testing becomes increasingly vital. This issue focuses on how the Army, specifically the Office of the Assistant Secretary of the Army for Acquisition, Logistics and Technology, is adapting experimentation and testing to improve processes and deliver product faster and better. However, experimentation and testing are not the same thing, and it is crucial to distinguish between operational experimentation and exercises. While exercises focus on improving readiness with training objectives and scenarios, experiments are designed to validate capabilities that increase readiness and influence the future of the Army, according to the Army's 2023 publication, "Understanding Army Experimentation." Exercises are about the present; experiments are about the future.

Integral to both experimentation and exercises are the Agile development methodology and the Soldier-centered design concept. The Agile methodology highlights people over process, responding to change over following a plan and working product over comprehensive documentation, while the Soldier-centered design concept puts the warfighter at the center of the design and development process—and relies on Soldier feedback to improve design and performance. Trying to balance these competing demands, of course, isn't a new concept. You've heard multiple notions of how to do this over the years in various versions: Agile Acquisition; the Agile philosophy of fail fast, fail often; the Agile manifesto; Agile transformation; and on and on. The basic idea behind all these concepts is fusing experimentation and testing into a seamless process … easier said than done.

Email Nelson McCouch III
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Combining experimentation and exercise is exactly what the story "Persistent Experimentation," Page 22, in this issue is all about. Read about how the Medical Research and Development Command's Experimentation Integration Cell—which serves as a central coordination point for the command's participation in persistent experimentation events—has become the standard method for participating in readiness and interoperability exercises to provide real-time testing of new medical technologies for the warfighter. Learn how the Army is identifying specific units to experiment with near-term networked communications systems to ensure that the network and its myriad radio systems, like blue force tracking, meet requirements in "Transforming in Contact," Page 36. Finally, speaking of Agile processes, on Page 28 in "A Matter of Course," learn how the Next Generation Combat Vehicles Cross-Functional Team created its own in-house course on digital engineering practices and applications to help accelerate the design and development processes and keep up with commercial manufacturing.

This and many other thought-provoking articles, such as the Army deploying AI technologies and leveraging free and open-source software on the battlefield, are in this issue, so please take your time and enjoy. As always, if you have comments, concerns or an actual story you would like to pass our way, please contact us at **armyalt@army.mil**.

Nelson McCouch III
Editor-in-Chief

QUICK JOURNEY
MTA enabled the M10 Booker Combat Vehicle to go from program start to low-rate initial production in just four years. (Photo by Bernardo Fuller, Army Multimedia and Visual Information Division)

AGILE ACQUISITION

Providing Soldiers the edge to conduct multidomain operations in all environments.

As we near the end of the first quarter of the 21st century, Army acquisition faces a rapidly evolving threat environment that demands changes in how fast we develop, field and produce weapons, equipment and supplies.

We are seeing new, innovative technologies enter the battlefield. Drones and cyberattacks are being used often and effectively. Other technologies are on their way: artificial intelligence (AI), machine learning, autonomous technology, deep sensing, hypersonic flight and mixed communications networks.

The threat environment is also seeing the emergence of new, potential adversaries. The list includes near-peer threats, like China and Russia; mid-tier adversaries, such as Iran and North Korea; and violent, nongovernmental terrorist and criminal organizations, like Hamas, the Houthis, Hezbollah, Somali pirates and criminal narcotics gangs.

To meet the challenge of these threats, we are achieving acquisition at speed by developing, testing and fielding new weapons and equipment quickly and responsibly. We must give our warfighters a decisive edge so they can successfully conduct multidomain operations in land, water, air, space and cyberspace environments.

Army acquisition is also helping our defense industry partners develop the capacity to produce at scale, so when the need arises, industry can surge production of weapons, munitions and other supplies. The ability to produce at scale has a deterrent effect: Potential foes are less likely to act if they know that America has the ability to supply our own forces, as well as those of our friends and allies.

So, how is Army acquisition laying a foundation for acquisition at speed and production at scale? We are adopting a new design philosophy that helps us achieve both these priorities.

MODULAR OPEN SYSTEMS APPROACH

We are incorporating a modular open systems approach (MOSA) on our new ground vehicle and aircraft platforms. MOSA avoids the problem of vendor lock that has been encountered on some platforms in the past. This allows small businesses to compete for and participate in contracts that offer greater innovation at lower costs. This system architecture also makes it easier and less expensive to repair, replace and upgrade subsystems on existing platforms. It makes it easier for other companies to make subsystems for these platforms, which leads to a broader, more resilient supply chain that can more easily ramp up production when needed.

UNIFIED DATA REFERENCE ARCHITECTURE

What MOSA is to hardware, the unified data reference architecture (UDRA) is to data. UDRA is a modular and standardized format that makes it easy for many different systems to use the same data. Until now, it was difficult for many Army digital systems, even those operating on a single platform, to communicate and share data because they handle and process data differently. The UDRA sets up a system in which all these systems speak the same digital "language." In March, the Army opened the cloud-based Innovation Exchange Lab, which allows prospective vendors to test their systems to see how they function using UDRA 1.0.

This allows better and broader use of data across the Army and opens doors for more innovation and competition.

AUTHORITIES

Army acquisition has also laid foundations for acquisition at speed and production at scale by working with Congress for new authorities. These authorities give the Army the legal framework for conducting acquisition in new and effective ways that promote fair and open competition to ensure we exercise responsible stewardship of taxpayer money.

The new authorities provided by Congress give us alternative and flexible paths that enhance acquisition at speed.

RAPID FIELDING

1st Sgt. Patrick Casha, flight paramedic with the Oregon Army National Guard, demonstrates the new MH60M Medical Upgrade Interior kit designed for Future Long-Range Assault Aircraft at Yuma Proving Ground, Arizona, in May 2023. MTA rapid prototyping could get the aircraft into service four years earlier than anticipated. (Photo by Mark Schauer, U.S. Army Yuma Proving Ground)

RIGHT DOWN THE MIDDLE

Col. Christopher Midberry, garrison commander of Fort Campbell, Kentucky, fires a Next Generation Squad Weapon machine gun in September 2023. MTA was used to quickly develop and field the weapon system. (Photo by Kayla Cosby, Fort Campbell Public Affairs Office)

One of these authorities is the Software Acquisition Pathway (SWP). The SWP recognizes that software development differs from traditional hardware-oriented acquisition, which follows a linear or "waterfall" process in which one step precedes the other. Software development, on the other hand, is a continuous process. This is because it is far easier to improve software than improve hardware. Rewritten software code can easily be downloaded, whereas improved mechanical parts must be designed, manufactured and shipped to a location where they can be installed by skilled technicians.

Using SWP encourages more agile acquisition by shifting from prescriptive, monolithic requirements to high-level needs statements that can be modified in response to changes in user needs.

The Army is now using the SWP for 17 programs, and that number is likely to increase. Two examples are:

- Army Integrated Air and Missile Defense: The Army is using the SWP to conduct Agile software development for the Integrated Air and Missile Defense program in support of Joint All-Domain Command and Control. The Integrated Air and Missile Defense Battle Command System entered full-rate production in 2023.

- Project Linchpin: The Army is using the SWP for Project Linchpin, which is the Army's first program to build a trusted AI and machine operations pipeline. The program entered the SWP Planning Phase on Nov. 1, 2023.

Other authorities being used to meet modernization and readiness objectives include the middle tier of acquisition (MTA), other transaction authority (OTA) and the rapid acquisition authority (RAA).

Congress established the MTA in the fiscal year 2016 National Defense Authorization Act. It employs constant Soldier testing and feedback to inform requirements and enables the use of two expedited development pathways: rapid prototyping and rapid fielding.

Examples of Army MTA successes include:

- Next Generation Squad Weapon: The MTA pathway allowed Next Generation Squad Weapon to quickly develop prototypes in production-level quantities and rapidly transition to fielding in approximately three years—saving almost 18 months.

- M10 Booker (formerly Mobile Protected Firepower): The MTA rapid prototyping pathway allowed M10 Booker to go from program start to

The threat environment is also seeing the emergence of new, potential adversaries.

low-rate initial production in just four years. In comparison, this typically takes six to 10 years on the major capability acquisition pathway. The first 26 of 350 vehicles were delivered in the first quarter of fiscal year 2024.

- Future Long-Range Assault Aircraft: The MTA rapid prototyping pathway allowed the Future Long-Range Assault Aircraft program to streamline requirements processes and documentation and to conduct significant risk-reduction efforts before a Milestone B decision. It already has shaved a year off the program and may allow the aircraft to be fielded in 2030, which will save almost four years.

The OTA enables acquisition at speed, providing a flexible business tool that is exempt from the standard regulatory requirements governing traditional procurement contracts. This increases speed and flexibility and is particularly useful for working with nontraditional defense contractors to rapidly procure prototypes and demonstrate potential capabilities.

In fiscal year 2023, the Army awarded 1,767 OTA agreements valued at more than $6.9 billion. OTAs allowed the Army to shave seven months off the time to award a contract for many programs, and were particularly useful during the COVID-19 pandemic.

Congress also provided the Army with RAA, which enables the Army to quickly acquire and deploy capabilities in response to urgent operational needs.

A good example of how useful the RAA can be is the Coyote Interceptor program, which uses unmanned aircraft systems (UAS), or drones, as a counter-UAS system. After the Hamas attack on Israel on Oct. 7, 2023, Iranian proxies in several areas began attacking American Soldiers with drone systems. The Army used RAA to order hundreds of Coyote Interceptors and started securing these systems less than 30 days after receiving authorization to move ahead. Motivated acquisition professionals used the new authorities to acquire systems at the speed of relevance.

CONCLUSION

New acquisition authorities are also being used to improve the strength, resilience and ability to produce at scale for our industrial base.

Congress included temporary authorities in support of Ukraine, Taiwan and Israel. These temporary authorities, which are set to expire on Sept. 30, 2028, allow DOD to waive statutory limitations associated with undefinitized contract actions, and waive certified cost and pricing data requirements for covered contracts. These flexibilities have been critical in helping the Army move quickly to deliver capabilities in response to the conflict in Ukraine and to replenish U.S. stocks.

To date, the Army has used these authorities more than 70 times, which has reduced procurement action lead time by an average of three to six months.

This helped to more than double domestic production of 155 mm artillery rounds and will result in the ability to produce approximately 100,000 155 mm rounds per month in fiscal year 2026. This approach has been used to boost production of Guided Multiple Launch Rocket System rockets, Bradley Armored Personnel Vehicles and other systems.

Another change involved increased use of multiyear procurements (MYP), which are generally preferred by industry because they provide revenue stability.

Additionally, as a result of our response to Ukraine, Congress modified the base MYP statute to include "industrial base stability" as another reason to enter into an MYP contract, giving us more flexibility to use MYP authority. This means DOD can now enter into an MYP contract based on the anticipation that it either will result in significant cost savings, or will result in necessary defense industrial base stability. This is an incentive to industry to add capacity, which enhances our ability to produce at scale.

As you can see, the Army continues to evolve to ensure that our warfighters have a decisive edge on the battlefield today and in the future. We are working in partnership with industry, academia and DOD to ensure we will meet this challenge—enabling both acquisition at speed and production at scale.

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MOSA MUSKETEERS

Muskets, like the ones fired here in Boston by participants in the U.S. Military Entrance Processing Command's Military Member of the Year competition, were the first Army item to employ the modular open system approach, which relies on the design and development of systems with highly interoperable and reusable components. (Photo courtesy of the U.S. Military Entrance Processing Command)

DIGITAL MODULARITY

Architecting for adaptability with the Army.

by Jennifer A. Swanson

In 1798, newly independent Americans faced the threat of war with France, at that time a formidable military power. The U.S. needed to quickly re-arm, so the Army signed a contract with Eli Whitney for 10,000 muskets. But this was not just an order for muskets. It called for a new, modular-style technology: interchangeable parts.

Before this, each Army musket was handmade and essentially unique. When muskets of that era broke or were damaged, they were usually discarded and replaced because repairs were too complicated. Standardized interchangeable parts reduced the cost of buying, repairing and sustaining military equipment and made mass-production possible. The Army was quick to adopt this technology. It mandated that the arsenals in Harpers Ferry, Virginia (now West Virginia) and Springfield, Massachusetts, adopt precise and standardized production methods. That mandate led to the first mass-produced musket with interchangeable parts, the M1842.

More recently, the Modular Open Systems Approach (MOSA) has built upon this history by encouraging the design and development of systems with highly interoperable and reusable components. With this approach, the government owns the key system interfaces that allow vendors to build physical modules that are swappable on the intended platform. This makes it easier, faster and less expensive to develop new systems, add capabilities, upgrade older systems and maintain current ones. Most importantly, this approach enables the Army to replace products easily and cost-effectively as new technology becomes available, ensuring our Soldiers always get the most cutting-edge capabilities.

Today, efficiency in hardware development remains important, but the pace of development in the software world has grown exponentially. To maintain overmatch in peer competition, the Army must adapt to the unprecedented explosion of software and

technologies driven by artificial intelligence (AI). To that end, the Army must be able to develop and deploy digital capabilities at speed and at scale:

- At speed: agility and accelerated development and delivery of software upgrades and innovative solutions.
- At scale: rapidly and seamlessly integrate and compose disparate software solutions and orchestrate them into larger, end-to-end capabilities, even across system and program boundaries.

Just as modularity has facilitated incredible advances in hardware, the Army must now apply the principles of modularity in the burgeoning digital space.

INTEROPERABLE AND INTERCHANGEABLE

Before we explore the nuts and bolts of digital modularity, it's valuable to consider two guiding concepts: interoperability and interchangeability.

The Institute of Electrical and Electronics Engineers Standard Computer Dictionary defines interoperability as "the ability of two or more systems or components to exchange information and to use the information exchanged." This is achieved through the adoption of open standards for networking protocols, messaging formats and application programming interfaces (APIs). Such standards enable disparate software systems, possibly developed by different vendors using varied technologies, to connect and communicate effectively.

However, the mere exchange of data is not sufficient by itself. In an enterprise context, the real value is often realized by integrating two or more systems or components to form a bigger, more powerful capability—for example, the ability to plug one sensor device into multiple weapon system platforms, or the option to deploy one machine learning algorithm in multiple system environments and have it function as expected. As the Army continues to expand its capabilities, the concept of interchangeability becomes equally vital. This involves seamless substitution of one system or component with another, enhancing the effectiveness of the overall solution while mitigating risks associated with vendor-lock, supply chain vulnerabilities and scheduling pressures. It also reduces costs and facilitates upgrades.

Embracing interoperability and interchangeability in software allows us to enjoy the benefits of MOSA in the digital realm, ensuring that our technological infrastructure is robust, versatile and future-ready.

BUILDING BLOCKS FOR DIGITAL MODULARITY

Building for interoperability and interchangeability starts with open APIs, which enable software applications to communicate and share data across various platforms. More importantly, open APIs are platform-agnostic; they are not confined to any proprietary system, which broadens their utility across different software products. By standardizing how solutions interact and exchange data, open APIs facilitate the seamless integration of new products into an existing framework. This standardization ensures that introducing new products or replacing old ones can be accomplished without disrupting the underlying system architecture. The result is a flexible, robust digital infrastructure that supports easy upgrades and enhancements.

For example, the Enterprise Business Systems – Convergence (EBS-C)—the Army's new flagship business system—will replace five other large legacy business systems. The program is applying MOSA concepts by separating the underlying operating platform from a new "agility layer." The agility layer provides a separate software layer that hosts an ecosystem of applications and data products to enable interoperability and interchangeability. Using open APIs in this layer makes it easy to incorporate solutions from third-party vendors, ensuring the Army can continue delivering the best capabilities cost-effectively and rapidly.

While exposing open APIs is a critical first step toward modularity, it is not sufficient on its own. Many vendor solutions, despite boasting open APIs and adherence to open standards, suffer from proprietary and tightly coupled implementations that lurk beneath the surface of the open facade. As a result, these solutions are not truly interchangeable and fail to meet MOSA objectives.

This is where reference architectures come into play. A reference architecture provides a collection of architecture design artifacts and templates that outline recommended components and patterns. These invaluable guides instruct development teams on how to effectively realize their specific implementations of the solution and ensure that all implementations adhere to broader standards and principles for true modularity.

Reference architectures encompass design patterns that offer proven, repeatable abstractions for implementing a targeted mission functionality. By applying the right design patterns, substituting products for replacements is relatively painless.

THE VIEW FROM THE SUMMIT

Johanna Sears, director of accounting and audit for EBS-C within the Office of the Assistant Secretary of the Army for Financial Management and Comptroller (OASA(FM&C)), addresses attendees of the Army Audit Summit, held Dec. 14, 2023, in Washington. By applying MOSA concepts, EBS-C, the Army's flagship business system, will replace five other large legacy business systems. (Photo by Matt Leonard, OASA(FM&C))

An example of a reference architecture is the Unified Data Reference Architecture (UDRA) 1.0, co-developed by the deputy assistant secretary of the Army for data, engineering and software (DASA(DES)) within the Office of the Assistant Secretary of the Army for Acquisition, Logistics and Technology (ASA(ALT)) and the Army chief data and analytics officer in close collaboration with industry. Released in March 2024, the UDRA provides the reference for moving Army capabilities toward data centricity. UDRA is "MOSA for data," defining a modular data architecture that enables broader and faster sharing of data. UDRA, which we outlined in "Quarterbacking Digital Transformation" in the Winter 2023 issue of Army AL&T magazine, is in direct support of Reform Initiative 11. (See sidebar, Page 14.)

BRINGING ARCHITECTURE TO LIFE

The concept of modularity for digital systems can be difficult to grasp, as it centers on concepts that are somewhat abstract. Let's consider an analogy:

Think of reference architectures as the blueprints and architecture products for a housing development. These documents outline various house designs, structural guidelines and zoning laws that dictate what can be built, but they allow for variations in materials, interior layouts and exterior styles according to builder or homeowner preferences. The blueprints provide a broad framework that ensures safety and coherence but offers flexibility to meet diverse needs and tastes.

Open APIs can be likened to the standard interfaces and connections within the homes, such as electrical outlets, plumbing connections or even the standardized fittings for fixtures and appliances. Just as electrical outlets have a standard design to allow any appliance with a corresponding plug to connect and operate, open APIs provide a standardized way for different software components or services to connect and communicate. These APIs ensure that regardless of the manufacturer or developer, products or software can interact seamlessly within the system. Just as a homeowner might replace an old

FIGURE 1

ON A CONTINUUM

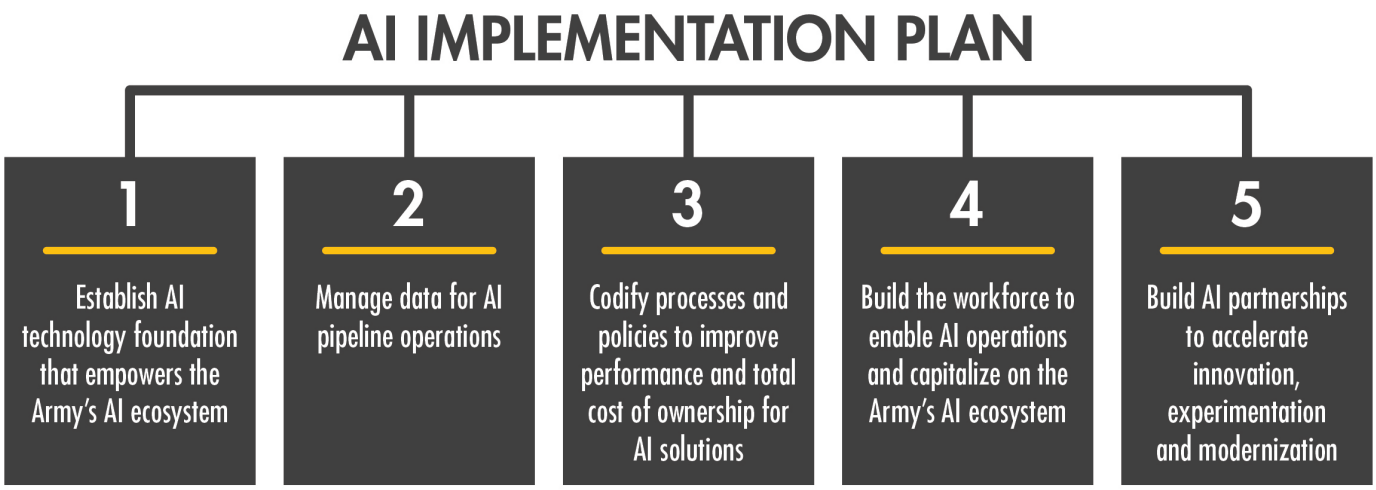
An integrated product team has begun implementing these 12 initiatives, issued by DOD to support digital transformation. (Image by DASA(DES) and U.S. Army Acquisition Support Center)

Enabling Modern Software Development and Acquisition Practices

On March 11, 2024, Secretary of the Army Christine Wormuth signed Army Directive 2024-02, Enabling Modern Software Development and Acquisition Practices. This policy was spearheaded by Margaret Boatner, deputy assistant secretary of the Army for strategy and acquisition reform (DASA(DES)) within ASA(ALT). It was the culmination of work led by DASA(DES) to leverage five pathfinder programs to identify and resolve obstacles to implementation of modern software practices in the Army. This directive drives the Army to update many processes that software programs are concerned with, including how we develop requirements, determine cost, issue contracts and test. Boatner led the monumental effort to write the policy and coordinate it across the Army.

An integrated product team has been established and has begun implementation of the initiatives identified in the directive. Each task lead will update Army senior leadership monthly until implementation is complete.

FIGURE 2



STEPWISE PROGRESSION
This five-step AI implementation plan outlines AI-related investments made by DASA(DES) in science and technology, catalogs AI requirements across the organization's portfolio and addresses challenges in the AI landscape. (Image by DASA(DES) and U.S. Army Acquisition Support Center)

appliance with a new one without needing to rewire the house, users of a system with open APIs can swap out or upgrade components like software modules without overhauling the entire system.

But there are times where an additional level of understanding is needed. This is where our final MOSA building block comes into play: reference implementation.

A reference implementation is like a model home in that housing development. It's a fully constructed house, built according to one specific set of blueprints and showcasing what a finished home could look like when those plans are followed to the letter. It includes choices on components that represent one way to interpret the blueprints.

A reference implementation is a concrete, "opinionated" application of a reference architecture, along with relevant standards and specifications. It serves as a practical demonstration of how the reference architecture can be effectively used, allowing teams to observe the key concepts and functionalities in action. In this context, "opinionated" refers to the specific choices and decisions made by the authors to exemplify their interpretation and recommendations within the broader framework established by the architecture.

An example of a reference implementation available now is the Unified Data Reference Implementation hosted in the Innovation Exchange Lab (IXL). Resulting from a partnership between DASA(DES) and the U.S. Army Combat Capabilities Development Command's Command, Control, Communications, Computers, Cyber, Intelligence, Surveillance and Reconnaissance Center, the IXL offers a cloud-accessible environment that vendors and programs can use to demonstrate plug-and-play interoperability of potential new capabilities with the UDRA 1.0. Additional reference architectures will be accessible through the IXL in the future. The IXL currently supports Impact Level (IL) 2 security requirements with IL 5 support coming later in 2024.

REAPING THE BENEFITS

The efficiencies garnered from MOSA's architectural approach are not merely advantageous, they are essential. As we navigate a battlespace that is evolving with unprecedented speed, the capacity to adapt swiftly and efficiently is a fundamental requirement, not a luxury.

We are not just preparing for the future; we are actively shaping it.

Digital modularity offers several key advantages that are critical to meeting the challenges of modern warfare:

- It significantly shortens the capability development and deployment life cycles, enabling our forces to meet new and dynamic mission requirements swiftly.
- It facilitates the incremental and continuous introduction of innovative capabilities, ensuring that technological advancements are seamlessly integrated and immediately beneficial.
- It enhances the ability to orchestrate operations across multiple missions and between various branches of the Army, other services and coalition partners, promoting a more unified and effective approach to military engagements.
- It fosters a diverse and competitive industrial base, reducing reliance on single vendors and thereby minimizing risks associated with vendor lock-in.
- It diminishes the risks posed by rapid technological changes, enhancing the resilience and flexibility of our military enterprise.
- It lowers overall development and sustainment costs, ensuring that resources are allocated efficiently and strategically.

The path of architecting a fully adaptable force requires concerted efforts from stakeholders across the Army. To spearhead this crucial initiative, DASA(DES) is developing the Modern Software Framework (MSF), a cornerstone in building the infrastructure necessary for embracing digital modularity.

The MSF provides:

- The basis for defining reference architectures, enabling the community to develop new ones as needed.
- Prescriptive guidance and guardrails on how to achieve modularity objectives in software architecture and design, as well as how to assess MOSA maturity in software programs.
- A repository of repeatable, vendor-agnostic design patterns to reduce proprietary and suboptimal software implementations.
- A lexicon of fundamental concepts, principles and relationships, giving ASA(ALT) a shared understanding independent of vendor technologies and implementations.

The ASA(ALT) community will have access to version 1.0 of the MSF in September 2024. This framework is not just a tool but a transformational strategy that will empower our forces, enabling them to thrive in the complex and fluid environments of both today and tomorrow. By collaborating for digital modularity, we are not just preparing for the future; we are actively shaping it, ensuring that our military remains robust, reactive and ready to face whatever challenges may arise.

CONCLUSION

Digital modularity is pivotal in the digital transformation of the Army. It also forms the bedrock for deploying AI technologies swiftly and at scale. A strategic approach is essential for the effective adoption and implementation of AI. (See Figure 1, Page 14.)

The DASA(DES) team is leading the charge on implementation of a 100-day AI plan, which is designed to strategically outline our AI-related investments in science and technology, catalog AI requirements across our entire portfolio and address challenges in the AI landscape, such as evolving testing methodologies. Furthermore, this plan emphasizes strengthening the security of our AI capabilities to ensure that the technologies we develop are dependable and trusted by our Soldiers. In a future issue, we will delve deeper into AI implementation across ASA(ALT) and discuss the details outlined in Figure 2.

For more information on digital transformation initiatives within DASA(DES), follow on LinkedIn at ***https://www.linkedin.com/in/dasa-des*** *and go to* ***https://www.army.mil/dasades****.*

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MULTIDOMAIN DOMINANCE

U.S. Army Test and Evaluation Command launches virtual environment to evaluate systems in multidomain operations.

by Rebecca Wright

PASSING THE TEST

Aberdeen Test Center's electromagnetic environmental effects dynamometer with built-in turntable is the only one of its kind across DOD. It is engineered to test the effectiveness of wheeled vehicles in congested and contested radio frequency environments. (Photo by Steven Lowther, Aberdeen Test Center)

The U.S. Army is known for protecting our nation predominantly on land. But as our adversaries' capabilities advance, so must the Army's abilities to predict, counter and, if necessary, defeat them. Focusing mainly on proficiency in one or two domains can limit the Army's ability to advance in support of the joint force. Potential adversarial threats—primarily posed by (but not limited to) China and Russia—call for the Army, as part of the joint force, to continuously transform to operate in all domains on a future battlefield. This means not only having specialized experience on the ground, but across all domains holistically.

In December 2018, the Army published "The U.S. Army in Multi-Domain Operations 2028," which outlines the importance of maintaining a position of superiority and how to win future conflicts. According to the U.S. Army's Field Manual 3-0, "multidomain operations are the combined arms employment of joint and Army capabilities to create and exploit relative advantages that achieve objectives, defeat enemy forces and consolidate gains on behalf of joint force commanders. Employing Army and joint capabilities makes use of all available combat power from each domain to accomplish missions at least cost." In essence, multidomain operations are an effort that the Army, as part of the joint force, is undertaking to expand frontline operations and expertise across all domains and synchronize them across an interconnected and uncertain operating environment.

THE DOMAIN IN MULTIDOMAIN

For the U.S. and its allies to maintain dominance, warfighters must remain ready to engage across the competition continuum. Current Army doctrine identifies five key areas covered in multidomain operations: land, air, maritime, space and cyberspace. Potential adversaries are challenging these areas and competing for dominance across the multidomain environment. Space and cyberspace operations have not always been at the forefront within the Army, but are becoming increasingly important.

"There are specific departments of the DOD that are our specialists in those areas: the Air Force, the Navy, cyber and even Space Force," said Col. Rashad Fulcher, senior simulations officer with the U.S. Army Operational Test Command. "In order to fully round out a true MDO [multidomain operations] environment, I think that we absolutely need to conduct joint testing or at least have joint representation in our operational testing. It's important to the Army because of our current and future threats. As we see world events in current conflicts … people are targeting electronic signals. The electronic environment is a concern for us, and we need to be ahead of that threat."

For example, in a potential combat scenario the Army will secure terrain with armored vehicles and ground forces while coordinating with Air Force-operated fighter jets and Navy-operated ships, while using space satellites to track and monitor the location of the threats and using cyberspace communications to exploit and disrupt the enemy's technology.

TESTING THE WATERS … AND LAND, AIR AND CYBERSPACE

While stressing the importance of multidomain operations is easy, experimenting, testing and training to operate in a multidomain environment is a different story. It comes as no surprise that live, physical testing and training is costly and potentially hazardous. In October 2023, to address the Army's need to prepare for future dominance, the U.S. Army Test and Evaluation Command (ATEC) conducted multidomain operations in a test environment that included live, virtual and constructive (LVC) simulations. The demonstration, conducted in Maryland at Aberdeen Proving Ground, networked capabilities from all eight ATEC locations throughout the U.S. to successfully test operational scenarios in the land, air, space and cyberspace domains. In addition to testing, the LVC environment can enable experimentation and training opportunities that are not only realistic but allow testing of systems, concepts, formations and

Focus areas that are tested today will change tomorrow and organizations will require different training conditions. The LVC test environment can be tailored based on specific user needs and requirements.

RANGE OF COMMUNICATION

The Distributed Test Control Center can link two or more ranges across multilevel security networks to create an integrated test environment. The capability is used to assess system performance and effectiveness against real and simulated threats in an operationally relevant LVC environment. (Photo by Steven Lowther, Aberdeen Test Center)

forms of maneuver that would otherwise be too costly or impractical to perform in a live environment.

"We created an operationally relevant learning environment by connecting a number of test facilities from across the country through an innovative test network provided by the Test Resource Management Center," said Paul Weimer, a supervisory engineer at the U.S. Army Aberdeen Test Center, a subordinate of ATEC. "To achieve the scale commensurate of an MDO environment, the physical test capabilities were integrated and synchronized with virtual systems using the LVC construct."

Weimer explained that the live, virtual and constructive environment enables experimentation with new scenarios that could not be tested and evaluated in live-only or virtual-only settings. These scenarios test the user and the materiel solutions in real time and provide additional data that enables users to be better prepared if a similar scenario occurs in a tactical environment. "In order to get to an operational level of scale, we need to supplement the live assets with virtual assets in a way that the user is unable to tell whether the system is live or virtual," he said. "The systems in the LVC environment respond in the same manner as the systems in the real-world environment, which allows us to build up the scale of the experiment, test or exercise. Using LVC, we're now getting after an operationally realistic, scaled MDO environment."

Weimer described one of the threads demonstrated at the October 2023 event. A live, fielded tactical vehicle was placed in an electromagnetic interference (EMI) chamber, a controlled environment used to test radio frequency emissions, susceptibilities and interference. While in the chamber, the tactical vehicle was secured to a dynamometer, a device that measures torque and engine power and enables a vehicle to operate in different driving conditions.

During the demonstration, an operator used throttle and steering input inside the vehicle to drive while it was secured to the dynamometer. In a feedback loop, the vehicle's steering and engine output were measured on the dynamometer and returned to the simulated test environment, changing the simulation output. The live tactical vehicle could be seen moving in the simulated scene and the movement drove changes with live or virtual threats or entities in the simulation.

"In this thread we demonstrated an electronic warfare attack on the vehicle to see how it would impact the convoy. Using a live jammer in the EMI chamber, we jammed the tactical vehicle's fielded GPS and radio systems. Then, you could see in the simulation where the live vehicle lost contact with the simulated convoy. The live vehicle was no longer visible on the tactical screens and the operator driving the system lost situational awareness of their position," Weimer said. "The objective of the test was to measure the time for the operator to regain situational awareness and communication with the convoy. I think it is important to be able to see the effect of a threat beyond just the effect on an individual system. In traditional developmental testing, my focus would just be the effects on the live system in the chamber, but with the LVC environment we were able to see the effects on the live vehicle and how that effect impacted the overall tactical operation. We can now learn the broader impacts of that electronic warfare attack on the entire formation and operation."

JOINT FORCE PLANS

Operating as a joint force within the military is nothing new, but doing it seamlessly, in all domains, is a new challenge. ATEC's ability to simultaneously test with both live and virtual assets while providing real-time data and results gives the Army a leading edge in experimentation, training and testing. "We've always been able to do live testing, virtual [only] testing, and use

MISSION ACCOMPLISHED

Paladin howitzers prepare to receive a fire mission during exercise Combined Resolve 18, held in May 2023 in Hohenfels, Germany. The exercise included more than 4,000 service members, allies and partners from 15 countries, and was designed to assess units' abilities to conduct combat operations in a multidomain battlespace. (Photo by Spc. Casandra B. Ancheta, 117th Mobile Public Affairs Detachment (Hawaii))

"The electronic environment is a concern for us, and we need to be ahead of that threat."

simulations to provide some results or some statistics for single systems, but the most powerful thing about LVC is the increased scale of the test environment and the ability to measure the interactions and interoperability of systems," Weimer said. "Now we can have Soldiers that are included in this environment communicating with these assets and see how they respond when another member of the formation is hit with an electronic warfare attack. We can see how the formation responds in an operationally relevant environment and use that information to inform material system improvements, leader development, training, tactics and procedures."

Weimer added that the live, virtual and constructive test environment is capable of rapidly adjusting to new parameters and scenarios. Focus areas that are tested today will change tomorrow and organizations will require different training conditions. The LVC test environment can be tailored based on specific user needs and requirements. "So, the environment is built for the application," he said.

To date, the environment has only been tested among Army users. ATEC is working to coordinate with users from other branches of the military to engage in the LVC test environment. Traditionally, each branch of the military operates independently and works within the fields that they specialize in. And while that tradition may remain in place for the most part, to achieve the leading edge in providing desired effects across all domains requires increased collaboration across the joint force. "MDO is inherently a joint environment," Fulcher said. "I really think it's the future of testing and the future of how the American force—and not just the ground force but the joint force—will be conducting operations."

CONCLUSION

In an environment that is always changing, the Army is transforming its test and evaluation capabilities to stay abreast of its multidomain operations initiative. ATEC's LVC test environment provides a new way of testing, collecting instantaneous results and providing a new pathway to test in real time. The LVC environment can produce a multitude of different scenarios to better prepare users for future operations.

"We all need to work together in both testing [and] training in order to prepare for our next mission. I think it's very important. We need to do more of it, and we need to ensure that we're the best at it," Fulcher said.

By identifying and improving upon our weaknesses, enhancing response time and collaborating across all frontline environments with joint forces, the Army can better prepare itself for operational challenges against potential adversaries and achieve multidomain dominance.

For more information, go to ***https://www.atec.army.mil/index.html****.*

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STRENGTH IN NUMBERS

USAMRIID's Diagnostic Systems Division from left William Dorman, Paul Kallgren, Maj. John Sellers, Dr. Chris Stefan and Capt. Ian Davis, tested gear at JBER's Camp Bull during Arctic Edge 2024. Joint exercises like Arctic Edge provide scientists and warfighters the chance to stress-test new capabilities and their protocols in extreme weather conditions. (Photos courtesy of USAMRIID Public Affairs Office)

PERSISTENT EXPERIMENTATION

The Experimentation Integration Cell ensures that the right medical technology is at the right event at the right point in the acquisition process.

by Paul Lagasse

The mission of the U.S. Army Medical Research and Development Command (USAMRDC) is to create, develop, acquire and deliver medical capabilities to the warfighter. A critical part of ensuring mission success involves testing those capabilities in real-world conditions. Throughout the year, USAMRDC's nine direct reporting units (DRUs) regularly participate in Army, joint service and multinational training exercises. They provide scientists and warfighters alike with hands-on opportunities to stress-test new capabilities and their protocols in a wide range of real-world conditions to ensure they are reliable and address gaps in providing far-forward care and returning warfighters to duty.

Two years ago, USAMRDC wanted to field multiple teams from across its DRUs to participate in Project Convergence (PC), a joint, multiyear and multinational experiment in the effective integration of modernization capabilities that is organized by the U.S. Army Futures Command (AFC), USAMRDC's parent organization. But having each DRU coordinate individually with the experiment's sponsor would risk confusion, inconsistency and redundancy for the DRUs and could also significantly increase the logistical, resourcing and administrative burden on the sponsors. So, Maj. Gen. Anthony L. McQueen, USAMRDC's then-commanding general, charged the Office of the Principal Assistant for Acquisition—the organization responsible for fielding new and improved medical capabilities to end users after thorough testing and evaluation for use in austere combat environments—with creating an Experimentation Integration (EI) Cell to serve as a central coordination point for the command's participation in persistent experimentation events.

The EI Cell has demonstrated success in reducing points of contact, streamlining the coordination process, integrating capabilities and improving the consistency and quality of information dissemination at PC 2022. As a result, it has become USAMRDC's standard method for participating in readiness and interoperability exercises as a way to provide real-time testing of new medical technologies for the warfighter.

