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ARMY SUSTAINMENT

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HIP-POCKET GUIDE

The Commander's Role in Audit Readiness

SUSTAINING AND MAINTAINING

THE ARMY'S MODERNIZATION EFFORTS

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ON THE COVER

Sustaining and Maintaining the Army's Modernization Efforts is the theme for the fall 2024 edition of *Army Sustainment Professional Bulletin*. (Cover design by Sarah Lancia)

This medium is approved for the official dissemination of material designed to keep individuals within the Army knowledgeable of current and emerging developments within their areas of expertise for the purpose of enhancing their professional development.

By Order of the Secretary of the Army:

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Mission: *Army Sustainment* is the Department of the Army's official professional bulletin on sustainment. Its mission is to publish timely, authoritative information on Army and Defense sustainment plans, programs, policies, operations, procedures, and doctrine for the benefit of all sustainment personnel. Its purpose is to provide a forum for the exchange of information and expression of original, creative, and innovative thought on sustainment functions.

ARMY SUSTAINMENT

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Is your formation working on new, cutting-edge initiatives or developments that could significantly impact the entire sustainment enterprise? Your work is crucial, and we want to hear from you!

DID YOU KNOW?

Our new “Did You Know?” section is a platform for units and service members to showcase initiatives that enhance formations and operating procedures. By sharing your successes, you're not just highlighting your hard work, but also helping other units avoid duplicating efforts.

Let's make sure no one has to reinvent the wheel.

SUSTAINING & MAINTAINING

THE ARMY'S MODERNIZATION EFFORTS

■ ***By Lt. Gen. Christopher O. Mohan***

In 2018, the Army established Army Futures Command and identified signature modernization priorities to ensure U.S. dominance on the battlefield in the future. We quickly recognized that sustainers needed to embed alongside cross-functional teams (CFTs) and the research and development community to ensure maintenance and sustainment equities were considered early in the process. In the ensuing six years, we also realized the importance of looking at modernization holistically, not just sustainment of the system itself, but the training and infrastructure required to field, project, operate, and maintain them. The Army requires modernized training ranges, ports, airfields, motor pools, and storage facilities for Soldiers to integrate, train on, and operate new systems effectively.

None of this is new. These are foundational, common-sense responsibilities for the Army sustainment enterprise (ASE) supporting Army modernization. But we cannot, and will not, stop there. The Army is in a period of continuous transformation, iteratively adapting and evolving how we fight, equip, organize, and train to outpace adversaries at the speed of war, and Army transformation will not happen without the ASE. In a recently published three-part series in *Military Review* describing the phases of continuous transformation, Gen. James E. Rainey, Army Futures Command Commanding General, notes that the Army needs the ASE "to ensure we get concepts and requirements right, help divest old capabilities, and support fielding and sustainment of new ones."

During a period of unprecedented technological change, the Army is grappling with how to challenge the status quo and speed processes to be more flexible and agile. The sustainment community is making major strides in the use of technology,

artificial intelligence (AI), and data analytics. Army Materiel Command (AMC) continues to partner with the Contested Logistics CFT as they develop next-generation sustainment capabilities and systems focused on autonomous distribution, predictive maintenance, advanced power, and demand reduction. Sustainers are demonstrating innovative solutions to complex problems with systems like the AMC Predictive Analytics Suite, processes like organic industrial base (OIB) forward repair and tele-maintenance, and initiatives like the OIB Modernization Implementation Plan. But we are still behind our civilian counterparts, and we are only scratching the surface of what is in the realm of the possible.

I challenge the ASE, as we consider our role in support of Army modernization, to be the innovators. Be change agents. If technology exists that allows us to be more efficient and equally, or even more, effective, then adopt it. If a process can be automated that will allow leaders to make more informed decisions faster, then change the process. Actively seek opportunities to leverage AI, and double down on data analytics so we can do things faster and better. This is not about technology replacing humans: it is about getting to a point where humans can conduct better analysis and make better-informed decisions.

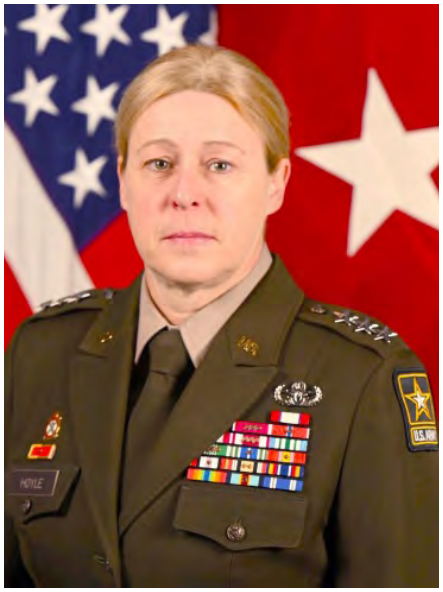
Army modernization will be driven by technology and data, and sustainers must be data literate. We must be able to understand and analyze data sets to provide predictive and precision sustainment at the point and time of need.

Transformation is essential for the Army to counter emerging threats and to operate effectively in diverse, contested environments. Modernization is about ensuring the Army can fight and win our nation's wars in an era of great power competition. Our adversaries are rapidly advancing their technologies, and we must do the same to maintain our competitive edge. Our sustainment capabilities have always been a strategic advantage on the battlefield. We must ensure that advantage remains.

Lt. Gen. Christopher O. Mohan currently serves as the deputy commanding general of U.S. Army Materiel Command. He also serves as the senior commander of Redstone Arsenal, Alabama. He was commissioned into the Army from Appalachian State University in Boone, North Carolina, where he graduated as a Distinguished Military Graduate with a Bachelor of Science degree in criminal justice. His military education includes the Ordnance Officer Basic Course, the Combined Logistics Officer Advanced Course, the Naval College of Command and Staff, and the Army War College. He holds a Master of Science degree in national security and strategic studies from the Naval War College and a Master of Science degree in military strategy from the Army War College.

Army modernization will be driven by technology and data, and sustainers must be data literate.

SUSTAINING
the Army's Continuous Transformation



■ *By Lt. Gen. Heidi Hoyle*

I'll begin this quarter by taking some time to honor and remember Lt. Gen. (Retired) Arthur J. Gregg. As you all likely know, Lt. Gen. Gregg passed away on August 22, 2024. Many of us were blessed to meet and interact with him over the last few years. I want to take a moment and reflect on his amazing career and life.

Lt. Gen. Gregg's story was an important chapter in the history of the sustainment community, the Army, and American history at large. He enlisted in the Army as a private and rose through the ranks until he retired as a lieutenant general. Lt. Gen. Gregg was also a mentor to countless Soldiers in our Army. His service at home and abroad is the gold standard for which we all should strive. He served all over our Army and all over the world, including a tour in Vietnam, where he commanded one of the largest battalions in the Army. He went on to become the first African-American Soldier in U.S. history to reach the rank of lieutenant general, culminating his career as the Deputy Chief of Staff for Logistics, Headquarters, Department of the Army.

His legacy and impact on our Army were exemplified last year when Fort Lee, the home of the Sustainment Center of Excellence, was renamed Fort Gregg-Adams, honoring both Lt. Gen. Gregg and Lt. Col. Charity Adams.

Lt. Gen. Gregg's commitment to excellence lives on in the form of the annually awarded Lieutenant General (Retired) Arthur J. Gregg Sustainment Leadership Award. Awarded annually each March at the Association of the United States Army Global Force Symposium & Exposition in Huntsville, Alabama, it honors the top sustainment leaders in our Army. I encourage leaders at all levels to look across their formations and submit nominations on behalf of their top performers. This year's All Army Activities message has been released with instructions, and we will be accepting nomination packets through October 31, 2024. As with past years, the criteria are as follows:

1. Military - One Army logistics officer, warrant officer, or noncommissioned officer (all components included).
2. Civilian - One Department

of the Army civilian (all components included).

3. Legacy - One retired civilian or veteran who met the criteria set forth in the first two categories during their service.

While it is important to remember and value the past, we are also constantly striving toward the future. As we near the fifth year of what President Biden has called the decisive decade, the Army continues the process of continuous transformation, which is a framework for thinking in time across three concurrently executed time horizons. The first time horizon, transformation in contact, captures the near-term efforts, within 18 to 24 months, to rapidly prototype organizational changes and integrate emerging technology. The second time horizon, deliberate transformation, uses existing Army processes (Total Army Analysis and Planning, Programming, Budgeting, and Execution) to program and build formations in the two-to-seven-year time horizon. The final time horizon is concept-driven transformation, which looks at the period between 2030 and 2040 to identify potential new concepts, formations, talent, doctrine, technology, or other doctrine, organization, training, materiel, leadership and education, personnel, facilities, and policy changes required to compete in the future.

Continuous transformation is a top priority for the Chief of Staff of the Army; Army Materiel Command; Headquarters, Department of the Army, G-4; Combined Arms Support Command; and other senior Army organizations. However, this requires a collective effort from across the Army. I call on leaders at all levels to stay abreast of changes and updates to modernization efforts. The programs and policies are being shaped at the strategic level but the execution, implementation, and feedback on transformation in contact will happen at the tactical level.

As always, it is an honor to serve alongside you. Thank you so much for all the work you do.

Be all you can be.

This we'll defend.

Lt. Gen. Heidi J. Hoyle currently serves as Headquarters, Department of the Army, Deputy Chief of Staff, G-4, and oversees policies and procedures used by Army logisticians. A graduate of the U.S. Military Academy, she has a Master of Science degree in systems engineering from the University of Virginia and a Master of Science degree in national resource strategy from the National Defense University. She is a graduate of the Chemical Officer Basic Course, Combined Logistics Officer Advanced Course, United States Army Command and General Staff College, and the Eisenhower School of National Security and Resource Strategy.

Lt. Gen. Gregg's story was an important chapter in the history of the sustainment community, the Army, and American history at large.

HOLISTIC Fleet Management

Prioritizing Proactive Metrics for Enhancing Materiel Availability

■ *By the Honorable Christopher Lowman*

In April, the DoD took a significant step forward in sustaining the joint force with the release of DoD Instruction (DoDI) 3110.05, Sustainment Health Metrics in Support of Materiel Availability. I want to ensure that our sustainment communities are fully aware of and tracking this pivotal update. This instruction evolves our strategic frameworks for measuring sustainment performance throughout the lifecycle of our equipment by establishing materiel availability (Am), operational availability (Ao), and the newly introduced cost per day of availability (C/DA) as the superordinate measurements of performance.