CELL STRUCTURE

"AFC has a directive for persistent experimentation," said Col. John T. Nuckols, acting principal assistant for acquisition and the officer instructed by McQueen to stand up the EI Cell. "If you're going to accomplish that, you have to create the environments and the relationships to conduct experimentation without interrupting training. Experimentation in training scenarios helps us not only gain perspectives on the limitations of our capabilities, but also to see how warfighters use the capabilities, often

in unique and novel ways that we hadn't even conceived. That's very informative."

The Office of the Principal Assistant for Acquisition (OPAA)—under the guidance of Nuckols, Acquisition Workforce Development Manager Eva Rosvold and Science Adviser Joan Cmarik, Ph.D.—manages and coordinates USAMRDC participation in events sponsored by the capability development integration directorates, the Rapid Capabilities and Critical Technologies Office, program executive offices and similar organizations. A representative from the Office of the Principal Assistant for Research and Technology, OPAA's counterpart on the research and development side of the organization, manages and coordinates USAMRDC's participation in the AFC's Future Studies Program and focused excursions.

To organize participation in these events, the Experimentation Integration Cell maintains relationships with the Futures and Concepts Center and the Medical Capability Development Integration Directorate. It also actively seeks opportunities to build relationships with new partners to facilitate participation in other events. This increased access significantly benefits USAMRDC scientists seeking venues to test and refine their new capabilities.

BENEFITS OF THE EI CELL APPROACH

The EI Cell has quickly found its niche as a joint interagency capability by enabling USAMRDC's DRUs to "piggyback" on training exercises in ways that are both complementary and mutually beneficial to the experimenters and exercise sponsors and ultimately to the warfighter. By consolidating previously disparate efforts, serving as a single, consistent and reliable point of contact for medical experimenters and exercise sponsors and providing logistical support to experimentation teams before, during and after events, the EI Cell significantly improves the agility of USAMRDC to seize opportunities to participate in unique experimentation events that lead to more and better testing of new and improved medical capabilities.

"We define our role as making sure that we have the right products at the right type of events at the right time in their maturity or development," says Rosvold. "This involves being a linchpin between the experimentation sponsors and DRUs. A lot of last-minute requirements and requests for information come up as an event progresses that can be complicated or confusing to understand. We help serve as a clearinghouse and help determine exactly what is needed from the DRU or sponsor."

HAVE TRUNK, WILL TEST

Capt. Ian Davis of USAMRIID's Diagnostic Systems Division conducts baseline testing in extreme cold weather at JBER during Arctic Edge 2024. With support from USAMRDC's EI Cell, the Diagnostic Systems Division plans to test new capabilities in next year's Arctic Edge exercise.

The EI Cell has demonstrated success in reducing points of contact, streamlining the coordination process, integrating capabilities and improving the consistency and quality of information dissemination.

The EI Cell's heterodox approach also embraces participation by industry partners in experimentation events alongside USAMRDC scientists and warfighters, providing a channel for USAMRDC to inform and influence industry best practices. "When we have innovative partners that come out into the field with us—and many times, they are veterans themselves—they find that things are very different from how they envisioned it in their labs," said Nuckols. "I think that kind of experience is very informative to industry and in some cases, it may even help them be more competitive. The lessons learned and gathered at an event will help not only those who participated, but also ultimately the defense medical industry as a whole."

ARCTIC EDGE 2024: A CASE STUDY IN COORDINATION

The EI Cell coordinated the efforts of four DRUs and a collaborating partner, the Naval Health Research Center, to test seven technologies at Arctic Edge 2024, the annual exercise led by the U.S. Northern Command at Joint Base Elmendorf-Richardson (JBER) in Alaska, in February and March 2024. Representatives of the Diagnostic Systems Division of the U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID) tested three field-forward devices for detecting the presence of pathogens—a real-time polymerase chain reaction (PCR) thermocycler, a lateral flow immunoassay and a portable targeted genomic sequencer—in extreme cold-weather conditions. Their participation was part of the division's efforts to get commercial off-the-shelf testing devices into the hands of service members who can stress-test them in the field under real-world conditions—to "kick the tires," in the team's parlance—so that they can be deployed more quickly than by going through traditional acquisition processes.

FREEZE FRAME

From left, Paul Kallgren, William Dorman and Capt. Ian Davis, all with USAMRIID's Diagnostic Systems Division, test PCR thermocyclers and handheld assays before sunrise to achieve the coldest possible environment during Arctic Edge 2024. Results from the exercise will be used to develop initial protocols that will be tested in subsequent exercises.

Cmarik worked with Maj. John Sellers, the USAMRIID team's lead, and representatives from the U.S. Air Force to ensure they had the correct points of contact and other necessary information for delivering supplies, reagents and personnel to JBER. She also coordinated with the exercise organizers to ensure the team had the resources they needed when they arrived. The team arrived at JBER a week early since their experiments would not need to be

MINION TESTING

The MinION Mk1C Sequencer, developed by Oxford Nanopore Technologies, is readied for indoor field-testing during Arctic Edge 2024. By encouraging industry participation in experimentation events, USAMRDC's EI Cell helps inform industry best practices.

operated by service members—that will happen in future tests—and Cmarik traveled to JBER to provide on-site assistance.

"Dr. Cmarik was very proactive in terms of making sure that I was getting the support I needed from the POCs that she put me in touch with," said Sellers. "Once we got on ground, it was a very smooth process. The team was testing within probably an hour and a half of arriving at the testing site."

The extreme cold and high winds of Alaska provided the USAMRIID team with valuable knowledge that they would not be able to gain in a lab setting, even inside their own cold-weather facility. The wind blew off pipette tips, scattered notes and reduced the dexterity of scientists' hands clad only in nitrile gloves, while the extreme cold froze samples and reagents, turned plastic tools brittle and lowered battery efficiency, reducing the number of test runs that could be completed.

In identifying solutions for these problems, the scientists focused on using things that warfighters would likely have on hand in the field, such as chemical hand warmers, flameless ration heaters and, in a pinch, even body heat. They will use this experience to develop initial protocols that warfighters will test in subsequent exercises and to suggest novel solutions, such as 3D-printed immunoassay holders with slots for inserting hand warmers to keep them from freezing.

"That's the reason we took this team to Arctic Edge," said Sellers. "Our reason for going was to break this stuff, but I knew they had the expertise to address and solve these problems on the fly. A medic or a warfighter trying to perform tests following strict protocols might find it very difficult under those conditions."

"When we have innovative partners that come out into the field with us … they find that things are very different from how they envisioned it in their labs."

With support from the EI Cell, the Diagnostic Systems Division plans to participate in next year's Arctic Edge to conduct baseline testing on another group of technologies, to be followed by additional cold-weather testing during which warfighters will get a chance to use the diagnostic tools in training scenarios, following the protocols developed by the USAMRIID team based on their Arctic Edge experience.

CONCLUSION

In just a short time, USAMRDC's Experimentation Integration Cell has made it easier for the organization's DRUs to field-test a wide range of impactful, life-saving medical capabilities, including pathogen diagnostics, casualty collection and protection, temperature sensors and hypothermia prevention, freeze-dried plasma and oxygen generators. As the command's central coordinator for participation in experimentation events, the EI Cell eliminates pain points that would otherwise prevent participants from getting the most out of their time in the field.

Furthermore, because much of the experimentation conducted at USAMRDC is iterative, research teams may want to return to annual and semiannual exercises in subsequent years, particularly when a capability has matured to the point where it is ready to be handed off to warfighters to see how they train with it and incorporate it into their routine operations. The ability of the EI Cell to build lasting relationships with event sponsors gives DRUs confidence that their experimentation teams will have the information they need to plan and execute those experiments successfully.

The leaders of the EI Cell believe their approach to integration could represent a model for other military services and government research organizations to improve their agility in developing, testing and fielding new capabilities.

"What started as a way to coordinate the DRUs has evolved into a joint and interagency capability that acts like glue or mortar holding the process together," said Nuckols. "You need to have cool minds at the table who understand that failure is acceptable. It's the nature of experimentation that things will change; you have to be able to capture value in the change. How we overcome that failure and how we learn from it is what the EI Cell does very well. We're not going in with a firm vision of what will happen; we're going in with an agile vision of what can happen and how to take advantage of that to get better results."

For more information, go to ***https://mrdc.health.mil****.*

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REPLACEMENT NEEDED
The XM30 will replace the M2 Bradley Fighting Vehicle. (Photo by Spc. Jensen Guillory, Combined Joint Task Force – Operation Inherent Resolve)

A MATTER OF COURSE

In-house digital engineering course aims to accelerate design and development processes.

by Dan Heaton and Gerald Gomes

A 21st century, data-centric approach being used by the U.S. Army is transforming the way future battles will be fought and the way future capabilities will be developed.

A key piece of innovation technology being integrated into Army processes is digital engineering. Digital engineering is the process of digitally designing military equipment, such as future combat vehicles or other military hardware, to be designed and built in a virtual environment where it can be tested and analyzed and can engage with Soldiers before a single piece of iron is bent to build the prototype.

While digital engineering has become the norm in many commercial manufacturing settings, it is still a relatively new concept to the Army, and this knowledge gap has created a need for professional education inside the force. To meet that need, the Next Generation Combat Vehicles Cross-Functional Team (NGCV CFT) created its own in-house course on digital engineering practices and applications to help accelerate the design and development processes. "One thing that the Army knows how to do well is to identify a challenge and then develop training to build the skill set necessary to meet that challenge," said Brig. Gen. Geoffrey A. Norman, director of the NGCV CFT, which is using digital engineering to facilitate the development of the XM30 Combat Vehicle and other projects.

The use of digital engineering and other 21st century industrial development tools is in line with the priorities that Secretary of the Army Christine E. Wormuth identified at the

2023 Association of the U.S. Army annual meeting. "We must continue to embrace innovation and transformation or risk failing to address future threats," Wormuth said at the October event in Washington. "In close partnership with industry, the Army has pressed ahead and stayed on track to implement our most ambitious modernization effort in 40 years. With the introduction of each new system, we continue to increase our force's capability to respond to various threats and serve as a credible deterrent to our adversaries."

WHAT IS DIGITAL ENGINEERING?

Defense Acquisition University defines digital engineering as "an integrated digital approach that uses authoritative sources of systems' data and models as a continuum across disciplines to support life cycle activities from concept through disposal." The beginning of the digital engineering effort for combat vehicles can be traced back to 2021, when the Army placed five companies under contract to develop digital designs of the XM30, a combat vehicle that will replace the M2 Bradley in armored brigade combat teams. The XM30 was previously known as the Optionally Manned Fighting Vehicle.

The digital design process has allowed the Army to save time and cost while developing design solutions for the future armored vehicle.

Five digital designs were analyzed and evaluated by the Army against the requirements detailed in the acquisition process and managed with a product life cycle management (PLM) tool. The PLM tool serves as the product's authoritative source of truth—a single centralized model to avoid issues of version control that often develop with a document-based approach. The PLM allows the Army to map high-level requirements, from broad-based concepts such as mobility and lethality, to more focused details, such as the tests and evaluations that will prove whether the product meets the capabilities outlined in the Capability Development Document (CDD).

"We are maximizing the best, most modern tools available to us to ensure that the vehicle that we deliver will be the best."

CLASS ACTION

Macam Dattathreya, Ph.D., chief engineer at the DEVCOM Ground Vehicle Systems Center, leads a class on digital engineering for civilians and Soldiers assigned to the NGCV CFT at the Detroit Arsenal. The use of digital engineering is accelerating the development of the XM30 and other future combat vehicles. (Photo by Dan Heaton, NGCV CFT)

According to DOD's Digital Engineering Strategy, "The goal [of the authoritative source of truth] is to enable delivery of the right data to the right person for the right use at the right time."

Norman stressed that imperative as the Army looks to the future of combat vehicles. "We are committed to using the right tools and to building the best teams to drive these new capabilities into our formations," he said.

Previously, when the Army designed combat vehicles and other major systems, an analog or paper process was used. This document-based approach is expensive and error-prone. Costs increase as artifacts become inconsistent and assumptions change faster than the document approval process can support. This created problems

EMBRACE INNOVATION

Secretary of the Army Christine E. Wormuth said the Army "must continue to embrace innovation and transformation or risk failing to address future threats," during the Association of the U.S. Army annual meeting in Washington in October 2023. (Photo by Christopher Kaufmann, U.S. Army Multimedia and Visual Information Division)

with version control and ensuring that all relevant players had access to the most up-to-date information.

CRAWL, WALK, RUN

To maximize the use of digital engineering in the XM30 and other development efforts, the Army is taking a "crawl, walk, run" approach to the concept. With the "crawl" step now completed, the Army design team transitioned the XM30 CDD—the document that details the requirements that the vehicle must be able to achieve—into a PLM tool controlled by a single repository.

In the "walk" step, the Army project managers continue to maintain the CDD within the PLM and to map capabilities to performance specifications to support the request for proposal (RFP) process.

Finally, in the "run" step, which is now ongoing, the Army has generated the CDD within the PLM tool and continues to leverage workflows to refine capabilities and ultimately manage the entire approval process.

"The process allows everyone who is working on the XM30 project to be able to utilize the same digital data, to be able to take the design steps necessary to ensure we are delivering the best vehicle to our Soldiers," said Lt. Col. J. Michael Eisenlohr, XM30 requirements lead for NGCV CFT. "Since we have engineers and designers in multiple places working on this program, when we make a change in the digital environment, everyone can see that in real time. The efficiencies this creates in time and material costs are significant."

TEAM TRAINING APPROACH

To facilitate the use of digital engineering and maximize its impact on the combat vehicle development process, the NGCV CFT recently created and conducted a local, informal, week-long overview course on the topic for Soldiers and civilians. The course began with developing a greater understanding of the Army's current and future acquisition process and then went more in-depth regarding how to develop accurate requirements to enable model-based requirements. By the end, participants understood that model-based acquisition is built off an authoritative

TOUCH POINT
Soldiers from 2nd Battalion, 5th Cavalry Regiment participate in a virtual experiment at the Detroit Arsenal. The Soldiers were providing input on possible crew configurations for the XM30 Combat Vehicle. (Photo by Dan Heaton, NGCV CFT)

source of truth, a single centrally maintained model that is managed throughout a program's life cycle.

virtually every international automaker in the world. The primary instructor for the course was Macam Dattathreya, Ph.D., chief engineer at the U.S. Army Combat Capabilities Development Command's Ground Vehicle Systems Center, which is co-located at the Detroit Arsenal with the NGCV CFT.

The first iteration of the model-based requirements digital engineering course was held at the Detroit Arsenal in February 2024 and brought together about two dozen personnel for the instruction. The course focused on the following concepts:

- Model-based acquisition.
- Model-based requirements.
- Modeling a functional architecture.
- Use cases and use case diagrams.

Model-based acquisition "is the technical approach to acquisition that uses models and other digital artifacts as the primary means of information exchange, rather than document-based information exchange," according to the model-based acquisition standards published by the Object Management Group, a professional industry forum.

"One thing that the Army knows how to do well is to identify a challenge and then develop training to build the skill set necessary to meet that challenge."

To assist Army engineers and technicians in closing the knowledge gap on the latest advancements in digital engineering, the NGCV CFT used an on-staff contractor, Gerald Gomes, from within the CFT to design the course. Gomes leveraged his extensive experience working in a digital ecosystem. Before working for NGCV CFT, he spent more than 20 years working as an engineer in the automotive industry. Gomes' goal for the class was to focus on "institutionalized success," which is a concept that creates a workflow to yield consistent results from one program to the next, even when a new team is in place. Gomes' experience in the auto industry is a direct dividend of the Army's decision to locate the NGCV CFT at the Detroit Arsenal in Warren, Michigan, right down the street from the General Motors Technical Center and a stone's throw from engineering centers for

These models are intended to improve the RFP process through increased collaboration in their development and streamlined communication of changes and decisions within the Army and externally to our industry partners. Clearly articulated product requirements significantly reduce the waste of the communication loop associated with a document-based information exchange and provide product development teams a more focused effort around meeting the goals of the RFP.

Model-based requirements can be represented in several ways, but in the case of the NGCV CFT training, the focus was first on the "what" of a good requirement, which was followed by review of how various computer tools can be used to manage these requirements. It is important to note that requirements exist to outline

the product's needs in a clear and concise manner from a user's perspective. Once these models are created in a digital engineering ecosystem, they afford traceability to downstream teams, and systems continue to work from the authoritative source of truth. This means that if changes are made upstream, then predefined workflows will roll those changes down to affected areas in the model.

Modeling a functional architecture is an important step in digital engineering because it identifies and leverages the product's primary and secondary functions, and the associated interactions, to demonstrate how they support the system's mission. This step forces the team to think in greater detail regarding functions versus preconceived solutions. This opens the door to innovations that wouldn't have necessarily been considered had the team never taken the step to distill the system down to clear primary, secondary and sometimes tertiary functions.

The use case step is used to create a clear picture of how a singular function in the system is used by its operators and the interactions they have with each step in using the product or system. The use case diagrams are used to ensure that each stakeholder understands what the system does.

The course allowed the students to test their knowledge via several unique examples and highlighted how different viewpoints can affect the overall solution.

FUTURE VEHICLE DEVELOPMENT

Now that the first digital engineering overview course has been completed, the cross-functional team will keep that course in its kit for potential use as new personnel are assigned to the XM30 or other projects. The NGCV CFT will update and offer the model-based requirements digital engineering course in the future, as the need arises.

"We are maximizing the best, most modern tools available to us to ensure that the vehicle that we deliver will be the best, most capable combat vehicle on the battlefield of tomorrow," Eisenlohr said.

CONCLUSION

In 2023, the Army awarded contracts to two vendors to create new digital designs and to build physical prototypes of the XM30. Those designs and prototypes will then be tested by Soldiers and evaluated by Army engineers and other specialists before a final design for the vehicle is ultimately selected. The XM30 is scheduled to be the first unit issued by the end of 2029.

While digital engineering has become the norm in many commercial manufacturing settings, it is still a relatively new concept to the Army.

For more information, contact Dan Heaton at ***usarmy.detroit.devcom-gvsc.mbx.ngcv-cft@army.mil****.*

DAN HEATON is the director of communications for the NGCV CFT, based at the Detroit Arsenal. He became an Army civilian and joined the NGCV CFT in 2020 after a long career in the media and local government service. He also serves as a senior master sergeant and public affairs specialist in the Michigan Air National Guard's 127th Wing and has more than 30 years of military service. He holds an M.S. in marketing from Walsh College and a B.A. in human resource management from Spring Arbor University.

GERALD GOMES is the chief systems engineer contracted to support the NGCV CFT through the Army Futures Command. His professional career includes 20 years at original equipment manufacturers in the auto industry in numerous leadership roles, including five years as an advanced engineering manager at a Tier 1 auto supplier, and more than three years in the defense industry. He holds an M.S. in manufacturing engineering from the University of Michigan and a B.S. in mechanical engineering from Kettering University.

MAJ. DAVID "JON" LILJA

COMMAND/ORGANIZATION: Program Executive Office for Aviation, Project Manager for Uncrewed Aircraft Systems

TITLE: Assistant product manager for Future Tactical Unmanned Aircraft Systems

YEARS OF SERVICE IN WORKFORCE: 2

YEARS OF MILITARY SERVICE: 21

DAWIA CERTIFICATIONS: Practitioner in program management

EDUCATION: MBA, University of St. Thomas; B.S. in commercial aviation, University of North Dakota

AWARDS: Bronze Star; Meritorious Service Metal; Air Medal (3); Army Commendation Medal (5); Army Achievement Medal (3); Global War on Terrorism Expeditionary Medal; Global War on Terrorism Service Medal; Senior Aviators Badge; Air Assault Badge; Combat Action Badge

LEARNING DOESN'T STOP

Job stagnation is a common occurrence when tasks become routine, and one feels they've mastered every aspect of their role. However, Maj. David "Jon" Lilja doesn't subscribe to this mindset and firmly believes that the journey of learning is perpetual.

"Learning doesn't stop," he said. "It is humbling to have the opportunity to work with my team and colleagues who possess exceptional knowledge and skills in acquisition. They inspire me to keep on learning and growing my skills so that I can contribute as much as they do."

As the assistant product manager for Future Tactical Uncrewed Aircraft Systems (FTUAS) under the Program Executive Office for Aviation's Project Manager for Uncrewed Aircraft Systems (PM UAS), Lilja is leading the prototyping effort to develop a group 3 Unmanned Aircraft Systems (UAS) replacement for the existing RQ-7B Shadow, which has been in service for over 20 years. The RQ-7B Shadow provides reconnaissance, surveillance, target acquisition and force protection for brigade combat teams in near-real-time, day and night, and in limited, adverse weather conditions.

This being his first acquisition position, Lilja didn't expect the prototyping program to be nearly as fast paced and dynamic as it has turned out to be. But he couldn't be happier with all the learning and challenges he's been able to take on with his team, which, he said, is the "best part of the assignment."

"I am directly involved with a team of experts to replace the RQ-7B Shadow, a system I had as an attack troop commander, and I know firsthand the capabilities and challenges associated with that system's operations." He is highly motivated to find a replacement. "It is thrilling to be working on the successor program. I know what capabilities Future Tactical UAS brings to the warfighter, and I'm excited to be a part of it," he said. "This program has given me a fantastic opportunity to learn at a rapid rate, not only in the realm of program management but also the intersection where technologies merge."

While Lilja was still in graduate school, following his time as a troop commander with Alpha Troop, 6-17th Calvary Regiment, 4th Infantry Division at Fort Carson, Colorado, he took advantage of the Voluntary Transfer Incentive Program (VTIP)—a means for eligible officers to apply to transfer to a different branch or functional area. "The opportunity to use the VTIP process and explore a new career pathway, while still contributing to the service and providing advanced capability to warfighters, is something I am passionate about," he said.

Lilja noted what people typically find interesting about his work is the cutting-edge technology his team develops, the efficiency of his organization and "how great of a team" he gets to work with. "I've been in the Army for over 20 years in all three components [active duty, Reserve and National Guard] and this is one of the most outstanding organizations I've been lucky enough to be part of." He said there are experts from engineers, acquisition analysts, cost analysts, program integrators and logisticians who've

been working for over two decades in their fields and are driven to make lives better for our warfighters.

"The competitive prototyping effort for Future Tactical Uncrewed Aircraft Systems is a foundational experience for me," he said. "Throughout this process, Tactical Unmanned Aerial Systems and PM UAS leadership have provided excellent guidance and mentorship for executing this program as well as shaping the program and guiding the team. Additionally, my leaders have given me the latitude to grow and lead my team and interact directly with industry and Army senior leaders to share the successes we've had."

Supportive leaders and team members combined with critical career development programs helped Lilja navigate along his career path. Most recently, he took a program management course called PMT 3550/360V, which he completed in July 2021. The course was designed to reinforce knowledge and hone analysis, synthesis and evaluative skills through the use of individual examinations, case studies and team exercises. Students completing this course are expected to be effective leaders in program offices at the upper mid- and senior-level positions, while serving in program management positions.

"It was a great capstone course for the pilot Army Acquisition Professional Education Program, allowing us to work through the fully Joint Capabilities Integration and Development System life cycle in small groups. I would recommend it to anyone who has a few years of PM [program management] experience," he said.

Lilja said he always encourages his team and coworkers to seek challenges and challenging assignments to avoid stagnation and keep learning and growing in their field and beyond.

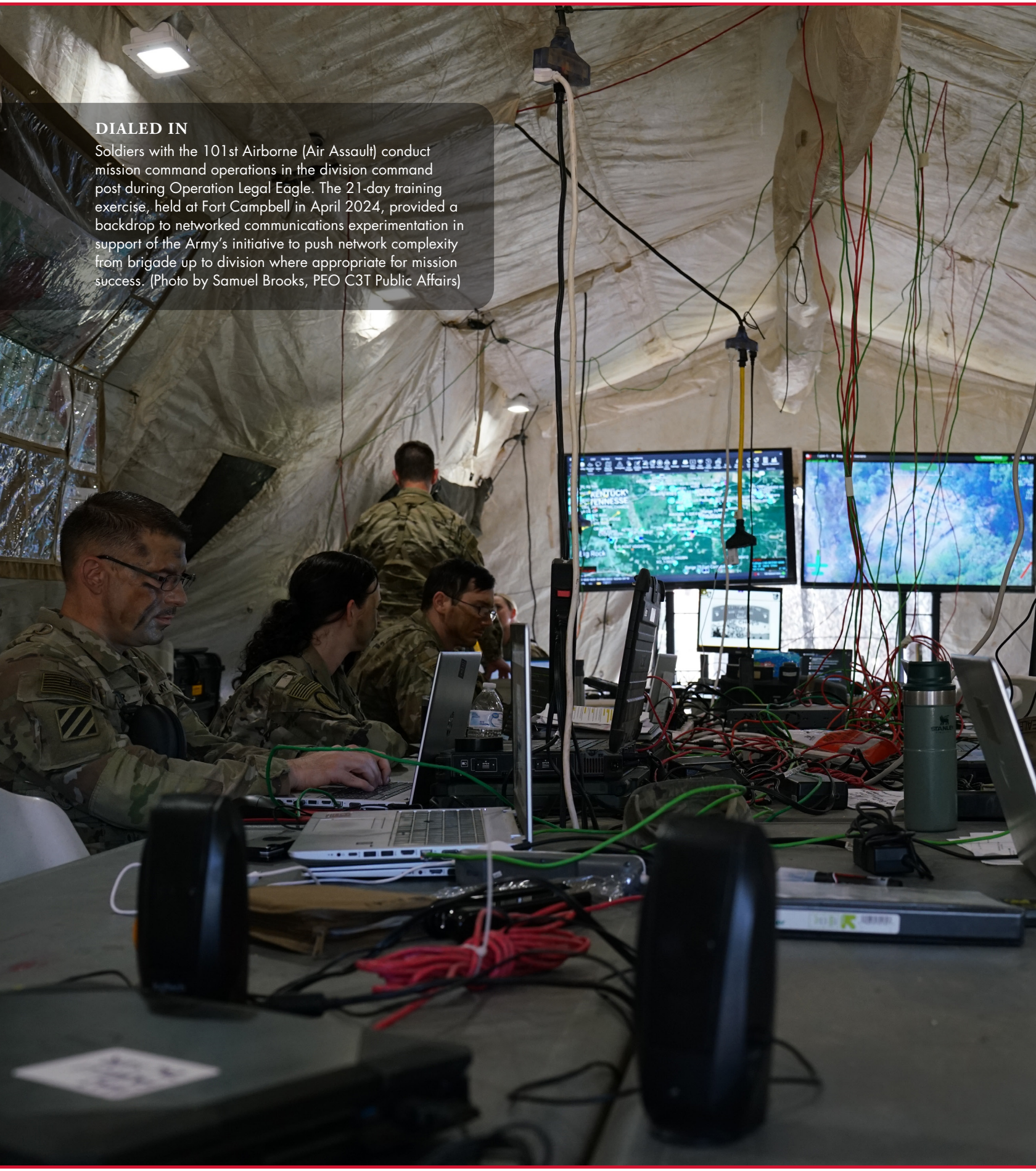
And the challenges don't stop at the end of the workday. Outside of work, Lilja enjoys cooking and is always in search of new recipes. "A few folks on my team might know that I love to cook and am very interested in perfecting recipes," he said. "Likewise, having a desire to improve processes and help the team with efficiencies is common to both [work and personal life] as well as having a passion for the resulting product."

"The product I'm working on is part of the Future Vertical Lift initiative of modernization. Using Shadow UAS, it can take a Soldier 12 to 24 hours to establish a working launch and recovery site requiring [Humvees] with ground controllers, maintenance support with air vehicle transportation shelters, trailer-mounted launchers and other associated equipment," he said. "With FTUAS, the system takes off and lands vertically, eliminating the need for the majority of that equipment [previously needed by Shadow UAS], and the controller is small enough to sit on a table or in an 'on-the-move' configuration."

TABLE FOR NINE
Lilja, fourth from left, dines with coworkers from PM UAS in Huntsville, Alabama, in May 2023. From left, Maj. Matt Huff, Lt. Col. Olin Walters, Maj. Mitch Boatwright, Col. Danielle Medaglia, Carson Wakefield, Lt. Col. Amanda Watkins, Maj. Josh McMillion and Lt. Col. Chris Getter. (Photo courtesy of Maj. David "Jon" Lilja)

The modernization initiative is a group effort, requiring diverse knowledge and experiences to seek out and deliver capabilities, he said. "No one person knows it all. Acquisitions is a team sport, and understanding that everyone can contribute to solve problems is critical."

—CHERYL MARINO



DIALED IN
Soldiers with the 101st Airborne (Air Assault) conduct mission command operations in the division command post during Operation Legal Eagle. The 21-day training exercise, held at Fort Campbell in April 2024, provided a backdrop to networked communications experimentation in support of the Army's initiative to push network complexity from brigade up to division where appropriate for mission success. (Photo by Samuel Brooks, PEO C3T Public Affairs)

TRANSFORMING IN CONTACT

The network is the top priority in the Army's transformation effort, calling for systems that are more simple and intuitive.

by Maj. Bradley Anderson and Kathryn Bailey

The future operating environment will be complex, spanning great distances over extended timelines and noncontiguous regions and placing the Army's network and command and control (C2) systems in the spotlight for every aspect of the fight. With so much riding on the communications of people and systems, Army senior leaders have designated the network as the No. 1 priority in the Army's transformation effort, calling for systems that are more simple, intuitive, low-signature and iterative.

To ensure the network and its myriad radios, blue force tracking (GPS-enabled systems for tracking people and assets), command post, fires support technologies, satellite systems and other capabilities meet these requirements, the Army is identifying specific units to experiment with near-term networked communications systems designed to counter the threats leaders see evolving on the battlefield.

Known as "transforming in contact," this experimentation is becoming an increasingly critical component for evaluating and helping to refine technologies that could be needed at a moment's notice. U.S. Army Forces Command (FORSCOM) is supporting these assessments by providing a mix of light and armored formations across brigade combat teams, divisions and enablers.

Transforming in contact is not just for network experimentation; it is part of a larger Army initiative that is also evaluating electronic warfare, counter-unmanned aerial systems and how personnel and tactics align with technologies. Driven by Army Chief of Staff Gen. Randy A. George and other senior leaders, the transforming in contact effort spans regions and theaters in Europe, the Pacific and the Middle East as well as the continental U.S. In addition to FORSCOM units, the Army's Centers of Excellence and program executive offices, as well as cross-functional teams from the Army

Futures Command and other stakeholders are participating in these assessments to quickly translate operational feedback into action.

"The Soldier feedback process is not linear, so we rely on operational exercises, targeted experimentation and formal pilots to obtain the feedback the Army needs to make informed decisions," said Program Executive Officer Mark Kitz, with the Program Executive Office for Command, Control and Communications – Tactical (PEO C3T), which leads the Army's network and C2 portfolio.

To jump-start the new transformation effort from a network perspective, the Army chose the 101st Airborne Division (Air Assault) based at Fort Campbell, Kentucky, to experiment with multiple networked communications technologies. The unit used these systems before and during its third annual Operation Lethal Eagle exercise. Held in April 2024, it was designed to build Soldier and unit lethality and to assess the 2nd Brigade's transformation from an infantry brigade combat team to a mobile brigade combat team. The brigade will continue to employ the systems at a Joint Readiness Training Center rotation later this year.

The 101st continues to provide comprehensive feedback on technology and organizational changes that may be needed to ensure the right skill set is at the right echelon to conduct the fight. At the division command post, for example, the unit is handling network architecture that was previously relegated to the brigade level. Additionally, aircraft pilots and dismounted Soldiers are finding new ways to communicate and share information during long-range air assaults.

"The division just completed the first comprehensive field assessment of the Army's transformation in contact efforts by capitalizing on its unique training glide path to experiment with organizational change and inject modern capabilities at scale and under load," said Maj. Paul Bingham, maneuver planner for the 101st Airborne Division (Air Assault).

"The timing was perfect, just based on where we were in our training, to take the newest thing and incorporate it," said Col. Clinton Cody, Combat Aviation Brigade commander for the 101st. "We've been pushing the limits when it comes to large-scale combat operations … [and] we bring a unique perspective to the ground force and giving them that asymmetrical advantage."

COMMS ON-THE-MOVE

Army leaders have identified C2 on-the-move (OTM) as a critical enabler to increase survivability and provide commanders with the flexibility to fight and win against near-peer adversaries during multidomain and large-scale combat operations. (See "Command and Control On-The-Move" in the Spring 2024 issue of Army AL&T).

The critical first step to achieve C2 OTM has been aligned under the Command Post Integrated Infrastructure (CPI2) experimentation and limited user test, conducted with the 1-2 Stryker Brigade Combat Team, 7th Infantry Division at Joint Base Lewis McChord, Washington.

The CPI2 capability provides modular command post capability that integrates network and communications technologies, including the Integrated Tactical Network (ITN), into the family of medium tactical vehicle platforms, replacing existing tent-based command post capability.

"The conflict taking place in Europe continues to validate the need for mobile command posts," said Lt. Col. Herb Gamble, CPI2 product manager within PEO C3T. "Mobility significantly increases survivability and it also provides the commander with the flexibility to command from anywhere in the fight."

In 2023, the 1-2 Stryker Brigade Combat Team experimented with various vehicle types and sizes, from the smaller Humvees, which were used as a tactical command post, up to Mobile Command Platform Vehicles, which were used for more comprehensive command post functions such as intelligence and network operations.

The limited user test pushed the brigade combat team further onto the range, generating additional feedback on the need for onboard power versus a microgrid, which required platforms to be tethered to a power source. The network program integration team installed generators on each vehicle platform in just two months. As a result, the unit now has more mobility to quickly emplace and displace vehicle-based command posts, which would increase survivability in a real-world operation.

Army leaders are now pushing for even greater mobility and less complexity at brigade level and below, citing the need to move the command post quickly and "hide in plain sight" from an electromagnetic signature perspective.

"We must have high-throughput, low-latency bandwidth and the ability to function in a dispersed environment, while minimizing electromagnetic signature," Gamble said. "In addition to speed, we need to understand how our signatures appear in the electromagnetic spectrum to ensure we can't be targeted."

ALREADY GONE

Soldiers from the 2nd Brigade Combat Team, 101st Airborne Division (Air Assault) conducts battlefield circulation during hasty defense and vehicle drop-off operations as part of Operation Lethal Eagle at Fort Campbell. The exercise tested systems designed to ensure that Soldiers are never in one place long enough to be seen, physically or through electronic signature. (Photo by Sgt. 1st Class Joseph Truesdale, 101st Airborne Division (Air Assault) Public Affairs)

Today, PEO C3T's CPI2 Program Office is integrating the 101st Airborne with networked mission command technologies and placing them at the division echelon, leaving the smaller, more tactical vehicles at brigade and below, as part of the C2 OTM transforming in contact effort.

BOOSTING SITUATIONAL AWARENESS

Until recently, the staple for blue force tracking and situational awareness in vehicles and the command post was the Joint Battle Command – Platform (JBC-P) hardware and software. The Army has begun upgrading the JBC-P software with the Mounted Mission Command – Software (MMC-S), relying heavily on experimentation efforts with the 2nd Brigade Combat Team, 82nd Airborne Division.

Unlike JBC-P, MMC-S provides an open software platform known as Tactical Assault Kit (TAK). "MMC-S is replacing JBC-P, utilizing a TAK baseline enabling the convergence of warfighting functions at a rapid pace, and leveraging Soldier feedback using a DevOps approach," said Daniel Ghio, product manager for MMC within PEO C3T.

During the experimentation, the MMC program team did not wait for the traditional acquisition process; rather, it implemented Agile software practices and collaborated with other program offices, inserting industry partner technologies into the code and using multiple Soldier touch points with key stakeholders in attendance to obtain user input in real time.

The unit's initial feedback after experimenting with the MMC-S in the field, which included a tablet integrated into the vehicle, indicated that the software was simple to use and provided a common look and feel from the vehicle to the command post. However, users wanted to be able to take the capability with

them when transitioning to dismounted operations.

Program office developers took this feedback and provided the ability for the tablet to connect to any network point of presence in the formation, such as tactical radios, Wi-Fi and the upper tactical internet, giving dismounted troops the same common operating picture and chat function.

Soldier-driven feedback and the quick response from program developers for resolution provided the catalyst for the Office of the Director, Operational Test and Evaluation to deem the system effective, suitable and survivable. As a result, the system will be approved for full fielding in October 2024.

For the hardware, Mounted Mission Command – Transport (MMC-T) will replace the current legacy receiver to provide multitransport capabilities, such as low Earth orbit, geosynchronous Earth orbit and line-of-sight waveforms, which are critical to large-scale combat operations in contested and congested environments. The 11th Armored Cavalry Regiment at Fort Irwin, California, validated critical anti-jam and multipath diversity capabilities within the MMC-T during a Soldier touch point in January 2024. The MMC-T is moving into low-rate production in 2025.

The 2nd Brigade Combat Team relied on these lessons to incorporate the ITN and MMC-S into its brigade combat team maneuver experimentation, including Operation Lethal Eagle, enhancing on-the-move communications and helping to reduce the team's footprint and electronic signature.

ROGER THAT
Soldiers with the 3rd Brigade Combat Team, 25th Infantry Division complete an overnight assault mission during the Joint Pacific Multinational Readiness Center at Schofield Barracks in November 2023. They provided feedback on the Army's Division Warfighting at Echelon effort, which pushes network complexity up to division. (Photo by Samuel Brooks, PEO C3T Public Affairs)

A MORE FLEXIBLE FIRES APPLICATION

The Advanced Field Artillery Tactical Data System (AFATDS) software, fielded by the Army in 1995, was the first system to fully automate support for planning, coordinating, controlling and executing fires and effects. Fast forward nearly 30 years to Project Convergence Capstone 4, held at Fort Irwin in February and March 2023. There, the Army conducted a demonstration of the Artillery Execution Suite (AXS) software, a modernized version of AFATDS, to replace the monolithic Fires C2 software with a TAK-based system. This new version is now undergoing Soldier experimentation at the division level with several units within the Army.

"While consistently effective throughout the years, AFATDS was not designed to be easily upgradable," said Lt. Col. Timothy Godwin, product support manager for AFATDS.

The demonstration at Project Convergence showed that AFATDS and AXS could pass fires chain traffic back and forth, and both systems displayed the same common operating picture.

"AXS will be the flexible fires support software of the future and will be data-centric, hardware-agnostic and able to reside in the cloud," Godwin said.

AIR ASSAULT COMMUNICATIONS

The ability of pilots and commanders to communicate with ground forces during air assaults provides an asymmetrical advantage to Soldiers in the fight. The 101st Airborne, which specializes in air

assault operations, continues to provide critical feedback on the ITN Aviation Demonstration Kit. This capability puts the ITN, which is widely fielded across brigade combat teams, into the air for air-to-ground communications. Preceding the current experimentation with the 2nd Brigade Combat Team, 101st Airborne Division, the 25th Infantry Division's Combat Aviation Brigade provided experimentation and feedback during its Joint Pacific Multinational Readiness Center rotation at Schofield Barracks, Hawaii, in November 2023.

The ITN Aviation Kit inserts a two-channel Leader Radio into the helicopter's cockpit, providing the mesh network relay down to the dismounted Soldiers. The kit also includes a handheld tablet that provides text and chat functions for the pilot and commander to converse alongside radio communications.

Taking lessons learned from the 25th Infantry Division's Combat Aviation Brigade, the PEO C3T program office for air-to-ground radios continues to experiment with support from the 2nd Brigade Combat Team, 101st Airborne Division. These efforts included the unit's Joint Readiness Training Center rotation in January 2024, where nearly 80 helicopters conducted a 500-mile, large-scale, long-range air assault, from Fort Campbell to Fort Johnson, Louisiana, and back.

Better connectivity during such long-range, large-scale air assaults enables units to be task-organized and able to immediately share battlefield data when they hit the landing zone.

"The 'Screaming Eagle' Soldiers of the 101st demonstrated enthusiasm for utilizing the ITN Aviation communications package, [especially after] seeing their position location and information on their tablets and the ability to communicate via chat," said Jerry Harper, product manager for Helicopters and Multi-Mission Radios for PEO C3T's PM Tactical Radios.

The unit conducted a second long-range, large-scale air assault during Operation Lethal Eagle in April, taking off at night from Fort Campbell, flying to Camp Atterbury, Indiana, and then Fort Knox, Kentucky, before returning to Fort Campbell. The Army continues to collect lessons from this air assault as it provides guidance for additional kits and helps to refine the mesh network needed during the comprehensive, fast-moving, long-range air assault missions.

CONCLUSION

As the Army continues to experiment with increasing tactical mobility and survivability and pushing some of the more complex network communications systems up to division as part of transforming in contact, it is also ensuring that necessary capabilities remain at brigade level and below to enable commanders' operational requirements. Soldier participation and feedback will ensure that the network architecture will support "fight tonight" missions as well as future needs.

"These Soldiers' voices are being heard throughout the Army, from our program office up to the chief of staff of the Army, who has made the network and C2 systems the Army's No. 1 priority for transformation," Kitz said. "How these systems perform in the field, from ease of use to their functionality, carries a tremendous amount of weight for the Army to decide how it will conduct large-scale combat operations."

*For more information, contact the PEO C3T Public Affairs Office at 443-395-6489 or **usarmy.APG.peo-c3t.mbx.pao-peoc3t@mail.mil**. Go to **https://go.usa.gov/xMSNz** for the 2021 Army Unified Network Plan or follow PEO C3T at **http://peoc3t.army.mil/c3t** and **https://www.facebook.com/peoc3t**.*

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KATHRYN BAILEY is the public communications specialist for Bowhead Business and Technologies Solutions, assigned to PEO C3T, where she has covered PM Tactical Radios for the past six years, including the ITN effort and Army, joint and coalition fielding and training events worldwide. She holds a B.A. in communications studies from the University of Maryland Global Campus.

FEEDBACK ADVANCES SATCOM

Implementing a Soldier feedback loop is a critical component in the Army's efforts to enhance its Unified Network to support potential large-scale combat operations. The Army is leveraging Soldier feedback in two high-profile efforts to cost-effectively deliver the resilient, multi-orbit satellite communications (SATCOM) it needs to be successful in future conflicts.

For several years, the Army has worked closely with commercial vendors through streamlined cooperative research and development agreements to securely integrate and explore the capabilities of emerging commercial low Earth orbit and medium Earth orbit satellite constellations, as well as the services and ground terminals needed to access them. As some of these commercial solutions mature and expand in global coverage, the Army is beginning to conduct operational assessments to inform near- and long-term network design decisions. Since September 2023, the 51st Expeditionary Signal Battalion-Enhanced (ESB-E) has supported an Army assessment to inform the potential integration of emerging high-throughput, low-latency (HT/LL) low Earth orbit commercial SATCOM into the Army's expanding Unified Network transport arsenal.

Recent geopolitical conflicts continue to underscore the need for commanders to possess multiple transport options to enhance their primary, alternate, contingency and emergency communication plans to ensure resilient, rapid and uninterrupted data exchange on the battlefield. The more network pathway options that exist for data to travel through—especially in disrupted, disconnected, intermittent and low-bandwidth environments—the more resilient the network becomes to signal roadblocks, including enemy jamming.

The HT/LL assessment supported by the 51st ESB-E leverages several different maturing commercial low Earth orbit solutions integrated with the unit's organic baseband systems. The purpose is to determine the best mix of solutions to potentially add HT/LL transport to the Army's portfolio of SATCOM terminals. The assessment will also inform concept of operations and tactics, techniques and procedures for future HT/LL use in Army units.

The unit will deploy and use the commercial assets in a variety of training exercises, mission sets and locations, and provide its feedback. The valuable quantitative and qualitative data points and Soldier feedback collected from the assessment will help shape Army HT/LL requirements and drive decisions on what to procure and how to implement materiel solutions to meet those requirements.

Later this fiscal year, the Army plans to conduct a HT/LL medium Earth orbit assessment leveraging Scalable Class of Unified Terminal, or SCOUT, satellite terminals, to evaluate whether medium Earth orbit SATCOM could be a viable solution for transport diversity at division and above headquarters.

SATCOM AS A MANAGED SERVICE

Another pilot will inform Army decisions on a lease-versus-buy business model for acquiring and delivering scalable commercial SATCOM to support unit readiness and unique missions in future large-scale combat operations.

To kick off the pilot, known as Satellite Communications as a Managed Service (SaaMS), the Army fielded different bundled commercial equipment, bandwidth and service packages to units in several regional coverage areas around the globe. Instead of the Army having to procure, field, sustain and modernize equipment on its own for every unit and every mission, SaaMS could enable the Army to lease these capabilities at the point of need. This business model would be scalable to expand or contract as missions change, helping to reduce on-hand inventory, satellite airtime and cost. SaaMS would ensure bandwidth is allocated at the right place and time to support data exchange in a wide variety of mission sets.

As PEO C3T released in April 2024, Army will leverage the data and Soldier feedback from the pilot and other DOD efforts to make informed decisions on implementing SaaMS to meet the increasing demand for secure reliable SATCOM.

In line with the Army Unified Network Plan, a SaaMS model could potentially help the service to more affordably keep up with the accelerating speed of technology advancement, while reducing equipment obsolescence and other sustainment challenges. Solutions will be flexible and tailorable to meet the needs of specific mission sets and enable SATCOM connectivity and

BASE OF OPERATIONS

Soldiers from the 86th Expeditionary Signal Battalion, 11th Corps Signal Brigade (CSB) and 11th CSB Network Operations take part in new equipment training in February 2023 at Camp Pendleton, California, as part of the Army's SaaMS pilot program. (Photo by CW3 Nathan Paquette and CW2 Tim Gass, 11th CSB)

LINKED UP

PEO C3T's Project Manager for Tactical Network facilitated new equipment training for the Virginia Army National Guard's 529th Sustainment Support Battalion in February 2024 in North Chesterfield, Virginia. Feedback from the session will help shape Army HT/LL requirements and drive decisions on procurement and implementation. (Photo by Amy Walker, PEO C3T Public Affairs)

hardware to be surged for deployments or humanitarian assistance and disaster relief missions.

The SaaMS pilot encompasses commercial capability in both low Earth orbit and the traditional geosynchronous Earth orbit constellations. Leveraging SaaMS' multivendor, multi-orbit SATCOM capability could fuel the Army's efforts to enhance network resiliency through transport diversity, especially in denied, degraded, intermittent and limited-bandwidth environments. The intent of the pilot is not to create a separate SaaMS evaluation event, but to enable operational units to use the different service and equipment sets to best suit their individual needs and roll them into their existing training events through fiscal year 2024.

During the pilot, the Army is assessing varying degrees of leased end-to-end service models with tailorable features that include satellite terminals, bandwidth capacity, security compliance, logistics and repair.

The pilot also encompasses different scenarios, such as using SaaMS to provide a stopgap for maintenance issues due to obsolescence or to rapidly deliver the "latest and greatest" in commercial technology to an Army National Guard unit before a deployment, said Seth Chouinard, SaaMS project lead for Product Manager for Unified Network Capabilities and Integration.

Alongside the pilot, the Army is accelerating the potential use of an "as a service" business model by concurrently using lessons learned from other DOD efforts in the managed services realm, including those conducted by the U.S. Navy and U.S. Marine Corps. Similarly, the Army is looking into the potential of leveraging a commercial "as a service" model for tactical radios, releasing a request for information to industry to gain further insight. To further examine the pros and cons of the SaaMS model, the Army is working with Johns Hopkins University to conduct a SaaMS business case and cost analysis to aid in future lease-versus-buy decisions.

—LT. COL. MARK SCOTT & AMY WALKER

WEIGHING THE BENEFITS

The Army Cold Regions Test Center staged a multiweek test of the Army's NGSW at Fort Greely in January 2024. The XM7 and XM250 boast improved accuracy and range, weigh less than their predecessors and fire with less recoil. (Photo by Sebastian Saarloos, Yuma Proving Ground)

LIGHTEN UP

Maximizing collaboration and incremental testing to deliver lightweight ammunition to the warfighter.

by Maj. Robert K. Rodell

Given the significant weight burden of weapons, ammunition, sustainment, protection and mission command equipment that warfighters carry, reducing Soldier load continues to be a top priority for the Army. The Product Manager for Small Caliber Ammunition (PdM SCA)—part of Project Manager for Maneuver Ammunition Systems (PM MAS) within the Joint Program Executive Office for Armaments and Ammunition (JPEO A&A)—continues to support this priority through development and fielding of lightweight small-caliber ammunition. Prototype testing and experimentation with alternative materials such as polymer and steel are in progress to substitute ammunition cartridge components to reduce weight without degrading performance.

EVERY POUND MATTERS

An infantry Soldier's approach march load, consisting of their combat load and mission-critical equipment, changed from 89 pounds during the Gulf War to 133 pounds during Operation Enduring Freedom and Operation Iraqi Freedom, to 122 pounds today. PdM SCA is currently maturing lightweight metallic- and polymer-cased 7.62 mm ammunition that provide cartridge weight savings of approximately 15% and 24%, respectively. For an M240 7.62 mm machine gun crew, this equates to approximately 13 pounds of weight savings with metallic-cased ammunition and 17 pounds with polymer-cased ammunition. Beyond the individual Soldier and tactical benefits, integrating lightweight small-caliber ammunition holds significant potential for reducing transportation costs and increasing ammunition throughput capacity across the Army's logistics infrastructure. Replacing legacy brass cases with polymer would reduce the pallet weight of 7.62 mm ammunition by more than 400 pounds and allow for additional pallets of ammunition to be loaded on strategic transportation assets such as cargo ships and planes.

FIELDING NEXT-GEN SOLUTIONS

XM1186 (general purpose) and XM1188 (reduced range) ammunition was fielded with the XM7 and XM250 rifles in support of the Army's First Unit Equipped event for the Next Generation Squad Weapon (NGSW) program at Fort Campbell, Kentucky, in April 2024. Both XM1186 and XM1188 feature a hybrid metal case design consisting of a brass body and steel head, reducing cartridge weight by more than 20% compared with a brass-cased equivalent cartridge. In March 2024, the 11th Airborne Division had the opportunity to put the NGSW and ammunition to the test in extremely cold conditions at Fort Greely, Alaska, where temperatures reached as low as 50 degrees below zero

Lightweight small-caliber efforts have come a long way.

Fahrenheit. Throughout the ammunition development process, improvements were continuously informed by Soldier touch points, engineering assessments and developmental testing. The fielding of XM1186 and XM1188 serves as a critical step forward in the use of alternative materials in small caliber ammunition to lighten Soldier loads.

MANY HANDS MAKE LIGHTWEIGHT WORK

The Joint Lightweight Ammunition Integrated Product Team (JLWIPT) meets annually to synchronize lightweight programs across the services to prevent duplication of effort and to identify opportunities for collaboration. The JLWIPT also has established a partnership with the United Kingdom. Under this partnership, the United Kingdom Ministry of Defence leads the 5.56 mm lightweight effort, with the Army leading 7.62 mm and the U.S. Marine Corps leading .50-caliber efforts.

Over the course of the past two years, PM MAS and PM Ammo (part of Marine Corps Systems Command) have taken advantage of this partnership to support advancement of the Marine Corps' MK323 .50-caliber polymer-cased ammunition. Through shared funding and oversight, PM MAS and PM Ammo executed a joint limited user assessment in July 2022, design verification testing in January 2023 and reliability testing in July 2023. These critical activities supported the safety concurrence by the Navy Weapon System Explosives Safety Review Board in early 2024 to allow the fielding of MK323 for Marine Corps use. Collaboration between PM MAS and PM Ammo on these events has significantly reduced testing quantities required for Army qualification. PM MAS and PM Ammo are currently executing a developmental contract for MK323 to improve manufacturability and performance in extreme temperatures to support

MAKING LIGHT WORK

Polymer-cased rounds like these, used in a recent Marine Corps training exercise, are 30% lighter than their brass counterparts, reducing the weight that warfighters have to transport. (Photo by Cpl. Cameron Hermanet, U.S. Marine Corps)

program transition to the Army, as the Single Manager for Conventional Ammunition, by 2026.

LIGHTER MATERIAL, CONSIDERABLE CHALLENGES

PdM SCA works hand in hand with the U.S. Army Combat Capabilities Development Command Armament Center (DEVCOM AC), DEVCOM Army Research Laboratory (ARL) and industry partners to advance lightweight ammunition solutions. While polymer materials have great potential to maximize weight savings, their physical and chemical properties present unique technical and life cycle challenges that are not present in metallic alternatives. "Extreme temperature performance has historically been a challenge with polymer materials," said Brian Kim, project officer for Lightweight Small Caliber Ammunition at DEVCOM AC. "There are also many unknowns with how polymer will perform in terms of long-term storage and shelf life. However, with the recent development and incremental testing of new case designs, we have increased confidence in meeting Army extreme temperature requirements. Accelerated aging studies are currently ongoing to inform the limitations of polymer ammunition storage."

In maturing 7.62 mm polymer ammunition technology, the team has learned that testing often and failing early is key to learning. PdM SCA is currently executing an other-transaction authority contract with a polymer ammunition vendor, maximizing test iterations and data exchange between the contractor and the U.S. government. "It is critical to have a continuous feedback loop of designing tests to isolate and understand key variables, test execution first at ambient and then at operational temperature extremes, and then use those observations to refine the test design for the next round of testing," Randy Mrozek, Ph.D., team lead for polymer physics and processing at DEVCOM ARL, explained. "This critical feedback loop is only enabled by having expertise in ammunition manufacturing, weapons operation and materials understanding on the development team."

"It is critical to have a continuous feedback loop of designing tests to isolate and understand key variables."

CONCLUSION

Lightweight small-caliber efforts have come a long way. Despite the inherent challenges of incorporating new materials into products, the successful fielding of XM1186 and XM1188 as well as the approval of MK323 for fielding to the Marine Corps set a path for further lightweight integration. PdM SCA continues to leverage collaborative opportunities through the JLWIPT, incremental testing methodology and industry expertise to support weight reduction priorities that will benefit the warfighter.

For more information, go to the PdM SCA webpage at ***https://jpeoaa.army.mil/Project-Offices/PM-MAS/Teams/PdM-Small-Caliber****.*

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READY FOR BLITZ

HIVE unmanned aircraft systems (UAS) prepare to take flight during Project Convergence – Capstone 4 at Fort Irwin, California, in March 2024. Small UAS weigh less than 1,320 pounds and travel at speeds less than 250 knots. (Photo by Sgt. Gianna Chiavarone, 24th Theater Public Affairs Support Element)

NEED FOR SPEED

JPEO A&A works to develop munitions to counter the growing threat of small unmanned aircraft systems.

by Lt. Col. Paul Santamaria and Maj. Jake LaGue

From fighting tanks in World War I to defeating improvised explosive devices in the Middle East, Soldiers on the battlefield have been forced to adapt and develop innovative countermeasures to emerging threat technologies. On today's battlefield, one such emerging technology comes in the form of small unmanned aircraft systems (UAS), which the DOD defines as Groups 1-3, weighing less than 1,320 pounds and traveling at speeds less than 250 knots. Speed is needed to counter the small UAS threat with affordable and scalable kinetic options. Unfortunately, the threat has proliferated so quickly that our processes for budgeting and programming the resources for fully developed systems, though ideal, will not bring about timely solutions.

Enter the Joint Program Executive Office for Armaments and Ammunition (JPEO A&A) at Picatinny Arsenal, New Jersey. The Product Manager for Medium Caliber Ammunition (PdM MC) out of the office of the Project Manager for Maneuver Ammunition Systems, along with their counterparts in the U.S. Army Combat Capabilities Development Command Armaments Center (DEVCOM AC), have been on the cutting edge of providing low-cost counter-unmanned aircraft system (C-UAS) munitions designed for Groups 1 and 2 for the past seven years.

THE UAS THREAT

The world has borne witness to the effects of small UAS in recent years through asymmetric warfare in the Middle East and large-scale combat operations in Europe. Small UAS are widely available, cheap to buy and easy to weaponize, with an almost endless supply to employ behind enemy lines. They can go virtually undetected to reconnoiter enemy positions, spot for artillery fire or deliver lethal payloads on troops, equipment and key infrastructure.

TEST MATCH
Soldiers test the 30 mm anti-drone XM914 chain gun on an M-LIDS in July 2023 at Udairi Range, Kuwait. (Photo by Capt. Austin May, Area Support Group – Kuwait)

Secretary of the Army Christine Wormuth stated in a February 2024 Defense Writers Group that "we in the Army have got to do more and more and more on UAS, C-UAS in terms of investing in those systems. We as a service are investing more than any other service in those areas already, but I think when you look at the threats to our Soldiers in CENTCOM [U.S. Central Command], for example, we have got to do more." This is particularly evident when we consider that the Army is currently relying on precision missiles that can cost up to $350,000. While these missiles have a role, they should be reserved for larger targets at greater distances. Heavier emphasis is needed to invest in strengthening the inner-most layer of short-range air defense with low-cost kinetic solutions.

NEXT WAVE OF C-UAS AMMUNITION

In 2017 and 2018, the Army issued directed requirements for the Mobile-Low, Slow, Small Unmanned Aircraft Integrated Defeat System (M-LIDS) and the Mobile Short Range Air Defense (M-SHORAD) platforms and mandated fielding by fiscal year 2021. These platforms come equipped with a 30 mm XM914 chain gun that integrates into the layers of short-range air defense. At the time, the Army had no existing 30 mm ammunition that was compatible with a ground-based weapon system that fires a percussion-primed cartridge. The only existing tactical 30 mm cartridge was the Apache helicopter's electrically primed M789, which contains a shaped charge liner for light armor penetration. To provide M-LIDS and M-SHORAD with an immediate ammunition solution, the engineers at DEVCOM AC modified the M789 by swapping the electric primer for a percussion primer and added a self-destruct feature to minimize collateral damage in ground-to-air engagements. That round is the XM1198 High Explosive Dual Purpose Self-Destruct (HEDP-SD). While the XM1198 HEDP-SD can have effects against small UAS targets, it is better suited for ground-to-ground engagements because it

is a point detonating round that requires a direct hit, which is quite challenging on a three-dimensionally maneuvering small UAS target at range.

To provide a more effective cartridge to defeat small UAS, PdM MC developed the next iteration of counter ammunition, the XM1211 High Explosive Proximity (HEP). In the XM1211, a proximity sensor is incorporated into the fuze while retaining the self-destruct capability. Rather than requiring a direct hit, the XM1211 just needs to get close enough for the proximity sensor to detect the target, at which point it airbursts, sending lethal fragmentation to defeat the drone. In testing, the XM1211 was demonstrated to be significantly more effective against small UAS than the XM1198, requiring fewer rounds to defeat a target. The XM1198 and XM1211 were rapidly developed and issued to select units under an urgent materiel release in fiscal year 2021 and fiscal year 2022 and are in limited production.

Realizing the need to retain a ground-to-ground force protection capability, the Air and Missile Defense Cross-Functional Team wrote a requirement for a single 30 mm cartridge that could rapidly transition between air and ground targets. Leveraging the proximity fuze work from the XM1211, DEVCOM AC designed a programmable proximity cartridge along with a contact fuze setter, the XM1223 Multi-Mode Proximity Airburst (MMPA), a fiscal year 2024 new-start program that achieved Technology Readiness Level 6—a system model or prototype demonstrated in a relevant environment—in technology maturation. The XM1223 combines the anti-armor capability of XM1198 HEDP-SD with the proximity airburst capability of the XM1211 HEP, along with a few new features. The XM1223 MMPA leverages a contact fuze setter integrated into the XM914 chain gun that sends a programming message when the round is cycled into the weapon. XM1223 can be programmed in the following modes:

- Point detonate for lightly armored targets.
- Proximity airburst for small UAS or personnel in the open.
- Proximity airburst delay for troops in a protected position.
- Self-destruct range, customizable per engagement.
- Gated mode, which is designed to minimize collateral damage in cluttered urban environments by telling the proximity sensor to ignore ground clutter en route to the programmed target distance, so that it does not airburst prematurely.

The government development and owned technology in proximity and programmable fuzing is being explored to proliferate into different calibers—including an electrically primed version of the XM1211 HEP for the Apache helicopter, a programmable proximity airburst 40 mm cartridge for the Mk-19 Grenade Machine Gun, and a 25 mm proximity airburst cartridge to provide Bradley Fighting Vehicles an organic counter-UAS capability. The success of the 30 mm counter-UAS munitions has generated strong enthusiasm for quickly incorporating the proximity technology across the medium caliber portfolio. Though each individual munition caliber presents its own challenges, it is important to note that the proven C-UAS proximity technology is government owned, which allows the program office the opportunity to leverage and share its technical data package with industry partners to help reduce technical risks.

Small UAS are widely available, cheap to buy and easy to weaponize, with an almost endless supply to employ behind enemy lines.

THE REQUIREMENT FOR PRODUCTION PROFICIENCY

There are still considerable challenges to overcome to provide these capabilities at scale. It's important to note that this ammunition does nothing on its own. Ammunition is always tied to a weapon, or in most instances for medium caliber, a platform. There is a precedence to focus on platforms to provide capability, and ammunition is often left without the proper resources to develop or integrate into platforms. This results in disjointed capabilities and forces ammunition product offices to get creative through reallocation of resources in the year of execution to catch up to the platform.

All too often, ammunition development is overlooked and gets lumped in with the broader system development without giving

AIR DEFENSE

Air defenders from 5th Battalion, 4th (5-4) Air Defense Artillery Regiment conducted integrated maneuver live fire training on an M-SHORAD in June 2023 at Grafenwöhr Training Area, Germany. (Photo by Spc. Andrew Simeri, 5-4 Air Defense Artillery Regiment)

the appropriate consideration to leveraging proven government-owned technology. As a result, the ammunition industrial base also goes overlooked and often lacks the capacity to meet current demand of these critical munitions, let alone surge capacity. This results in long production lead times, high unit costs and inconsistent quality. The XM1211 HEP proximity module contains microelectronics—which are tediously assembled by hand onto circuit boards that compete across industries—resulting in long lead times. This exacerbates the time required to produce substantial quantities of this round. All the touch labor means a higher unit price, making it challenging to provide proximity ammunition in any substantial quantity or realize cost savings through economies of scale. Another side effect of hand assembly is inconsistent quality because of undefined process control. Our industry partners are managing processes as stringently as possible, but hand assembly will never beat an automated production line.

Those components and processes are not specific to the XM1211—all medium caliber proximity-fuzed cartridges have significant overlap in parts and processes. Once a fuze is proven and ready for production, the effort required to produce

Ammunition is always tied to a weapon, or in most instances for medium caliber, a platform.

TEST FLIGHT
A small UAS flies over Fort Sill, Oklahoma, as more than 20 students from the Army, Navy and Air Force participate in the Joint C-sUAS University. Asymmetric warfare in the Middle East and large-scale combat operations in Europe have shown the effectiveness of small UAS. (Photo by Amber Osei, U.S. Army Air Defense Artillery School)

that fuze in high volumes is considerable. Many hardware developers for new platforms or weapon systems do not understand the industrial base considerations of introducing new ammunition—nor is it their responsibility to. It is JPEO A&A's responsibility to identify the proper resources to automate and upgrade production lines, especially with rapidly developed and fielded munitions. For example, JPEO A&A has recently invested in increasing the manufacturing throughput of the liquid reserve battery, a critical component that will be common across multiple proximity C-UAS munitions in the medium caliber portfolio.

There is an issue with capability developers and resource managers viewing capability from a platform perspective. They believe capability resides predominantly with the platform and budget accordingly to strengthen their warfighting function. The challenge is the C-UAS threat is not unique to any one platform or weapon system. For medium caliber ammunition, it spans various portfolios, including maneuver, Soldier, aviation and air and missile defense. To better synchronize the development of new platforms with the development of new ammunition, capability developers and resource managers should ask themselves a few critical questions when allocating resources:

- If new ammunition is required, what existing and proven technology can be leveraged to reduce risk in ammunition development?
- Does our budget request consider the appropriate resources and schedule to account for ammunition development and procurement?
- What ammunition industrial base considerations must we account for in the platform acquisition strategy?

CONCLUSION

Focused investment in the ammunition industrial base is vital. It will reduce production lead times to get enhanced capability to the warfighter as quickly as possible and enable cost reduction through high-volume orders and economies of scale. The Army cannot rely on expensive missiles for much longer to address the rapidly evolving small UAS threat. With the proper industrial base investments, medium caliber proximity-fuzed munitions can be a critical low-cost contributor to the inner-most layer of short-range air defense. The European conflict has revealed the necessity to make heavy investments in domestic production of 155 mm artillery shells. The same emphasis should be placed on the C-UAS ammunition industrial base immediately.

For more information, contact JPEO A&A Public Affairs at ***eric.w.kowal.civ@army.mil****.*

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STRYKER READY

Using machine learning to forecast maintenance readiness at the frontline unit level.

by Lt. Col. Nate Platz and Maj. Matt Gilbert

DATA CAPTURE
Stryker maintenance can be improved by exploiting untapped data that is readily available. (Photo by Maj. Matt Gilbert, 1-41 Infantry Battalion)

The Army's current model to determine future equipment readiness levels falls short of enabling command decision-making in large-scale combat operations. The current model uses the bank time system, which calculates the sum of available equipment hours per fleet over a 30-day reporting window. But it does not consider external factors such as training conditions, personnel strength or parts availability, and only projects the current 30-day reporting period (from the 15th of the month to the 14th of the next month). With the availability of other analytical tools, the sustainment community should explore alternatives.

During a rotational deployment to Korea, leaders from 2nd Stryker Brigade Combat Team, 4th Infantry Division pursued an improved model to forecast equipment readiness using machine learning tools, while considering the influence of exogenous data. This research focused on forecasting equipment readiness for the Stryker fleet within one Stryker infantry battalion, specifically 1st Battalion, 41st Infantry Regiment (1-41). Training and maintenance data were included to establish impacts on current and future readiness. Machine learning then enabled the design of models based upon time-series data to assess their accuracy, with powerful results.

Using data available at the battalion level through U.S. Army systems of record, Soldiers from 2nd Stryker Brigade Combat Team developed a model to accurately predict one month of equipment readiness.

THE APPROACH

The team gathered two years of daily maintenance and training data for one Stryker infantry battalion and analyzed the data using a linear regression. While the linear regression fell short of a sufficiently accurate predictive model, it helped identify statistically significant variables for determining maintenance readiness. With the regression analysis as a baseline, the team transitioned to more robust machine learning tools to find a best-fit predictive model. To assess accuracy, the team compared forecasted data with real data on a weekly basis over a 30-day period. To assess variation in forecasts and understand how each model learned, the team replaced forecasted data with current data on a weekly basis over the same 30-day period. At the conclusion of the study, each model's 30-day forecasting performance was compared against the others to find which model provided the greatest accuracy over the longest period.

In developing the model, the team tested three time-series forecasting tools using machine learning and catalogued their

WHAT IS LINEAR REGRESSION?

A linear regression is a statistical model that estimates the relationship between a dependent variable and independent variables. A dependent variable relies on independent variables to determine its value; in the study, the dependent variable was Stryker readiness. An independent variable is arbitrary and not reliant on outside values—essentially these were used to predict the dependent variable. Linear regression is used to determine if the dependent variable can be explained or predicted by the independent variables.

ational readiness rate, Prophet proved most accurate. Prophet is an open-source machine learning model developed by Meta Platforms designed for producing forecasts from time-series data. Other models tested that showed promise include random-search/random-forest regression and a Bayesian gradient booster regression, and all produced better results than legacy tools and methods. The random-search/random-forest is an ensemble machine learning model that creates nodes for testing and training data for evaluation; the gradient boosting regressor model is an ensemble machine learning model.

THE DATA AND METHODS OF COLLECTION

Initial attempts focused on data collection for an entire Stryker brigade but found too much variation in how training data was captured between battalions. To ensure data accuracy of training inputs, the team scaled down the sample to one Stryker infantry battalion. This allowed control for variations in training data when assessing the impact on Stryker maintenance readiness, which served as the dependent variable. The models used two datasets comprised of independent training and maintenance variables.

Training data was classified in a binary fashion to distinguish the days when equipment was operated from days when equipment sat idle. The data also included days when the battalion had no scheduled activity (a day of no scheduled activities, or DONSA) and days when the battalion was moving to and from training. This categorization method effectively weighted training volume for each day over time. The two datasets differed in the DONSA variable—one with this variable and one without.

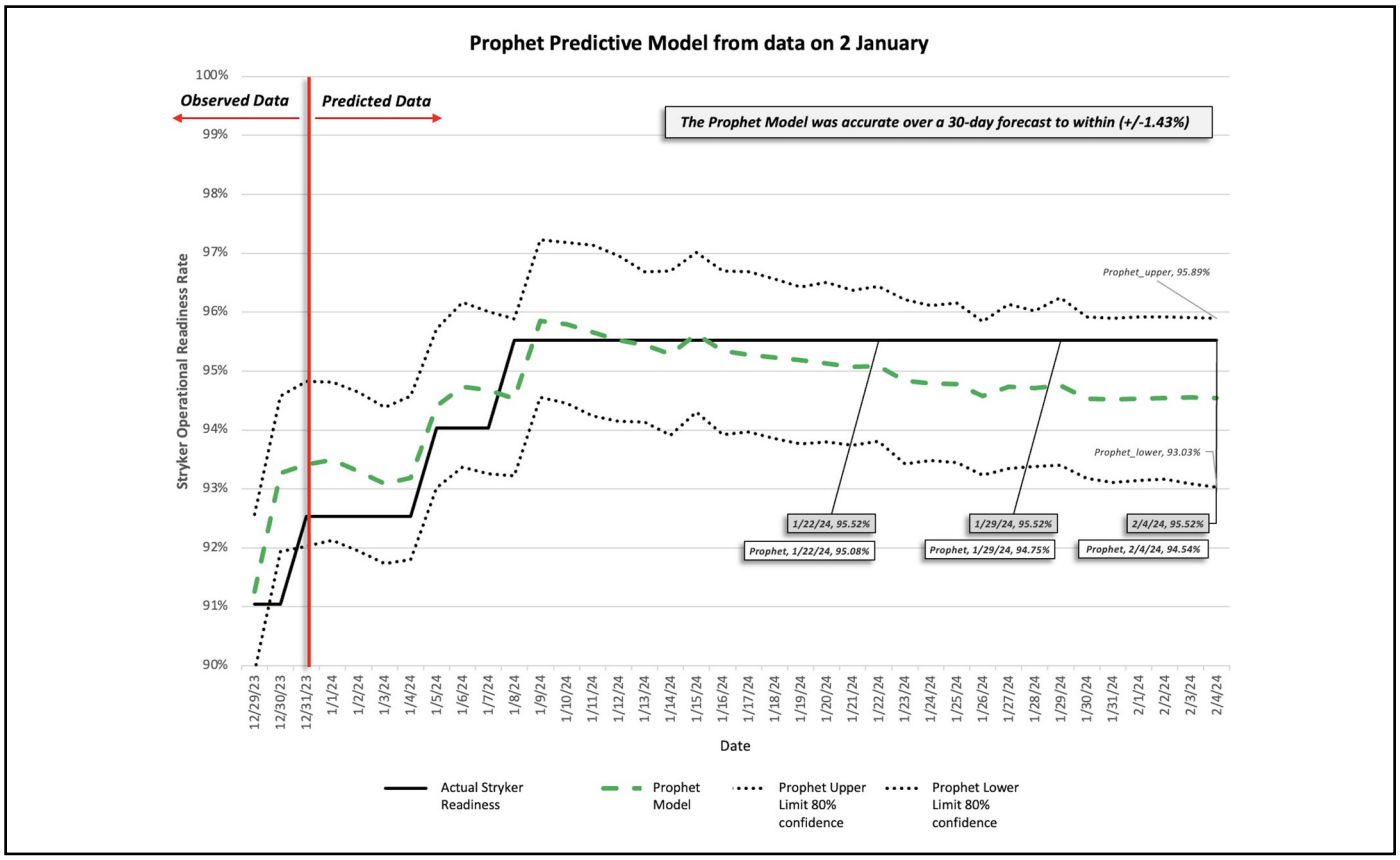
Maintenance data was assembled from Global Combat Support System – Army, the U.S. Army's system of record and a highly

configured version of an enterprise resource planning system containing daily maintenance information. In our models, we considered overdue Stryker services, completed Stryker services, non-mission capable vehicles for maintenance and for supply and non-mission-capable pacing vehicles for maintenance and for supply. The models then used observed values for all maintenance data inputs.

To create the forecast for each model, the research team entered the independent variables for the forecasted dates—this comprised the exogenous data (variables not affected by other variables in the system). Values for the exogenous data were obtained from the battalion training calendar for all training data and from the maintenance schedule for services and non-mission capable vehicles. Where appropriate, the team input the expected value for maintenance data and any planned training that fell within the category. This exogenous dataset was created for the next 60 days.

ANOMALIES AND OBSERVED INCONSISTENCIES

Completed services were observed to have an outsized impact on the forecast for gradient booster and random forest, as did DONSAs. (A DONSA includes weekends and federal holidays.) The periodicity of weekends within the DONSA variable resulted in inaccurate dips in predicted values, yielding inconsistencies. Removing the DONSA variable improved all models. The significance of the complete services variable suggests the importance of sticking to a service schedule at the unit level to accurately predict unit maintenance readiness. This also implies that senior leaders could make resourcing decisions from these models based on several compounding factors, such as when to schedule services and ensuring availability of service kits, as well as when to surge maintenance personnel to maintain equipment readiness.



ON TRACK

A graph comparing the Prophet Model's accuracy over a 30-day period with actual readiness. (Graphic by Capt. Bailey Smith, 704th Brigade Support Battalion)

APPLICATION

The Prophet model can aid commanders in understanding where maintenance will impact future operations and where future operations will impact readiness and operational endurance. Staffs can leverage this information for more precise assessments and improved planning. Picture the ability to understand the impact that changes to a training calendar have on Stryker readiness. For instance, when planned mechanic hours are diverted by unpredicted medical or other readiness requirements, a leader could communicate the tangible risk associated with those changes with precision. Using these models, commanders can test these unpredicted events to understand the impact on readiness.