1. Am: Provides a macro perspective of the total active inventory, allowing transparency into the effectiveness of the entire sustainment enterprise and extending beyond mere presence to operational readiness.
2. Ao: Delivers a micro perspective, reflecting the readiness of primary mission active inventory systems within operational units, thus offering a clear view of front-line serviceability.
3. C/DA: Ties operational effectiveness to cost, offering a crucial metric for identifying and addressing cost inefficiencies within the fleet.

These metrics augment the traditional readiness measurements to enable a more proactive and predictive management of our fleet's serviceability. They allow the DoD to measure and assess the effectiveness and efficiency of the DoD sustainment enterprise; Am and Ao measure effectiveness, while C/DA measures efficiency. Together the metrics help isolate strategic sustainment challenges and inform resource allocation decisions.

Enabling Holistic Fleet Management Strategy

The department has long inserted sustainment requirements into the Joint Capabilities Integration and Development System process. These sustainment key performance parameters ensure that original equipment manufacturers adhere to specified thresholds of availability, reliability, and cost requirements throughout development phases and during operational test and evaluation.

However, after deployment, our Services often default to using conventional readiness metrics. These metrics predominantly offer a snapshot of a unit's ability to execute its mission. Based on the availability and serviceability of personnel and equipment, these metrics, albeit comprehensive, are fundamentally

retrospective. This reactive approach is predicated on identifying problems at emergence and responding to failure or near-failure.

To transcend this, we have evolved our strategic frameworks to be proactive and offer a holistic approach to fleet management. This strategy enables the following improvements:

- Surveillance of fleet equipment by sustainers at all echelons and use of data-driven decisions to implement mitigations within their control.
- Precise identification of assets that minimally contribute to readiness through low availability, thus influencing strategic decisions regarding resource distribution and maintenance scheduling.
- Operational and strategic-level understanding of sustainment resource consumption and the ability to implement preemptive solutions.

Institutionalizing these measures enables a comprehensive understanding of fleet performance over time. This understanding fosters better resource allocation, maintenance scheduling, and overall operational readiness. This enables sustainers to identify the key availability degraders across the fleet and to implement targeted actions to improve the performance of our sustainment enterprise, including depot maintenance, transportation, storage, and processing for the equipment fleets regardless of their location.

This pivot toward a health-centric model complements rather than replaces traditional readiness. Integrating Am and Ao into the sustainment business area allows us to measure fleet performance based on expected levels of performance, to enhance root cause analyses, and to inform resource allocation decisions. This transformation enables sustainers in preempting issues through data-driven decision-making processes. By anticipating issues, we foster an environment where resource allocation is strategic, downtime is reduced, and operational readiness is increased.

To illustrate this concept, consider the implementation of these metrics within a fleet management scenario. Imagine a key weapon system fleet experiencing varied availability rates across different units.

With the new metrics — Am, Ao, and C/DA — fleet managers can identify trends and patterns that indicate potential sustainment issues before they result in significant downtime. For instance, they can isolate a maintainer capacity issue at the depot maintenance facility that is increasing the depot turnaround time and causing assets to defer their planned maintenance. Or, if C/DA shows an increasing cost for a particular weapon system, the key degrader can be identified, and targeted maintenance can be scheduled proactively to address the root cause before it affects operational availability. This proactive approach keeps more assets mission ready while optimizing maintenance resources and reducing overall costs.

The updated DoDI 3110.05 is not just an administrative update; it is a strategic overhaul aimed at enhancing how we prioritize resources and manage our equipment fleets more effectively. By embracing a more forward-looking, predictive model, the sustainment community is primed to move beyond traditional readiness metrics. The integration of these measures will revolutionize sustainment decision-making, ensuring that holistic management of the fleet is transparent, visible, predictable, and ready to deliver decisive combat power to the joint force.

Today, we champion the marriage of engineered performance expectations with the realities of the sustainment lifecycle. New metrics — Am, Ao, and C/DA — facilitate a nuanced understanding of fleet performance and guide resource allocation and strategic sustainment initiatives. This alignment deepens our comprehension of fleet performance across time and allows for predictive maintenance at echelon.

The Honorable Christopher Lowman is the Assistant Secretary of Defense for Sustainment. He is the principal staff assistant and advisor to the Under Secretary of Defense for Acquisition & Sustainment, the Deputy Secretary of Defense, and the Secretary of Defense on DoD logistics, materiel readiness, and product support. He oversees the Defense Logistics Agency and Defense Microelectronics Activity, and he is the principal logistics official within senior DoD management. He enlisted as a U.S. Marine in 1984 and entered the Army Civil Service as an Army maintenance management intern in 1989. He holds a Master of Science degree from the National War College and a Master of Business Administration degree from Monmouth University.

DID YOU KNOW?

Think about the last time your command needed mobile power in the field. This probably required the servicing, maintenance, dispatching, and recovery of an Advanced Medium Mobile Power Source (AMMPS) generator. The AMMPS generator in tow behind the Family of Medium Tactical Vehicles (FMTVs) provided the unit with power for everything from tactical operations centers (TOCs) to radio battery charging stations and life-support systems.

Over time, both the AMMPS generator and the FMTV require additional maintenance due to regular operational use and the additional load burden of the pintle-mounted rolling stock. But what if there were a way to provide safe, reliable, advanced power for unit operations while reducing the demand of the tow-behind generator?

Two of the centers subordinate to the U.S. Army Futures Command's (AFC's) Combat Capabilities

STAMP

Advanced Power Distribution as a Force Multiplier

By Chief Warrant Officer 3 Sean McClenachan, Samuel Gwinn, and Joseph McFillin

Development Command (DEVCOM), namely, the Ground Vehicle Systems Center (GVSC) and the Command, Control, Communications, Computers, Cyber, Intelligence, Surveillance, and Reconnaissance (C5ISR) Center, have demonstrated advanced power through a joint capability technology demonstration (JCTD) called Secure Tactical Advanced Mobile Power, or STAMP. The STAMP JCTD showcased a highly mobile microgrid using a variant of FMTVs called the high-power variant (HPVFMTV), capable of exporting significantly more power than a single tow-behind generator. When employed in microgrid mode, two connected STAMP HPVFMTVs can produce roughly the power consumption of a maneuver division TOC by harnessing power directly from the powertrain of the FMTVs. The HPVFMTV microgrid requires no additional batteries, no energy storage capacitors, and no tow-behind generators, yet can replicate the power supply production of up to eight AMMPS generators.

The DEVCOM and Army sustainment teams involved in developing the STAMP capability and vehicle microgrid technologies proved the ability to provide power to the warfighter during multiple events. In August 2023, during the STAMP JCTD operational demonstration, Soldiers from the 11th Air Defense Artillery Brigade, Fort Bliss, Texas, provided power to both ground-based loads and simulated bed-based loads. Following four days of new equipment training, the unit demonstrated the flexibility and mobility of vehicle-based generation. "The JCTD demonstrated Soldiers could stop the vehicles, form a two-vehicle microgrid in roughly two-

and-a-half minutes, then pack up the system and depart in less than 60 seconds," stated Dean McGrew, the DEVCOM GVSC Powertrain Electrification branch chief, whose team supported the JCTD with vehicle systems integration and power systems development.

Following the STAMP JCTD operational demonstration, the STAMP HPVFMTV system participated in additional experimentation during AFC's capstone event, Project Convergence Capstone 4 (PC C4), both at Camp Pendelton and the National Training Center (NTC). During PC C4, the vehicles provided operational power to multiple units in disbursed locations. Supported elements benefitted from the ability to rapidly reconfigure a tactical microgrid from two co-located STAMP HPVFMTVs or dispersed into two systems. The STAMP HPVFMTV vehicle microgrids provided power to several static displays and activities in two footprints about a half mile apart.

During experimentation at the NTC phase, the split STAMP HPVFMTV system simultaneously supported the TOC footprint of the 101st Brigade Support Battalion, 1st Infantry Division, and a Canadian Forces command post roughly a mile away. The STAMP HPVFMTV team recorded the ability to provide a foreign partner with advanced power distribution as a first for this system, despite some challenges. During pre-execution inspections, DEVCOM engineers identified and quickly resolved physical cabling mismatches between the two elements, enabling coalition power integration.

Advanced power distribution supports operational fuel savings through maximization of load sharing among power sources. Although a single vehicle alone does not reduce fuel consumption compared to a single generator, the advanced power distribution technology behind STAMP allows it to replace multiple standalone generators, consolidate demand, and reduce reliance on Class III (fuel) during operations. A single generator for a single load results in generator underuse and in the passage of unburned fuel to the exhaust system, or wet stacking conditions. The STAMP HPVFMTV leverages the advanced power distribution techniques used by microgrids to consolidate loads and increase fuel efficiency overall.

The experimentation at PC C4 proved these concepts, with data showing a nearly 50% reduction in fuel usage using the STAMP HPVFMTV in both standalone and microgrid modes, compared to between three and six underused standalone generator sets employed by the units. Tactical units integrating vehicle power sources into mission planning will realize higher fuel savings when compared to using tow-behind generators alone, especially where mobility plays a significant factor in mission success.

STAMP and the vehicle microgrid capabilities work by harnessing energy from the FMTV powertrain and distributing it through a universal power gateway (UPG) to the load that requires power. To harness this energy, technicians modify the transmission, which is currently the drop-in standard on the FMTV, on mine-resistant ambush-protected vehicles and on Stryker vehicles, with a generator integrated in the bell housing unit. The transmission inline generator creates variable voltage and variable frequency alternating current (AC) power that is internally conditioned to distribute direct current (DC) power from the vehicle's power distribution unit (PDU) to the DC microgrid or directly to the external UPG. STAMP's advanced power distribution systems, the UPG, and the vehicle PDU, allow units using tactical microgrid technology to employ their organic power generation assets more efficiently.

The UPG serves as a bi-directional power converter that bridges DC to AC, providing both DC-to-AC and AC-to-DC conversion. Through the UPG, DC power can be used to power AC external loads that comply with the Tactical Microgrid Standard (TMS; MIL-STD-3071), or legacy AMMPS PDUs and Power Distribution Illumination System Electrical equipment. This technology allows the STAMP HPVFMTV to provide power to an external power load, such as a TOC or life-support equipment, at the point of need.