A second application would be predicting Stryker readiness over a deployment period, such as a Korean Response Force rotation, a European Defender rotation or a combat training center rotation. Commanders would be able to identify periods where training will require a complimentary intense maintenance focus and plan accordingly or adjust their plan to meet Armywide training gate targets. Commanders also would be able to model the impact of changes in training plans or service schedules on equipment readiness during a rotation, informing decisions to maximize training and equipment readiness and identifying areas of risk.

A third application can be seen in an adaptation for large-scale combat operations. Instead of using a training calendar, a commander can use the operational synchronization matrix along with the maintenance plan to assemble the exogenous data and better understand which unit is best postured to be the main effort or when to commit a reserve for exploitation or reinforcement. This enables improved decision-making and informs recommendations from staff to commanders at echelon.

Battalions can replicate these models by exploiting untapped data that is readily available and generated as a byproduct of daily activities. The maintenance data used is common to all battalion maintenance technicians and the brigade support operations staff. The training data used is available and common to all battalion operations staff. Using a template and running the provided code into a Jupyter code environment—an online environment for writing and running programs, accessible on government computers through **https://jupyter.org**—any battalion can produce these results.

These models were narrow in scope, and forecasted data was only observed for one month. Continued testing of these models will occur over a three-month period with 2nd Battalion, 23 Infantry Regiment, 1st Stryker Brigade Combat Team, 4th Infantry Division to determine how each model performs over a longer period with data structured at the outset. The team also will expand these models to the Stryker brigade and include all vehicle types to build a model capable of predicting maintenance readiness at the brigade level.

RECOMMENDATIONS: WHERE THE ARMY NEEDS TO IMPROVE

Data: The foundation of every model is data. The success of these models is reliant on the research team exploiting untapped data, transforming that data to an interoperable format and then loading it into the models for training. This process revealed gaps in the availability of data at the tactical level and interoperability of that data throughout Army systems. Both gaps are areas that the Army has published strategic intent on improving through the Federal Data Strategy 2020 Action Plan and the Department of Defense Data, Analytics and Artificial Intelligence Adoption Strategy. For the Army to achieve the goals outlined in these strategic documents, it must increase the availability of data and ensure the interoperability of that data once available.

Training: The Army must lower the cost of entry for data and analytics. Specifically, the Army needs to continue to teach data familiarity in its professional military education at all levels and expect a baseline competency across the force. Data literacy is becoming as essential as the current requirement of a basic ability to read and write. As data literacy increases, the force will become more comfortable interacting with and capturing data for informed decisions, improving the cognizance and utility of data collection and management. Additionally, leaders must improve their understanding of what data and models tell us. Looking at a chart predicting a future state is simple, but asking if the variables were statistically significant and understanding the adjusted significance of a model should be second nature to decision-makers for the Army to become a data-centric force. Education and training are the bridge between leaders and analysts, helping organizations better employ effectively.

Software: The Army cannot be datacentric without access to the tools to transform data and load it into models for analysis. Some of these tools are standard in the computers available for daily operations, but most are restricted by local or global network regulations. The Army needs to prioritize accessibility to such tools to enable future research on employing data for knowledge and understanding at echelon. Additionally, the Army should add data interoperability standards and practices that better align with machine learning requirements for all future software adoption contracts.

PRE-CHECK
Soldiers from 1-41 conduct pre-combat checks before loading up on the Strykers and crossing the line of departure during platoon certification in Korea. The current method of predicting maintenance doesn't consider external factors such as training conditions, personnel strength or parts availability. (Photo by 1st Lt. Samuel Hughes, 1-41 Infantry Battalion Public Affairs)

CONCLUSION

Rapid growth in artificial intelligence (AI) has outpaced the Army's and DOD's current capability to modernize. We are fighting to keep pace through essential partnerships with Palantir, Amazon Web Services and Microsoft, all which provide systems that eventually may leverage AI tools against vast Army datasets—but we are still challenged in fully operationalizing AI at echelon. The models discussed are not a panacea for AI use and do not negate the Army's need to rely on vital industry partnerships. They are an example of how units at echelon can integrate available tools for improved decision-making. These tools are available, or can be made available, for all units to employ by leveraging the talent of the Soldiers and without relying solely on commercial solutions. Coupling these tools with the solutions and technology already provided by industry partners is the key to ensuring that we successfully and maximally leverage AI for military purposes.

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PROGRAM REASSIGNMENT

The Army has reassigned primary responsibility of the Mid-Range Capability (MRC) program to the Program Executive Office for Missiles and Space. The MRC provides a land-based, ground-launched system supporting multidomain fires against specific threats. (Photo courtesy of Darrell Ames, PEO MS)

PREPARE TO LAUNCH

Two new missile programs deliver enhanced capabilities to thwart emerging threats and bolster joint force effectiveness.

by Cheryl Marino

Missiles play a crucial role in modern warfare, continually evolving with technological advancements and shaping military strategies worldwide. From this ever-changing landscape, two new groundbreaking missile programs have emerged, promising to redefine military capabilities and strategies with cutting-edge technology.

The Army's Long-Range Hypersonic Weapon (LRHW) and Mid-Range Capability (MRC) programs were designed to enhance the military's rapid response capabilities, allowing for swift and flexible deployment to address emerging threats while contributing to interoperability among different branches of the military and allied forces.

Initially developed by Lockheed Martin Corp. for the Army's Rapid Capabilities and Critical Technologies Office (RCCTO), these programs are expected to fully transition to the Program Executive Office for Missiles and Space's (PEO MS) Task Force for Strategic Integrated Kinetic Effects (STRIKE) in fiscal year 2025 for additional, long-term development, modernization and sustainment.

While both the LRHW and MRC are ground-launched systems that provide advanced capabilities to engage targets effectively across different ranges, they operate differently. The LRHW system enables rapid and precise strikes against time-sensitive or heavily defended targets at hypersonic speeds over long distances. The MRC system delivers accurate strikes against a variety of targets within intermediate distances.

"LRHW and MRC are complimentary weapon systems, filling gaps in the Army's long range precision fires portfolio," said James Mills, deputy director for the Army's Hypersonic Project Office at RCCTO. "Both systems provide extended ranges that support the Army's multidomain operations."

FUELING THE LONG-RANGE NEED

The Army has prioritized the LRHW modernization portfolio in support of the National Defense Strategy to provide combatant commanders with diverse capabilities for battlefield dominance at a multitude of ranges and to address the critical need for U.S. hypersonic capabilities across domains and platforms to effectively engage high-value targets and disrupt the ability of potential adversaries to anticipate and respond to attacks. LRHW does not replace an existing Army or DOD weapon. It is a new class of weapon for the Army and DOD and is the nation's first operational hypersonic weapon, with a total of three LRHW batteries planned for delivery.

"The responsiveness and survivability of hypersonic weapons is unmatched by traditional ballistic capabilities for precision targeting, especially in anti-access/area denial environments," said Lt. Gen. Robert A. Rasch, director of Hypersonics, Directed Energy, Space and Rapid Acquisitions for RCCTO. Rasch testified March 12, 2024, at a House Armed Services Committee hearing where policies, programs and priorities associated with U.S. hypersonic capabilities and intent of adversaries' hypersonic development efforts were addressed.

TOMAHAWK TAKE-OFF

RCCTO's MRC Project Office, in conjunction with Soldiers from the 1st Multi-Domain Task Force and the Navy's Program Executive Office for Unmanned Aviation and Strike Weapons, successfully demonstrated the launch of a Tomahawk missile from the Army's prototype MRC system in June 2023. (Photo courtesy of Darrell Ames, PEO MS)

Anti-access/area denial (A2/AD) aims at preventing an adversary from entering or operating freely within a specific area, typically a region of strategic interest. It involves the deployment of ground-based missile systems, artillery and other assets to protect key locations, deny access to enemy forces and create a layered defense against potential threats.

The RCCTO was chartered in April 2019 as part of the Army's Modernization Strategy, to spearhead developing, prototyping and delivering emerging technological capabilities on an accelerated timeline to combat units for operational experimentation.

In 2020, the LRHW Abbreviated-Capability Development Document (A-CDD)—used to establish the Army's requirement for development of a materiel capability—was validated by Army Futures Command. This A-CDD confirmed the need and provided the source for desired capabilities to execute rapid experimentation and prototyping efforts.

"Upon the decision to embark on the development of these systems, the services, government labs and industry rallied together with remarkable speed to build out a commercial industrial base to meet combatant commander requirements," said Col. Patrick D. Farrell, project manager for MRC and Task Force STRIKE lead.

PUTTING THE LONG IN LONG-RANGE

The LRHW is a road-mobile and air-transportable weapon system, armed with missiles that can travel at speeds in excess of 3,800 miles per hour, with a reported range of 1,725 miles. It communicates with the Army's command and control networks via the Advanced Field Artillery Tactical Data System.

The LRHW system consists of Army ground support equipment—one battery operations center (BOC), four transporter erector launchers, a BOC support vehicle and up to eight All-Up Rounds plus Canister. The LRHW leverages a Navy-designed missile (a two-stage booster and the Common Hypersonic Glide Body (CHGB)) packaged in an Army canister.

The system "can reach the top of the Earth's atmosphere and remain just beyond the range of air and missile defense systems

SPECIAL DELIVERY
The delivery of the first prototype hypersonic hardware to Soldiers of the 5th Battalion, 3rd Field Artillery Regiment, 17th Field Artillery Brigade was completed in October 2021 and marked by a ceremony at Joint Base Lewis-McChord, Washington. (Photo by Spc. Karleshia Gater, I Corps)

until they are ready to strike and by then it's too late to react," according to Army statements in a March 2023 Congressional Research Service report. The report further noted that the missile component of the LRHW, developed by Lockheed Martin and Northrop Grumman Corp., can be fired from surface vessels and submarines.

"The term 'hypersonic weapon' is often confusing," Farrell said. "Technically, a weapon is hypersonic if it travels faster than five times the speed of sound. But by this measure, nearly all ballistic missiles going back to World War II are hypersonic." The real difference with today's hypersonic weapons, he said, is that they combine multiple features that in the aggregate make them very hard to shoot down. Speed, maneuverability (unpredictability) and flight at relatively low altitudes (as compared to ballistic missiles) make modern hypersonic weapons survivable and more likely to reach the intended target.

The Army and Navy are closely partnered and the Navy's Conventional Prompt Strike program and Army's LRHW program share development efforts and resources. "The Navy leads the design of the CHGB, while the Army leads its production," Farrell said. "Previous hypersonic technology development has largely resided only within government labs, but recently has significantly transitioned to industry."

The CHGB is based on the Alternate Re-Entry System developed by the Army and Sandia National Laboratories. Currently, Leidos Dynetics is under contract to produce CHGB prototypes for the Army and Navy. According to the congressional report, "The CHGB uses a booster rocket motor to accelerate to well above hypersonic speeds and then jettisons the expended rocket booster. The CHGB, which can travel at Mach 5 or higher on its own, is planned to be maneuverable, potentially making it more difficult to detect and intercept."

"Hypersonic weapons solve the problem of survivability to target," Farrell said. "Ultimately, hypersonics provide a combination of speed, maneuverability and a flight profile enabling survivable, long-range, rapid defeat of time-critical, heavily defended and high value targets."

POWERING THROUGH CHALLENGES

Accelerated programs like LRHW inevitably face hurdles, potentially leading to technical and logistical challenges. While

TWO TYPES OF HYPERSONIC WEAPONS

There are two basic types of hypersonic weapons: hypersonic cruise missiles and boost-glide weapons. LRHW is a boost-glide weapon.

A hypersonic cruise missile is normally launched from an aircraft and uses an air-breathing engine for thrust all the way to the target. In contrast, a boost-glide hypersonic weapon uses a missile booster stack to carry a hypersonic glide body above the atmosphere. The glide body is then released to follow a ballistic (arcing) trajectory until it enters the atmosphere, at which point it generates lift and levels out to glide at hypersonic speeds over a long distance to the target.

Part of the Army's Long Range Fires Battalion in support of multidomain operations, LRHW is the Army's contribution to joint hypersonic efforts to counter peer and near-peer adversary development and deployment of A2/AD strategies.

testing may be limited, proactive mitigation and adaptive strategies can offset setbacks, foster innovation and drive the program toward success.

According to Farrell, the LRHW program is executing an Army-directed development timeline that is much more aggressive than what is normally applied to weapon system development programs. In 2019, the system was originally planned to be delivered within five years from initiation. However, unexpected snags prompted an extension. "Even with delays to work through these challenges, the current timeline is still faster than the normal 10- to 15-year development timeline," he said. "The target delivery for residual combat capability is [calendar year] 2024."

The Army planned for three flight tests of the LRHW before the first battery fielding in fiscal year 2023. In October 2021, the booster rocket carrying the CHGB vehicle reportedly failed a test flight, resulting in what defense officials characterized as a "no-test" because the CHGB had no chance to deploy. A June 2022 test of the entire LRHW missile also resulted in a no-test. In October 2022, DOD delayed a scheduled LRHW test to assess the root cause of the June 2022 no-test.

"Challenges were realized in several joint flight test attempts in 2023," Farrell said. "The Army and Navy teams worked with industry as quickly as possible to take the necessary corrective actions and return to the range for further testing." Analysis and ground test activities are underway to mitigate risks associated with flight test events.

Currently, Farrell said, the LRHW is in the final stages of flight tests designed to collect required data, demonstrate capability and validate the system's design. Following a successful end-to-end flight test, RCCTO will deliver the first LRHW missile and transition the LRHW capability to PEO MS, where the program will continue flight testing and further development.

According to a January/February 2022 Arms Control Association article, the Cost Assessment and Program Evaluation Office within the Office of the Secretary of Defense estimated that the Army's LRHW program will cost $4.4 billion for development and $2.5 billion for production. With a plan for 66 missiles, including 48 tactical missiles, the cost of each LRHW missile comes to $106 million.

FILLING THE MID-RANGE GAP

While the LRHW incorporates a new missile, new launcher design and a new command and control design, the MRC takes two existing Navy missiles, normally fired from ships and submarines, and hosts them inside a road-mobile launch platform. A modified version of the Navy's Vertical Launching System is housed within a 40-foot container on the trailer, allowing the Army to launch both types of Navy missiles—the Standard Missile 6 (SM-6) and the Tomahawk Land Attack Missile—from land, with MRC focusing on the ranges between the Precision Strike Missile (PrSM) and LRHW.

With the dissolution of the Intermediate-Range Nuclear Forces treaty in 2019, which prohibited all U.S. and Soviet missiles with ranges between 500 and 5,500 kilometers, DOD and the Army began weighing options to fill the range gap. The RCCTO initiated the Mid-Range Capability program in July 2020, in response to the Army's 2020 Strategic Fires Study, which indicated the need for a fires capability at ranges between PrSM, which has a range of roughly 300 miles, and LRHW to engage adversary moving maritime, high-payoff and A2/AD threats in support of multidomain operations.

The Army determined that using existing Navy missiles was the fastest way to meet this operational need (as stated in the fiscal year 2020 Strategic Fires Study). The SM-6 (a fast, multipurpose

FASTER THAN THE SPEED OF SOUND

Hypersonic weapons, capable of flying at speeds greater than five times the speed of sound, are a new capability that provides a unique combination of speed, maneuverability and altitude to defeat time-critical, heavily defended and high-value targets. (Photo by Spc. Karleshia Gater, I Corps)

missile) and the Tomahawk Land Attack Missile (a slower, low-flying cruise missile with longer range) were selected as most suitable for engaging the targets required by the Army. The Army also leveraged other existing capabilities, such as the ability to fire a Tomahawk from a trailer-mounted platform, to develop the MRC launch system. Through a number of iterative designs, this capability matured to what the Army adopted as its initial starting point for the MRC program.

"The MRC rapidly progressed from a blank piece of paper in July 2020 to the Soldiers' hands in just over two years. The RCCTO team, as well as our joint service and industry partners, delivered this hardware so Soldiers can begin training as quickly as possible," Rasch said in December 2022 in a Lockheed Martin press release.

PROGRESS THROUGH PARTNERSHIP

The MRC battery is a road-mobile, air transportable system composed of four launchers, a battery operations center and other support vehicles. The trailer-mounted containerized launcher incorporates a modified version of the Navy's Mk-41 Vertical Launching System, controlled by a BOC that hosts the Aegis Weapons System and Tactical Tomahawk Weapon Control System, the command and control systems necessary to launch either munition.

According to a December 2022 Congressional Research Service report, the MRC weapon system leverages existing SM-6 and Tomahawk cruise missiles, both produced by Raytheon Co., as is.

"These weapons control systems are also common with the Navy, which greatly expedited the development process," Farrell said. "By adopting these systems, the Army gained decades of capability and knowledge from the Navy through the shared partnership in developing this system."

Through partnerships with the Navy, the Office of the Secretary of Defense and Lockheed Martin as the MRC prime contractor, the capability was developed

"The MRC rapidly progressed from a blank piece of paper in July 2020 to the Soldiers' hands in just over two years."

and fabricated in record time and delivered to the unit in December 2022.

"Following new equipment training, the gaining unit at Joint Base Lewis-McChord supported two successful flight test events demonstrating the system and unit's readiness to support operations," Farrell said. "Following munitions delivery, the MRC reached its full operational status, and the unit is currently supporting operational exercises, exercising the hardware and networks needed to conduct these missions."

By using existing Navy munitions, the Army inherits the capabilities provided by these missiles. "Future variants of both the SM-6 and Tomahawk will provide greater range, speed and the ability to prosecute a wider range of targets with great effect," Farrell said. "The Army and Navy have linked destinies, both wanting these missiles as soon as possible to meet operational needs. This requires consistent progress, funding and support to ensure these enhanced capabilities are developed and produced on time to meet operational needs."

The missiles are housed at a government-owned facility and MRC munitions are currently maintained by the Navy at key sites worldwide. Because the MRC can be deployed around the world, MRC munitions storage will ultimately support operational demands where needed.

The MRC program is a fully funded, $629 million program that expects to deliver a total of five batteries to the operational force. The Army's system uses several common components with the Navy as well as the Navy's munitions.

"By purchasing these with the Navy, economies of scale can be achieved, supporting both service's bottom lines," said Maj. Brendan Georgas, MRC assistant product manager.

The first battery of MRC capability is currently in the field as part of the Army's 1st Multi-Domain Task Force, which is gaining experience training on and employing the system in operational environments. The MRC program continues to produce and enhance capabilities of additional batteries that will be used around the world as needed to ensure freedom of movement for U.S. and allied forces.

"With MRC as part of the joint force, the Army will provide combatant commanders the ability to shape the battlespace in contested areas from the land," Farrell said.

CONCLUSION

The Army's advancements of its LRHW and MRC weapon systems mark significant milestones in modern warfare technology. These systems offer unparalleled speed, range and precision, bolstering the Army's capacity to deter and swiftly respond to emerging threats.

Looking ahead, sustained investment in research, development and deployment will be imperative to fully harness the potential of these technologies. Fostering international collaboration and strategic planning will be vital to seamlessly integrate these capabilities into broader defense strategies.

As these systems continue to evolve, they have the potential to fundamentally reshape the dynamics of military engagements, underscoring the importance of responsible and strategic use in preserving global stability and security.

For more information, go to ***https://www.army.mil/peoms****.*

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U.S. ARMY

PROTECT THE NET
The Army is implementing vital defensive cyberspace systems to protect networks and information. (Image courtesy of PM DCO)

PILOT IS PARAMOUNT

BA-08 pilot is vital for safeguarding Army information networks.

by Jared D. Auchey, Lt. Col., USA (Ret.)

The Single Appropriation Pilot for Software and Digital Technology Budget Activity (BA) 08 builds upon current and previous initiatives to align acquisition processes to the evolving and fast-paced technological and adversarial environment and the imperative outlined in the interim National Security Strategic Guidance. This pilot helps the Project Manager for Defensive Cyber Operations (PM DCO), within the Program Executive Office for Intelligence, Electronic Warfare and Sensors, protect the Army's network and information systems and expedite the implementation of vital defensive cyberspace systems.

The traditional approach to funding software development has proven cumbersome and inefficient in today's rapidly evolving technological landscape. The practice of relying on multiple appropriations for various stages of software acquisition is inefficient, resulting in delays and increased costs and leaving the Army's network and information systems vulnerable to increased risks of adversary attacks.

The Defense Innovation Board's Software Acquisition and Practices study and the report to Congress on the 2018 National Defense Authorization Act Sec. 874 Agile pilots highlighted the necessity of modernizing the acquisition process to keep pace with technological advancements. The BA-08 effort represents a significant step toward modernization and ensures that DOD remains at the forefront of innovation in the defense sector. In 2020, PM DCO was named one of eight Office of the Secretary of Defense pilot programs.

The idea for the ongoing BA-08 pilot program was inspired by suggestions from various reports, studies and DOD initiatives to bridge the gap between contemporary software development methods and the division of funds for research, development, test and evaluation, procurement and operations and maintenance.

The BA-08 pilot is pivotal because it enables PM DCO to streamline the software acquisition process by allowing a single appropriation for all software and technology activities, regardless of their stage of development. By consolidating funding into one category, the pilot helps PM DCO promote software development and be more responsive to warfighter needs.

The pilot underscores the importance of modernizing the software acquisition process for cyber defense capabilities. As cyberthreats become more sophisticated, the ability to rapidly develop and

deploy defensive systems is paramount for ensuring the security and effectiveness of Army IT operations in any domain.

By consolidating funding into a single appropriation for software and technology activities, the pilot optimizes programming and budgeting efforts for PM DCO initiatives. "BA-08 allows the assistant program managers to focus on development efforts instead of focusing on how to fund the effort," said Linda Jones, Ph.D., deputy project manager for PM DCO. This streamlined approach mitigates delays in software acquisition, reduces overall lifetime costs of software development and accelerates the deployment of critical defensive cyberspace systems.

By leveraging the flexibility and efficiency of the BA-08 pilot program, PM DCO can better adapt to the dynamic cyberthreat landscape and stay ahead of adversaries. Additionally, the pilot supports the mission readiness of the Army and reinforces DOD's commitment to innovation and agility in the face of evolving security challenges.

PM DCO CAPABILITIES

In today's digital age, cyber warfare has become increasingly critical in ensuring the security and effectiveness of military operations. PM DCO plays a crucial role in rapidly delivering innovative and dominant cyberspace capabilities and tailored

By enabling faster delivery of capabilities, reducing lifetime costs and enhancing predictability in programming and budgeting efforts, BA-08 funding has positioned PM DCO as a leader in defensive cyberspace operations.

Why DCO Matters

Defensive Cyber Operations (DCO) capabilities provide essential platform and security measures, which are pivotal components of the Department of Defense Information Network-Army (DODIN-A) infrastructure.

Protect designated critical assets and infrastructure to ensure continued operational effectiveness.

Deter potential cyberspace threats and discourage malicious actors from targeting DODIN-A.

Destroy and **defeat** cyber threats, which safeguards the network's integrity and functionality.

Secure and **harden** weapon platforms.

Keep pace with evolving adversarial threats routinely attempting to penetrate our networks and systems.

BIG TO-DO LIST

PM DCO rapidly delivers innovative and dominant cyberspace capabilities and tailored IT solutions for national, joint and allied partners. (Image by PM DCO)

information technology solutions for our national, joint and allied partners. Its capabilities safeguard critical systems and networks and provide a decisive warfighting information advantage in the ever-evolving cyber domain.

One of the organization's key strengths is its ability to provide rapid prototyping, deployable and cloud-based defensive cyber solutions, applications and analytics to meet the needs of the operational forces and to aid in detection of cyberthreats.

As a leader in the field of cyberspace operations, PM DCO is dedicated to delivering innovative, integrated and cost-effective solutions that address the complex challenges of modern warfare. Our proactive approach enhances the resilience of military networks and ensures that the Army maintains a strategic advantage in cyberspace operations.

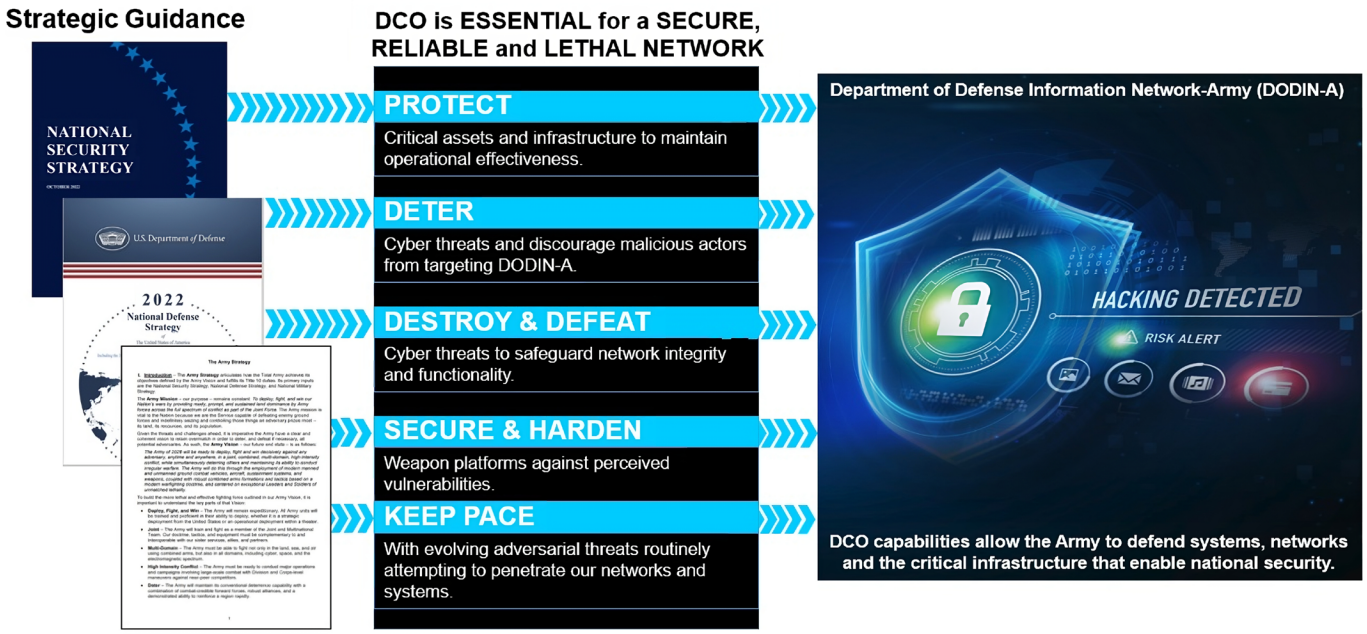
In essence, PM DCO is a strategic asset that enables the Army to stay ahead of emerging threats, protect vital assets and uphold the integrity of national defense. As technology advances and cyberthreats become more sophisticated, PM DCO capabilities must also adapt to remain relevant and instrumental in safeguarding military readiness and achieving mission success in an increasingly complex and interconnected world.

PM DCO AND DODIN-A

PM DCO also plays a key role in defending the Department of Defense Information Network – Army (DODIN-A) by rapidly delivering innovative and dominant cyberspace capabilities that protect critical infrastructure and national security interests.

DODIN-A is the Army's portion of DODIN, responsible for providing secure, reliable and resilient communication and information services to support military operations. PM DCO programs support DODIN-A infrastructure by providing vital platform and security measures. Essentially, PM DCO serves as the cornerstone in safeguarding the integrity and operational capability of DODIN-A, ensuring preparedness and resilience against potential cyberthreats.

PM DCO programs are fundamental in achieving a variety of strategic objectives in protecting DODIN-A from cyberthreats. PM DCO measures act as a powerful deterrent, discouraging malicious actors from targeting the network and equipping the



PART OF A BIGGER PICTURE
PM DCO capabilities enable the Army to defend systems, networks and critical infrastructure that enable national security. (Image by PM DCO)

Without BA-08 Funding, the program must deal with:
Burdensome Unfunded Requirements (in each appropriation), Budget Requirements and Program Board, and Below Threshold Reprogramming/Above Threshold Reprogramming processes (year of execution issues).

a. Expense (RDTE and OMA) vs investment (OPA and RDTE) funding issues.
b. Modernization vs sustainment (cross-PEG PPBE issues).
c. Reduced flexibility, slower delivery, and less responsive to cyber warfighter needs.
d. Not conducive to rapid agile hardware and software development and utilization.
e. Significant impacts to execution of requirements.

FREE TO BE MORE FLEXIBLE
BA-08 funding frees program managers from focusing on funding issues and instead focus on improving capabilities for warfighters, improving program responsiveness and speeding delivery times. (Image by PM DCO)

Army with the means to detect, destroy and defeat cyberthreats to ensure the network's integrity. By securing key terrain in the cyber domain, PM DCO initiatives help safeguard critical assets and infrastructure, while also protecting designated critical assets and contributing to intelligence development.

IMPORTANCE OF BA-08 FUNDING

In the realm of cyber warfare, responsiveness, predictability and efficiency are critical factors in ensuring the effectiveness of defensive cyber operations. The introduction of the BA-08 funding initiative has changed the way PM DCO manages resources, allocates budgets and meets the ever-changing needs of warfighters in the cyber domain. By establishing a standardized framework for budget allocation and management, the BA-08 funding program is poised to enhance operational efficiency, accelerate administrative processes and bolster responsiveness to the dynamic requirements of warfighters. This streamlined approach affords program managers the advantage of a predetermined two-year appropriation, eliminating the need for resource-reallocation complexities to adapt to rapidly evolving needs and circumventing the bureaucratic hurdles associated with shifting between appropriations. By leveraging a standardized funding framework, the PM DCO program is better equipped to navigate the dynamic cyber landscape, deliver innovative solutions and maintain the security and readiness of Army operations in the cyber domain.

By streamlining administrative processes and providing a clear and predictable budget allocation structure, BA-08 enables program managers to swiftly address cyber warfighters' rapidly evolving needs. The strategic use of BA-08 funding optimizes programming and budgeting endeavors, averts delays in software procurement and reduces the overall lifetime expenses associated with software development. By facilitating the swift adaptation of resource planning and programming within the program objective memorandum framework, this funding mechanism enables agile prototyping and procurement cycles that are traditionally challenging to pre-program over extended timeframes, thereby curbing overhead costs and conserving valuable time and financial resources for the Army.

Unlike traditional budget management approaches that involve cumbersome reprogramming actions and approval processes, BA-08 funding offers a two-year appropriation cycle, eliminating the need for constant adjustments and reallocations to accommodate changing requirements. This predictability expedites the decision-making processes and ensures that resources are allocated more efficiently to support mission-critical operations.

Moreover, the predictability offered by the BA-08 funding initiative optimizes programming and budgeting efforts within PM DCO's programs. By mitigating delays in software acquisition

BA-08 funding offers a two-year appropriation cycle, eliminating the need for constant adjustments and reallocations to accommodate changing requirements.

and reducing overall lifetime costs of software development, BA-08 enables the program to overcome challenges in planning and programming resources. This is particularly beneficial in navigating the complexities of the program objective memorandum and enabling accelerated prototyping and procurement cycles that may be difficult to program years in advance. The streamlined approach minimizes overhead costs and saves significant time and resources for the Army, ultimately enhancing the program's agility and responsiveness. Before being part of the BA-08 pilot program, project managers would have to figure out how to use the three appropriations to accomplish ever-changing requirements. This typically meant going to legal agents to find out what was allowed and looking for every option to use one appropriation in lieu of another. Decisions were sometimes put on hold while a project manager waited for a legal decision or attempted to move money around within the Army as a reprograming action. BA-08 makes it easy for policymakers and managers to evaluate funding options and trade-offs, enabling faster delivery of solutions.

CONCLUSION

At present, Congress conducts an annual review and approval of the pilot program as part of the appropriations bill process. "BA-08 stands out as a key component among several ongoing initiatives and endeavors aimed at fostering flexibility in fund reallocation across software program development, procurement and maintenance," said Robert Zoppa, PM DCO project manager. "This flexibility makes it easier for projects to concentrate on their primary goal of establishing initial operational capabilities while also allocating remaining resources toward further iterations to enhance capabilities."

With BA-08 in place, the Army's network and information systems are bolstered, enabling PM DCO to enhance acquisition velocity and prioritize swift development and delivery of vital capabilities, effectively fortifying our defenses against adversary attacks and minimizing critical gaps in response to threats. The absence of BA-08 funding would result in expense-driven budgeting issues, reduced support to Agile software development and slower delivery of critical cyber capabilities. This would impede the program's ability to keep pace with changing requirements, significantly impacting the execution of mission-critical tasks.

In essence, adopting the BA-08 funding initiative has changed how the PM DCO program manages resources and responds to warfighter needs and has strengthened the readiness and security of Army operations in the face of evolving cyberthreats. By enabling faster delivery of capabilities, reducing lifetime costs and enhancing predictability in programming and budgeting efforts, BA-08 funding has positioned PM DCO as a leader in defensive cyberspace operations within the military.

As technology advances and cyberthreats become more sophisticated, the benefits of BA-08 funding will be paramount in safeguarding national security and maintaining a strategic advantage in cyberspace operations.

For more information, go to ***https://peoiews.army.mil/pm-dco/****.*

JARED D. AUCHEY, LT. COL., USA (RET.), retired from the Army with 24 years of service and serves as the strategic communications specialist for PM DCO. He holds an M.A. in leadership development from Penn State University, an M.A. in strategic security studies from National Defense University and a B.A. in political science and crime, law and justice from Penn State University.

RECIPE FOR SUCCESS

PM MAS team helps to update specifications for munition chemicals.

by Jorge A. Munoz and Mark D. Motyka

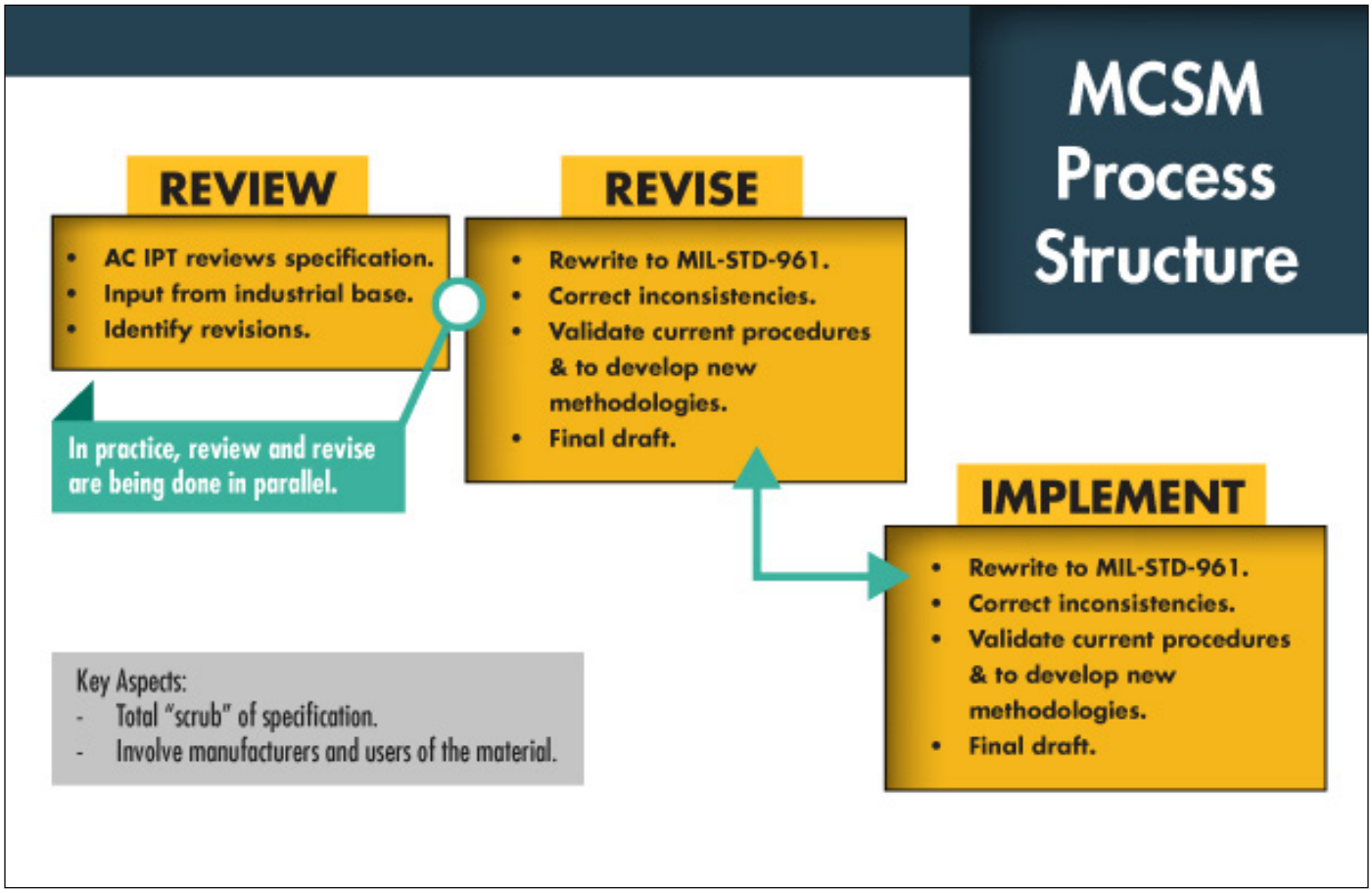
Military specifications—specs—especially for chemicals, are like cookbooks. They detail requirements, formulations, testing, inspection procedures and even packaging and labeling information. If not properly maintained, the specs become obsolete and testing and inspection procedures become outdated. These outdated methods make it difficult to impossible for suppliers to meet the spec's requirements. This is especially true for new suppliers who often have no experience working with specs and their older methodologies.

The 2024 National Defense Authorization Act limits or—in some cases—prohibits the procurement of foreign-sourced chemical materials for defense applications, encouraging the use of new suppliers. The Munitions Chemical Specifications Modernization (MCSM) Integrated Product Team (IPT) at the Project Manager for Maneuver Ammunition Systems (PM MAS) Systems Engineering and Technology Integration (SETI) Division at Picatinny Arsenal, New Jersey, has been working to help establish these new domestic sources through much-needed technical updates to these old specs. This work is being done in collaboration with two groups within the Office of the Secretary of Defense (OSD): the Critical Energetic Materials Working Group (CEMWG) and the Defense Production Act (DPA) Title III Program, now known as the Defense Production Act Title III Executive Agent Program Office (EAPO). Together, these groups are bringing chemical production back to the United States, and new specs with updated testing methodologies are a critical enabling element.

TEST THE SPECS

Many chemical specs are outdated or have test methods requiring the use of large amounts of toxic or hazardous materials. In MCSM IPT's continuous process improvement plan, chemical specs are tested and the inspection procedure is validated by chemists. (Photo by Chokniti Khongchum, Pexels)

FIGURE 1



PROCESS STRUCTURE

The Munitions Chemical Specifications Modernization follows the continuous process improvement methodology by coordinating with other organizations, laboratories and industry to update spec requirements. (Graphic by MCSM IPT)

CRITICAL ENERGETIC MATERIALS WORKING GROUP

According to Marta Pazos, Ph.D., the CEMWG is a group of experts from each service that conducts fragility and criticality assessments of the industrial base using data from industry surveys, DOD databases, DOD experts and open-source data mining. Pazos, as lead of the critical chemicals portfolio in the Manufacturing Capability Expansion and Investments Prioritization Directorate, guides the strategic investments in such expansion based on the risk assessments of the CEMWG, the MCSM IPT and the broader DOD community. These analyses are used to prioritize and pursue risk mitigations for vulnerable energetic materials.

Many critical chemicals within DOD munitions originate from unstable and, at times, unfriendly countries. Stimulating our commercial industry to produce these chemicals domestically contributes to making the U.S. less dependent on external procurement of critical energetic materials, while strengthening our domestic supply chains and economy.

MCSM continues to be a key enabler of the DOD munition mission to support OSD domestic initiatives.

THE HISTORY OF MCSM

The Munitions Chemical Specifications Modernization Program can trace its origins to 2012, when a magnesium powder manufacturer requested updates to two magnesium specs. At the time, one of the specs had not had a major update in 45 years and had recently been canceled despite still being needed for active munition production. The PM MAS SETI Division took up the challenge of working on these two specs and formed the MCSM IPT with members from the Armaments Center. Updating the magnesium powder specs was the beginning of the MCSM effort.

In 2015, the MCSM Program expanded to updating the aluminum powder and aluminum-magnesium alloy powder specs. In addition to being antiquated, one of the specs had not been updated since 1952. These two specs were selected because of the commonality of the testing procedures to the magnesium specs.

In 2019, MCSM IPT took on an ambitious effort of updating 13 chemical specs and began the process of prioritizing spec work. Then, in early 2020, COVID hit. The mandate to telework ceased all laboratory activities, stopping the work of verifying existing spec testing procedures and developing new testing methodologies. This pause in work allowed the MCSM program to partner with CEMWG and the DPA Title III program office to focus on updating specs based on their criticality to the supply base.

PRODUCTION ACT TITLE III EXECUTIVE AGENT PROGRAM OFFICE

"The focus of the DPA Title III EAPO is the expansion of productive capacity and supply," said Susanna H. Back, Ph.D., who represents the EAPO during acquisition meetings. "DPA Title III authorizes the use of economic incentives to develop, maintain, modernize and expand the productive capacities of domestic sources for critical components, critical technology items and industrial resources essential for the execution of the national security strategy of the United States."

Back has coordinated several requests for proposals, or calls, to try to locate potential domestic producers of critical chemicals. If successful, the calls generally become three- to five-year agreement awards. Key to DPA Title III investments is the incentive for new domestic suppliers to share the cost of the agreements, creating a more robust and viable solution.

Regarding lab safety, every hands-on procedure is carefully reviewed and areas found to be ambiguous or dangerous are reworded in clearer language, increasing its overall safety.

DPA investments, through DPA Title III authorities, aim to establish funding opportunities to create sustainable new businesses or expand existing ones that will be commercially viable and successful even during fluctuations in government ordering.

MCSM PROGRAM

The main issue with chemical specs is that many are severely outdated and reference equipment no longer available or have test methods requiring the use of large amounts of toxic or hazardous materials. Prior U.S. Army funding and centralized initiatives to maintain nearly 400 specifications critical to munition performance have been discontinued.

Over time, this led to manufacturers, contractors and users of those specs to not be in compliance because they could not duplicate the old testing methods. What was discovered was that those contractors had transitioned to using modern, efficient and effective testing techniques. In addition, these new techniques often minimized or eliminated the use of toxic materials. This all led to the creation of the Munitions Chemical Specifications Modernization Program.

The criteria originally used by the MCSM Integrated Product Team to choose which specs to work on was the oldest specs corresponding to chemicals with the highest usage within the PM MAS ammunition portfolio.

During the COVID shutdown, organizations such as the Joint Program Executive Office for Armaments and Ammunition, the CEMWG and DPA Title III program office took a deep dive to focus on supply chain issues, especially around critical chemicals. The CEMWG and DPA Title III program office began identifying specific critical chemicals and solicitating for domestic sources of these chemicals through its fiscal year 2022 and fiscal year 2023 efforts. The future U.S. suppliers of these chemicals would need modern specs to succeed. MCSM's criteria for selecting and prioritizing specs to work on had now evolved to include the criticality of those chemicals to the supply base and tied it to the CEMWG and DPA Title III list of critical chemicals.

THE PROCESS STRUCTURE

When updating specs, MCSM follows the continuous process improvement methodology (see Figure 1, Page 76). This is not a simple rewrite; it is a total scrub of the specs requiring coordination with several organizations, laboratories and outside industry.

The Quality Engineering and Systems Assurance Directorate within the Enterprise and System Integration Center at the U.S. Army Combat Capabilities Development Command Armaments Center is the preparer of most specs. But it has been a team effort that includes members from several divisions within the Armaments Center.

In the first step of the update process, MCSM reviews an old spec with input from industry. Industry days are held, and users and producers of the chemicals are invited to discuss the specs where, as a team, updates are identified. The event permits the issuance of specs that can be adhered to by chemical manufacturers.

In the revise step, specs are updated to MIL-STD-961 and any inconsistencies are corrected. Every testing and inspection

DOMESTICALLY DEPENDENT

A Soldier assigned to 58th Infantry Regiment trains on shoulder-launched munitions in October 2023 at Fort Moore, Georgia. The MCSM IPT works to streamline the process of acquiring chemical materials for munitions domestically. (Photo by Capt. Stephanie Snyder, Fort Moore Public Affairs)

Together, these groups are bringing chemical production back to the United States.

procedure is validated by our chemists. If the procedures cannot be followed, then new testing methods are developed and incorporated into the specs.

According to Aleksander Y. Gandzelko, lead chemist in the Energetics Analysis and Propellant Surveillance Branch, "Over 140 procedures have been reviewed, 20 have been improved and 25 have been removed or replaced. Removal/reduction of toxic materials and safety improvements were not a primary goal of this effort, but it did come as a consequence." Regarding lab safety, Gandzelko stated every hands-on procedure is carefully reviewed and areas found to be ambiguous or dangerous are reworded in clearer language, increasing overall safety.

Implementation, the final step, occurs when all changes to the spec are captured in an engineering change proposal, which is then reviewed and approved by the Configuration Control Board. The board is made up of DOD stakeholders in the particular chemical and typically has over 25 members. Once everyone signs off on the changes, the new modified spec is uploaded to ASSIST, the official database for the most current specs and standards in use by DOD.

CONCLUSION

The MCSM IPT has completed updates on 12 chemical specs and is actively working on the remaining three specs of the most recent tranche. OSD funding became available in mid-2023 to help defray the cost of the expanding MCSM effort.

MCSM continues to be a key enabler of the DOD munition mission to support OSD domestic initiatives. The next tranche of spec work is being planned with a goal of 18 spec updates. Lofty goals are necessary to try to modernize the Armament Center's approximately 400 chemical specs.

The CEMWG, the DPA Title III program office and the MCSM IPT complement each other in the strategic objective of acquiring chemicals domestically required by our munitions. This is accomplished by identifying critical chemicals, helping locate domestic producers for these chemicals and developing corresponding state-of-the-art chemical specs. It is in this unique manner that these three organizations, working collaboratively toward common goals, have become key ingredients that have formed an effective team with the right "recipe for success." This will contribute to making DOD more self-reliant and less dependent on foreign sources for critical chemicals for its munitions.

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MARK D. MOTYKA is the senior technical adviser for the Pyrotechnics Technology Division. He holds a Master of Systems Engineering from Stevens Institute of Technology and a Bachelor of Chemical Engineering from the University of Delaware. He holds a Green Belt certification in Lean Six Sigma.

CANNON UPGRADES

Previously, cannon and propulsion technologies have mostly been upgraded and developed on separate development paths leveraging legacy designs. PD TAS has initiated a project to develop a new cannon system that can support future capability upgrades such as increasing the system's rate of fire while improving reliability and safety. (Photo by 1st Lt. Stephanie Snyder, 25th Infantry Division)

WE HAVE IGNITION

A team of engineers and statisticians take a systems approach to developing cannon artillery.

by Peter Harvey

A search in the Defense Technical Information Center database for technical terms like ignition, artillery, propulsion design or cannon design will result in reports from the 1950s through the 1970s written by very knowledgeable people providing a wealth of information on a particular topic. What may be missing from these reports is the "system interface" approach.

In this context, a "system" is defined as a group of subsystems or components that are assembled to create a functioning artillery howitzer. In terms of interfaces (i.e., how one subsystem works with another) that make up a complete artillery system, the cannon-ammunition interface can arguably be the most important. Through the progression of artillery design spanning decades, cannon technologies as well as propulsion technologies have been upgraded and developed, mostly on separate development paths leveraging prior legacy designs.

This lack of a systems approach is a likely contributor to issues of poor reliability, lack of interoperability, unoptimized performance and safety concerns. By taking advantage of advancements in modeling and simulation in both cannon and propulsion design, as well as adding a heavier presence of statistical modeling and analysis, we have an opportunity to provide a fresh look at developing a robust cannon-ammunition interface.

IT'S ALL ABOUT THE TEAM

In 2022, the Project Director for Tactical Artillery Systems (PD TAS) initiated a project to develop a new cannon system that can support future capability upgrades, such as increasing the systems rate of fire while improving reliability and safety. Eager to begin, PD TAS

created a team with experts from across the U.S. Army Combat Capabilities Development Command (DEVCOM) Armaments Center, DEVCOM Army Research Laboratory, the Program Manager for Combat Ammunition Systems and the Army Test and Evaluation Command in an effort to assemble a group of engineers and statisticians from multiple artillery competencies, each representing a piece of the cannon-ammunition interface. Once assembled, the work began.

DIGITAL SYSTEM DESIGN TOOL

The diverse team held many discussions and brainstorming sessions to develop a plan of action. Through collaborative discussions and experiences, the team agreed that the focus of this cannon design should be on ignition, with the premise that improved ignition will create an environment to develop future complex systems that can survive in the battlefield with higher reliability.

With the focus established, the team then defined "improved ignition." For this effort, the team defined the phrase as a reduction in the rate of change in pressurization over the change in time during the ballistic cycle as well as a reduction in pressure waves while maintaining established projectile muzzle velocity performance.

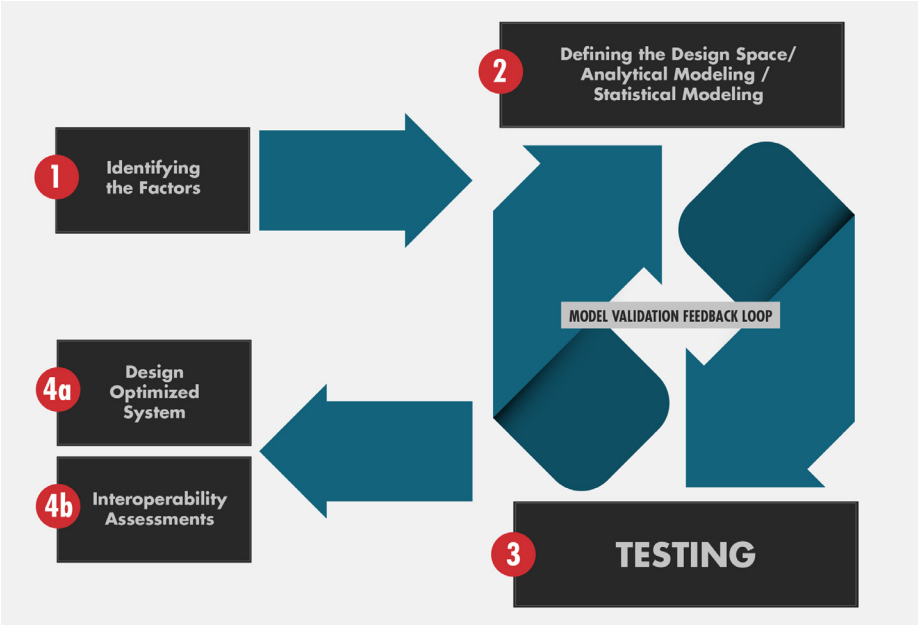
This project employed the statistical tool called design of experiments. This is a novel approach in the design of both the cannon and the propelling charge as well as the interface between them.

An extensive design of experiments was used in conjunction with other statistical modeling tools and existing interior ballistic models. In addition to the models, the team obtained test data from a ballistic simulator, which is a test apparatus that ignites propellant in a clear tube to allow for the visual analysis of the ignition phase of the ballistic cycle. The ballistic simulator fixture is also equipped with the capability to capture pressure traces at both the simulated breech end and the simulated projectile base locations. Using such tools and incorporating them into the design of experiment process makes it possible to identify the strong relationships among different factors—or, in other words, to mathematically understand and identify how different features of the cannon design affect different features of the propulsion design, and vice versa.

Identifying all these features, also known as "factors," was the backbone of this process. After the team defined all the factors (e.g., dimensions, weights and rates, as well as other specifications and characteristics) between the cannon and propulsion systems, a range of values for each factor was determined. From this, the team was able to produce thousands of different design configurations. Then, using the interior ballistic modeling tools, the team was able to predict the performance of each configuration. The statistical analysis combined all these predictions to produce a surrogate model, later named the Digital System Design Tool (DSDT), which enabled the ranking of all the factors in influential order.

A system engineering tool called "value functions," which provides a way to define acceptability and to rank the importance of different characteristics, was then applied, giving the team the criteria necessary to determine configurations that will improve ignition as well as configurations that do not.

Validation is the key to any modeling effort, as it gives the effort credibility by confirming outputs through actual testing. Validation also enables modeling enhancements that will increase its fidelity. For the DSDT effort, ballistic simulator testing was the best tool available to assess ignition. The DSDT provided thousands



DESIGN OF EXPERIMENTS

Overview of the design of experiments process created to design the cannon and propelling charge, and the interface between the two. (Graphic by Peter Harvey, PD TAS)

of viable cannon configurations that could improve ignition of the propelling charge. The team chose several of these configurations for testing in the ballistic simulator to provide data for the model validation process. The team used this data to update the models.

Validation is the key to any modeling effort.

PULLING IT ALL TOGETHER

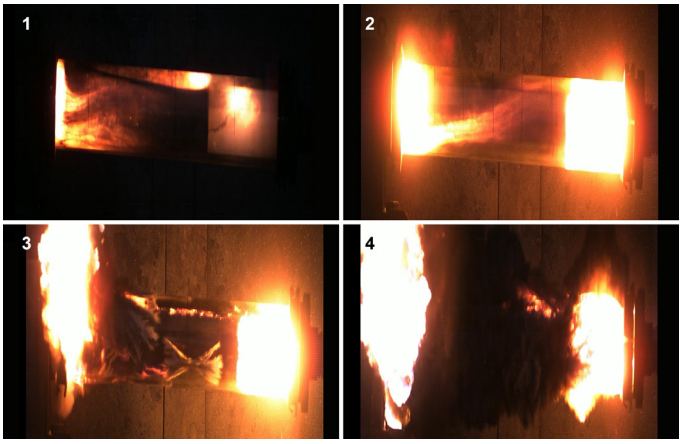
At this point of the project, the team was in place, the tools were created and validated and there were thousands of different cannon configurations to potentially improve ignition to be evaluated.

The next step in this process was to use the surrogate model to navigate through all the cannon design configurations. The team filtered the cannon configurations using the value functions that consider other factors that are important to the design of cannon artillery. This includes projectile muzzle velocity, cannon chamber pressure limits and manufacturing capability. Once all these other factors were included, the team was able to successfully down-select to a single cannon configuration that will improve ignition. A complete cannon is being manufactured to this configuration and is scheduled to be live-fire tested late in the third quarter of fiscal year 2024 as the final validation of the team's efforts.

CONCLUSION

In addition to developing a new cannon chamber to improve ignition, this project brought together a technically diverse team to develop a novel DSDT for a collaborative design of the cannon-propelling charge interface, while keeping focus on the system aspect. The tools and processes developed allow team members to conduct numerous analyses, as required, without the need for timely and costly live-fire testing. The team can use these modeling and simulation tools to develop whole cannon and propelling charge systems jointly or even assess the interaction of either developmental propelling charges in an existing cannon or a developmental cannon with existing propelling charge systems.

One major potential application of the DSDT can be applied to the conflict in Eastern Europe. This tool can provide an assessment of interoperability among the many different artillery cannons and propellant system combinations currently seen. Not knowing how these systems interface can lead to catastrophic results. This is also a major benefit to the U.S. Army as it can all be completed without the extra cost and scheduling implications of traditional prototyping and live-fire development procedures.



SIMULATOR IGNITION

Screen shots from a high-speed video shows ignition in a ballistic simulator during a test event in November 2023 at Yuma Proving Ground, Arizona. The ballistic simulator is a test apparatus that ignites propellant in a clear tube to facilitate visual analysis. (Image by Peter Harvey, PD TAS)

For more information, contact the author at ***peter.j.harvey.civ@army.mil****.*

PETER HARVEY is a program management engineer with PD TAS at Picatinny Arsenal, New Jersey. He holds a B.S. in mechanical engineering technology from the State University of New York at Alfred. He is a DAWIA certified Practitioner in engineering and technical management.

JUMPING THE GUN

U.S. Army Soldiers assigned to 2/11 IBCT(A) conduct a jump from a C-17 Globemaster III during the Joint Pacific Multinational Readiness Center 24-1 exercise at Malemute Drop Zone, Alaska, in November 2023. (Photo by Mysti Bicoy, 154th Wing, Hawaii Air National Guard)

REVOLUTIONIZING AIRBORNE ENROUTE MISSION COMMAND

The 11th Airborne Division (Arctic) enabled critical internal communications in-flight.

by Maj. Joey D. Rodriguez

The 2nd Infantry Brigade Combat Team (Airborne), 11th Airborne Division (2/11 IBCT(A)) was the first in the Army to establish push-to-talk, air-to-air and air-to-ground Enroute Mission Command, employing Integrated Tactical Network fielded AN/PRC-158 Mobile User Objective System capable radios internally, removing the involvement of external organizations. This innovation has revolutionized the way the airborne commander communicates in-flight.

COMMS IN-FLIGHT

Traditional Enroute Mission Command provides units with critical plane-to-plane and plane-to-ground network communications in short-notice, joint forcible entry operations (JFEOs). It employs Key-leader Enroute Node (KEN) and Dependent Airborne Node (DAN) teams from signal organizations that are not organic to the five Army Airborne Infantry Brigade Combat Teams. KEN and DAN teams also require seats within the aircraft to support each mission.

KEN provides airborne units with broadband reach-back data capability; intra-aircraft data and voice communications with subordinate units; secure video teleconferencing; and plane-to-plane and plane-to-ground communications between task force commanders and combatant commanders. DAN enables in-flight subordinate commanders, who

are connected with their leaders operating a KEN, to receive critical situational awareness updates through the intra-aircraft data and voice capability using services such as chat and radio voice.

The 2/11 IBCT(A) proved that Airborne Infantry Brigade Combat Teams can establish command and control internally with fielded systems, removing dependencies from these external organizations. Through proper coordination with U.S. Air Force pilots and crew chiefs, Army signal support personnel used the Boeing C-17 Globemaster's roll-on/off satellite communications panel to patch into and use the existing affixed antennas providing signal transport capabilities. UBI-2590 Battery Eliminator Circuits were also used on AN/PRC-158 multichannel manpack radios to provide continuous uninterrupted power generation using the 120-volt outlets inside the aircraft. Army signal support personnel installed the radios between the number one and number two jumpers, the Airborne commander and brigade signal officer (S6) seats, enabling easy access for radio calls.

Airborne Infantry Brigade Combat Teams can establish command and control, removing dependencies from these external organizations.

RIGGING THE PLANE
The author, a signal officer for the 2/11 IBCT(A), conducts plane-to-plane radio tests on an installed AN/PRC-158 Mobile User Objective System-capable radio in preparation for an eight-hour, cross-Pacific forcible entry operation during Arctic Aloha 2024. (Photo courtesy of 2/11 IBCT(A))

RADIO ON

The 2/11 IBCT(A) tested the communications from the newly configured command and control setup inside the aircraft during four separate joint forcible entry operations. First, in Arctic Aloha 2024, involving two cross-Pacific JFEOs from March Air Reserve Base in California onto the Transfiguracion Drop Zone in Hawaii, followed by a second JFEO, an eight-hour, cross-Pacific trip from Hilo International Airport, Hawaii, onto the Malamute Drop Zone in Alaska. The 2/11 IBCT(A) proved the internal setup works a third time during Cobra Gold 2024, executing an 18-hour, cross-Pacific JFEO from Alaska to the Tongmin Drop Zone in Thailand. This concept was used successfully again most recently in the first over-the-North Pole JFEO in Norway onto a frozen lake, the Sparrow Drop Zone, during Arctic Edge, also referred to as Northern Edge 2024.

This revolutionary command and control concept enabled the Airborne commander to interface in-flight with the 11th Airborne Division (Arctic) Joint Operations Center on Joint Base Elmendorf-Richardson, Alaska, as well as with the drop zone safety officers during all four JFEOs.

To advance this capability further, with increased funding, the 11th Airborne Division can establish digital command and control with AN/PRC-158 multichannel manpack radios using a Klas 8 Voyager in conjunction with a Tactical Relay Integration Kit (TRIK). The Voyager TRIK provides a lightweight, portable solution for tactical radio networking that serves as a bridge between internet protocol and radio and can be used across

SMOOTH LANDING
A Soldier from the 2/11 IBCT(A) jumps from a C-17 on Pohakuloa Training Area in October 2023. (Photo by Spc. Wyatt Moore, 28th Public Affairs Detachment)

MAKING CONTACT
JPMRC 24-01 included more than 5,300 participants from across the U.S. Joint Force, New Zealand, the United Kingdom, Indonesia and Thailand, with the aim of generating readiness in the environments and conditions these forces are most likely to operate in. (Photo by Spc. Wyatt Moore, 28th Public Affairs Detachment)

multiple aviation platforms and networks, extending the commander's ability to support the mission.

CONCLUSION

The resulting absence of KEN and DAN teams freed additional seats on the aircraft for each Airborne operation. This increased capability enabled the 2/11 IBCT(A) to exit more paratroopers out the door, therefore increasing movement and maneuver combat power on the objective during the mission. As the U.S. Army focuses on refining its Arctic Strategy, the 11th Airborne Division (Arctic) continues to push the envelope and develop unique command and control solutions in the Arctic, Airborne, high-altitude and high-latitude environments to fight and win tonight.

For more information, contact Maj. Joey D. Rodriguez at ***joey.d.rodriguez.mil@army.mil****.*

MAJ. JOEY D. RODRIGUEZ is the signal officer for the 2/11 IBCT(A) in Joint Base Elmendorf-Richardson, Alaska. He holds an M.A. in information technology management from Webster University and a B.S. in aeronautical science from Embry-Riddle Aeronautical University. He is currently qualified as a U.S. Army static-line jumpmaster.

STEVEN DAVID GAVIN

COMMAND/ORGANIZATION: Program Executive Office for Combat Support and Combat Service Support

TITLE: Executive officer

YEARS OF SERVICE IN WORKFORCE: 15

YEARS OF MILITARY SERVICE: 34

DAWIA CERTIFICATIONS: Practitioner in program management; Foundational in life cycle logistics

EDUCATION: Master of Strategic Studies, U.S. Army War College; Master of Public Administration, Georgia Southern University; Master of Public Affairs, Savannah State University; B.A. in political and military science, Augusta University

AWARDS: Bronze Star (4); Army Commendation Medal (2); Army Reserve Components Achievement Medal (3); National Defense Medal (2); Armed Forces Reserve Medal; Meritorious Service Medal (2); Defense Meritorious Service Medal; Certificate of Achievement by the Chief of the General Staff – Afghanistan (Joint Command)

COMMUNICATE, SERVE, GET INVOLVED

Steven David Gavin has served the U.S. Army in a number of capacities throughout his career, providing mission planning support, new system capabilities and interoperability worldwide. His experiences and lessons learned have paved the way for fellow Soldiers and Army acquisition professionals. "It is fulfilling to execute a whole-of-program effort to build and provide defense material to our allied partners that will achieve their national security goals and objectives," he said. "By focusing on synchronization, customer expectations, effectiveness and efficiency, as well as inoperability of global capabilities … the U.S. warfighter and the allied partners can fight as one on the battlefield."

Gavin retired after 34 years from the Army and Army Reserve as a colonel at the end of September 2022 and transitioned into government civilian service within Joint Light Tactical Vehicle (JLTV) in Security Assistance (Foreign Military Sales) under the Program Executive Office for Combat Support and Combat Service Support (PEO CS&CSS).

On Feb. 1, 2024, Gavin transitioned to serve as the PEO CS&CSS executive officer as part of an ongoing leadership development process where he will also attend the Acquisition Leadership Challenge Program. For the next six months as executive officer, he is responsible for the management of day-to-day activities on behalf of the PEO and PEO staff, such as preparing briefings and reports and acting as the principal point of contact on issues as required.

This assignment differs from the position he was hired on, as assistant program manager under PEO CS&CSS, where he was responsible for the management of all security assistance programs for the JLTV program's deliveries, retrofit efforts, contractual activities, logistical support and programmatic efforts. In this role, he is often required to interact with internal and external customers (other acquisition program offices and U.S. government agencies) and with industry to ensure our partner nations' defense material requirements can be achieved through the proper processes, so necessary resources can be obtained and directed.

"The one thing that others find interesting or surprising [about his role in acquisition] is the amount of time and effort spent interacting with all foreign defense establishments (DOD, Department of State and partner nations) to build defense relationships that promote specific U.S. security interests, develop allied and friendly military capabilities for self-defense and multinational operations, and provide U.S. forces with peacetime and contingency access to host nations," he said. "This may require extensive travel to host nation countries for face-to-face meetings and countless hours on teleconferences."

During his Army career, Gavin was the first African American officer to serve as the chief of staff for the 80th Training Command, which has oversight for all training under the U.S. Army Training and Doctrine Command and U.S. Army Reserve Command. He was also the first African American commander of the U.S. Army Command General and Staff Officers College Brigade, responsible for providing the "next group

of Army strategic thinkers." He was one of few officers in his career to have served two command positions at each level—twice: company, battalion and brigade, as well as having served in two joint billets as the Army acquisition executive officer for the Defense Contract Management Agency, and a deputy commander for the Combined Security Transition Command – Afghanistan.

"I was unofficially introduced to the Army Acquisition Workforce during my second deployment in Iraq by my sister, then Lt. Col. Debra D. Daniels, who was in charge of Army contracting for Multi-National Corps – Iraq," he said. "[We] worked on several acquisition and contractual contracts while in Iraq for the newly developed detainee prison."

Following that deployment, in 2007, Gavin was assigned to his first acquisition position as the Army executive officer and operation officer for the newly established Mine-Resistant Ambush Protected (MRAP) program and a systems acquisition manager for system integration.

"What appealed to me about this position was that it allowed me to see firsthand the strategic planning that is involved to effectively execute acquisition programs," he said. Fewer than 50 people were tasked to lay the framework of the program's strategy for developing a heavily armored light tactical vehicle that consisted of an armored V-shaped hull to resist and protect against land mines and an assortment of improvised explosive devices.

During his tenure with the MRAP program, he was exposed to the inner workings of the defense acquisition process and how it is implemented by DOD Instruction 5000.02 and DOD Instruction 5000.85, which are the management foundations for all defense programs. He said that exposure taught him how to develop a contract to best support warfighter needs.

Because of his firsthand knowledge as a military staff officer and combat Soldier, Gavin said he was able to provide input, expertise and guidance in every aspect of the MRAP program. As a systems acquisition manager, he was tasked to integrate critical capabilities such as the Common Remotely Operated Weapon Station, or CROWS, Check-6 rear-vision system camera, Tube-launched, Optically Tracked, Wire-Guided Improved Target Acquisition System, or TOW ITAS, and other key critical capabilities on the MRAP family of vehicles.

"The most satisfying of all is to see acquisitions programs that you support or manage reach the warfighter and you as a warfighter are able to utilize those systems in real life," he said.

Gavin has been a part of an array of important acquisition projects throughout his career and said he would advise junior personnel to "garner enough information about DOD capabilities and have a keen understanding what the warfighter requires and needs."

"I would recommend anyone in the Defense Acquisition Workforce participate in any of the acquisition leadership programs in order to increase their professional growth," he said. He also highly recommends they attend any of the Senior Service Colleges because they provide "the opportunity to study and critically evaluate broad national security policy, strategy, interagency affairs, civil-military relations and operational issues, which is needed in this ever-changing global environment."

"The most important lesson that I learned, whether on or off the job, has been the ability to build relationships with peers and external customers, either through the use of humor or a strong knowledge base or lifetime experience," he said. "By building strong partner relationships, it creates open and honest communications and builds trust."

—HOLLY DECARLO-WHITE

MEN OF HONOR

Lt. Col. Steven Gavin, right, with retired Army Reserve Chief Warrant Officer 5 Phillip Barshear at his retirement ceremony at the Defense Supply Center in Richmond, Virginia, in 2022. Brashear, whose father's story of becoming the Navy's first Black American master diver featured in the movie "Men of Honor," was appointed as an honorary chief petty officer during the ceremony. (Photo provided by Steven Gavin)

COLLABORATIVE APPROACH

PEO EIS uses Agile methodologies and a diverse set of teams to develop wide-ranging ATIS program.

by Maj. James Oliver

The U.S. Army has one of the world's most distinctive and varied populations, comprised of Soldier and civilian communities with varied specialties, backgrounds and demographics. They must continually adapt to evolving tactics, technology and doctrine—factors crucial to maintaining the Army's competitive edge. This dynamic setting aligns well with the use of Agile methodologies, as iterative processes and incremental delivery of capability provide opportunities for Army acquisition programs to solicit continuous feedback and refine their approach.

Agile methodologies are particularly essential in complex software development programs, where the malleability of code and the highly competitive nature within the information technology (IT) industry make change especially frequent.

Recognizing the importance of adaptability, the Army Training Information System (ATIS) product office under the Program Executive Office for Enterprise Information Systems (PEO EIS) adopted the Scaled Agile Framework (SAFe) and instituted parallel user-centered iterative processes aimed at delivering best value for ATIS' exceptionally unique and diverse user population. The program has undergone a significant evolution since the launch of its first Agile Release Train (ART), with substantial refinement of its processes putting increased emphasis on continuous community and user feedback to best shape and deliver an ideal solution for Soldiers.

DRAFT OBJECTIVES
Product Team One hosts a team breakout session at the program increment planning event, where the team's cross-domain experts and government product owner draft and prioritize their objectives for the next 10 weeks of development. (Photos by Dave MacLuskie, Product Manager ATIS)

AN APPROACH BUILT ON COLLABORATION

ATIS is tasked with delivering a cutting-edge, one-stop training management, development, scheduling, resourcing and distributed learning system for the Army. It will replace 28 legacy systems and more than 70 applications with one authoritative system, and will have a user population including all Soldiers, Army government civilians, military in other DOD components, and many others, including contractors and foreign allies. This makes ATIS a complex solution for a complex problem, requiring continuous input and buy-in from all of the system's user communities to ensure the build of ATIS can benefit from the extensive lessons learned and feedback the legacy systems have gathered over years of operation.

To facilitate this collaborative relationship, the program established an iterative backlog refinement process centered around two recurring events—epic and feature development, and epic and feature refinement—that bring together legacy system experts, representatives from the Combined Arms Center – Training (CAC-T) and ATIS requirements analysts and user experience researchers.

The epic and feature development event happens once per 10-week interval, with the primary goal of informing and framing features for the program's backlog, essentially breaking down the plan for delivering ATIS' complex, objective solution into smaller, more manageable Agile work items that can be delivered incrementally by the program's cross-functional teams. At these events, legacy system experts provide live demonstrations of their systems and discuss friction points and opportunities for improvement on what value those legacy systems deliver for their user communities. These insights are incredibly valuable in framing the future build of ATIS, as they uncover potential pitfalls, challenges, risks and opportunities for greater user satisfaction.

ON THE MAP

Melissa Lee and John Tato, left, brief U.S. Army Training and Doctrine Command ATIS Proponent Office leaders Col. Kevin Riley and Dave Bolt on the program's road map during the program increment planning event in March 2024.

ATIS will replace 28 legacy systems and more than 70 applications with one authoritative system.

By capturing these insights, ATIS ensures that the features written for the program backlog are best informed from the very beginning of the process.

The epic and feature refinement event takes place every week and brings together stakeholders from all of the program's user communities. They collaboratively outline acceptance criteria, annotate traceability to functional requirements, identify possible interfaces and dependencies and further refine the scope of individual features. All these details are logged in GitLab, the program's collaborative project management platform and version-controlled repository, during the live meeting to ensure that nothing is overlooked and that the process is open and transparent. While the development events may eventually end as all requirements are initially framed into features, the refinement events will continue throughout the program life cycle.

ATIS' iterative backlog refinement process fosters a culture of continuous improvement, maximizes collaboration and reasserts the Army training community's steadfast commitment to delivering optimal value for Soldiers. It provides ATIS with opportunities to learn from past mistakes and incorporate lessons learned, honing its approach to crafting an ideal and relevant solution for the Army. Ultimately, the process provides teams with a well-informed starting point as they prepare to build and deliver features outlined in the program's backlog.

BUILDING THE RIGHT TEAMS

In September 2022, ATIS launched its first Agile Release Train (ART). The ART is ATIS' "team of teams," consisting of cross-functional teams that collaborate to deliver the objective solution. The ART plays a pivotal role in keeping the teams aligned to the same program vision, cadence of work and consistent iterative processes. It also manages cross-team dependencies and knowledge sharing, reducing risk and promoting efficiency. While the ART provides a powerful modular framework, offering the program a high degree of flexibility while ensuring an adequate level of predictability, the real work is done at the lowest level by the cross-functional teams.

The teams on ATIS' ART include both product teams and enabling teams. The multidisciplinary product teams are building the ATIS objective application, using a range of diverse perspectives and expertise to encourage innovation, effective communication and maximum agility in iteratively defining, building, testing and deploying software. The enabling teams, on the other hand, define and convey the architectural vision, oversee DevOps alignment, lead system interface work, oversee seamless integration of the solution and enable the work of the product teams in every aspect.

The mix of responsibilities and relative autonomy of the teams require a diverse range of expertise. Although every position and role on each team is crucial for the success of ATIS, there are three roles that ensure Soldiers have a voice in every facet of ATIS design and development: the government product owner, the user experience (UX) researcher and the UX designer. These roles provide the Army with three substantial reasons to be confident ATIS will deliver relevant and best value.

THE ROLE OF THE GOVERNMENT PRODUCT OWNER

ATIS benefits tremendously from the decentralized team of teams approach prescribed by the Scaled Agile Framework, which provides teams with significant autonomy during their iterations, allowing them maximum flexibility in systematically constructing ATIS one piece at a time. To optimize efficiency—while simultaneously ensuring collaboration, oversight and that user communities have a voice at the team level—ATIS has embedded government product owners on every team.

These team members act as the voice of the Army at the team level. They set the priorities for their teams at the beginning of each 10-week interval and receive demonstrations of the work being delivered at the end of each two-week sprint. At the end of each 10-week interval, they make the determination as to whether the delivered work realizes the business value planned.