A driver of STAMP and vehicle microgrid technology is adherent to the vendor-agnostic TMS, which was published in January 2023. TMS specifies how power

sources, distribution devices, loads, converters, and storage devices communicate with one another and how control protocols are established within a microgrid. At the most basic level, TMS enables plug-and-play microgrids to seamlessly integrate power generation sources, energy storage systems, feeder systems, distribution systems, control systems, loads, and power converters into a coordinated, resilient power network. This microgrid can be used in any application where there is a demand for mobile power.

The TMS also allows the microgrid operator to interface with the microgrid for health, status, and control requests via either a standalone dashboard or an application programming interface to a command-and-control information system. The TMS dashboard, developed by the DEVCOM C5ISR Center for the STAMP JCTD, gives the operator information, warnings, alarms, and system information from fuel levels to power usage. It also provides a means to control the microgrid and enables automated efficiency of multiple power sources. The TMS intelligent microgrid control supports reduced fuel consumption by automatically starting and stopping external power sources to adapt to ever-changing operational needs and by optimizing generator output for efficient fuel consumption.

The future of the STAMP HPVFMTV system, and of other highly mobile power generation and distribution technologies, relies on the continued experimentation, capability development, and ultimately, fielding of the UPG and other TMS-compliant equipment, where the need is the greatest. "Our power foundation for the future fight is spelled U-P-G," said Michael Gonzalez, the branch chief of the DEVCOM C5ISR Center Expeditionary Power and Environmental Control Branch. Experimentation with the current STAMP HPVFMTV system will inform the development and planned transition to the Vehicle Integrated Power Kit, which will incorporate not only the technology to power external loads, but also advanced anti-idle technology, similar to auxiliary power in passenger vehicles.

Experimental data has already proved that consolidating loads and generators into smart microgrids will drastically reduce Class III consumption and generator maintenance hours. Future experimentation with advanced power systems will include vehicle-centric on-the-move power and anti-idle technology in operations at-the-halt. These technologies will eventually allow the commander to continue directing a dynamic fight from a mobile tactical command post without stopping to set up and maintain a tow-behind generator.

Additionally, as the Army reduces the presence of large, forward operating bases, which are easily targetable in conflict, the need for reliable power will remain a constant. Forward arming and refueling points, air defense sites, and forward logistics bases will still need TMS-enabled intelligent power systems provided by the STAMP HPVFMTV, UPG technology, and TMS-compliant emerging load capabilities. Leveraging advanced power distribution systems will reduce Class III consumption in contested logistics arenas, build decision space for commanders, and serve as a force multiplier during combined and joint operations.

The authors wish to acknowledge the contributions of Marnie Bailey, Frank Bohn, Dean McGrew, Michael Gonzalez, and the entire STAMP team to this article.

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Samuel Gwinn is an electrical engineer with the DEVCOM C5ISR Center. He holds a Bachelor of Science degree in electrical engineering from Clarkson University.

Joseph McFillin is an electrical engineer for the Power Division of the DEVCOM C5ISR Center. He holds a Master of Science degree in electrical and computer engineering from the University of Delaware. He served in the III Marine Expeditionary Force in the Indo-Pacific.

Featured Photo
Staff Sgt. Enock Kirui and Sgt. Travis Higgs, both assigned to the 101st Brigade Support Battalion, 1st Infantry Division, work with Canadian Army Cpl. Warren Loo to set up a Secure Tactical Advanced Mobile Power system during Project Convergence - Capstone 4 in Fort Irwin, California, March 18, 2024. (Photo by Spc. Walker Pino)

BASES CLUSTERS

Displace, Disperse, Defend to Survive

By Capt. Jonathan P. Davis

Background and History

The 325th Brigade Support Battalion (BSB) operates in the U.S. Indo-Pacific Command region and supports an infantry brigade combat team through a variety of island-hopping campaigns, often in a jungle environment. During the battalion's train-up for Joint Pacific Multinational Readiness Center (JPMRC) 24-01, the 325th BSB identified an operational requirement to develop and exercise base cluster operations in response to several rising threats from near-peer competitors.

> "A major advantage to conducting the typical BSA base defense is that it can easily self-secure and reinforce, whereas conducting base clusters divides the battalion's base defense assets in two while also maintaining operations."

The major challenge in exploring base cluster operations was that much of the doctrinal guidance offered little instruction on how base cluster operations should work in a brigade support area (BSA). Army Training Publication 3-37.10, Base Camps, provides information about larger long-term contingency operating bases rather than smaller tactical, short-term bases. During the rotation to the Leader Training Program at Fort Johnson in July 2023, members of the battalion received intelligence-oriented threat briefings that catalyzed research into increasing BSA survivability from existential threats, such as theater ballistic missiles and enemy-detection capabilities. The resulting concept produced during mission analysis resembled a decentralized multinodal disbursed support technique using three geographically separated nodes that contained redundant capabilities to support the operation. This was a viable option at the time, but later its shortcomings became apparent (defensibility, timeliness, and reactivity).

The battalion continued to refine the concept into a two-cluster design during the brigade's collective field training exercise. It would not be until the brigade's validation exercise, JPMRC 24-01, that the battalion would have the opportunity to exercise the base cluster plan. The battalion used a phased approach to allow the companies to quickly address shortcomings and operational oversights while adapting to the new BSA construct. The battalion initially established the standard base defense while waiting for operations to begin for JPMRC. During the first jump to the next BSA location, the battalion occupied an easily defendable area to test systems and processes. The area was large enough and compartmentalized enough that the 325th BSB's headquarters and headquarters company (HHC) and distribution company (A Company) could occupy one area, and the field maintenance company (B Company) and the medical company (C Company) could occupy the other area while remaining nearby. It was only then, on the final jump, that the BSB established two geographically separate base clusters. The BSB operated as two base clusters for approximately four days until it redeployed the BSA to the cantonment area. During those four days, the BSB continued to adjust the plan by disbursing sustainment assets (fuel, water, distribution, recovery, etc.) between both base clusters to increase operational survivability and further enhance continuance of operations.

The Final Base Cluster Design

The final design used in JPMRC 24-01 was simple and functional and maintained the ability to self-secure and promote efficient sustainment operations. The overall design of the base clusters was that a majority of the battalion administration and logistics operations center (ALOC) would occupy Base Cluster II, along with the field maintenance company and the brigade medical support company. Support operations (SPO) staff occupied Base Cluster I with the distribution company, the remainder of HHC, and a consolidated field trains command post (FTCP). Senior battalion leadership and additional operational enablers occupied one or both of the other base clusters for the duration of JPMRC 24-01. These enablers included a military police platoon (confinement), an explosive ordnance disposal section, a mortuary affairs team, the brigade ALOC, the brigade plans section, and a forward resuscitative and surgical detachment.

Base Cluster Placement

Placement of the base clusters requires a methodical and well-rehearsed plan to ensure success. Poor placement or poor site selection will cause one or the other clusters to be destroyed or severely isolated. During the military decision-making process (MDMP), the battalion staff decided on placement criteria that would meet the commander's intent.

There are six criteria for placing base clusters:

- The base clusters are far enough away from each other to reduce the presence of the BSA to enemy sensory equipment.
- The base clusters are close enough to each other to mutually support each other with security and sustainment.
- The base clusters are placed on opposing sides of a minor terrain feature, such as a spur, a hill, or a slope. This creates a natural defilade between the base clusters and reduces the

possibility of fratricide from direct-fire weapon systems from opposing base clusters. If a terrain feature is not available, leaders at all levels must ensure all sectors of fire are first established using requisite fire control measures, so as to note fire into the opposing base cluster. This inadvertently creates a dead zone in which base clusters need to use precision to destroy enemy forces who gain entry to this area. In JPMRC 24-01, this was resolved using increased presence patrols, anti-personnel mines along avenues of approach, designated marksmen, strategically placed target reference points (TRPs), and early warning detection systems borrowed from the military police.

- The base clusters are interconnected using an established road system, giving immediate access to the nearest main supply route or alternate supply route and between each other (if possible). In JPMRC 24-01, creating new roads was not timely and could have delayed sustainment for the rest of the brigade.
- The fifth criterion involves the geographic placement of each base cluster in relation to the strength of the BSA location. The BSA location should offer a natural or manmade strong point.
- The base cluster is placed in a way that enables the concealment of the BSA. As discovered during the train-up for JPMRC, the battalion did not have enough camouflage netting to conceal all tactical equipment. It became necessary to push all equipment into existing vegetation, which can be a challenge in Hawaii. Adequate vegetation resembles tightly woven mangrove forests and large swaths of open prairies. Enemy small unmanned aerial surveillance drones and other fixed-wing capabilities were frequently used to direct indirect fires and various chemical, biological, radiological, or nuclear attacks on the BSA when ground infiltration failed. This also prompted the battalion to downsize mission command nodes to further reduce detection. It became impossible to tell which tent or high-back Humvee was the tactical action center (TAC) or tactical operations center (TOC) by the end of JPMRC 24-01.

Base Cluster Security

A major advantage to conducting the typical BSA base defense is that it can easily self-secure and reinforce, whereas conducting base clusters divides the battalion's base defense assets in two while also maintaining operations. To reduce the overall burden on personnel and equipment, the battalion staff explored other methods to self-secure while maintaining situational awareness and responding to imminent threats.

The first element they explored used a geometric defensive pattern similar to patrol bases. Two that were explored during the MDMP were the cigar and triangular methods. During JPMRC 24-01, the battalion used a triangular defense that consisted of three strong points interconnected by concertina wire and individual fighting positions. Executing this perimeter defense enabled the ease of flexing reinforcements and ammunition to the direction of attack from enemy forces while maintaining situational awareness. The BSA incorporated concertina wire obstacles inside and outside the perimeter, which further delayed perimeter breaches.

The most challenging element of the defense was the use of two base defense operations centers (BDOCs). HHC's command post (CP) served as the BDOC for Base Cluster I while B Company's CP served as the BDOC for Base Cluster II. B Company initially had a steep learning curve because they had not trained in BDOC operations beforehand. Each BDOC could heighten a threat posture for the entire BSA based on intelligence input. However, the battalion TOC decided when to release both base clusters from that posture once the threat had passed. Each base cluster developed and incorporated the use of TRPs, which were processed by the S-2 and approved by the brigade fires cell. Battle staff successfully used TRPs to destroy an enemy motorized infantry platoon that had attempted to overrun one of the base clusters in the later stages of JPMRC 24-01.