ATIS has filled these crucial positions with government civilians and military personnel from the Combined Arms Center and the Army Training and Doctrine Command. They're the individuals most familiar with the capabilities of the legacy systems ATIS is subsuming and have the most holistic understanding of the requirements. Their embedded role on teams expedites decision-making by enabling them to provide on-the-spot feedback and guidance. This dynamic also provides the

PROGRESS REPORT

The ATIS system team hosts a team breakout session at the program increment planning event. At the end of each 10-week interval, program participants decide whether the work they've delivered advances development.

teams with a level of autonomy, accelerating team velocity and decreasing the time it takes the contractor to deliver capability to the Army. Additionally, this approach minimizes the risk of miscommunication and potential rework, ultimately contributing to long-term cost avoidance for the program.

A USER-CENTERED DESIGN PROCESS

The second and third roles bringing the voice of Soldiers to ATIS are the UX researcher and UX designer. The researchers on the ART's product management team are closely aligned to the requirements analysts, who work hand in hand to ensure the end user's voice is heard and incorporated in the write-up of features.

The UX designers are embedded on every product team, closely aligning them with the developers who will be implementing the design. This streamlines communication and ensures end-user needs are well communicated and understood by the developers

ATIS' iterative backlog refinement process fosters a culture of continuous improvement, maximizes collaboration and reasserts the Army training community's steadfast commitment to delivering optimal value for Soldiers.

before they begin writing or integrating code, dramatically reducing the risk that ATIS won't deliver a relevant solution for Soldiers. Ultimately, the strategic placement of the UX researchers and designers within teams is designed to support the program's end-to-end, user-centered approach to UX design, which requires that they're able to empathize and communicate the needs and preferences of end users during every step of ATIS' design and development cycle.

CONTINUOUS USER ENGAGEMENT

In December 2022, Headquarters Department of the Army tasked Army commands and direct reporting units to provide users for ATIS' user engagement process. The order required Soldiers and government civilians to participate in user engagement sessions with ATIS' UX researchers, providing them with sufficient opportunities to understand user needs, generate design ideas and validate or invalidate ideas through continuous user engagement. This process ensured the program would make design decisions backed by empirical data generated through continuous engagement with Soldiers and government civilians, further ensuring that ATIS will deliver an ideal and relevant solution.

As of March 2024, ATIS' UX researchers have engaged with more than 170 Soldiers and government civilians in live video sessions where users are asked to provide input on ATIS' upcoming work. During those sessions, system end users describe their preferences and any unofficial workarounds they've created to overcome the challenges of using legacy IT systems. Those engagements inform the building of design prototypes, which end users provide additional feedback on, validating the efficacy of UX design before it's handed off to developers to implement.

CONCLUSION

The Army's collective shift toward Agile is providing an opportunity for acquisition programs to take a more collaborative and user-centered approach, a paradigm exemplified by ATIS. The iterative nature of Agile supports recurring events and feedback cycles, providing government community representatives with opportunities to continuously provide input—the value of which can't be overstated as they're experts with years of experience in engaging with their unique populations.

Furthermore, Agile teams deliver software incrementally, providing embedded government product owners with the ability to iteratively direct and verify that what's being delivered is the best value for the Army, and the UX design of the software can be backed by empirical data iteratively solicited and validated by system end users before code is ever written and implemented. This shift to an Agile approach is being accompanied by a shift in culture, in which a user-centered mindset is paramount in delivering best value. If embraced, Army acquisition programs could perpetually field solutions that Soldiers want to use.

For more information on ATIS, go to ***https://www.pdmatis.army.mil/Media-Resources.html****.*

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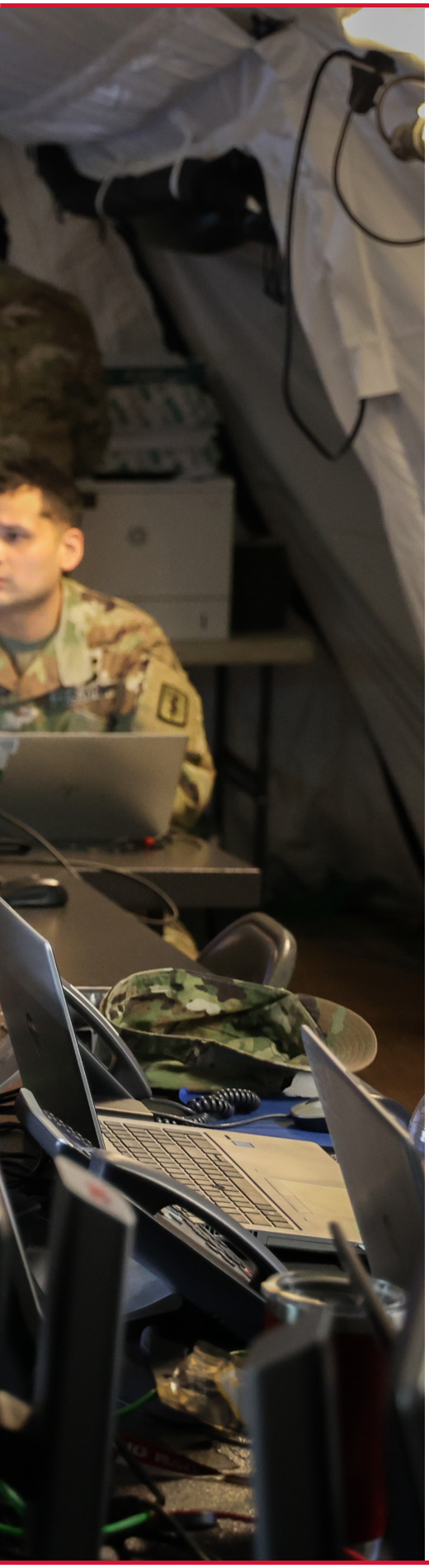
LOOKING FORWARD
Capt. Craig Neal and Capt. Julio Rodriguez search for documentation during a March 2023 command post exercise at Rhine Ordnance Barracks in Kaiserslautern, Germany. Using FOSS enables Soldiers to move away from manual documentation and other outdated practices. (Photo by Spc. Samuel Signor, 21st Theater Sustainment Command)



THE POWER OF FOSS

Leveraging Free and Open-Source Software on the battlefield.

by Capt. Noe Lorona

The DOD has witnessed the pivotal role technology plays on the modern battlefield and felt the sting of relying on software that fails to meet dynamic needs—clunky interfaces, outdated features, a degraded user experience—and is frustratingly unable to adapt at the speed of war. It is an issue that hampers operational effectiveness and can also jeopardize mission success. There is a need to maintain momentum in transforming military personnel from mere consumers of technology into active creators through initiatives within each military service. That is where the vast potential of Free and Open-Source Software (FOSS) comes into play.

FOSS refers to software that is freely licensed to use, modify and distribute. The "free" aspect means users have the freedom to run the software for any purpose, to study and modify the software and to redistribute copies of either the original or modified software without having to pay royalties to previous developers. The "open-source" aspect emphasizes the availability of the software's source code to the public, encouraging collaborative and transparent development that allows for continuous improvement and adaptation of the software. DOD champions the use of FOSS as a strategic component of its operations. DOD's Office of the Chief Information Officer leads this initiative, emphasizing the integration of FOSS to enhance software modernization activities. This approach aligns with DOD's commitment to developing secure, resilient software quickly and efficiently, in accordance with its 2018 Cyber Strategy and the DOD Software Modernization Strategy, ensuring that FOSS remains integral to meeting the nation's defense needs effectively.

Unlike proprietary software that is locked behind paywalls and licensing requirements, FOSS provides a flexible toolkit DOD can leverage to address the challenges it is facing. This flexibility is evident in the use of tools like Git for collaborative code management and Jenkins for continuous integration and deployment, streamlining the software development process. For artificial intelligence and machine learning tasks, DOD can use FOSS tools like TensorFlow for building and training neural networks or Apache Hadoop for processing large datasets, enhancing its capability to adapt and innovate in response to evolving military needs.

Imagine FOSS as a massive warehouse with digital building blocks such as code, libraries and complete frameworks. These building blocks can be assembled into custom solutions tailored to unique operational needs. A scenario could include a unit operating in a region with limited connectivity where commercial communication systems might falter, causing isolation. In such cases, FOSS enables tech-savvy Soldiers to use open-source technologies to build and deploy a code solution, re-establishing communications systems and moving away from antiquated pen and paper solutions, which are often not scalable. In an isolated operational environment, using Jenkins would enable the unit to continuously integrate and deploy software once it has been updated for security vulnerabilities or enhanced with new features. The source code for these updates could be managed and version-controlled in a Git repository, hosted on a local server within the unit's network. This setup ensures that even in disconnected or bandwidth-limited situations, the unit can maintain up-to-date software, enhancing operational effectiveness and cybersecurity resilience. Then the solution can be better codified by a software factory or used as a prototype for a contractable solution.

The power of FOSS extends far beyond rapid prototyping, unlocking Soldier-driven innovation. A Soldier working in

COLLABORATE, CREATE, INNOVATE

Army Software Factory engineers work on projects at Grafenwoehr Training Area, Germany, in February 2023, part of the Army Software Factory's initiative to collaborate with civilian engineers and Army developers to create innovative, technology-based solutions to the military's biggest challenges. (Photo by Staff Sgt. Ashley Low, 7th Army Training Command)

logistics may have an idea for streamlining supply chain management. Instead of filing a suggestion report for the currently used software and hoping for the best, they can use FOSS frameworks such as Angular and Django to create a proof of concept. Angular's robust front-end development capabilities can facilitate the creation of an intuitive user interface for tracking and managing supplies in real time. Concurrently, Django, with its efficient back-end structure, can be used for complex data processing and integration with existing military databases. The application may perform some lightweight tasks, which could be containerized with Docker or Kaniko. These tools allow the application to be standardized and isolated from its environment, making it portable and consistent across any computing platform. The application can then be deployed and shared with other units, giving them the ability to deploy the application in a Kubernetes cluster or other container orchestration services. Kubernetes, a popular orchestration system, manages the deployment, scaling and operations of these containers across a cluster of virtual machines. Putting this power in the hands of Soldiers in the battlefield leverages the power of innovation and FOSS. This approach fosters an environment where the best ideas are given space and tooling to be developed and deployed by Soldiers who will use them on the front lines.

TRAINING THE NEXT GENERATION OF SOLDIER-DEVELOPERS

Initiatives like the Army Software Factory, Kessel Run (U.S. Air Force), Kobayashi Maru (U.S. Space Force) and the U.S. Marine Corps Software Factory are at the forefront of this transformation, and have leveraged FOSS to train, enable and deliver software to DOD. These factories are not only upskilling service members, but also providing commanders with organic problem-solvers who can be deployed as strategic assets. DOD is learning the importance of the potential of FOSS, modern development practices that emphasize agility and the principles of DevSecOps, where security is woven into the fabric of software from day one. These programs align with DOD's emphasis on building a technologically empowered force.

NAVIGATING CHALLENGES AND EMBRACING COLLABORATION

Some might question the practicality of FOSS. The question of whether it will it create a patchwork of unmanageable custom tools is a valid concern. That's why there also needs to be a push to promote collaboration and secure knowledge sharing. Imagine repositories where proven solutions are not locked away, but accessible to units across the force. A breakthrough developed to streamline medical logistics in one theater could be adapted and deployed to others, multiplying its impact and reducing duplicative efforts. This collaborative model reinforces DOD's guidance on open-source software (OSS), which highlights the importance of knowledge sharing to maximize the potential of open-source solutions. As a caveat, there exists the need for a legal review of approved OSS; special licensing and user agreements need to be reviewed by the proper legal team to ensure licensing compliance.

CONCLUSION

Integrating FOSS in military operations is not just about technological advancement. It signifies a fundamental shift toward a more agile, innovative and technologically proficient military force. The Army's new software policy and the growing recognition of FOSS's value herald a future where military innovation is continuous, collaborative and deeply integrated into defense strategies. As our adversaries also navigate the digital terrain, leading the race to harness the full spectrum of technological innovation will be critical in defining the future of military supremacy.

For more information on open-source software, go to ***https://dodcio.defense.gov/Open-Source-Software-FAQ/#q-isnt-using-open-source-software-oss-forbidden-by-dod-information-assurance-ia-policy****.*

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GOBLN ON DECK

The GOBLN neutralization subsystem is tested during one of the program's touch points at Yuma Proving Ground, Arizona. The system is designed to evaluate developing technologies and strengthen relationships with industry and other government partners. (Photo by Maj. Thomas Fite, PM CCS)

NAVIGATING FISCAL BOUNDARIES

Maximizing results and minimizing risk in a fiscally constrained environment through cumulative testing and industry observations.

by Maj. Thomas Fite and Amit Makhijani

For a project in its early stages with budget limits and extensive prototyping, it's crucial to use funds wisely and minimize risks as much as possible before key project milestones to enable overall success. Using cumulative testing and observing industry-led demonstrations can prove to be an effective strategy in achieving this goal.

Cumulative testing allows for the continuous improvement and refinement of designs and maintaining focus on user needs and requirements while optimizing resource allocation. Observing industry-led demonstrations offers several benefits, including leveraging commercial resources, fostering collaboration and validating practicality of new technologies from industry's internal investment. In all cases, the critical factor for success is open and candid communication with all stakeholders.

The XM123 Ground Obstacle Breaching Lane Neutralizer (GOBLN) team incorporated cumulative testing and industry demonstrations into the program's test and evaluation (T&E) strategy during the Technology Maturation and Risk Reduction (TMRR) Phase of the program, and used this approach to help tailor the program's touch points and early user assessments (EUA). The program team is now using the approach to help translate desired characteristics for the Abbreviated Capability Development Document (A-CDD) into measurable performance requirements.

CUMULATIVE TESTING: DEFINITION AND BENEFITS

Cumulative testing involves breaking the development and testing process into small, manageable and measurable increments. Each increment focuses on a specific

functionality or feature, which is tested and evaluated before moving on to the next increment. For a complex system, or system of systems, each increment could represent a major subsystem or design feature. As testing progresses, knowledge gained from previous increments is incorporated (i.e., subsystems are integrated and tested together) until the design is sufficiently mature to move onto the next major milestone or test event.

The main goal of cumulative testing in a fiscally constrained environment is to deliver the best possible capability to the warfighter while optimizing resource allocation. This approach ensures that capabilities and prototyping meet the needs and requirements of the user and fall within budget limitations. The benefits are numerous.

First, by testing and evaluating each increment, potential issues can be identified and addressed at an early stage. This prevents the accumulation of problems that may be difficult and costly to rectify later in the development process. Second, cumulative testing allows for adjustments and modifications to be made based on user feedback through engineering tests and subsystem-specific touch points. Capabilities are tailored to the specific needs, preferences and anticipated requirements of the warfighter, maximizing their effectiveness and usability. Third, by focusing on specific increments, resources can be allocated earlier to higher-risk areas, maximizing the impact of limited resources. Fourth, cumulative testing facilitates continuous improvement throughout the development cycle. Feedback from testing each increment or subsystem can be incorporated into subsequent iterations, resulting in a refined, high-quality product for the end user. Finally, breaking the process and the system into smaller pieces reduces the risk of large-scale failures.

Issues identified in one increment or subsystem can be resolved before moving onto the next, minimizing the impact on the overall program schedule and budget while maximizing results. However, carrying out continuous improvement to reach toward a perfect solution may lead to what is called "the acquisition valley of death." This occurs when too many resources have been focused on maturing technologies or pursuing design improvements, and not enough future resources have been allocated to move the program into the next phase of the acquisition life cycle. Attempting to improve the design can slow a program's forward momentum, which in turn reduces prioritization of funding for the program. Potential materiel solutions languish in this valley of death until future resources become available.

The critical factor for success is open and candid communication with all stakeholders.

DETECT AND NEUTRALIZE
GOBLN team members attend an industry demonstration of alternate neutralization technologies in Opelika, Alabama, in February 2024. (Photo by Maj. Thomas Fite, PM CCS)

LEVERAGING INDUSTRY-LED DEMONSTRATIONS

In a budget-constrained environment, it is important to leverage all available resources, including internal industry investment for resourced maturation of technologies and demonstrations. This strategic approach can advance technology and help inform future program requirements without significant use of Army resources. By tapping into industry expertise, infrastructure and resources, programs can benefit from access to state-of-the-art facilities, cutting-edge technologies and a wealth of experienced

INDUSTRY INTERACTION
The GOBLN team conducts a detection subsystem touch point, which was open for industry partner participation, at Fort Walker, Virginia, in April 2023. (Photo by Amit Makhijani, PM CCS)

professionals. This collaboration not only accelerates the development of innovative solutions but also enhances their reliability and effectiveness. Additionally, by adopting this strategy, Army program stakeholders can effectively communicate with industry partners regarding desired requirements and capabilities.

XM123 GOBLN T&E STRATEGY

Developed by Project Manager Close Combat Systems (PM CCS) within the Joint Program Executive Office for Armaments and Ammunition, the XM123 GOBLN is a mine- and obstacle-clearing system designed to maintain a high operations tempo by clearing non-explosive and explosive obstacles. It will improve deployment speed, force protection and survivability and allow warfighters to execute penetration, disintegration and exploitation in close and deep maneuver areas.

From its inception in 2020, the XM123 GOBLN program has focused on a strategy of cumulative testing and observing industry investments: maturing subsystems individually, observing options from industry and formulating an objective system that will eventually be brought together for a concept assessment. GOBLN's prototype testing was planned to be cumulative, so that knowledge gained from testing builds upon itself and is incorporated in subsequent test events. Additionally, the GOBLN team has actively engaged with industry, observing industry- and government-sponsored events.

For example, the team traveled to Grassobbio, Italy, last fall to participate in a demonstration of Tesmec's ground penetrating radar technology. During the Tesmec-sponsored event, the company set up its own minefield and successfully showcased its technology while also highlighting the work that remains for the system to be fully functional. This demonstration clearly showed the current state of the technology and what the baseline requirement could be for buried detection. Additionally, the team recently traveled to Fort Moore, Georgia, to participate in the Army Expeditionary Warrior Experiment 2024, hosted in February by the Maneuver Battle Lab. At the event, the XM123 GOBLN team had the opportunity to engage with industry partners on emerging technology, such as unmanned aerial systems (UAS) delivering kinetic, lethal payloads. The recent events in Eastern Europe have shown the importance and value of UASs as hunter-killers, including their role in breaching operations. Since program inception in 2020, our team has led 16 of its own tests and participated in more than 30 industry and service demonstrations of supporting technologies. The TMRR effort

will culminate with a EUA in 2024 where a fully integrated capability of government- and industry-provided solutions will be demonstrated before a Milestone B decision.

KEEPING INDUSTRY ENGAGED

From the XM123 GOBLN program's inception, resource limitations have driven the program acquisition strategy and timeline. To overcome those limitations, the XM123 GOBLN team prioritized open and frequent communication through Industry Day events, opening communication lines with all stakeholders, conducting regularly scheduled meetings and establishing feedback mechanisms to generate and maintain industry interest. Since the program's formal initiation, the team has executed three Industry Day events and hosted three industry engagements at prototype tests. Industry Day events allow program personnel to engage with potential materiel solution vendors, provide them with insights on the program's goals, requirements and potential opportunities for investments and help them understand existing risks and limitations. These events also allow industry to have a dialog with the user and acquisition communities to ask questions, understand user needs and express any concerns.

The main goal of cumulative testing in a fiscally constrained environment is to deliver the best possible capability to the warfighter.

A second avenue that the XM123 GOBLN team adopted is to open the communication lines between all stakeholders: transparency is the key to success. Regularly sharing updates, progress reports and any relevant information helps maintain trust and interest. The program keeps communication channels wide open with industry partners and stakeholders. Although it requires extra time to answer questions, the relationships formed and data exchanged during both industry and program resource demonstrations have been highly valuable, helping to shape system requirements and informing users on technical feasibility.

BENEATH THE SURFACE
The U.S. Marine Corps conducts a live demonstration of its semi-autonomous subsurface detection technology at Camp Lejeune, North Carolina, in June 2023. (Photo by Maj. Thomas Fite, PM CCS)

A third communication avenue that has proven effective for our team is through regular scheduling of tag-ups. These scheduled meetings with industry partners and stakeholders provide a structured forum for discussing progress and challenges and addressing any issues. These regular check-ins keep everyone on the same page and facilitate collaborative problem-solving. Additionally, tag-ups enable the team and our industry partners to adapt and respond to changing priorities, which is incredibly important in a fiscally constrained environment.

Finally, the team has established feedback mechanisms that allow stakeholders to provide input, voice concerns and contribute to the program's evolution. This iterative process ensures the program remains relevant and responsive to stakeholder needs. Col. Russell Hoff, former project manager for PM CCS, said it best at program initiation: "Industry involvement is paramount to a program's success, and effective communication and engagement is the foundation." The XM123 GOBLN program has followed his guidance. During any engagement with industry, planned or unplanned, feedback is listened to, recorded and incorporated as the program moves forward.

CUMULATIVE KNOWLEDGE SUPPORTS EUA

In addition to observing more than 30 different technology demonstrations and conducting 16 different engineering tests, the program also conducted three touch points at the subsystem level. These events play a crucial role in the cumulative knowledge roll-up in support of the program's cumulative EUA, where an integrated capability will be demonstrated along with demonstrations from industries. To communicate the intent of this event, the team hosted an Industry Day at Picatinny Arsenal, New Jersey, in January 2024. More than 140 representatives from 49 companies and 15 government organizations attended. Participants received a classified briefing on breaching and a program update brief, participated in one-on-one break-out sessions and received guidance on how to participate in the upcoming EUA. Both government and industry partners will have an opportunity to demonstrate candidate system or subsystem technology solutions that will provide the warfighter with the ability to detect and neutralize surface-laid and buried threats at standoff. The technology demonstrated will help translate A-CDD desired characteristics to measurable requirements that can be used in developing the full Capability Development Document. In addition, it will help shape the acquisition approach for the Engineering and Manufacturing Development Phase. Leading up to the event, the XM123 GOBLN team will continue evaluating potential concepts, attend industry-led demonstrations and regularly host tag-ups with industry partners and the user community.

CONCLUSION

Navigating a fiscally constrained environment in the early stages of a project demands strategic allocation of resources and a keen focus on risk mitigation to ensure success. By continuously refining designs, incorporating user feedback and optimizing resource allocation, cumulative testing enhances the efficiency of the development cycle and ensures the capability meets user needs while staying within budget constraints. Leveraging industry-led demonstrations offers a strategic advantage by tapping into external expertise, infrastructure and resources. This collaboration accelerates innovation, enhances reliability and helps inform future program requirements, ultimately bolstering the project's success.

The XM123 GOBLN program shows how blending cumulative testing with industry observations boosts its T&E efforts. Fostering open communication, involving stakeholders through Industry Days and regular tag-ups and setting up feedback loops to stay in sync with user needs and technical capabilities is supporting planning for the next phase of acquisition. The XM123 GOBLN program serves as a testament to the efficacy of this approach, highlighting how it fosters innovation, mitigates risks and is actively working toward delivering a capability tailored to meet the demands of the end user.

For more information on an A-CDD, go to ***https://aaf.dau.edu****.*

For more information on prototype experimentation, go to ***https://aaf.dau.edu/aaf/mca/prototyping****.*

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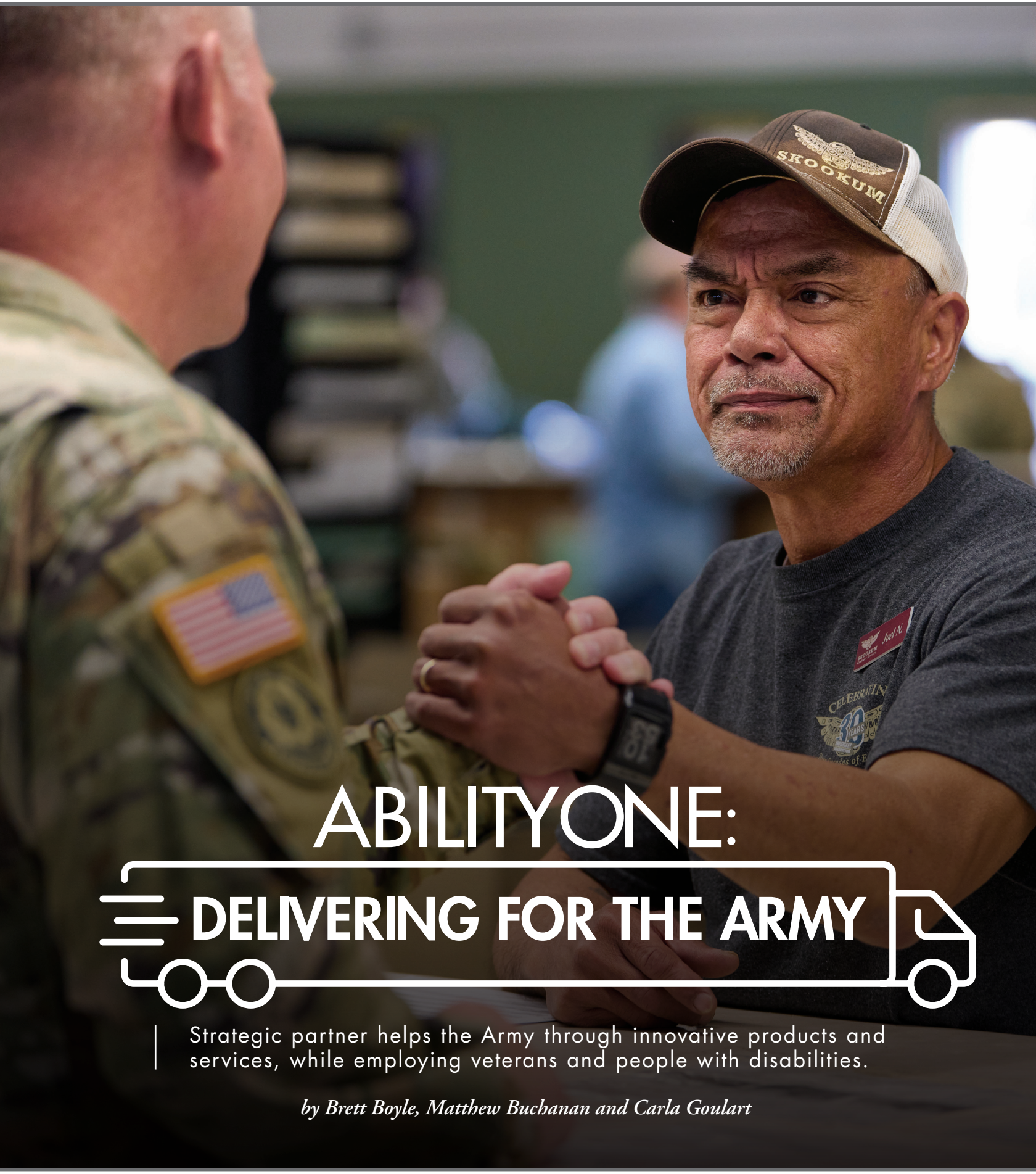


ABILITYONE:

DELIVERING FOR THE ARMY

Strategic partner helps the Army through innovative products and services, while employing veterans and people with disabilities.

by Brett Boyle, Matthew Buchanan and Carla Goulart

PARTNERING FOR READINESS
Army veteran Joel Nededog, right, and fellow Skookum employees issue equipment and process returns on an AbilityOne contract at the JBLM central issue facility in July 2023. (Photo by Cade Martin, SourceAmerica)

The Army looks to its industrial base for innovative products and services, efficient development and fielding, cost savings and other aspects of best value to meet warfighter needs. At the same time, Army acquisition supports socioeconomic objectives such as veterans' employment and other economic opportunities for underserved communities. The AbilityOne Program is helping the Army meet its procurement needs while making a difference in the lives of veterans and others with disabilities.

According to the U.S. Bureau of Labor Statistics, more than 60% of working-age Americans with disabilities are not actively participating in the labor force. AbilityOne is one of the largest sources of employment in the U.S. for people who are blind or have significant disabilities, including veterans. The program is a strategic partner that helps the Army support warfighters through innovation, timely delivery, cost savings on goods and services and waste reduction.

The program is overseen by the U.S. AbilityOne Commission, an independent federal agency. The Army's representative to the commission is Megan Dake, deputy assistant secretary of the Army for procurement (DASA(P)), who was appointed to the commission by President Joe Biden in October 2022. "AbilityOne is a valuable resource for supplying goods and services to the warfighter," she said. Dake recently sponsored the first Armywide AbilityOne Training Day for the Army contracting enterprise, held virtually on April 3, 2024. The training used panel discussions to reinforce the benefits of the AbilityOne Program in meeting warfighter needs and saving taxpayer dollars.

AbilityOne is implemented with the support of two central nonprofit agencies—National Industries for the Blind (NIB) and SourceAmerica—designated by the commission to help administer the program through a network of nearly 425 nonprofit contractors that perform the work.

SERVING THE WARFIGHTER

NIB and SourceAmerica provide agile development and Soldier-centered designs through a manufacturing and development service contract that develops innovative prototypes as well as improvements to existing products.

Take the five-layer Cold Temperature and Arctic Protection System (CTAPS), for example. When the Army quickly needed a state-of-the-art cold weather clothing system that improved Soldier mobility and performance, and could withstand temperatures as low as minus 65 degrees Fahrenheit, it contracted with commercial manufacturers and the AbilityOne Program. Four AbilityOne apparel and equipment manufacturers were able to produce a durable, high-quality system within an accelerated six-month delivery time frame in spring 2023.

During the compressed production schedule, SourceAmerica and NIB's productivity engineers performed a lean manufacturing study that identified

new ways to eliminate waste and cut and handle materials to meet the aggressive deadline. For example, the productivity engineers created a new laser cutting station that allowed operators to cut and also adhere multiple fabric layers simultaneously, which significantly reduced manpower for material handling and sewing. Ten thousand CTAPS units, half of which were provided by the AbilityOne Program, were field-tested at Fort Wainwright and Fort Greely, Alaska, in March 2023 during a large-scale cold-weather exercise. In the 5,000 garments produced by AbilityOne contractors during the compressed production schedule, fewer than 10 defects were identified.

EMPLOYING UNDERSERVED COMMUNITIES

More than 36,000 people who are blind or have significant disabilities make up the AbilityOne workforce, including roughly 2,500 veterans, and more than half work on DOD contracts. More than 6,600 AbilityOne employees contribute to Army warfighter readiness, providing mission-critical services on Army bases nationwide or producing mission-critical products like CTAPS. By doing so, they uphold Executive Order 13985, which charged the federal government with advancing equity for all, including communities that have long been underserved, such as people with disabilities.

DELIVERING EXPANSIVE BASE SERVICES

AbilityOne contractors offer an extensive range of expertise. At Joint Base Lewis-McChord (JBLM), Washington, six AbilityOne nonprofit agencies perform work on 11 different contracts with an annual contract value of more than $41 million. Their combined total economic impact—tax revenues and cost savings through reduced reliance on federal benefits as well as additional tax revenues created in local economies—is estimated at more than $3 million.

KITTED UP
AbilityOne Program employees are proud to support the U.S. military, creating uniforms, helmets, tools, hydration systems, protective equipment and many other items to outfit American warfighters from top to bottom. (Graphic courtesy of NIB)

The contracts include a central issue facility, barracks and vehicle maintenance, dining facility services, custodial and latrine services, laundry, dry cleaning and base supply center services. Many of the contractors have long-term experience with the base and employ veterans who bring military insight and commitment. AbilityOne contractor Professional Contract Services Inc. oversees barracks maintenance at JBLM, with veterans representing 69% of the direct labor force and 60% of leadership personnel.

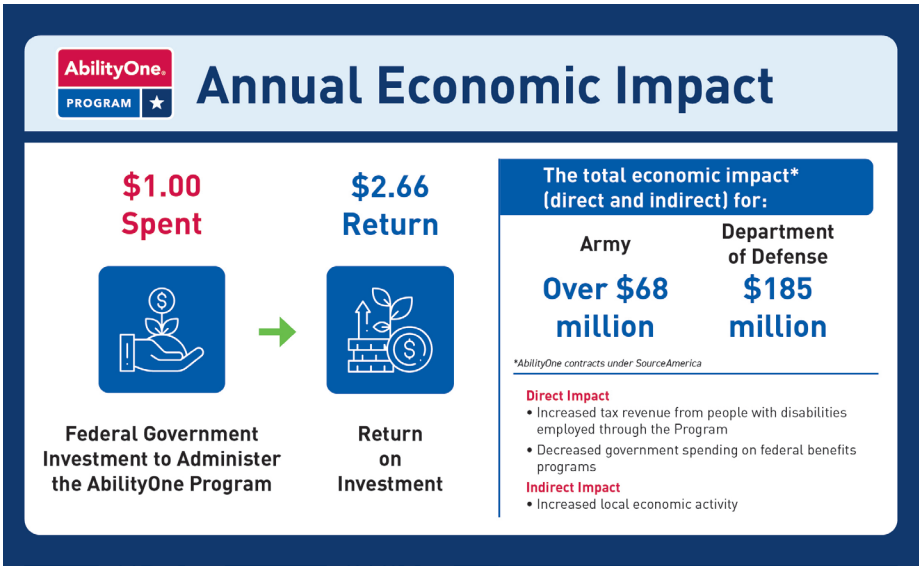
Additionally, JBLM employs 371 full-time AbilityOne employees with disabilities through SourceAmerica's network, saving the government an estimated $1.4 million through reduced reliance on public benefits and generating an estimated $1.2 million in tax revenue by employing people who may not otherwise be able to find work. At JBLM alone, AbilityOne procurements create an additional $630,000 in local economic benefits through job creation and federal tax revenues.

AbilityOne contractor Skookum Services has streamlined the Army's equipment-issuing processes at the JBLM central issue facility, which provides service members and civilians with organizational clothing and individual equipment and also stores, receives and exchanges the gear that helps facilitate the service member's clothing record. Historically, Organizational Clothing and Individual Equipment (OCIE) was issued to Soldiers without being electronically recorded in the Soldiers' central issue facility records. Skookum's central issue facility team has properly accounted for it in the property book and has since

A POSITIVE ECONOMIC INVESTMENT

An independent 2023 Mathematica Socioeconomic Impact Study commissioned by NIB and SourceAmerica found that AbilityOne provides a positive return on investment (ROI) for every dollar spent on program administration and increased employment of people who are blind or have significant disabilities. The average ROI for the federal government is $2.66 for every $1 spent to administer the AbilityOne Program.

The total economic impact (direct and indirect) of AbilityOne contracts held by SourceAmerica's nationwide nonprofit network and DOD is $185 million. Considering the Army's share of AbilityOne DOD contracts, the study indicates that more than $68 million of total economic impact is generated by Army purchases of AbilityOne products and services. Direct impact includes tax revenues and cost savings through reduced reliance on federal benefits for AbilityOne employees. Indirect impact includes additional tax revenues created in local economies. When veterans and people who are blind or have significant disabilities are employed, they are also able to invest in their communities through spending on housing, transportation and other sectors of the local economy.



FACTS AND FIGURES
Research indicates that the AbilityOne Program benefits Army warfighters as well as those who are employed by the contractors who support it. (Image courtesy of AbilityOne)

recovered millions of dollars of OCIE. This excess equipment is then refurbished and redistributed to support other installation missions, reducing waste and unaccounted-for government equipment. AbilityOne contractors Austin Lighthouse and Peckham Inc. provide cost savings for the U.S. Army Tank-automotive and Armaments Command through contracts for OCIE receipt, inspection, repair and reissue that allow the Army to avoid or reduce its purchase of new, higher-cost equipment.

Angela Chaplinski, contracting officer for the U.S. Army Mission and Installation Contracting Command – JBLM, explained why her team is so driven to succeed. "We are proud to have programs in our country that support those who are blind or have disabilities. This creates an incredible sense of purpose and esprit de corps for all those involved in and supporting the program."

SAVING MONEY AND COMBATING WASTE

Along with CTAPS, AbilityOne contractors also manufacture the Army Green Service Uniform (AGSU) and the Improved Outer Tactical Vest (IOTV). The AGSU, originally called the pink and greens by service members in the 1940s, was redesigned a few years ago to provide Soldiers a uniform for professional environments. In July 2021, four AbilityOne contractors and eight commercial industry partners successfully completed initial fielding efforts for the ensemble, including manufacturing, sourcing, packaging and shipping. Using an innovative, state-of-the-art distribution system, the contractors were able to streamline delivery to the Army.

Work on the IOTV is an excellent example of how the program combats waste. Through a repurposing effort developed by

"Even though I'm not in the military anymore, I still am helping Soldiers. I love my work. I love the people I work with."

the Program Executive Office for Soldier, AbilityOne agencies inspect legacy bulletproof vests; remove, cut down and sew the soft armor ballistic inserts; and integrate them into the new Modular Scalable Vest (MSV). By repurposing the ballistic inserts, the Army was able to reuse existing item inventory and reduce waste and contracted for 76,500 MSV units rather than buying new tactical vests.

PERSONAL IMPACTS

The AbilityOne Program offers extraordinary benefits to veterans, employees and the warfighters they support. James McGarity was sworn into the National Guard three days before 9/11. Shortly after infantry training, he was in a devastating car accident that resulted in cervical and other fractures, a lacerated liver and head injuries. Doctors placed him in a medically induced coma for 75 days.