The battalion had also planned to use a listening post and/or an observation post but could not do so because of manning shortfalls and operational priorities. The battalion, however, made major gains in situational awareness by using local surveillance and reconnaissance (S&R) patrols early in the exercise. The BSA sent patrols out around each base cluster to detect signs of life and enemy weapons caches. Each BDOC chose random times and search methods, such as box and clover leaf, to keep the enemy forces from effectively staging inside the combined security area. Both BDOCs deconflicted S&R patrols with the battalion TOC to mitigate fratricide. Each base cluster also maintained primary and alternate entry control points at two of their three apexes.

The final and most important of the security considerations was the early establishment of brigade fires and other effects. These capabilities were often tied up in supporting competing brigade operations, placing the BSA lower on the priority list for support. Available maneuver, fires, and other effects included adjacent quick reaction forces, indirect fires, air weapons teams, and armed and/or surveillance drones. The BSA made it a habit of requesting any and all available capabilities for each enemy engagement. Some were approved, while others were not. In hindsight, if pre-coordination had been made for crucial operations such as a BSA jump, the battalion may have alleviated much of the consternation felt during those operations.

Base Cluster Mission Command Structure

Maximizing existing mission command systems and the redundancy of capability shared between clusters is crucial for effective base cluster operations and security. In the design phase of the base clusters, battalion staff task-organized mission command capabilities across both clusters. Effective use of mission command systems allowed for expedited command and control and enabled the battalion to rapidly employ its forces, mitigate threats, and push information to the collective, keeping Soldiers down at the lowest level informed. In several instances, battalion leadership overheard Soldiers and junior leaders discussing future operations among themselves. This was due to the incorruptible method of transmitting messages in plain text. Information integrity can be lost during voice communications due to a myriad of reasons such as foul weather, faulty equipment, or an individual's syntax.

Due to the threat of enemy detection and existential threats, the battalion decided to employ an admin net using digital means to manage 90% of information and data being transmitted on a daily basis. Systems used included the satellite-based Mobile User Objective System, the Windows Team Awareness Kit, the Android Team Awareness Kit, the Joint Battle Command-Platform, and government cellular phones paired with Wi-Fi using a virtual private network.

Electromagnetic signatures produced by frequency modulation (FM), or very high frequency systems, formed hazardous environments for the BSA due to its inability to displace in a timely manner and to avoid launched and dropped munitions. Communicating in data-based systems was done out of necessity. The goal of the BSA was to not only be hidden from physical view but from state-of-the-art electromagnetic detection systems, which could be used to direct all manner of fires.

When could units use FM comms? There were two instances when this could be done. One instance was when units were conducting ground movements in which a mounted element would continuously move from location to location, albeit once at a release point, and would need to reduce their usage to avoid giving away adjacent units' locations. The other instance was when the BSA was under attack.

The BSA adopted the mantra "silence, violence, silence" to necessitate timely communication with perimeter security, entry control points, BDOCs, and subordinate CPs. Once an action was complete, radios fell silent and resumed using data-based systems. Task organization and placement of units played an important role in effective mission command. The SPO tent, or SPO TOC as it became known, served as the senior mission lead for Base Cluster I. The SPO TOC was collocated with A Company, the logistics response force, and the

combined FTCP, which possessed much of the sustainment equipment needed to quickly respond to emerging requirements.

On the other hand, Base Cluster II consisted of the battalion TOC/TAC, which provided senior mission command for that base cluster, serving as the interlink between battalion and brigade. B Company, C Company, and the other enablers were positioned in Base Cluster II to drive all decision-making processes on future plans, dispersion, and threat awareness reporting. Maintaining situational awareness on downed equipment at the maintenance collection point (MCP) and dead/wounded personnel at the Role 2 within Base Cluster II drove decision-making processes on when and how to jump the BSA.

In BSA's grand design, base clusters operated synchronously to push and pull sustainment to the warfighter. Combat logistics patrols (CLPs) would originate at Base Cluster I with validation by the SPO TOC and tasked by the battalion TOC (S-3). CLPs would move to a rally point near Base Cluster II, pick up additional capabilities (field litter ambulance, wrecker, logistics response force) if required, and depart to conduct their mission. At the conclusion of their mission, CLPs would briefly halt at Base Cluster II, release any damaged equipment to the MCP, and turn over casualties to Role 2 care. CLPs would then return to Base Cluster I to reset for the next mission.

One Pitfall and Lessons Learned

When developing base clusters from their initial inception to their eventual implementation during JPMRC 24-01, planners overlooked one glaring problem early on: the inability to maintain base clusters over extended periods of time. During the MDMP, staff had mitigated many of the existential threats. They had concealed the BSA from ground and aerial detection. Staff had also achieved the electromagnetic signature of a few households' worth of typical cell phone usage. The BSA could defend itself from enemy attacks through well-established defenses and well-rehearsed battle drills. The problem surfaced only after the battalion had established base clusters following the third BSA jump. The BSA had also jumped into base clusters during the brigade's defense, compounding the issue. With manpower dispersed to two locations, defenders now had four additional perimeters to secure while continuing to provide sustainment to the brigade prior to and during its second offensive. Soldiers hit the limit of their individual stamina fending off consecutive waves of attacks at all hours across multiple days. To combat this, especially in large-scale combat operations, it is necessary to know when to flex between the typical base defense and base clusters when conditions are right. Doing this gives Soldiers and equipment the necessary respite to reset, refit, and rest during natural lulls in combat.

With regard to decisive action operations, base clusters could almost be seen as a technique used by the BSB during offensive operations to improve survivability and to keep the brigade base of support hidden from the enemy. Naturally, there are times in decisive action where friendly forces will transition from offense to defense and back to offense again. This offers the opportunity to transition to a base defense in which the battalion is collocated, enabling it to reconsolidate and reorganize in preparation for the next offensive.

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Mission Command Principles

Operation Phantom Fury's Effective Utilization

■ *Capt. John Morrissey*

The Iraqi insurgency in Fallujah was on its back foot after five straight days of fighting. The Americans' concentration of combat power to penetrate presumably secure lines had resulted in a constant retrograde, leaving the enemy little time to rest or recoup. However, now, in the late afternoon of November 11, 2004, there was a lull in the conflict, a pause that lasted long enough for the insurgents to become uneasy. As tensions rose and discipline began to crack, a loud noise, a song, pierced the air. It was the Marines' Hymn, blasted over an American loudspeaker. "Our flag's unfurled to every breeze, From dawn to setting sun; We have fought in ev'ry clime and place, Where we could take a gun." The hymn cracked the insurgents' resolve. They began firing wildly into the night, retreating farther, despite no push made by U.S. forces.

Maj. Gen. Richard Natonski had broken the insurgents. Natonski led the I Marine Expeditionary Force (I MEF) during Operation Phantom Fury (OPF), also called the Second Battle of Fallujah. It was his leadership and ability in the mission command principles that led to one of the most decisive victories of the Iraq War. Natonski's demonstration of competence, clarity of commander's intent, development of shared understanding, and building of mutual trust serve as strong examples for military leaders looking to follow in his footsteps.

Background

It had been almost exactly a year since the U.S. invasion of Iraq in 2003. The collapse of the Iraqi government, Saddam Hussein's capture, and the sporadic violence between U.S. military personnel and Iraqi civilians had meant a turbulent year for U.S.-Iraqi relations. It would not culminate, however, until March 31, 2004, when insurgent forces ambushed a convoy of American private military contractors. After a volley of small arms fire, all four Blackwater contractors were killed, and a mob rushed their vehicles.

By the morning of April 1, images of the contractors' burned and mutilated bodies that hung limply from the supports of what would be dubbed Blackwater Bridge were being broadcast all over the world. Jeremy Scahill, an author who chronicled the history of the Blackwater private military company, would describe the 2004 Blackwater killings as the Iraq War's Mogadishu moment, in reference to the 1993 Battle of Mogadishu made famous by the book and film *Black Hawk Down*.

One month before the events on Blackwater Bridge, the 82nd Airborne Division had transferred responsibility for the Iraqi city of Fallujah to I MEF. With American blood now spilled, I MEF Marines were ready for their first push into Fallujah. The U.S. would launch Operation Vigilant Resolve (OVR), a spirited but short and ultimately ineffectual attempt at taking Fallujah from the insurgents who killed the American contractors. After less than a month of fighting, U.S. forces withdrew, having brokered an agreement with the newly established and CIA-backed Fallujah Brigade, an Iraqi force that was supposed to keep insurgents out of the city.

By understanding and learning from the past, even one's personal history, leaders can begin to contextualize their present situation and provide a clear commander's intent.

Despite this agreement, extremism flourished in Fallujah, and by the fall of 2004, U.S. commanders knew they needed to definitively take the city to better position themselves to shape the upcoming 2005 Iraqi democratic election, the first one since Hussein had been ousted from power. U.S. forces conceived OPF to violently and decisively rip Fallujah from the control of extremist and terrorist organizations.

Before OVR, then-Brig. Gen. Natonski led Task Force Tarawa during the march up to Baghdad in 2003. Natonski, a 30-year veteran of the Marine Corps at that point, had served in a variety of positions that primed him to lead I MEF. Those positions covered all three domains of learning: operational as a ground force commander, institutional at the NATO War College in Rome, and personal as a dedicated student of Marine Corps history.

Competence

Natonski demonstrated consistent competence throughout both the planning process and execution of OPF. Learning from previous experiences and meticulous study of past conflicts, Natonski leveraged this knowledge to prepare his formations for the assault. The newly frocked major general arrived at Camp Fallujah in the summer of 2004 to take command of I MEF. While OPF had not yet been officially ordered, the Fallujah Brigade's inability as a security force had already led to a rise in insurgency forces in the city. Higher headquarters needed a leader with experience fighting (and winning) against insurgents. During Natonski's march up to Baghdad in 2003, he had engaged a large insurgency force in the city of Nasiriyah. In his book, *Operation Phantom Fury: The Assault and Capture of Fallujah*, Dick Camp writes of Natonski's Nasiriyah

assault: "In the ensuing four-day battle, Natonski's Marines seized the city and its important bridges, allowing the 1st Marine Division to continue the attack to the capital." This experience primed him on what to expect on a second attempt to take an insurgency-controlled city.

Natonski also studied OVR, what worked, what did not work, and what needed improvement. Richard Lowry writes in his book *New Dawn: The Battles for Fallujah*, "In fact, all involved in the planning relied heavily on the lessons learned in previous fights." For example, one of OVR's failures was the inability to maintain the aggressive tempo with which the operation began. Camp writes, "One of the lessons learned from the first battle was to stockpile essential supplies. 'A disruption of the supply lines was one of our worst-case planning assumptions.'" In planning for OPF, Natonski built 15 days' worth of supplies at Camp Fallujah. He also ordered that supply routes only be used during the day so that convoys could maintain a faster speed, thus limiting their exposure to the improvised explosive device threat.

Natonski's studies were not limited to conflicts in the Middle East, however. Maj. George Christmas, a Vietnam veteran and then-Lt. Natonski's first company commander, had written numerous articles on fighting house-to-house, providing invaluable lessons learned from fighting a guerilla threat. As Lowry writes, "Many on Natonski's staff dug through the archives to retrieve Christmas' words of wisdom. They studied his lessons from the last time the Marines had conducted large-scale urban combat."

Natonski is a model example of the Soldier-scholar archetype modern formations are seeking for a command role. By understanding and learning from the past, even one's personal history, leaders can begin to contextualize their present situation and provide a clear commander's intent.

Commander's Intent

Natonski consistently gave clear intent to his subordinate leaders. He would ensure that his commanders had enough guidance to understand the desired end state while continually updating and refining well into the actual conflict. Camp quotes Brig. Gen. Joseph Dunford speaking on the similarities between Natonski and I MEF's incumbent commander: "Both were engaged with subordinate commanders; both had great rapport with the young enlisted Marines; both gave very clear guidance to their staffs." Natonski's planning process was collaborative in nature, and he valued his subordinates' opinions. He was skilled in how he weighed the advice of those he was tasked to lead while always understanding the end state was his alone to shape and dictate.

Camp writes of Natonski's clarity of vision with his commanders. His guidance to his commanders was the need for speed. "We didn't want the enemy to conduct a protracted defense in the city because we thought you'd see it in the news and ultimately there might be a public pressure to end the attack, like the April fight," referring to OVR. Natonski wanted quick penetration. "The quicker you could break through the enemy defenses, the more you could disrupt his command and control — and keep them off balance."

Natonski would reiterate over and over to his commanders and troops alike that the operational tempo of this new assault must be high enough to throw the enemy on his back foot. This relentless strategy would culminate in the previously mentioned playing of the Marines' Hymn to finally break the insurgency's spirit. Natonski had internalized Marine Corps Doctrinal Publication 1-3, Tactics: "We must remember that war is a violent clash of two opposing wills in which each side is trying to wrest advantage from the other." Natonski's clearly stated intention was violence of action, quick penetration, and an unrelenting tempo throughout operations. Natonski was not content with only dictating end states, however. He wanted to ensure that I MEF's purpose was clear down to the squad level.

Shared Understanding

Natonski built a shared understanding within his formation by communicating the why behind what they were doing. One of the failures of previous attempts to remove insurgents was disregard for the civilian population that would be left to pick up the pieces after the dust settled. Natonski knew that winning hearts and minds would be just as important as ousting the

Maj. Gen. Natonski crosses "Blackwater Bridge" during his assault into Fallujah, Iraq. November 14, 2004. (Photo by Anja Niedringhaus)

insurgency. In *Fighting for Fallujah: A New Dawn for Iraq*, John Ballard, a professor of Joint Military Operations at the U.S. Naval War College, writes, "Every Marine and Soldier had to understand that the local population was the center of gravity in the city after December 23." Ballard adds, "It is a great credit to the leadership of General Natonski and Colonel Shupp … that this emphasis on the residents and not the insurgents took prominence down to the squad level."

Natonski also ensured that all his commanders knew the value of civil-military operations in the area. The Middle East tends to be a tower of cards that could collapse at any moment, but Natonski was doing his level best to add supports and structure to Fallujah as he assaulted across it.

He went to extreme lengths to ensure he was understood. Maj. Tim Henson, a civil affairs team leader on the ground at the time of the battle, recounts that to his great surprise, Natonski himself was on the front lines listening to feedback, directing efforts, and ensuring he was seen among those he was tasked to lead. Natonski believed in face-to-face leadership and wanted to see the toll the war effort was taking on frontline Soldiers and Marines. His insistence on being so close to the action and ensuring he could literally witness the reality on the ground led to impactful decisions derived from a shared understanding between the general and his subordinate commanders. As Lowry writes, "So here was Natonski, standing in the middle of the fight polling his commanders before he made the decision to move forward." From shared understanding, Natonski had a solid foundation to build trust.

Mutual Trust

Natonski understood that attempting to build mutual trust with words alone was folly. A two-star general dodging sniper fire on the front lines showed the ground-level troops how he would never ask them to do something he himself would not do, while his interaction with his subordinate leaders communicated

a humility and openness that led to better decisions.

For example, on the fourth day of fighting, Natonski made one of his routine trips into the city to survey the battlefield and discuss strategy with his commanders. He had planned to inform Col. Shupp that he would be moving 2nd Battalion, 7th Cavalry Regiment (2-7 CAV), a key unit from Shupp's forces, to the northeastern side of the city to support Regimental Combat Team 7, which was having a tough going into the city. However, unknown to the general, Shupp had an opportunity to advance the northwestern front, plunging deeper south into Fallujah. Camp notes that Natonski then asked, "Could you keep on going to the south of the city?" Shupp responded, "Absolutely, sir, but we would need [Lt. Col.] Jim Rainey [of the 2-7 CAV] to stay with us." Natonski approved the change of plan right there. These two held a strong professional rapport, and Natonski had fostered a climate of trust in his organization that allowed for changes of plans and the seizing of opportunities.

Natonski's influence even extended beyond his own organization. He was a strong advocate of joint operations and brokered deals across military branches to get the combat power he needed. Early in the planning process, Natonski realized that I MEF did not have the manpower necessary to both isolate and infiltrate Fallujah. During OPF, main supply routes and forward operating bases would need protection simultaneously during the push into the city. "Fortunately," Lowry writes, "all three officers were advocates of joint operations." Natonski was able to secure assistance from the Army to do what they do best: wide-area security and joint logistics. As the Marines conducted house-to-house warfare, the Army would provide pivotal resupply and containment to the ongoing battle.

For less secure commanders, trusting something as vital as your supply lines to an outside organization would not be feasible. Natonski, however, trusted his cross-branch service members to do their job and do it well. Following the operation, he would speak incredibly highly of the Soldiers who contributed to the operation, even advocating for them to wear the 1st Marine Division shoulder sleeve insignia for their efforts. Camp quotes Natonski as saying, "When those Army units went back to their commands we tried to make sure that every soldier got two beers to take with them because they were part of the team. … We thought the world of them."

Conclusion

OPF proved to be the bloodiest battle of the Iraq War. By the time the conflict had concluded on December 23, Fallujah had been captured with an estimated 2,000 insurgents killed and another 1,200 captured, as opposed to 150 coalition casualties. Since the U.S. military's withdrawal from Afghanistan in 2021, the U.S. has made a decisive pivot into preparing for the near-peer, large-scale threat. In casualty estimates for what a war under such conditions could look like, the loss seen during OPF seems minor. If insurgents can make the U.S. bleed, what could a trained military on a roughly equal technological footing do? In studying the U.S. military's hardest fought days, answers to these uncomfortable questions begin to make themselves clear. In studying leaders like Natonski, modern commanders can understand what may be asked of them in the near future. Natonski's leadership ability and demonstration of the mission command principles of competence, commander's intent, shared understanding, and mutual trust enabled the coalition victory in November 2004. It will be this generation's study and adherence to the same principles that will net the next important victories in global conflict.

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Featured Photo
Marines, Cpl. Philip Dennis (kneeling), Cpl. Butterfield, Lance Cpl. Buskard, and Cpl. Justin Smith of Alpha Company, 1st Battalion, 5th Marines, engage insurgents while pushing into Fallujah during Operation Vigilant Resolve in Fallujah, Iraq, April 7, 2004. (Photo by Cpl. Matthew J. Apprendi)

Captains Career Corner is a new segmant for the Army Sustainment Professional Bulletin. The Captains Career Corner will contain top written products from students and faculty in the Logistics Captains Career Course at Army Sustainment University. This is an opportunity for them to present solutions to current issues facing the Army and the sustainment community while also providing lessons learned from historical battles.

ADAPTING ARMY WATERCRAFT MAINTENANCE

AS WE MODERNIZE OUR FLEET

By Capt. Taylor Anderson-Koball

In an era defined by technological advancements and evolving security challenges, modernizing the Army's watercraft fleet emerges as a strategic imperative. For the Army, this entails not only upgrading to a robust fleet of watercraft but also maintaining these assets to the highest standards to operate in various locations throughout the world.

Army watercraft systems (AWS) play a crucial role in supporting a wide range of military operations. These vessels transport heavy equipment, supplies, and troops, enabling units to bridge the last tactical mile. Ensuring these vessels are mission ready at all times requires innovative approaches to maintenance, leveraging new technologies, and addressing the evolving challenges posed when conducting contested logistics in the Indo-Pacific area of responsibility (AOR). There is a significant gap between the availability of these assets and the operational requirements in the Pacific and other theaters. As the Army looks to modernize the fleet, we must consider modernizing how we maintain our fleet while minimizing downtime and increasing the availability of forward maintenance and supply chain support.

This article discusses the critical importance of modernizing maintenance procedures to enhance operational efficiency, strategic mobility, and readiness of the Army's watercraft fleet, particularly in the Pacific theater, where demand often outpaces supply.

The Evolution of Army Watercraft

The Army's watercraft fleet has evolved significantly over the decades, transitioning from traditional vessels to more advanced and versatile platforms. Historically, the Army has relied on a variety of watercraft to support operations, including landing craft, utility; logistics support vessels (LSVs); and modular causeway systems. These vessels have been instrumental in transporting troops, equipment, and supplies across large bodies of water, providing critical logistical support in diverse operational environments. The history of AWS reflects a continuous evolution in military logistics, adapting to the ever-changing demands of the operating environment (OE) and technological advancements.

Early Beginnings and World War II

The concept of dedicated logistics vessels is not new. It was during World War II that the Army recognized the critical need for specialized vessels to support large-scale, transoceanic military operations. During this period, the Army operated a variety of landing crafts and utility boats that were essential for the island-hopping campaigns in the Pacific and the amphibious assaults in Europe. These vessels were crucial in transporting tanks, trucks, and artillery, directly supporting frontline operations.