Following extensive rehabilitation, he found work at Peckham, headquartered in Lansing, Michigan. After his first position learning to sew uniforms for the Army, he progressed through several job roles and now works at Peckham's largest warehouse, loading and unloading military equipment and fabrics while training to move into management. "Even though I'm not in the military anymore, I still am helping Soldiers," McGarity said. "So, I'm still doing my part, which I think is great. I love my work. I love the people I work with. There are people with severe disabilities. Peckham gives those people a purpose."

After hundreds of combat missions as a platoon sergeant with the 101st Airborne Division, Master Sgt. Jeff Mittman (USA, Ret.) was on a Baghdad highway in 2005 when a projectile struck his vehicle. It caused severe head and facial trauma and took away his eyesight. Retiring after 21 years and four combat tours, he underwent more than 40 reconstructive surgeries.

Mittman credits the NIB with helping to save his life. "When I got hurt on the battlefield, products produced by NIB agencies saved my life—from the gloves they treated me with, to the bandages they used to stop the bleeding, to components of the very helmet I was wearing on my head. Without those agencies, I would not be here."

Today, Mittman is president and CEO of Bosma Enterprises in Indianapolis, one of the largest disability service organizations in the Midwest and the largest employer and the only comprehensive service provider in the state for people who are blind. As a member of the NIB board of directors, Mittman is one of more than 500 veterans working at NIB and its associated nonprofit agencies.

CONCLUSION

The AbilityOne Program creates far-reaching value for the Army and offers meaningful and potentially life-changing

PAYING IT BACK
Army veteran James McGarity found meaningful employment at Peckham through the AbilityOne Program. (Photo by Jack Schabert, Peckham)

CONTINUING TO SERVE
Army veteran Jeff Mittman continues a career of service after leaving the military as president and CEO of Bosma Enterprises and on the NIB board of directors. (Photo courtesy of NIB)

The AbilityOne Program offers extraordinary benefits to veterans, employees and the warfighters they support.

jobs to veterans and people who are blind or have significant disabilities. In turn, they contribute economically to their local communities. The Army benefits as well: The AbilityOne Program provides innovative products and services that meet warfighters needs and are used by the warfighter in the field every day.

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For more information, go to the U.S. AbilityOne Commission, SourceAmerica and NIB websites.

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MATTHEW BUCHANAN is a lead AbilityOne representative for the NIB and was previously a contracting officer for the U.S. Army Contracting Command. As an Army civilian, he frequently used the AbilityOne Program to deliver products on time and at a reasonable price. At NIB, he works directly with federally appointed AbilityOne representatives and NIB nonprofit agencies to increase awareness and use of the AbilityOne Program. He holds a B.S. in business administration from Framingham State College and is a DAWIA certified DOD contracting professional

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MAJ. GREGORY GRIFFITH

COMMAND/ORGANIZATION: Program Executive Office for Ground Combat Systems, Project Lead for Future Battle Platforms, Product Manager for Robotic Combat Vehicle

TITLE: Assistant product manager

YEARS OF SERVICE IN WORKFORCE: 2

MILITARY OR CIVILIAN: Military

YEARS OF MILITARY SERVICE: 13

EDUCATION: M.S. in systems engineering management, Naval Postgraduate School; B.S. in mechanical engineering, United States Military Academy at West Point; Human-System Integration Certificate, Naval Postgraduate School

AWARDS: Bronze Star Medal; Meritorious Service Medal; Air Medal with Combat Device (Numeral 2); Army Commendation Medal (two oak leaf clusters); Joint Service Achievement Medal; Army Achievement Metal (two oak leaf clusters); Valorous Unit Award

AN AWESOME RESPONSIBILITY

After 10 years as an aviation officer, including nine deployments, Maj. Gregory Griffith made the switch to the acquisition functional area through the Army's Voluntary Transfer Incentive Program. "My primary motivation was to be a part of solving the hard capability gap problems, leveraging my operational experience to help field new equipment and capabilities that Soldiers need to retain technological overmatch," Griffith said. "It has been challenging to learn a new career field but has also been exceptionally interesting and rewarding to get to be a part of a new-start program that is developing a revolutionary new capability that is critical to the Army's transformation over the next few years. Thus far, I truly enjoy the intellectual stimulation of the work and getting to help solve the hard problem sets that will influence the future of warfare for generations to come."

Griffith's current position, as an assistant product manager on the Robotic Combat Vehicle (RCV) program, is his first within the acquisition workforce, where he oversees the surrogate prototyping line of effort. "In practical terms, I manage RCV Soldier experimentation, technology maturation, developmental testing and program risk reduction," he said. "These efforts provide the program early validation of integrated architectures, software capability releases and technology insertions … [and] are critical for both the success of the RCV program of record and for the Army's larger human-machine integration effort."

"Other than supporting Soldiers, my greatest satisfaction being a part of the Army Acquisition Workforce is being a part of shaping the future of warfare," Griffith said. "I wouldn't have thought it possible for a select few people to have so much influence on how capabilities develop and impact the future of warfare. However, seeing it from the inside now has really opened my eyes to the fact that the products we give Soldiers are the direct result of the leadership, foresight and trade decisions made by key personnel within the requirements and acquisition communities. Even more impressive is how acquisition leaders and technical subject matter experts at the lowest levels are the ones making many of the decisions or recommendations to senior leaders. It is truly impressive and provides me great satisfaction to be empowered, trusted and challenged to lead my line of effort and make decisions that will directly impact the final product we give Soldiers. Talk about an awesome responsibility."

"People are always surprised by how much technology goes into enabling new warfighting capabilities," Griffith said. He is proud to be a part of the RCV team providing "revolutionary" new capabilities that will "change the battlefield geometry and improve the survivability and lethality of the Army's ground maneuver formations." He added that while it is a lot to try to manage immediate expectations, each piece of technology is important to the RCVs long-term viability and success.

But, he said, the RCV program office can't do all of this by itself. The team relies heavily on other programs of record and the science and technology community for integration capabilities. "It is truly a team effort and no one organization can succeed in their mission without the support from everybody else," he said.

CAREER SWITCH
Griffith stands in front of a MH-47G Chinook during his time as an aviation officer, which included nine deployments. He moved to the acquisition functional area through the Army's Voluntary Transfer Incentive Program after 10 years in aviation.

TESTING ARMY TECH
Maj. Gregory Griffith stands in the middle of Army RCVs. As an assistant product manager for the RCV program, he manages RCV Soldier experimentation, technology maturation, developmental testing and program risk reduction. (Photos courtesy of Maj. Gregory Griffith)

While Griffith is still relatively new to the acquisition workforce, he has already found the experience to be valuable for both his professional and personal growth. "The community's emphasis on education and training is admirable, enabling me to attend graduate school and develop the skill set needed to be an effective acquisition officer," he said. "As with any Army career, there are an incredible number of opportunities but not enough time to do them all."

The latest career development Griffith attended was the Advanced Civil Schooling (ACS) program from 2020 to 2021, which allowed him to complete his graduate degree while he was transitioning to the acquisition functional area. He said it provided him with the foundation for technical leadership, program management and the application of systems engineering principles to military problem sets that prepared him for his new acquisition career field. "I would highly recommend the ACS program to anybody who has a passion for learning and a career timeline that can support it," he said.

His advice to fellow acquisition officers or those transitioning is "to take ownership of your career by proactively managing your career timeline, seeking out new opportunities, building a strong network and developing your interpersonal skills. Each of those things is essential to enabling your career success—whatever you decide that looks like for you."

Outside of work, Griffith is a family man, a pilot, a designer, a builder, a mountaineer, an athlete and a dedicated civil servant. "Many of these manifest themselves in how I approach work, how I take care of people, and where my strengths and weaknesses are," he said. For example, he said his love of designing and building things allows him to appreciate the technical work that goes into many of the acquisition programs. Similarly, his "fervent appreciation" for his family—and maintaining some semblance of work-life balance—manifests itself in how he manages schedules, prioritizes tasks and allocates resources.

"One of the most important lessons that I have learned is to not give up 'good enough' for 'perfect,' " he said, because perfect doesn't exist. "Striving for perfection is good, but acknowledging that the perfect conditions, perfect solution or perfect timeline doesn't exist is important to maintaining efficiency and effectiveness. We need to use the trade space we have, make informed decisions about where we accept risk and focus on delivering capabilities to the warfighter at the speed of relevance. Easy to say, but hard to do."

—HOLLY DECARLO-WHITE

CLEAR A PATH

The vehicle-integrated XM123 Ground Obstacle Breaching Lane Neutralizer, featured during the industry day demonstration, detects and neutralizes hazards at standoff, creating a passable vehicle-wide lane while reducing risk to the breaching force. (Photo by Sean Mazza, U.S. Army Yuma Proving Ground)

MAXIMIZE INDUSTRY DAYS

Connecting industry directly to the Army's capabilities and needs.

by Maj. Thomas Fite, Jesse Cohen and William Labance

Establishing and maintaining successful partnerships with industry doesn't just happen overnight. In fact, partnerships and business relationships require a strong foundation, built upon open communication, honesty and with an emphasis on accountability within and across all stakeholders. One way project management offices (PMOs) can establish and preserve these partnerships is through industry days. Industry day events are an important part of market research, as they invite industry to directly engage with the government in advance of future contract opportunities to understand program requirements and ask detailed questions.

The Demolition Reformation and XM123 Ground Obstacle Breaching Lane Neutralizer (GOBLN) Industry Day hosted by Project Manager for Close Combat Systems (PM CCS) under the Joint Program Executive Office for Armaments and Ammunition (JPEO A&A) was quite successful, attracting over 140 representatives from 49 defense companies and 15 government organizations. As a result of these industry events, a better understanding emerged of the technology that exists today and how industry envisions solving the complex problems faced by Soldiers while conducting lane breaching—clearing danger, like mines, from an area to create a safe path—and other types of operations with demolitions.

SETTING THE STAGE

Maj. Thomas Fite, assistant product manager for PM CCS, welcomes industry partners and government organizations to the XM123 GOBLN and Demolition Reformation Industry Day, hosted at Picatinny Arsenal, New Jersey, in January 2024. (Photo by Jeanie Fortunato, PM CCS)

THE MAIN EVENT

Under the leadership and guidance of Joseph Pelino, program manager for PM CCS; Michael Burke, product director; and Phillip Lawson, demolition branch lead, the Demolitions and Countermeasures (D&CM) team simultaneously executed two multiday industry events at Picatinny Arsenal, New Jersey, on Jan. 23-25, 2024. Expanding past a traditional industry day and covering multiple contract actions led to more than 140 representatives from the defense companies and government organizations descending upon the arsenal to review and discuss the use of innovative technologies, efforts to reform the demolition portfolio, the future of breaching operations and the development of the XM123 GOBLN program.

Demolition systems, with their rich history rooted in World War II technology, stand at a critical juncture. Recent conversations with the user community initiated by the D&CM team have sparked a renewed focus on modernization. PM CCS proactively launched this industry day as market research to align with emerging user requirements. By embracing modernization, we can enhance the versatility and multifunctionality of demolition systems to allow Soldiers to perform missions with safer, lighter and faster products and execute from greater standoff distance, ensuring they effectively support the needs of our modern forces. These developments position us for a transformative leap forward, bridging the past with the future, as we redefine the landscape of safe and efficient demolitions.

Pelino was no longer interested in how industry days were done in the past and sought an event that invoked more participation from its attendees. Within the planning process, Pelino stated, "Let's redefine industry days, move past the way they have always been done. Instead, let's create an event that sparks innovation, and challenge the participants to learn. That will truly transform our processes and drive progress."

With an outdated portfolio and stimulus for modernization, the industry day planning team included engagements among industry partners, 11th Airborne Division (Artic Angels), 20th Engineer Brigade (Airborne), engineer representatives from the Army, Navy and Marine Corps materiel development communities, the Army Office of the Chief of Engineers and the Walter

Reed Army Institute of Research , as well as NATO allies from the United Kingdom and Germany. Over the three-day event, attendees participated in a classified briefing, observed a live demonstration of new demolition technology and discussed carefully selected topics designed to inspire industry and spark valuable conversations to help create the foundation for future engagements. The last day of the event involved a full day of scheduled one-on-one sessions between industry and government representatives.

To put it into perspective, the Demolitions Modernization team conducted 11 separate one-on-one sessions, and the XM123 GOBLN team conducted another 22 simultaneously. These meetings acted as an open door for industry to leverage what they heard and observed the prior days to help modernize the demolitions portfolio. What the team learned throughout the event is that the information that experts provided to industry and in-depth discussions proved invaluable and helped set the foundation to building a relationship with industry—leading to several post-event follow-up conversations with the two different teams.

BREAKING THE MOLD

Organizing and executing an industry day engagement comes with its own challenges. But preparing for industry partners to attend one on base—conducting a classified briefing and a demonstration—proved to be an even more challenging endeavor. Navigating gate access, security clearances, escorting personnel through facilities and simply preparing rooms required all hands on deck for the weeks leading up to the event and on the days it took place. These types of events require a minimum of four months of advanced work, as well as coordination between various entities, both internal and external to JPEO A&A.

Using human-centered design, D&CM aimed to create future value in the industry days, which proved to require tactical foresight while organizing the events. Thoughtful planning went into briefing each topic, including who was briefing and who attended the one-on-one meetings with industry. We curated representatives from the government side, including project officers from the PMO, engineers from U.S. Army Combat Capabilities Development Command (DEVCOM) Armaments Center, DEVCOM C5ISR Center, the requirements team and Soldiers from various sources to sit in meetings specific to the work they are doing, what they have done in the past and the capability gaps that still exist today. The meetings were short but information-filled, and having a scribe in the room was necessary to gather the contributions from every participant. The team scheduled one-on-ones using the voluntary capabilities and interest statements solicited with the RSVP from the Sources Sought Notice (SSN) to ensure alignment between the competencies of the industry partner and the roles of the government stakeholders in attendance. We then created the opportunity to collaborate between industry and the user community in the one-on-ones to build the foundation of the next modernized demolition product.

ADVANTAGES: A VALUABLE BEST PRACTICE

The one-on-one meetings and follow-on conversations sparked by the event that made it clear that this kind of opportunity is an invaluable tool to bring industry

MODERNIZING DEMOLITIONS

Eric Beckel, Ph.D., an explosives engineer with DEVCOM Armaments Center, demonstrates the malleability of a modernized explosive by packing the product in an explosively formed penetrator. (Photo by Gunnery Sgt. Ryan May, U.S. Marine Corps)

in at the ground level for production. Industry days allow the PMO and the team to share their best practices with stakeholders, solicit feedback and foster collaboration for future and existing programs. This helps improve the quality, efficiency and safety of products and processes, as well as support the digital engineering efforts of the Army. It affords the opportunity for industries and suppliers to streamline work, adhere to industry standards and solve problems more efficiently. By making industry days part of best practices, we enhance communication with industry and our government organizations.

The D&CM team maximized our participation and made the event more attractive by conducting one industry day event for two programs. This proved to be an additional advantage that assisted in casting a wider net to industry. By cross-pollinating and submitting two SSNs with similar RSVP attachments, we found that the event participation far exceeded our expectations—and brought in new partners that had not yet explored the issues faced by Soldiers and how we want to modernize demolitions in the future. This worked well for the two programs—Demolition Reformation and XM123 GOBLN—since they align aiming to modernize demolitions and breaching technologies. This tactic proved useful to the companies that attended since they did not have to travel twice to learn about multiple programs.

WHATS NEXT?

Using detailed notes taken during the one-on-one meetings with industry, the PM CCS team reviewed highlights from the conversations with the user community and materiel development team to determine where a need exists for demolitions to be modernized and reformed with the Army 2030 and 2040 battlefield in mind. After careful review, follow-up meetings were set with members of the PMO and DEVCOM to begin conversations to advance the products and pursue modernization efforts for the demolition products discussed.

CONCLUSION

PM CCS's Demolition Reformation and XM123 GOBLN Industry Day exemplifies the importance and effectiveness of strategic partnerships between the government and industry. Despite the challenges faced in organizing this event, including navigating security clearances and coordinating with various entities, the PM CCS team demonstrated resilience, adaptability and innovation. Furthermore, through open communication, meticulous planning and a commitment to accountability, the team was able to bring together a diverse range of stakeholders to discuss the modernization of demolitions and breaching technologies and foster a deeper understanding of the evolving needs of the military. PM CCS is leveraging lessons learned and moving forward with the goal of one industry event per quarter. This will enable our team to continue to build upon that strong foundation and foster continued collaboration with stakeholders and a commitment to innovation for the battlefield of 2030 and beyond.

For industry day success:

- Customize one-on-one meetings to include users and engineers alike.
- Pair the events with similar products to cast a wider net.
- Expand to new partners.
- Bring more visibility to each program from companies that would not usually attend one.

Additionally, the platform can be used to advertise upcoming events. Start the planning process six months to a year in advance so you can put industry day events on the radar of the companies, leaving a taste for another opportunity in the back of their mind.

Industry days serve as a critical tool for engaging with industry partners, sharing best practices and driving innovation. By customizing one-on-one meetings, organizations can maximize the impact of their industry day events and build lasting partnerships with stakeholders.

For more information on JPEO A&A project offices, go to ***https://jpeoaa.army.mil.***

MAJ. THOMAS FITE is an assistant product manager for PM CCS. He holds an MBA in systems engineering from the University of Alabama in Huntsville, a Master of Public Administration from the University of Missouri and a B.A. in political science from the University of Iowa. He holds a DAWIA Practitioner certificate in program management.

JESSE COHEN is a Booz Allen Hamilton contractor operating as a special project officer at PM CCS. He holds a B.S. in general engineering from the United States Naval Academy and is expected to complete his executive MBA in technology management in August 2024 from Stevens Institute of Technology.

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ARMY AL&T

MARK WHITBY

COMMAND/ORGANIZATION:
Joint Program Executive Office for Armaments and Ammunition

TITLE: Operations officer

YEARS OF SERVICE IN WORKFORCE: 13

DAWIA CERTIFICATIONS:
Practitioner in program management

EDUCATION: B.A. in anthropology, Appalachian State University

AWARDS: Commander's Award for Civilian Service (2018); Superior Civilian Service Award (2017)

HONESTY IS THE BEST POLICY

Before he joined the Army Acquisition Workforce at Picatinny Arsenal in New Jersey, Mark Whitby and his wife, Lee, had close ties to New York City. Mark was an archaeologist for 16 years and worked at the same firm as his wife (then fiancé), in lower Manhattan. The couple decided to take a break from the city for a two-week vacation during the first week of September 2001, not realizing it was a decision that would alter the course of their lives. They witnessed the aftermath of 9/11—not from their lower Manhattan workplace, but while on vacation, a safe distance from Ground Zero.

Whitby and his fiancé had been shaken but spared. This motivated Whitby to want to support his country and do his part to protect others in some way going forward. He considered enlisting in the Army, but because he was already in his late 30s, he felt the time for active duty had passed. Instead, he pursued a contractor position at Picatinny Arsenal so that he could support the warfighter.

"I thought that by working for DOD, I could in some small way help our nation during that horrible time," he said. "I think my story is far from unique and was a quite common occurrence immediately after 9/11, when ordinary Americans, regardless of race, political affiliations, religion, etc., just wanted to do something ... anything to help their country. That's how I came to the DOD world." In 2010, Whitby's position was converted from a DOD contractor position to a DOD civilian, and he became a member of the Army Acquisition Workforce.

"Be ethical and honest. If you make a mistake, own up to it. Apologize and move on."

His greatest satisfaction as a DOD civilian, he said, is being a part of a greater entity that has the warfighter's interest at heart.

"There are personnel within JPEO A&A [the Joint Program Executive Office for Armaments and Ammunition] who are in the military or were in the military or have sons and daughters who are or were in the military. The personnel of JPEO A&A take pride in knowing that what they do helps and protects those warfighters by giving them the advantage they may need over current or future adversaries," he said.

In his role as an operations officer, Whitby is responsible for the coordination and execution of daily task management, staffing actions, briefing documentation and continuity of operations plans within JPEO A&A.

MILESTONE MOMENTS
Mark Whitby and his family before their daughter's senior prom in May 2023. From left are his wife, Lee, son Jamie, 17, and daughter Marah, 19. (Photo courtesy of Mark Whitby)

"I lead a small team of four operations officers within JPEO A&A headquarters who evaluate and develop action plans for tasks and actions received from the Office of the Assistant Secretary of the Army for Acquisition, Logistics and Technology, Headquarters, Department of the Army and the Office of the Secretary of Defense," he said. "We then task the O-6 level [colonel-led] organizations within JPEO A&A, coordinate and consolidate the information received from the PMs/PDs [project managers and project directors]. The consolidated package is then provided to JPEO A&A leadership for review and approval before providing the response to senior Army leadership."

Whitby and his team also manage all staffing actions associated with acquisition decisions, financial management, fielding and transition to sustainment for the six project management and project director offices within JPEO A&A.

"My role is basically to keep communications and information flowing between our organization and senior-level Army, other DOD organizations and Congress. This flow of information enables our government to make the best decisions for our warfighters," he said.

Whitby's first year as the operations officer within JPEO Armaments and Ammunition [then PEO Ammunition] was "an eye-opening time," he said. "Prior to that, I had worked for three O-6 organizations within PEO Ammunition. I knew how hard personnel within the O-6 shops worked each day but had no understanding and appreciation of the workload the PEO Ammunition headquarters staff and leadership carried out daily," he said.

It's a learning experience, and he would advise junior operations officers to just "be ethical and honest. If you make a mistake, own up to it. Apologize and move on. Be understanding of the workload of the personnel you are assigning tasks to."

Whitby said most people outside of work, other than those who knew him from his archeology career days, simply know him as "friend" and "dad." He enjoys spending time with his children in all their activities, whether it's sports, choir, musicals, his daughter's dance or his son's Boy Scout activities—or taking on landscaping and other projects at home. He said no matter what he's doing, he is always dedicated. "I try and have the same ethic no matter what it is. I attempt to be the best dad I can be to my kids. My goal is to complete projects at home and at work to the best of my ability," he said. "In other words, I strive to do the best job that I can do, no matter what or where that 'job' may be."

There are three important lessons Whitby said he's learned over the course of his career. First, no one is perfect. "Everyone makes mistakes. How you deal with those mistakes is what makes or breaks you. You can either wallow in your defeats or use those mistakes or defeats as a learning experience and move on."

Also, he said, listen to people, no matter the position they hold. "Don't be so caught up in what you're going to say that you miss some great piece of information that someone else is providing."

And lastly, he believes that "honesty is the best policy." There are exceptions to the policy but in most cases—in particular in the work environment—he believes honesty is the best course of action even if it initially puts you in a bad spotlight. It's all a work in progress, and Whitby said he's "still working on mastering all three."

—CHERYL MARINO

SUPPLY CHAIN IMPERATIVES

Five tactical insights for defense acquisition professionals navigating the most challenging supply chain environment in history.

by Jason Dury

PRODUCTION CHAIN
To ensure sustainability of its supply chains, the Army needs to recognize essential supply chain imperatives such as investing in tools and processes and building alternative source capabilities and plans for funding. (Photo courtesy of Joint Munitions Command)

In arguably one of the most unpredictable geopolitical climates in recent history, organizations across the U.S. military and defense industrial base recognize the urgent need to achieve both transparency and resilience in their supply chains.

With the pandemic, the chips crisis and munitions shortages serving as a few of the stark (and recent) reminders of the consequences of not acting proactively, there are five supply chain imperatives that should be on the radar of all contracting and acquisition professionals, as well as key supply chain and risk stakeholders like program executive office staff, counterintelligence analysts, logisticians and cybersecurity experts.

INVEST IN TOOLS AND PROCESSESS

The Government Accountability Office (GAO) cited supply chain challenges as one of the leading causes of cost increases across major defense acquisition programs and supplier disruptions among the top three factors contributing to the delay of these programs in its 2023 Annual Weapon Systems Assessment.

The first step in regaining control and ensuring the sustainability of vendors, parts and materials across the Army's supply chains is to identify exactly what and who make up the supply chains of individual programs. Merely mapping out first-tier vendors or doing a simple pre-acquisition scan of criminal or regulatory risk doesn't provide a complete or accurate picture of your risk exposure.

Instead, a deeper illumination—down to the nth-tier parts and components level for all programs—is essential to forming a better understanding of build-buy relationships and potential risks. Your supply chain solution should, where possible, be able to map your vendors back to the original manufacturer owner and map your materials back to the proverbial "hole in the ground." It should also provide a 360-degree assessment of all risk types (not just two or three), including foreign ownership, control and influence; financial; product; cyber; environmental, social and governance; reputational, criminal and regulatory; and operational. But it shouldn't stop there.

With new advancements in cognitive computing and generative artificial intelligence, your supply chain solution should also be able to provide risk-based insights and enable risk-informed decisions for your contracting and acquisition teams, program managers and the warfighter. All of these combined capabilities should form the basis of your supply chain risk management strategy.

BUILD IN REDUNDANCY AND ALTERNATIVE SOURCING CAPABILITIES

Understanding the alternative suppliers and redundancies landscapes are your best insurance policy in a world where critical minerals are scarce, geopolitical tensions are rising and supplier disruptions have become the status quo. Traditionally, having one or two alternative providers would suffice. Today, you need more, especially for essential parts and programs.

There are five supply chain imperatives that should be on the radar of all contracting and acquisition professionals.

In the case of something like PFAS (per- and polyfluoroalkyl substances), for example, which have critical national security applications for chemical, biological, radiological and nuclear issues as well as safety and other concerns, an accelerated phase-out of production has been poorly timed with the need for thorough research and testing of alternatives.

In the future, nontraditional suppliers and additive manufacturing may play a greater role in defense supply chains, with the Army proactively exploring alternative production methods, substitute parts and providers from adjacent areas. This happened out of necessity during the pandemic, when we saw everything from lacrosse helmet makers producing protective face shields to industrial workplace safety manufacturers making medical gloves and gowns.

DEVELOP A RESILIENT SOURCING STRATEGY

Whether it's propellants, raw materials or electricity, stable sourcing is vital to the success of any global military operation. Sourcing strategies need to be thoughtful, and constraints and risks, such as the viability of local providers as well as the logistics and time required to get materials into the hands of the warfighter, need to be thought through.

Stable energy sourcing, for example, should be a core component of the Army's long-term supply chain planning, particularly as the near-peer environment in Asia evolves. Energy storage, grid stability and a mix of feedstocks should all factor into the Army's energy sourcing strategy. The battlefield of tomorrow will demand forward-thinking and transformative programs. As the Army's climate

ENERGY NETWORK

Stable energy sourcing should be a core component of the Army's long-term supply chain planning. Energy storage and grid stability should factor into the Army's energy sourcing strategy. (Photo by Sgt. 1st Class Teddy Wade, U.S. Army Materiel Command)

KEEP SUPPLIES MOVING

U.S. Army Reserve Spc. Jozeph Dybalski, of the 341st Medical Logistics Company supply platoon, works alongside supply technician Aaron Miller in the U.S. Army Medical Materiel Center – Europe's cold-chain storage warehouse during Operation Patriot Press in May 2024. (Photo by Spc. Zoe Horton, U.S. Army Medical Logistics Command)

strategy envisions, things like battery storage systems and on-base renewable energy production will ensure reliable, sustainable energy for our troops.

If you pinpoint programs or capabilities that may pose sourcing risks further down the road, address them today. For example, GAO reports that the U.S. Navy is looking into replacing Dual Band Radar with Enterprise Air Surveillance Radar to guard against potential supply chain disruptions.

HAVE A PLAN TO DEPLOY ANNUAL FUNDING

At a time when we're averaging five continuing resolutions a year and the all-in-one fiscal year budget feels like a distant memory, defense acquisition stakeholders need to build the expectation of funding delays, gridlock and stop-gap measures into their financial planning.

As we've seen, the National Defense Authorization Act often gets held up in the mix, and DOD and the military branches need a budgetary approach that reflects this reality. To maximize your budget and ensure investments are being appropriately allocated to urgent and long-term priorities like supply chain resilience, you need to know how you will deploy funds and be ready to enact that plan as soon as funding becomes available (and while it lasts).

INCENTIVIZE TRANSPARENCY AND COLLABORATION

There are a variety of carrots and sticks that military and defense buyers can deploy to incentivize their suppliers to provide greater transparency and collaboration, which ultimately improves supply chain resilience. The industry needs to move toward treating supply chain security and resilience as a competitive factor (in addition to cost and performance) in acquisitions and sourcing.

The Army should begin incorporating language into contracts that enforce Federal Acquisition Regulation and Defense Federal Acquisition Regulation Supplement rules and require technical data for what is being purchased, thus providing the opportunity to gain better insight into supply chains. Other mechanisms include providing benefits for allowable costs related to supply chain technology, resources and mitigation spending, or instituting a safe harbor for voluntary disclosure and mitigation of vendor risks.

The sooner these measures are implemented, the sooner providers will invest in satisfying these kinds of requirements as a standard business practice going forward.

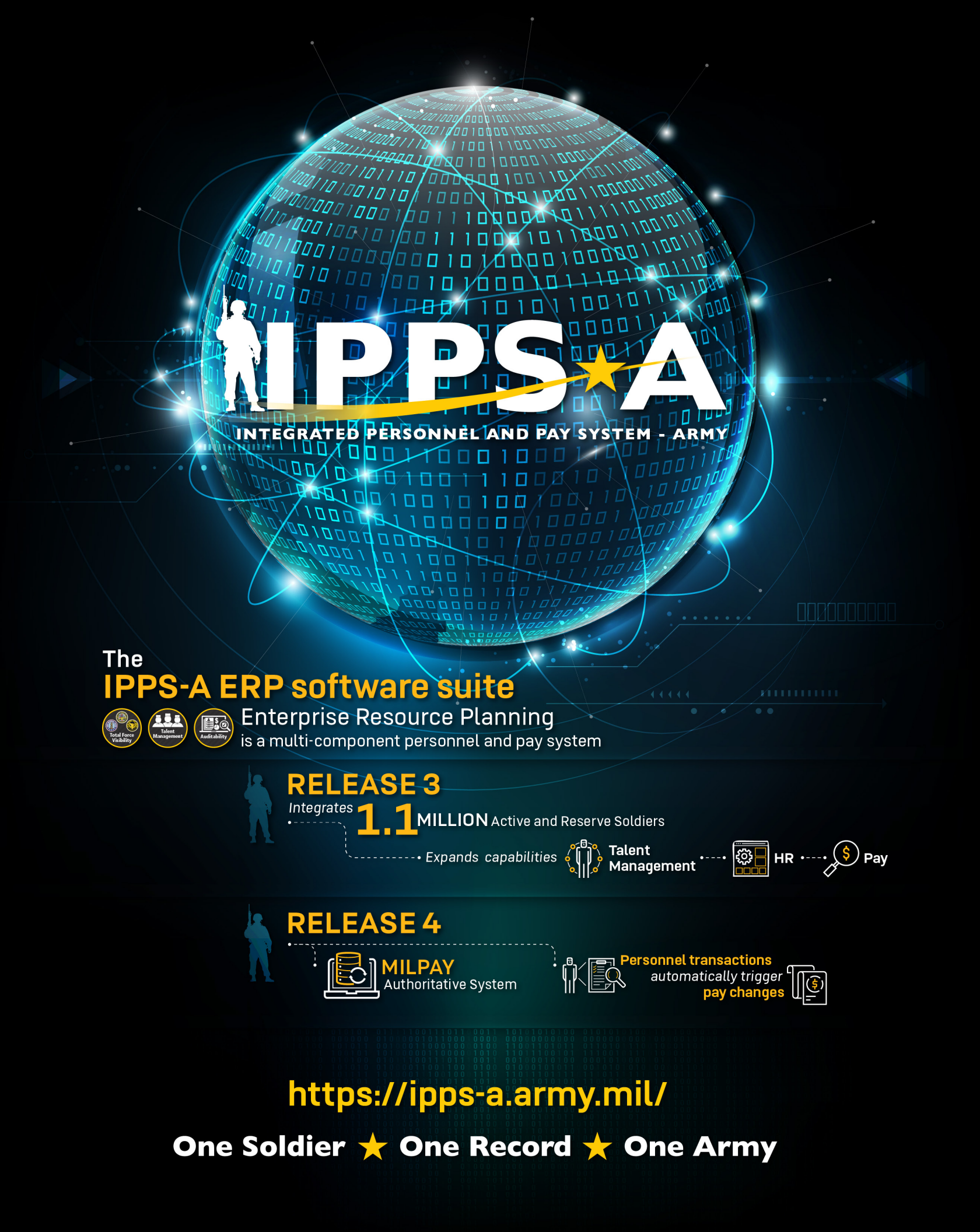
CONCLUSION

Today's defense acquisition leaders are rewriting the playbook for risk management, vendor requirements and supply chain preparedness. The measures they put in place will have a direct impact on our nation's security and competitiveness in the decades to come—as recent crises have underscored.

All of the necessary capabilities and use cases already exist in the market. It's merely a matter of prioritizing and implementing them. The Army's time and resource investment today will pay dividends to secure and empower the warfighter of tomorrow.

For more information about innovative supply chain risk management strategies and solutions, contact Jason Dury at ***jdury@exiger.com*** *or go to* ***exiger.com****.*

JASON DURY is vice president of defense programs at Exiger, where he leads the U.S. and international defense market segment. He brings over three decades of mission enablement across government and commercial clients. Before joining Exiger, he led supply chain risk management programs for global commercial and government clients for Guidehouse, a U.S. consulting firm. He holds an MBA from the University of Phoenix, a Master of public and international affairs from the University of Pittsburgh, and a B.A. in political science from Gettysburg College.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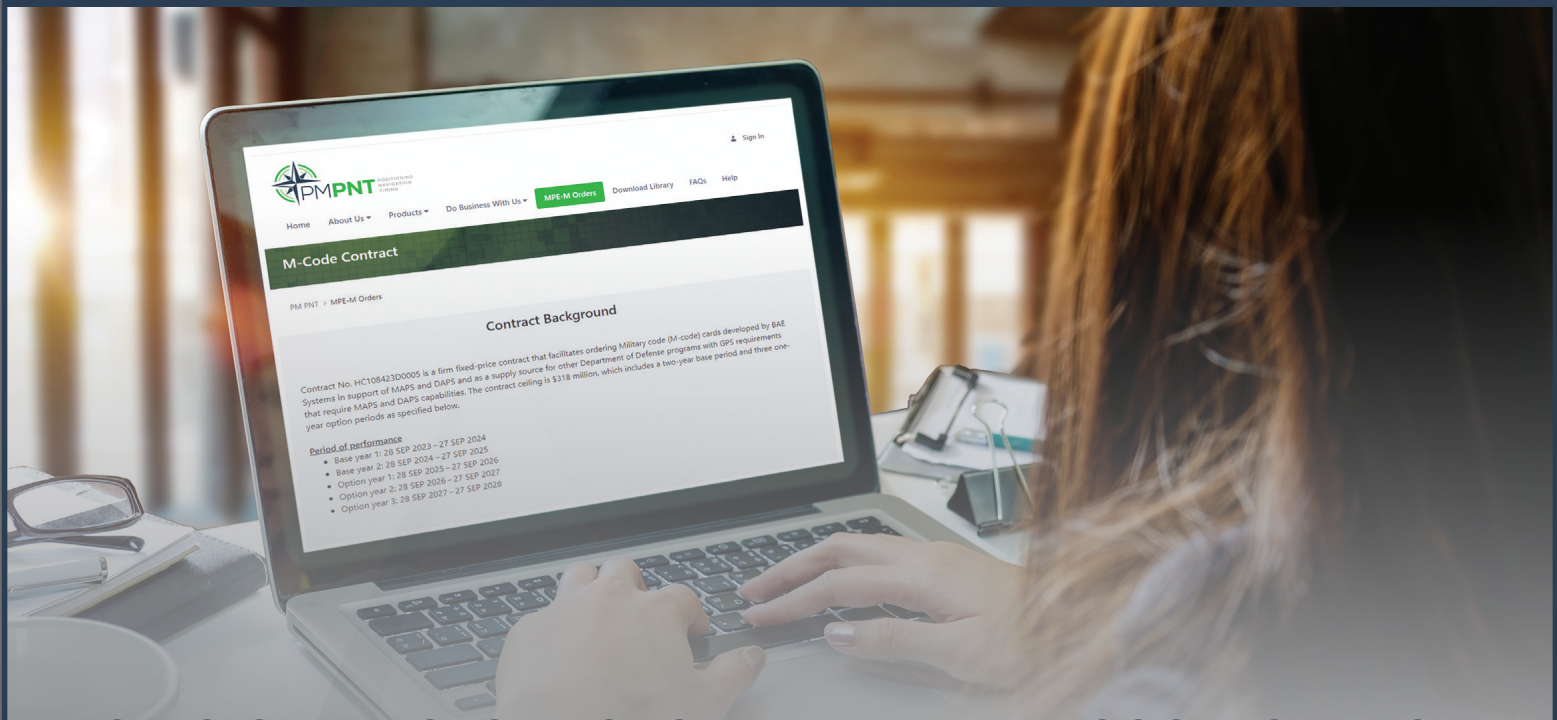

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PMPNT POSITIONING NAVIGATION TIMING

TRANSFORMING THE FORCE

I strongly advise every member of our AAW to review your relevant AAFL continuous learning memorandum.