Post-War Developments and the Cold War Era

Following the war, the importance of having a capable and ready

transport fleet led to further watercraft developments. During the Cold War, the geopolitical landscape demanded rapid deployment capabilities and a more robust logistical framework. The Army's fleet expanded to include larger, more versatile vessels capable of longer voyages and heavier loads.

Modern LSV Integration

The late 20th and early 21st centuries marked significant advancements in technology and design, influencing the development of LSVs. The Army introduced more modern vessels, such as the Gen. Frank S. Besson class of LSVs, which are still in use today. These ships are equipped with advanced navigation systems and heavy-lifting capabilities and can beach themselves to unload cargo directly onto shore, making them invaluable assets in both combat and humanitarian missions.

These modern LSVs are designed to operate across the vast distances of the Pacific and other oceanic theaters, reflecting a strategic shift in focus toward maintaining readiness in more challenging and remote environments. They are capable of carrying substantial payloads, including multiple combat tanks, large quantities of ammunition, and hundreds of troops. The Indo-Pacific AOR involves a vast expanse of water, necessitating an evolved watercraft strategy to meet intra-theater sustainment responsibilities. AWS are crucial in this context, serving as a force multiplier during theater opening activities and theater sustainment and distribution operations. These vessels support joint multinational exercises west of the international date line (IDL), like Defender Pacific, Keen Edge, Talisman Saber, Valiant Shield, Cobra Gold, and Garuda Shield.

In recent years, modernization efforts have focused on enhancing the capabilities of these watercraft to address the increasing complexity of military missions. The introduction of new technologies, improved designs, and advanced materials has resulted in more capable and resilient vessels. As the fleet becomes more sophisticated, maintenance practices must also evolve to ensure these assets remain operationally effective and efficient.

"To achieve effective forward maintenance, the Army must establish forward maintenance hubs and agile logistics networks that support expeditionary operations and rapid deployment."

The Importance of Effective Maintenance

Maintenance is a significant challenge for AWS due to their heavy reliance on contracted maintenance to keep aging vessels operational. AWS operate per on-condition cyclic maintenance (OCCM), where a vessel is dry-docked every three years, and depot-level maintenance is conducted. By the book, this process should take 90 to 120 days; realistically, this has taken vessels out of the fight for over a year. This issue is further compounded when vessels stationed in the Pacific must travel back to the U.S. — Virginia, Washington, California — for OCCM, leading to extended periods of reduced capability.

The current practice of sending Army watercraft back to the U.S. for repairs is not ideal for maintaining

Army watercraft Land Craft Utility Vessel 27 pulls away from the pier at Kuwait Naval Base, Kuwait, to do a routine maintenance run in the Northern Arabian Gulf, June 11, 2019. (Photo by Staff Sgt. Veronica McNabb)

a high state of readiness. To address this issue, the Army must find ways to conduct repairs within the theater of operations. One potential solution is to relocate sustainment-level maintenance capabilities to the Pacific, which would reduce downtime associated with cyclic maintenance.

Traditional maintenance approaches have often been reactive rather than proactive. The typical cycle involves operating watercraft until a failure occurs, followed by necessary repairs and maintenance. This method leads to unpredictable downtime and less efficient use of resources. Additionally, logistical challenges in sourcing parts and qualified technicians can further extend these downtimes, reducing operational readiness and effectiveness.

Effective maintenance is crucial for the operational readiness and longevity of military watercraft. In the context of modernized watercraft, effective maintenance takes on added significance. Advanced technologies and systems, such as integrated navigation systems, automated control systems, and enhanced propulsion units, require specialized knowledge and skills to maintain. The complexity of these systems necessitates a shift from traditional maintenance approaches to more sophisticated and proactive practices.

Leveraging Technology for Maintenance

One key strategy for adapting Army watercraft maintenance as we modernize the fleet is leveraging advanced technologies. The integration of digital tools and systems can enhance maintenance practices, improving efficiency and accuracy while reducing downtime.

3D Printing

Maintaining a fleet of watercraft involves a complex logistical network that must ensure the availability of spare parts, tools, and materials. Long lead times, dependency on multiple suppliers, and the challenge of managing inventory across various locations often burden traditional

Army Logistics Support Vessel 5, the Maj. Gen. Charles P. Gross, leads the Land Craft Utility Vessel 29 during a routine maintenance run at Kuwait Naval Base, Kuwait, June 11, 2019. (Photo by Staff Sgt. Veronica McNabb)

supply chains. The need to transport parts and equipment across vast distances, especially for vessels operating in remote or forward-deployed areas, further exacerbates these challenges for the Army. Additionally, delays in obtaining necessary parts can lead to extended periods of reduced capability, hindering the overall operational effectiveness of the fleet.

3D printing has the potential to revolutionize the supply chain for watercraft maintenance. Modern watercraft often incorporate specialized components that may have longer lead times or limited availability. By enabling on-demand production of spare parts and components, 3D printing can reduce dependence on traditional supply chains and shorten lead times. This technology is particularly valuable for producing specialized or hard-to-find parts.

One of the most significant advantages of 3D printing is its ability to produce parts quickly. Traditional manufacturing processes often involve multiple steps, which can take weeks or even months. In contrast, 3D printing can create a part in hours or days. This rapid production capability is crucial for maintaining operational readiness and reducing downtime for watercraft.

3D printing also excels at producing customized parts. This capability is essential for repairing and maintaining aging watercraft, where replacement parts may no longer be available from the original manufacturers. Manufacturers can create and print custom parts to meet specific requirements, ensuring they can replace even the most unique components.

Augmented Reality and Virtual Reality

Augmented reality (AR) and virtual reality (VR) technologies can enhance maintenance training and support. AR can overlay digital information onto the physical world,

providing maintenance technicians with real-time guidance and instructions. VR can create immersive training environments, allowing technicians to practice maintenance procedures in a risk-free setting. These technologies improve the effectiveness of training and ensure that personnel are well-prepared to handle complex maintenance tasks.

As these technologies continue to evolve, their integration into military maintenance practices will become increasingly essential, driving innovation and effectiveness in the field. Embracing AR and VR is an investment not just in technology but in the future readiness and capability of AWS.

Prioritizing Forward Maintenance and Supply Chain Support

As the Army continues to modernize its watercraft fleet to meet the demands of strategic operations, a critical aspect of this modernization is prioritizing forward maintenance and supply chain support.

One cannot overstate the strategic importance of forward-deployed maintenance capabilities. In an era where rapid response and operational agility are paramount, the ability to maintain and repair watercraft within the theater of operations is crucial. To achieve effective forward maintenance, the Army must establish forward maintenance hubs and agile logistics networks that support expeditionary operations and rapid deployment. These hubs would serve as central points for maintenance activities, equipped with the necessary tools, parts, and expertise to perform a wide range of maintenance tasks.

To augment forward maintenance capabilities and leverage global supply chain networks, the Army should explore public-private partnerships and international collaboration models, similar to how the Navy approaches maintenance for its watercraft. These approaches can provide access to additional resources, expertise, and innovative solutions to enhance the Army's maintenance and logistical capabilities. Partnering with private industry can give the Army access to cutting-edge technologies, specialized expertise, and additional maintenance capacity. Collaborating with allied and partner nations in the Indo-Pacific region can enhance the Army's forward maintenance capabilities and build stronger regional security ties. By establishing agreements with host nations for the use of their maintenance facilities and resources, the Army can expand its maintenance footprint and reduce reliance on U.S.-based facilities. These agreements can also support joint training and interoperability efforts, ensuring that maintenance personnel from different nations can work seamlessly together.

The modernization of AWS requires a comprehensive approach to maintenance and logistical support. By prioritizing forward maintenance and supply chain support, the Army can enhance its responsiveness, reduce downtime, and ensure that its watercraft are always mission ready.

Conclusion

As the Army continues to modernize its fleet of watercraft, adapting maintenance practices is essential to ensuring operational readiness and mission success. Key strategies for maintaining a modernized fleet include leveraging advanced technologies and prioritizing forward maintenance support. The commitment to continuous improvement and innovation in maintenance practices will ensure the Army's watercraft fleet remains a vital asset in achieving strategic objectives and maintaining global security west of the IDL. AWS remain indispensable for the joint force, driving the continuous modernization of Army watercraft. By adopting these innovative approaches, the Army can ensure that its watercraft remain mission ready and capable of supporting a wide range of military operations in an ever-evolving OE.

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Featured Photo
Soldiers assigned to the 558th Transportation Company, 10th Transportation Battalion, 7th Transportation Brigade (Expeditionary), adjust the governor and fuel injector rack on a Detroit Diesel 12V-71 watercraft engine during the company's first Maintenance Rodeo competition at Third Port, Joint Base Langley-Eustis, Virginia, Sept. 19, 2017. (Photo by Spc. Wilmarys Roman Rivera)

Over-th

Resupply for the Arctic Ai

In 2021, the Department of the Army renewed its focus on Arctic dominance and strategy, publishing the latest cold weather operations strategy, Regaining Arctic Dominance. The strategy emphasizes the ability to project power in high-altitude, extreme cold weather environments and compete with peer adversary threats in Arctic regions. There is likely no warfighting function that is more critical and complex in this harsh environment than sustainment. The Arctic strategy emphasizes that the Army will "be able to project power from, within, and into the Arctic to conduct and sustain extended operations in competition, crisis, and conflict from a position of advantage."

Recently 1st Squadron, 40th Cavalry Regiment (Airborne), 2nd

e-Snow

irborne Cavalry Squadron

By Capt. Clare Shea

Brigade, 11th Airborne Division (Arctic), participated in Joint Pacific Multinational Readiness Center (JPMRC) 24-02 at Donnelly Training Area, Alaska. This exercise gave the cavalry forward support troop (FST) the opportunity to test and exercise over-the-snow sustainment using snow mobiles and sleds. The following lessons learned from that exercise provide planning considerations for successful execution of over-the-snow sustainment in extreme cold weather environments. They also provide recommendations for future changes to Arctic sustainment doctrine and the common table of allowances (CTA) for forward support companies in Arctic environments.

Before JPMRC 24-02, the 11th Airborne Division (Arctic) used over-the-snow sustainment on an

extremely limited basis. Mobility, especially for sustainment vehicles, is considerably limited in Arctic environments due to snowfall and road conditions. In the past, over-the-snow resupply was only conducted from line company trains to the individual Soldier. However, the extreme distance of lines of communication (LOCs) that the 40th Cavalry Regiment faced during JPMRC 24-02 and the addition of new snow mobiles to the CTA, allowed the FST to validate running over-the-snow logistics packages (LOGPACs) from the FST all the way to the individual paratrooper.

During JPMRC 24-02, the FST supported two reconnaissance troops and the headquarters and headquarters troop (HHT). During the force-on-force fight, both reconnaissance troops fought mainly dismounted. Each reconnaissance troop operated with two to three Humvees and four snow mobiles. Each troop required significant JP-8 fuel to heat their Ahkio 10-man tents. HHT deployed with a significant package of vehicles to support the squadron tactical operations center (TOC), including two 15K generators, four Humvees, four snow mobiles, and three medium tactical vehicles. The majority of these vehicles were run at idle during the battle to sustain communications platforms and to keep batteries on vehicles charged.

Field Trains Command Post and the Brigade Support Area

The brigade support area (BSA) was located in a large area near the wood line approximately 25 km (15.5 miles) south of the reconnaissance troops. The terrain, restricted road networks, and snow conditions prevented bulk resupply forward of the BSA. The FST operated a node that served as the field trains command post (FTCP) at the BSA with primarily bulk assets and the maintenance control team. The FTCP did not have any over-the-snow capabilities. The FTCP was led by the troop executive officer and the maintenance control sergeant and included two M107 Tank Rack Modules, two load-handling systems, and a maintenance expandable van. The executive officer coordinated daily with the BSB for resupply of bulk fuel, motor gasoline (MOGAS) (used to fuel snow mobiles), Class I and Class IX repair parts, and various Class II supplies. The executive officer would then coordinate for supply forward to the combat trains command post (CTCP).

CTCP

The FST established its command post (CP) approximately 7 km (4.3 miles) forward of the BSA. The CP only brought forward smaller assets, including only fuel/water cans, three days of supply (DOS) of meals ready to eat (MREs), four snow machines, two contact trucks, and one command Humvee.

The removal of snow and coordination with the engineers is critical to the establishment of any CP in Arctic environments and must be a top priority. The FST placed the CP in a concealed area adjacent to the main supply route (MSR) to enable quick resupply. Additionally, the CP was located approximately 1 km from a frozen, snow-covered creek that served as a critical over-the-snow MSR leading to the logistics release point (LRP).

The headquarters section prioritized setting up the CP tent for communications. In addition to providing command and control (C2), the CP tent served as a critical asset to keep water cans liquid (i.e., keep them from freezing) for resupply forward to the reconnaissance troops.

Distribution

Trail creation and selection are critical to the success of over-the-snow resupply. The distribution platoon was able to use a frozen river as a high-speed avenue of approach and used existing logging trails to create an over-the-snow trail network for use by snow mobiles. Much of this trail system existed in another battalion's battlespace and required constant communication and coordination to prevent fratricide. In addition, the FST cached three DOS of MREs near the troop CPs to reduce LOGPAC requirements, alleviating distribution requirements.

The distribution platoon established the LRP at the edge of the wood line near an open area approximately 3 km (1.9 miles) south of the reconnaissance troop observation posts (OPs). The reconnaissance troop's executive officer or first sergeant met the distribution platoon at the LRP or picked up supplies at a later time, transporting the supplies to their troop OPs via snow mobile.

Fuel and water can resupply is critical for successful Arctic sustainment. The FST relied entirely on fuel can and water can resupply forward of the CTCP. Bulk vehicles are too large and targetable to move through any MSR in the area of operations. Snow mobile movement enabled the FST to move supplies undetected through a uniquely improvised trail network and reduced the number of large vehicles moving on the road. Mobility on the tight roads, hindered by snow drifts and under constant enemy surveillance, required alternate, non-wheeled resupply methods. During the operation, the FST determined that one snow machine sled has the following resupply capacities: One sled can carry 20 x fuel cans (both JP-8 and MOGAS) or 20 x water cans or 22 x cases of MREs or 1 x 75 gal MOGAS Drop Tank. This configuration is not optimal for movement on any uneven terrain because the load is more unstable than cans. This configuration would be optimal for a groomed snow trail.

Fuel Consumption

The four-stroke snow mobiles (Skidoo Skandic and Expedition models) consumed very low amounts of fuel compared to other military vehicles. The FST used approximately five gallons of MOGAS per day per snow machine (traveling approximately 40 km per day). The FST had the highest rates of fuel consumption in the squadron. The snow mobile fuel consumption for the line troops was significantly less because they moved shorter distances during the exercise. The FST delivered approximately one can of MOGAS per troop daily for their snow mobile operations. On average, the FST delivered 18 to 20 cans of JP-8 daily for the two recon troops that were fighting in dismounted operations, with some mounted battle positions.

Maintenance

Almost all vehicle maintenance was conducted in the rear at the BSA. Various small repairs were conducted forward. However, the terrain and weather forced all major repairs to occur in the rear where greater parts and assets were available. Instead of using large maintenance tents, the mechanics conducted maintenance using a tarp over the localized area of the vehicle and a bullet heater to keep warm.

The maintenance platoon assisted with vehicle and snow mobile recoveries. Maintenance towed downed snow mobiles with another snow mobile in the forward position. The recovery team used approved tow straps and removed the drive belt to tow the snow mobiles. While towing, a Soldier rode on the towed machine as a safety measure to control the brakes. The recovery team also used sleds to rear-tow a downed snow mobile. In future operations it would be beneficial to have an all-terrain vehicle (ATV) with tracks and winch to increase stability, especially if recovery from an established trail is required.

Medical Evacuation

Although not used during JPMRC 24-02, snow mobiles and sleds are a useful method for casualty evacuation from the forward line of troops back to the Role 1 medical facility.

Command and Control

Splitting the FST into two nodes over a long distance made C2 challenging. The CTCP maintained successful communications platforms with the squadron TOC for the duration of the exercise. However, the CTCP had challenges communicating with the FTCP. The only method of communication was the Integrated Tactical Network and the Alaska Land Mobile Radio. Communication was spotty and not reliable over the considerable distance. The FST is not equipped with the proper communications equipment to provide continuous communication between the FTCP and CTCP. One member of the command team would typically move over to the FTCP for battlefield circulation and provide important updates and orders to the FTCP.

Additionally, the maintenance control team struggled to access the Global Combat Support System-Army network. The maintenance team was unable to get very small aperture terminal (VSAT) connection through the duration of the exercise, likely due to tree cover and high latitudes that make satellite connection difficult. The FST was unwilling to compromise security for VSAT connection by placing the maintenance team in a wide-open area.

Other Considerations

The weather during JPMRC 24-

02 was favorable for sustainment, with temperatures hovering in the high 20s. This warmer weather contributed to the overwhelming success of the cavalry FST's over-the-snow sustainment. Only a few weeks earlier, the weather at Donnelly Training Area was -40 degrees Fahrenheit for two straight weeks. If this weather had held, the sustainment requirements for fuel would have significantly increased and put a severe strain on the distribution platoon. Additionally, the distribution platoon would have been put at a greater risk for cold weather injuries, causing significant complexities to LOGPAC operations.

Recommendations for Future Over-the-Snow Distribution Operations

During JPMRC 24-02, the FST selected only one LRP due to the length of the LOC. In future operations, it would be prudent to select multiple LRP locations to increase survivability and shorten the distances for line troops to travel to get supplies. Additionally, LOGPACs in the future can be used to deliver analog orders and 5988-E forms to improve the orders and maintenance processes.

CTA Recommendation

Since Arctic sustainment is still in the developing stages, much of the equipment used does not fall under the Arctic airborne modified table of equipment and instead is ordered as CTA equipment to support mission requirements. The use of small mobility platforms will increase sustainment reach in Arctic climates. The following equipment would significantly increase over-the-snow sustainment success for the forward support companies:

Distribution platoon: Four snow mobiles (three trail snow mobiles and one mountain snow mobile for cutting trails) with four sleds.

Maintenance platoon: One ATV with tracks for maintenance contact support and for recovery. This type of asset would enable the FST to drive on windblown surfaces with limited snow and not damage a snow mobile in terrain that does not allow Humvee movement. One small unmanned aircraft system to assist with route reconnaissance and route building.

Line troops: Line troops require a minimum of four snow mobile sleds to enable sled swaps for commodities. Each line troop requires a minimum of 40 JP-8 cans to enable fuel can swaps and a minimum of 10 cans of MOGAS. Additionally, the MOGAS cans must be clearly different from JP-8 cans to reduce mixing incidents. Also, line troops need at least 50 water cans.

Over-the-Snow Security

In the future, it would be beneficial to incorporate M249 machine gun platforms onto snow mobiles. Currently the only security available on LOGPACs is the operator's M4 rifle. Additionally, the snow mobiles cannot switch to blackout lights or turn off the lights. The distribution platoon used duct tape to block out the lights. In the future, it will be critical to incorporate blackout lights into the snow mobile.

Conclusion

The future success of Arctic dominance will depend on the reliability of sustainment in cold weather and high-altitude environments. Ultimately, any conflict in an Arctic region will require a transition from over-the-road to over-the-snow logistics. Continuing to realistically train these tasks and to equip sustainment units for this reality will enable the Army to project power in Arctic regions.

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Featured Photos
1st Lt. Brady Taylor and Sgt. Enrique Hurtado of the Distribution Platoon check fuel can loads during a LOGPAC on the Jarvis Creek at Donnely Training Area, Fort Greely, Alaska, during JPMRC 24-02, Feb. 11, 2024. (Photo by 1st Sgt. Brandon Fry)

Sgt. Scott Henderson of the Distribution Platoon prepares MREs in a snow mobile sled at the Forward Support Company CP for an upcoming LOGPAC at Donnely Training Area, Fort Greely, Alaska, during JPMRC 24-02, Feb. 13, 2024. (Photo by Capt. Clare Shea)

"WHERE'S WALDO?"

Hiding a Battalion Command Post in Plain Sight

■ *By Lt. Col. Steven T. Smith*

The famous children's book series titled *Where's Waldo*? showcased the main character Waldo, who dressed in a red and white shirt and hid among red-and-white-striped objects. The author, Martine Handford, wanted to challenge children to locate Waldo and his friends in various backgrounds, all hiding in plain sight. In comparison to finding Waldo, Army logistics leaders must start training on hiding our command-and-control nodes in plain sight to increase survivability. The intent of this article is to describe a starting point to help logistics leaders develop tactics, techniques, and procedures when it comes to hiding their command posts in plain sight.