The Army Digital Transformation Strategy requires the Army to build a foundation for change. This includes addressing people and culture to increase data literacy and embrace data for decision-making. As our systems have become more data-centric, our need for specialists such as data scientists and engineers has grown. But we also need program managers, contracting officers and testers—really all of the acquisition functional areas—to embrace and master the change and advantage that the digital evolution affords. Experimentation and testing are central to this transformation.

Last year—2023—was the year of digital transformation. And what a year it was. I'd like to share some of our accomplishments:

- In March 2023, my office rolled out a curated learning pathway within Udemy to ensure a baseline level of digital proficiency. Since then, approximately 10,000 Army Acquisition Workforce (AAW) professionals are actively enrolled in courses.
- More than 300 senior Army acquisition leaders attended the Data Driven Leadership Course offered by Carnegie Mellon University's Heinz College of Information Systems and Public Policy in fiscal year 2023. The course, which covers topics such as data management, data science, decision-making, emerging technology, change management, data privacy and security, is designed to assist our leaders in the development of a robust enterprise data management and data science capability to improve decision-making and better support the mission of the U.S. Army.
- Our partners at Defense Acquisition University (DAU) continue to build out their list of credentials, many of which focus on digital transformation such as software development, DevSecOps, artificial intelligence and cybersecurity.
- We partnered with the U.S. Army Combat Capabilities Development Command to launch an Army Digital Engineering Pilot under the DOD Public Private Talent Experience for fiscal year 2024. Companies that have a digital focus were solicited to participate, as were Army civilians who work in the digital engineering field. We were able to match four Army civilians with four companies. These civilians will be placed with the companies over a six-month period to gain exposure to digital engineering within an industry environment, as well as garner best business practices.

But 2023 was just the beginning.

FUNCTIONAL AREA SPECIFICS

We can't and won't stop at the basics. The foundations we learned in 2023 give us a level of proficiency and a common language with which we can cross-communicate. But as our line of work is complex and each situation we face is nuanced, we must now use that language and baseline understanding to discuss within and among our acquisition functional areas how to apply digital transformation principles into everything we do, from program management to contracting to test and evaluation and the other functional areas.

We're supporting the workforce in this effort by using our stakeholder network, specifically the Army acquisition functional leaders (AAFLs) and Army acquisition functional advisers (AAFAs). AAFLs and AAFAs serve as experts within a designated functional area and advise me and my office in shaping and developing the AAW within that functional area.

Each AAFL provides guidance on continuous learning, whether it's courses or credentials, specific to their acquisition functional area workforce. Recently, the AAFLs incorporated digital transformation training into that guidance.

For example, the contracting functional area AAFL, Megan Dake, who also serves as deputy assistant secretary of the Army for procurement, recommends that members of the contracting workforce focus 20% of the required 80 continuous learning points (CLPs) on data analytics and literacy and agile acquisition, and lists specific Udemy and DAU courses that can be completed toward this goal.

Acquisition Functional Area	CLP Memo
Contracting	https://asc.army.mil/web/document/recommended-continuous-learning-points-and-credentials-for-the-contracting-functional-area/
Test and Evaluation	https:/asc.army.mil/web/document/recommended-credentials-and-continuous-learning-points-for-the-test-and-Eevaluation-functional-area/
Business-Financial Management	https://asc.army.mil/web/document/recommended-credentials-and-continuous-learning-points-for-the-business-financial-management-acquisition-functional-area/
Business-Cost Estimating	https://asc.army.mil/web/document/recommended-continuous-learning-points-for-the-business-cost-estimating-acquisition-career-field-acf/
Engineering and Technical Management	https://asc.army.mil/web/document/recommended-credentials-and-continuous-learning-points-for-the-engineering-and-technical-management-etm-acquisition-functional-area-afa/
Program Management	https://asc.army.mil/web/document/recommended-continuous-learning-points-for-the-program-management-acquisition-functional-area/
Life Cycle Logistics	https://asc.army.mil/web/document/recommended-continuous-learning-points-and-credentialing-for-the-life-cycle-logistics-career-field/

James Cooke, AAFL for the test and evaluation functional area, recommends that test and evaluation workforce members focus 25% of their required CLPs in emerging technologies like big data and machine learning, as well as such areas as data science and cybersecurity.

I strongly advise every member of our AAW to review your relevant AAFL continuous learning memorandum, available in the DACM Policy Library, especially as we move into this new two-year CLP cycle beginning Oct. 1, 2024. Enter the appropriate functional area in the search bar on the right.

MOREIN'24

You've heard me and other acquisition leaders talk about upskilling, which is continuous learning to attain more relevant and advanced skills through additional education that expands abilities and minimizes skill gaps.

In 2024, we are accelerating the learning pathway with more curated courses that will arm you with essential skills needed to thrive.

Continuous being the key word.

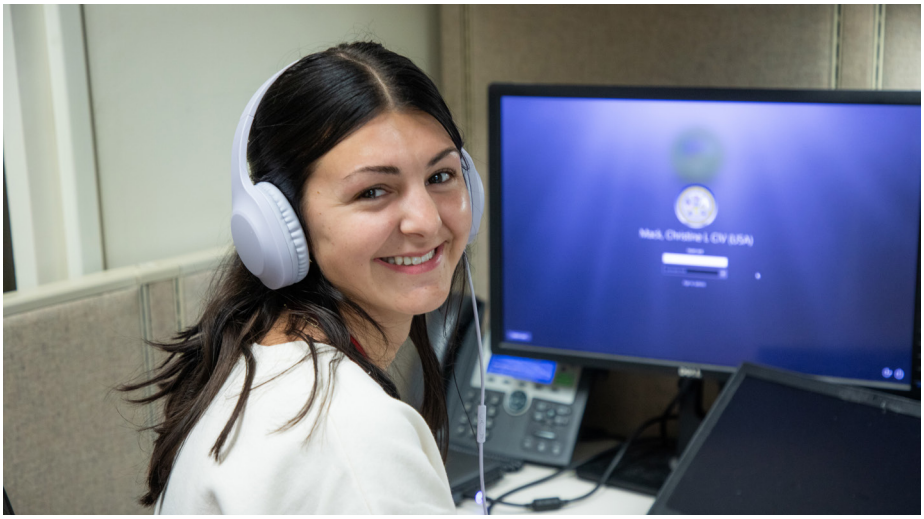
Offerings in 2023 provided that digital transformation baseline; in 2024, we are accelerating the learning pathway with more curated courses that will arm you with essential skills needed to thrive—not just survive—in today's ever-evolving digital landscape.

In March I announced our MOREin'24 campaign, which adds three new courses to the digital transformation pathway in Udemy. We also launched our first-ever Army-specific Digital Foundations credential for those who complete the original three digital foundation courses within Udemy. The credential comes with 18 CLPs and an official certificate issued by me, the Army director of acquisition career management.

You can read more about the MOREin'24 campaign in "Serving the Digital Entrée," Page 131.

CONCLUSION

Our extremely talented AAW knows how to get things done and get them done right. It's my mission to enable each of you in our workforce to persevere and succeed. I will ensure you have access to basic levels of knowledge and critical thinking capabilities to help you be more predictive and ultimately accelerate delivery of capability to the warfighter. I will continue to work with the AAFLs and AAFAs to functionally align our programs so that you are better able to adapt and operate in this emerging environment. We will use any and all tools available to us to deliver timely and relevant information. We will continue to engage directly with you—our workforce—to gauge digital competency growth and to identify gaps. It is our workforce that is at ground zero of our Army's digital transformation efforts. I'm looking forward to continuing this odyssey together.



KEEPING PACE WITH CHANGE

Christine Mack, a trainee with the U.S. Army Corps of Engineers (USACE) Rock Island District, logs in to her computer as part of her training program. She and other members of the AAW will benefit from DACM Office efforts to provide the workforce with skills to thrive in an ever-evolving digital landscape. (Photo by Kelcy Hanson, USACE Rock Island District)

CAREER NAVIGATOR

SERVING THE DIGITAL ENTRÉE

Photo by Nataliia Mysak, Getty Images

The push to equip the Army Acquisition Workforce with digital skills continues with MOREin'24.

by Jacqueline M. Hames

Last fall, the Army Acquisition Workforce (AAW) was introduced to the digital foundations pathway with Udemy—three online courses designed to digitally upskill workforce members in preparation for the digital transformation of the Army. (See "Serving the Digital Soup" in the Fall 2023 issue of Army AL&T.) The Army Director of Acquisition Career Management (DACM) Office spent the last few months improving that pathway. Those three online courses have become a new Digital Foundations credential, which can be accessed through Udemy—and the DACM Office is launching this first-of-its-kind credential with its MOREin'24 campaign.

The campaign signals the DACM Office's continuous commitment to upskilling and digital prowess as the Army prepares to excel in the digital age. Ashley Kestner, communications analyst in the DACM Office, explained that the campaign not only wants to educate the workforce about the availability of the new courses, but also how the workforce can continue to evolve in the overall transformation mindset.

"It all just comes down to fostering that digital-first culture and that, of course, starts with people," Kestner said.

The campaign promotes the new credential, three additional digital upskilling courses debuting in 2024, and educates new acquisition-coded employees about the fiscal year 2024 mandatory objective for the Udemy Digital Foundations learning pathway.

TRAIN UP
Young Bang, principal deputy ASA(ALT), delivers remarks on the Army's digital transformation during a panel at the Interservice/Industry Training, Simulation and Education Conference in Orlando, Florida, Nov. 28, 2023. (Photo by Caroline Hernandez, Program Executive Office for Simulation, Training and Instrumentation Strategic Communications)

THE DIGTIAL MAIN COURSE

Young Bang, principal deputy assistant secretary of the Army for acquisition, logistics and technology (ASA(ALT)), is spearheading the digital transformation mindset for Army acquisition. He initiated the search for a training solution to help upskill the workforce last year and found Udemy.

The MOREin'24 campaign nests under ASA(ALT)'s "accelerate mindset," Kestner explained. "People are at the center of the Army's modernization effort. By investing in acquisition workforce upskilling, we also grow our ability to have advantage over our adversaries," Kestner said. "Getting into that accelerate mindset, we gave you the foundations. But how do we take this a step further to the overall digital transformation of the Army? One area garnering a lot of focus of late is responsible integration of artificial intelligence (AI). Specifically, how can we responsibly use AI to empower our Soldiers with decision advantage—leveraging data quickly and effectively to build scalable and trusted AI capabilities that can be leveraged across programs."

The AAW is a big part of the Army's digital transformation, and "it's imperative that the workforce understand the AI landscape as part of our continuous learning and digital upskilling effort," Kestner said.

All new acquisition-coded personnel assigned to ASA(ALT), the U.S. Army Acquisition Support Center and the program executive offices are required to take the first three prioritized courses in the Digital Foundations learning pathway: the Digital Transformation Masterclass, Agile Samurai Bootcamp and Product Management in AI and Data Science. The Digital Foundations credential comprises those required courses—and is the first of four campaign pillars. The credential was officially launched in March 2024 and signifies a mastery of digital transformation.

The other three pillars of the campaign are the newly recommended Udemy courses for fiscal year 2024 in the Digital Foundations learning pathway:

- **Design Thinking: The Fundamentals** (1.5 hours).
- **Executive Briefing: Data Science and Machine Learning** (2 hours).
- **Introduction to the Cloud** (2 hours).

The new credential is the guiding credential for Army digital transformation, Kestner said. It will allow workforce members to earn a total of 18 continuous learning points (CLPs)—14 for the foundational courses and four more for the credential. If you've completed the courses in fiscal year 2023, your Digital Foundations credential and additional four CLPs will retroactively and automatically populate in the Certification Management System (CMS). An official certificate issued by the DACM Office is yours to download through the CMS tab in CAPPMIS.

"It all just comes down to fostering that digital-first culture and that, of course, starts with people."

MORE ON THE SIDE

While the Digital Foundations credential is open to all acquisition-coded employees, another course exists to target leaders. The DACM Office has partnered with Carnegie Mellon University to offer courses to higher-level officers and senior executives as part of the digital foundations pathway, in response to a fiscal year 2023 congressional mandate for the services to focus on developing a greater awareness of AI.

In response to that mandate, the DACM Office coordinated an in-person, weeklong Data Driven Leadership course for senior civilian and military leaders at Carnegie Mellon University, said Susan Clark, DACM development branch chief. "The course enables progress toward meeting our collective digital transformation goals," she said.

According to the program overview, the course will provide AAW members with a certificate in Data Driven Leadership, covering six key areas: Data management, data science, decision making, emerging technology, change management, and data privacy and security.

The certificate is a 10-module course where students will participate in group exercises to share experiences and discuss how they would apply what they learned during the course to benefit their career and the current work environment. Ultimately, course graduates will be able to assist Army leadership in the development of a robust enterprise data management and data science capability to improve decision-making.

"The course is very popular and receives excellent feedback from attendees—all of our classes for fiscal year 2024 are full with waitlists," Clark said.

FUTURE FOR AI

How will the integration of AI empower our Soldiers with decision-making advantages? (Image by Gerd Altmann, Pixabay)

CONCLUSION

The MOREin'24 campaign also hopes to expand its AI upskilling options during the summer of 2024 and will include the Defense Acquisition University's AI Foundations for the DOD credential in its offerings. This course will help acquisition professionals better understand AI projects. According to the course description, "students will receive a grounding in the topics of AI definitions and technologies, the AI ecosystem and the importance of data and algorithmic ethics." Check the DACM Office's Digital Transformation landing page for updated information later this summer.

The Digital Foundations learning pathway helps the workforce be agile, ready to adapt to the ever-changing digital landscape; versatile, mastering skills crucial for modern warfare; resilient, thriving in an environment of constant innovation and evolution; and will position workforce members as leaders in the digital revolution.

"It's an imperative that we keep pace with their [AAW members] learning, so that we can keep pace with technology, which keeps the Soldier in the field safe and gives them the tools they need to defeat our adversaries and ultimately defend the nation," Kestner said.

For more information, go to ***https://asc.army.mil/web/digital-transformation/#training.***

JACQUELINE M. HAMES is the senior editor with Army AL&T magazine. She holds a B.A. in creative writing from Christopher Newport University. She has more than 15 years of experience writing and editing news and feature articles for publication.

CHRISTOPHER AYOUB

COMMAND/ORGANIZATION: Joint Program Executive Office for Armaments and Ammunition, Program Manager for Towed Artillery Systems

TITLE: Defense Acquisition University Senior Service College Fellow

YEARS OF SERVICE IN WORKFORCE: 13

DAWIA CERTIFICATIONS: Advanced in program management; Practitioner in engineering and technical management

EDUCATION: B.S. in mechanical engineering, Rutgers University

AWARDS: Honorable Order of St. Barbara Award for Artillery (2023); Army Civilian Service Commendation Medal (2019)

GET INVOLVED

The fundamental skills and ideals we acquire in our formative years often serve as the most crucial building blocks for both our personal and professional development. According to Christopher Ayoub, who is currently a fellow in the Defense Acquisition University (DAU) Senior Service College Fellowship program, communication and relationship building are his top two.

"As we progress through our careers, we typically have a greater influence over a larger set of teammates, and with that, a growing number of generations who communicate and build relationships differently," he said. "We must continue to evolve our relationship building and communication modes to be able to connect with every member of the organization. As a leader, connecting with your various stakeholders is critical to your team's success."

Before "starting life as a student again," as he put it, Ayoub concluded a 15-month rotation as the acting deputy program manager (DPM) for the Program Manager for Towed Artillery Systems (PM TAS) and the Ukraine product lead. As DPM, he provided guidance to the functional and product leads responsible for all the towed artillery and artillery survey systems for the Army and U.S. Marine Corps. But as the Ukraine product lead, he said he experienced the greatest professional achievements of his career, leading a high-performing team that was at the forefront of support to Ukraine.

"Being able to provide the Soldier with a sustainable capability that they can rely on is what we are here to do as acquisition professionals. Being able to have a direct impact on what happens on the battlefield is the pinnacle of our craft," said Ayoub, who joined the Army Acquisition Workforce right out of college.

"I was interested in an employment opportunity that was not traditional," he said. "Having interviewed at Picatinny Arsenal [New Jersey] for an engineering role, I knew it was a good fit for what I was looking for in a career, as it would be challenging and interesting every day."

And it has been just that. With a few pivotal roles thereafter, he arrived at his most recent position with PM TAS.

After a few years in the U.S. Army Combat Capabilities Development Command (DEVCOM) Armaments Center, Ayoub was exposed to the PM TAS program management office via a rotational assignment that became a long-term move. "I found that my skill set better aligned with the PM [program management] mission set of managing cost, schedule and performance of programs," he said. "As my career evolved, I have been able to work with our customers directly and build relationships that ultimately led to providing them with the critical capability they seek. These relationships, and the impact that has on the battlefield, lead to a level of job satisfaction that is unmatched."

From there, Ayoub moved to a matrix position within PM TAS as the component acquisition lead for the 105 mm M119A3 howitzer program, a role he said had a significant impact on his career: It was the first time that he served as a team lead and he had to determine what his professional leadership style would be. Then he competed for a core position that subsequently resulted in becoming the M777 India product lead, where he was responsible for the cost, schedule and performance for that program.

Each of these roles prepared him for serving as the acting DPM for PM TAS, within the Joint Program Executive Office for Armaments and Ammunition (JPEO A&A)—a job with a completely new level of management responsibility, overseeing a staff of over 75 core, matrix and contractor personnel.

"I was given a peek behind the front office curtain to see the challenges that the PM and DPM face daily," he said. "This rotation helped me understand why certain decisions are made by the office leaders and gave me a greater appreciation for the criticality of clear and open communication up and down the entire organization."

As acting DPM, Ayoub interfaced daily with the JPEO A&A front office staff, where he briefed senior leaders inside and outside the organization.

"I was able to learn, grow and be exposed to the decision-making process through an alternate lens," he said. "I was further exposed to the mission set the other PMs within the JPEO portfolio had and build numerous relationships that I would not have if not in the DPM role."

Ayoub said this was the first time he supported the entire portfolio and was exposed to the happenings across the JPEO A&A and subordinate organizations, as well as activities related to Ukraine. That led to serving a dual role as the Ukraine product lead, an effort, he said, that has been the most challenging and rewarding of his career. "In each of these roles I was able to learn and be mentored by great acquisition professionals who have helped shape the leader that I am today."

He said he would always recommend taking on challenging developmental assignments, as they tell you a lot about yourself. "These assignments further showcase your strengths, allow you opportunity to grow and develop your skill set, and expose you to an alternate set of stakeholders who provide different perspectives."

In July 2023, Ayoub started the 10-month DAU Senior Service College Fellowship program.

"After just three months, I could see how this program will allow me to broaden my skill set and be a more refined acquisition professional supporting the various Army objectives," he said. "Luckily, there is no opportunity that I have missed out on."

No matter where he is or what he is doing, Ayoub said he is always available to offer advice to junior personnel. "Seeing their success and knowing I may have played a small part in that is an awesome feeling," he said. "My primary message [for them] is to get involved. If you see a gap somewhere, fill it and make it your own. Look to become an expert that others come to for advice. Be willing to take on new opportunities as they will continue to challenge you, allowing you to grow."

Best known by those outside of work for being "the sports guy who is filled with endless amounts of useless sports knowledge," Ayoub said he believes the parallels between his professional life and hobbies are that he takes great pride in what he does, and he "hates to lose."

"With pride, accountability and a strong work ethic, anything can be achieved," he said. "Finding a core group of leaders, peers and subordinates is paramount to long-term career success."

—CHERYL MARINO

"Being able to provide the Soldier with a sustainable capability that they can rely on is what we are here to do as acquisition professionals."

ON THE MOVE

PROGRAM EXECUTIVE OFFICE FOR COMMAND, CONTROL AND COMMUNICATIONS – TACTICAL

1: WHITE PINS ON FIRST STAR

Brig. Gen. Camilla A. White, deputy program executive officer for the Program Executive Office for Command, Control and Communications – Tactical (PEO C3T), ascended to her new rank during a March 1, 2024 promotion ceremony led by **Lt. Gen. Robert M. Collins** at Fort Eisenhower, Georgia. White, the first African American woman to hold the rank of brigadier general within the U.S. Army Acquisition Corps, will transition to her new role as program executive officer for PEO Combat Support and Combat Service Support later this summer.

2: CHANGE OF CHARTER FOR MISSION COMMAND

Col. Shermoan Daiyaan, left, accepted the charter for the Project Manager for Mission Command from **Col. Matthew Paul,** right, during a change of charter ceremony held March 14, 2024, hosted by **Mark Kitz**, middle, program executive officer for PEO C3T, at Aberdeen Proving Ground, Maryland. Paul now serves as project manager for Integrated Personnel and Pay Systems – Army within PEO Enterprise Information Systems. (Photo courtesy of PEO C3T)

3: NEW LEAD FOR TACTICAL RADIOS

Mike Hedley, left, accepted the charter for the Project Manager for Tactical Radios within PEO C3T from **Col. Shermoan Daiyaan**, right, during a March 13, 2024 change of charter ceremony hosted by Program Executive Officer **Mark Kitz**, middle, at Aberdeen Proving Ground. Hedley previously served as deputy project manager for the Project Manager for Mission Command. (Photo courtesy of PEO C3T)

4: POTTS FAMILY HONORED

Maj. Gen. Anthony W. Potts, former program executive officer for PEO C3T, was posthumously honored with the Order of St. Michael Gold Award at the 2024 Army Aviation Mission Solutions Summit on April 24, 2024 in Denver. Potts died in July 2023 in a plane crash in Maryland.

Jennifer Potts, his wife, received the Order of St. Michael Silver Award for her significant and long-lasting contributions to the Army and aviation communities. Her acquisition career includes stints as deputy project manager for Army Data and Analytics Platforms and product support director for the Defensive Cyber Operations (DCO) Project Office, both within PEO Enterprise Information Systems, and as deputy product director in PEO Aviation. Jennifer Potts accepted both awards from **Maj. Gen. Wally Golden** (USA, Ret.), vice president of the Army Aviation Association of America. (Photo by Mike Ullery)

PROGRAM EXECUTIVE OFFICE FOR ENTERPRISE INFORMATION SYSTEMS

5: CHARTER CHANGES AT EIS

The Program Executive Office for Enterprise Information Systems (PEO EIS) hosted a ceremony April 12, 2024, at Fort Detrick, Maryland, to establish the charter for the Operational Medicine Information Systems – Army (OMIS-A) Product Office. Part of PEO EIS' Integrated Personnel and Pay Systems – Army (IPPS-A) portfolio, OMIS-A is led by Product Lead **Steven Reichard**, right, who accepted the OMIS-A charter from **Col.(P) Robert J. Mikesh**, left, then IPPS-A project manager and now deputy program executive officer at PEO EIS. Mikesh relinquished the IPPS-A charter on April 24, 2024, and it was assumed by **Col. Matthew Paul**.

The April 12 event also marked the disestablishment of the charter for the Medical Communications for Combat Casualty Care Product Office. (Photo by Susan McGovern, IPPS-A Strategic Communications)

DIRECTOR OF ACQUISITION CAREER MANAGEMENT

1: DACM RECOGNIZES OAPS

Director of Acquisition Career Management (DACM) Ronald R. Richardson Jr. recognized several organizational acquisition points of contact (OAPs) and acquisition organizations at the annual OAP Lead Summit, held April 17-18 in Orlando, Florida. The OAPs honored were:

Melissa Carter, Program Executive Office (PEO) for Ground Combat Systems.

Linda Faison, PEO Assembled Chemical Weapons Alternatives.

Adam Hall, U.S. Army Corps of Engineers (USACE).

Christine Jolley, PEO Command, Control and Communications – Tactical.

Yancy Mitchell, U.S. Army Space and Missile Defense Command.

Kerri Momberger, U.S. Army Futures Command.

Juan Ortiz, U.S. Army Contracting Command's Mission and Installation Contracting Command.

Susan Povinelli, U.S. Army Materiel Command.

Laura Quick, USACE.

Tobias Smith, PEO Enterprise Information Systems.

The DACM also recognized the following organizations for reaching 100% compliance with the Senior Rater Potential Evaluation:

PEO Combat Support and Combat Service Support.

PEO Ground Combat Systems.

Army Space and Missile Defense Command.

Army Contracting Command, Mission and Installation Contracting Command.

(Photo by Stefanie Pidgeon, DACM Office)

THE CHIEF OF STAFF OF THE ARMY ANNOUNCES THE FOLLOWING OFFICER ASSIGNMENTS:

Brig. Gen. Christine A. Beeler, commanding general, U.S. Army Contracting Command, Redstone Arsenal, Alabama to program executive officer, Program Executive Office (PEO) for Simulation, Training and Instrumentation, Orlando, Florida.

Brig. Gen. John B. Hinson, commanding general, 3rd Expeditionary Sustainment Command, Fort Liberty, North Carolina to commanding general, U.S. Army Sustainment Command, Rock Island, Illinois.

Brig. Gen. David C. Phillips to program executive officer, PEO Aviation, Redstone Arsenal. He most recently served as project manager, Future Long Range Assault Aircraft, PEO Aviation.

Brig. Gen. Camilla A. White, deputy program executive officer, PEO Command, Control and Communications – Tactical (C3T), Aberdeen Proving Ground, Maryland to program executive officer, PEO Combat Support and Combat Service Support, Warren, Michigan.

Maj. Gen. Gavin A. Lawrence, commanding general, Military Surface Deployment and Distribution Command, Scott Air Force Base, Illinois to deputy chief of staff for Logistics and Operations, U.S. Army Materiel Command, Redstone Arsenal.

Maj. Gen. Douglas S. Lowrey, commanding general, Mission and Installation Contracting Command, Joint Base San Antonio, Texas to commanding general, Army Contracting Command, Redstone Arsenal.

Lt. Gen. Robert M. Collins to military deputy/director, Army Acquisition Corps, Office of the Assistant Secretary of the Army for Acquisition, Logistics and Technology (OASA(AL&T)), Washington. He most recently served as deputy for Acquisition and Systems Management, OASA(AL&T).

Lt. Gen. Mark T. Simerly to director, Defense Logistics Agency, Fort Belvoir, Virginia. He most recently served as commanding general, U.S. Army Combined Arms Support Command/Sustainment Center of Excellence and Fort Gregg-Adams, Fort Gregg-Adams, Virginia.

Col. (P) Kevin S. Chaney, project manager, Future Attack Reconnaissance Aircraft, PEO Aviation, Redstone Arsenal to deputy, PEO C3T, Aberdeen Proving Ground.

Col. (P) Robert J. Mikesh Jr., project manager, Integrated Personnel and Pay System – Army, PEO Enterprise Information Systems (EIS), Arlington, Virginia to deputy program executive officer, PEO EIS, Fort Belvoir.

THEN & NOW
1969 & 2024

ATACMS TO PrSM: OUT WITH THE **OLD**, IN WITH THE **NEW**

As the Precision Strike Missile system replaces the aging Army Tactical Missile System, integrating transformational technology will improve firepower, performance and producibility.

by Cheryl Marino

The Army Tactical Missile System (ATACMS) was first used in response to the strategic demands of Operation Desert Storm in 1991, providing a long-range, precision-guided missile system crucial for striking targets deep within enemy territory. At the time, it was an essential part of the Army's arsenal for countering threats posed by Iraqi forces.

By the early 2000s, a shift was evident in the Army's approach toward modernizing missile capabilities. Efforts to provide Soldiers with a more capable and versatile weapon system to meet the challenges of future conflicts led to the development of the Precision Strike Missile (PrSM) in 2020, a next-generation, surface-to-surface missile system built by Lockheed Martin Corp., aimed at eventually replacing the ATACMS and enhancing the Army's precision strike capabilities.

At the forefront of this initiative is the Project Manager for Strategic and Operational Rockets and Missiles within the Program Executive Office for Missiles and Space, working alongside the Long-Range Precision Fires Cross-Functional Team.

"The two major differences between the ATACMs and PrSM today are range and loadout quantities," said Darrell Ames, Army Materiel Command public affairs officer. Loadout refers to the amount of missiles a launch container, or pod, can hold. "The PrSM has doubled the loadout capability per pod and has a significantly greater range capability."

"The two major differences between the ATACMs and PrSM today are range and loadout quantities."

While the ATACMS uses pods that contain a single missile with a maximum range of roughly 300 kilometers (approximately 190 miles), PrSM provides two rounds per launch pod, with maximum ranges exceeding 400 kilometers (nearly 250 miles). Both missile systems are compatible with the Multiple Launch Rocket System M270A2 and High Mobility Artillery Rocket System (HIMARS) M142 family of launchers.

This increase in loadout capacity allows for more munitions to be carried and launched from a single platform without the need for additional pods, or reloads, thereby enhancing the operational flexibility and firepower of the system and enabling more efficient and effective use of the missile system in various combat scenarios. Additionally, PrSM represents a quantum leap in precision strike capabilities. The increased missile range provides greater standoff, which improves crew and launcher survivability.

LEVERAGING ATACMS
A U.S. Army Soldier prepares the crane for loading the ATACMS onto HIMARS in support of Talisman Sabre 2023, held in July at Williamson Airfield in Queensland, Australia. (Photo by Sgt. 1st Class Andrew Dickson, 133rd Mobile Public Affairs Detachment)

IF IT AIN'T BROKE

ATACMS was first deployed during Operation Desert Storm, but its development origins actually date back to the Cold War era (1945-1989), when it was developed to counter the former Soviet Union's arsenal of long-range artillery and missile systems. Though never used by the Army during the Cold War period, its advanced technology made it a highly valuable weapon during Operation Desert Storm, enabling the precision strikes, long-range targeting and significant firepower that were instrumental in the success of the campaign.

Coined "Steel Rain" by Soldiers during Desert Storm, ATACMS replaced the Lance Missile System (1972-1992), a track-mounted system capable of delivering nuclear warheads. It was designed to provide the Army with a versatile weapon system capable of delivering precision strikes against a variety of targets, including enemy air defenses, command and control centers, logistics facilities and troop concentrations. At the time—much like today—there was a significant emphasis on long-range precision strike capabilities to deter aggression and respond effectively in case of conflict.

The need for a system like ATACMS arose from the recognition that traditional artillery systems had limitations in terms of range, accuracy and lethality when it came to striking targets deep within enemy territory. The development of a missile system capable of delivering highly accurate strikes at extended ranges—made possible by advancements in missile technology, guidance systems and propulsion systems—addressed this operational requirement and provided commanders with a new tool for engaging distant and high-value targets.

"The ATACMS missile includes providing the warfighter with an ability to engage

TIME WILL TELL
The ATACMS, which replaced the Lance Missile System, was first deployed during Operation Desert Storm, but its development origins date back to the Cold War. (Photo courtesy of WSMR)

both point and area high-value targets with precision fires out to 300 kilometers," Ames said. "The limitations of ATACMS include range and volume of fire, which are insufficient to meet evolving operational requirements."

Since entering service with the Army, ATACMS has undergone several upgrades and improvements to enhance its capabilities and maintain its relevance on the modern battlefield. It has seen operational use in various conflicts, including the Persian Gulf War, and in Afghanistan, Iraq and Eastern Europe.

THIS IS JUST A TEST

PrSM was produced and delivered on an accelerated timeline for the Army's long-range precision fires priority, but a full transition from ATACMS won't happen overnight.

Rather than scrapping all ATACMS artillery, the older weapons were carefully assessed and tested while the new PrSM system was being developed and integrated, to determine their continued viability and to ensure that existing assets were used effectively. This allowed for a seamless transition, leveraging the strengths of proven technology while embracing the advancements offered by PrSM to enhance military capabilities.

On Dec. 14, 2021, a stockpile reliability test of early ATACMS versions was conducted by Soldiers from the 3rd Battalion, 321st Field Artillery Regiment, 18th Field Artillery Brigade at the White Sands Missile Range (WSMR) in New Mexico.

According to WSMR Public Affairs, during these tests, older missiles are pulled out of inventory and fired. The shots are then evaluated, and if the missiles can still perform to Army specifications, they can inform the Army about the longevity of other missiles in the same stock from the same production run.

"Tests like these make sure that the missile and the launcher communicate, and the software is working properly," said Mia Fitch, test officer with the WSMR Materiel Test Directorate. By identifying weapons that are still in good working order and able to be deployed, the Army saves money on disposal and replacement of the older missiles and improves readiness by certifying that the weapons could still be used in a future operation.

"[These missiles] are already past their prime, so we need to make sure they are still reliable, they still work, and they have the impact pattern and can reach the distances we need so we can still use them," Fitch said. Lockheed Martin engineers who supported the test noted that the missiles represented some of the oldest ATACMS missiles still in the Army's inventory—manufactured over 30 years ago, making them older than most of the Soldiers operating the launcher vehicle.

LAUNCHING A STRIKE

Following a development process completed in a compressed timeframe and marked by rigorous research and testing, PrSM has now taken center stage, poised to revolutionize the battlefield. Engineers, scientists and industry partners collaborated closely to refine concepts and address challenges to achieve seamless performance, reliability and compatibility and to ensure PrSM emerged as a formidable successor to ATACMS.

The transition from ATACMS to PrSM is part of the Army's broader modernization effort aimed at equipping Soldiers with cutting-edge weapon systems to address evolving threats and operational requirements. The PrSM's advanced features align with the Army's future operational concepts and strategic priorities, making it a crucial component of force modernization.

"The limitations of ATACMS include range and volume of fire, which are insufficient to meet evolving operational requirements."

AT FIRST LANCE

Employees for Engineering Research and Consulting Inc., a defense contractor working at Anniston Munitions Center with the Redstone Test Center, prepare a Lance missile for demilitarization. The Lance Missile System was replaced by ATACMS. (Photo by Jennifer Bacchus, Anniston Army Depot)

"PrSM is … designed to neutralize, suppress and destroy critical and time-sensitive area and point targets at ranges greater than 400 kilometers," Ames said. "It is a key enabler for the Army's long-range precision fires modernization priority. It doubles the magazine capacity and extends range by 50 percent," he said, enabling the Army to engage a wider array of targets while operating from safer distances. The system "aims to provide joint force commanders with an iterative, long-range precision strike capability that facilitates point, moving maritime and relocatable target engagements at ranges exceeding 400 kilometers."

With improved range, accuracy and lethality compared with ATACMS, PrSM incorporates advanced technologies to improve its performance against various targets and enemy air defenses.

PrSM leverages advancements in missile technology, guidance systems and propulsion to deliver enhanced performance compared to legacy systems like the ATACMS. These technological advancements contribute to improved operational effectiveness and efficiency on the battlefield. "The benefit to the Soldier is derived by increasing the volume of fire at extended ranges," Ames said.

PrSM's capabilities are enabled by the Northrop Grumman Corp. rocket motor. According to a Northrop Grumman press release, the motor "incorporates the latest high-performance solid propulsion technologies as well as enhanced Soldier safety features." Technological advancements, including the potential application of ramjet technology—a variant of airbreathing jet engine that uses the engine's forward motion to compress incoming air instead of a rotary compressor—could extend the weapon's range to as much as 1,000 kilometers (roughly 620 miles).

As the PrSM enters service, it will gradually replace the ATACMS in the Army's inventory. The phased transition allows for the integration of the new missile system into existing force structures while ensuring continuity of mission capabilities and readiness. Delivery will be composed of four increments.

Each increment represents a step forward in enhancing the missile's capabilities,

NO SECOND LANCES

More than half of the Lance missiles stored at the Anniston Munitions Center have been demilitarized using a process performed by the Redstone Test Center and its contract partner, Engineering Research and Consulting. (Photo by Jennifer Bacchus, Anniston Army Depot)

including range, lethality and technical sophistication, and fulfilling specific objectives. By breaking down the development process this way, the Army can manage risk, optimize resources and ensure a systematic progression toward achieving the desired performance and operational effectiveness for the system.

Ames said initial PrSM prototype flight tests began in 2019, and initial delivery of the first increment of early operational capability missiles began in November 2023, following successful production qualification testing at WSMR.

According to Lockheed Martin, PrSM was designed to achieve the Army's 400 kilometer-plus requirement and was built with open architecture to ensure new capabilities can be incorporated to achieve longer ranges. "PrSM's modular design offers an easy path to future growth," the company stated. That increased capability will provide even greater flexibility to commanders.

In March 2024, Lockheed announced that it had been awarded a fourth production contract from the Army to produce more early operational capacity precision strike missiles. That contract will allow for a significant increase in production capacity to meet Army demand. Additional testing, including an Army-led user test, is planned for later this year.

CONCLUSION

The Army's transition from the Lance Missile System to ATACMS to PrSM represents more than just a shift in weaponry. It embodies the pursuit of innovation and adaptability in the face of evolving threats and marks a pivotal shift in modern warfare capabilities.

The decision to replace the ATACMS with the PrSM reflects the Army's commitment to fielding advanced and capable weapon systems that meet the challenges of modern warfare. The PrSM's performance, extended range, lethality and technological advancements make it a suitable successor to the legacy systems.

With PrSM's advanced long-range precision fires capabilities, the Army stands ready to meet the challenges of tomorrow's battlefield with unmatched effectiveness and precision.

For more information, go to ***https://www.army.mil/peoms.***

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—The Hon. Douglas R. Bush
Army Acquisition Executive and
Assistant Secretary of the Army for Acquisition,
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