The 1st Armored Division (1AD) completed National Training Center (NTC) rotation 24-03, the Army's first "division in the dirt" NTC rotation, which highlighted the crucible and challenges divisions will face in large-scale combat operations (LSCO). 1AD's NTC 24-03 rotation concluded with a forward passage of lines (FPOL) for an organic armored brigade combat team (ABCT) to start NTC 24-04. 1AD's division sustainment support battalion (DSSB), the 142nd DSSB, was there for both NTC 24-03 and 24-04. During both rotations, the 142nd DSSB trained against four training objectives: (1) resupply the brigade support area (BSA) in two hours or less; (2) conduct rehearsals for resupplying the BSA down to the Soldier level; (3) conduct the military decision-making process with staff NCOs deliberately incorporated into the process; and (4) hide the battalion command post in plain sight.

The 142nd DSSB focused on hardening and hiding our battalion command post in plain sight during both NTC 24-03 and 24-04. The 142nd DSSB occupied both open and urban terrain to prove that we, as the sustainment community, must train our formations to execute command post survivability. For example, during the first battle period, the 142nd DSSB occupied TV Hill, which is in open terrain located south of Life Support Area (LSA) Santa Fe. To hide the battalion command post, the 142nd DSSB used deception tactics. We dispersed our logistics capability a football throw away, employed decoy command posts, and used camouflage netting to hide the command post in plain sight. As a second example, during the second battalion period, the 142nd DSSB was the first DSSB in NTC history to occupy urban terrain and hide

its command post inside a city. The 142nd DSSB battalion command post was never detected, not during the electronic warfare (EW) spectrum scans, not during five opposing force (OPFOR) raids (that included an OPFOR battalion), and not during the counterattack to the ABCT, all while occupying the same urban terrain as the DSSB.

The early phases of the Russian aggression against Ukraine proved that large command posts occupying open terrain are a thing of the past. At the initial invasion into Ukraine, Russian forces were quickly halted because their command posts were occupying open terrain and in large base clusters. As a result, a Russian command post was destroyed by Ukrainian fires, and the Russians' advance stalled due to their extended lines of communication. As a sustainment community, we must change our command post behavior by looking small and insignificant, and we must do so because our lives depend on it.

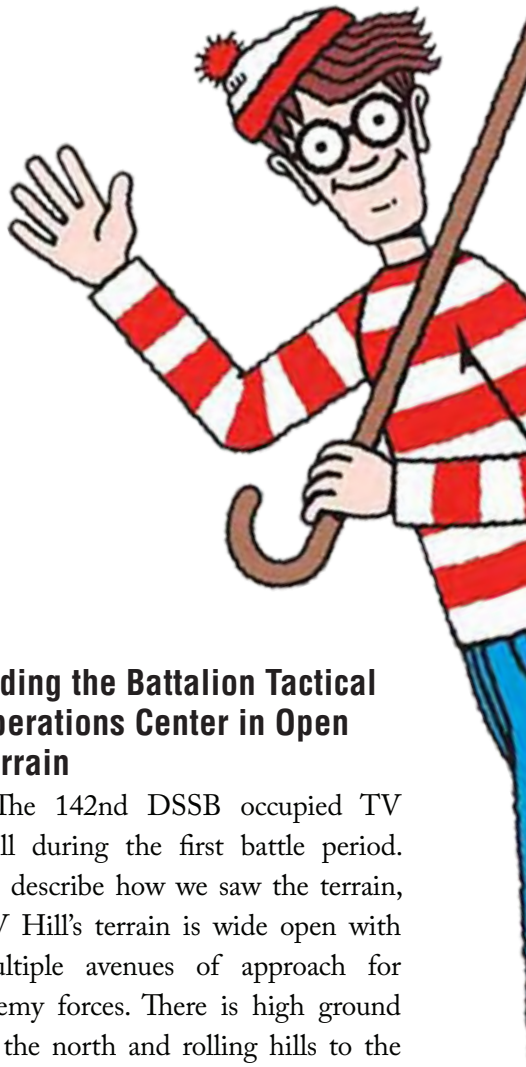
Field Manual (FM) 3-0, Operations, states, "Army forces must ensure their command posts are difficult to detect, dispersed to prevent a single strike from destroying more than one node, and rapidly displaceable. ... Use of existing hardened structures and restrictive terrain to conceal headquarters equipment and vehicles, instead of tents organized in standard configurations, are options commanders have to improve command post survivability." This article discusses a way to do this.

What Does Doctrine Say about Command Posts?

As the Russia-Ukraine War proves, command posts must look small and insignificant. Long gone are the days of robust command posts with lavish command and control systems and digital displays without a care in the world for what our EW signature looked like due to our dominance in the space and cyber domains.

Early in the Russia-Ukraine War, we saw Russia try to employ U.S. tactics, techniques, and procedures by establishing a robust command post in open terrain, only to have it rapidly targeted and destroyed by Ukraine's artillery. In an LSCO fight, divisions are the center of gravity and are supported from a division support area (DSA) typically found in the division rear boundary. The DSA historically is a large footprint located between 30 to 40 kilometers away from the forward line of troops and is either third or fourth on the enemy's target list. Russia learned a hard lesson when its main effort from Belarus to Kyiv was halted because its DSA was targeted and its lines of communications were overextended, which resulted in the end of its main effort and the failure to seize its objective, the city of Kyiv.

FM 3-0 states, "Command posts are extremely vulnerable to detection from air and space, as well as in the electromagnetic spectrum." Our command posts and DSAs must look small and insignificant. As sustainers, we often struggle to strike a balance with the mission-essential tasks of providing sustainment and defending. One way sustainers can find that balance is to make their formations look small and insignificant, so they are not targeted by enemy fires. Sustainers can do this by asking themselves three questions: How do I see the enemy? How do I see the terrain? How do I see myself? When we have the answers to these questions, we can disperse logistical assets, use creative thinking, and use hardened structures and restrictive terrain to conceal command posts from the EW spectrum and enemy forces.



Hiding the Battalion Tactical Operations Center in Open Terrain

The 142nd DSSB occupied TV Hill during the first battle period. To describe how we saw the terrain, TV Hill's terrain is wide open with multiple avenues of approach for enemy forces. There is high ground to the north and rolling hills to the east and south. Defending TV Hill

National Training Center during NTC Rotation 24-04. (Photo by 1st Armored Division Public Affairs Office)

is possible, but one would need the proper emplacement of crew-served weapon systems, obstacles, and roving patrols to increase survivability.

A typical rotational unit will place its command post in the center of TV Hill for command and control. The advantage of positioning the command post at the center is for the ease of command and control. However, a disadvantage is the command post can easily be targeted by enemy fires. The 142nd DSSB employed a different tactic. We placed the battalion command post at the most southern boundary of the DSA and placed three camouflaged decoy command posts scattered across the DSA. We emplaced the actual battalion command post at the southern boundary based on our assessment that it was the least likely avenue of approach by OPFOR, which proved to be true. This answered the question "how do I see myself?"

As the commander of 142nd DSSB, my biggest concern was making the command post look insignificant from a drone's perspective. As the war between Russia and Ukraine continues to evolve, sustainers must look at their support area from a drone's perspective if they want to increase survivability on the battlefield. If you have not been to NTC recently, you will find that drones are the new sensors and are habitually linked to the shooter, and that the shooter is linked to enemy fires. We knew we had to make the command post look insignificant. I told our junior leaders to think about how to increase survivability and what their positions looked like from the drone perspective. Our junior leaders met the challenge by pushing mission command nodes

as far away as possible from the actual battalion command post. This meant pushing out the upper tactical internet (TI) node, lower TI node, and power generation as far as possible, so that if those nodes were targeted, a node disruption would not destroy the DSSB command post.

The 142nd DSSB staff focused heavily on developing analog products using operational graphics and measures, maps, and overlays by warfighting function in the event enemy fires successfully targeted our power generation or our command post decoys. We achieved this training objective by pushing each of our mission command systems the full length that cable would permit, and buried cables in the ground. The intent was to prevent enemy forces from sensing friendly forces from an aerial perspective. We took hiding in plain sight a step further by only operating within TI blackout windows to minimize our EW signature. We quickly learned that the Joint Battle Command Platform (JBC-P) system emits a massive EW signature when used. We looked small and insignificant on the EW spectrum by only using our JBC-P and frequency modulation radios for two-hour periods twice daily to facilitate reporting from our dispersed formations.

One might ask how we were able to exercise command and control of our division convoys while resupplying three BSAs across the division's battle space. We did this by having the convoys use their JBC-P when they arrived and departed from LSA Santa Fe. The intent was to deceive the enemy into believing the division convoys were originating to and from LSA Santa Fe. The convoy commanders reported to our 916th Support Brigade liaison officer (LNO) using the 916th's JBC-P role name, since the OPFOR is accustomed to seeing the EW spike on a routine basis, and we used our LNOs as a digital retransmission process to communicate between the convoy command and the battalion command post. The battalion command post received transmissions on the convoys' progress from our 916th LNO only on the upper TI spectrum, which was hidden by TV Hill's EW signature, since TV Hill emits a massive EW signature that is largely used for transmitting Wi-Fi signals for garrison operations. Therefore, our communications between the command post and the convoy went undetected and increased our command post's ability to survive in a persistent observation environment. As FM 3-0 states, "during large-scale combat operations, survivability measures may include radio silence, communication through couriers, or alternate forms of communication."

While at TV Hill, the OPFOR conducted two night raids. On both occasions, the observer controllers/trainers (OC/Ts) and the OPFOR were unable to locate the battalion command post because of our deception plan, lateral dispersion, and camouflaging. Both the OC/Ts and OPFOR stated the 142nd DSSB were able to strike a balance between providing uninterrupted sustainment support and defending the DSA. On or about training day +2, we began key leader engagements (KLEs) with the Kunjhab mayor and police chief to set conditions for displacing the DSA into an urban environment. During the initial KLEs, the mayor requested security, food, water, and medical support because of OPFOR nightly raids inside the city. We did not promise security, but instead requested unmanned aerial surveillance through the engineer battalion's assets. The 142nd DSSB met city leaders' remaining needs internally. In total, we conducted three KLEs, and the mayor and the police chief granted the 142nd DSSB permission to occupy three buildings inside Kunjhab.

Hiding the Battalion Tactical Operations Center in an Urban Terrain

On training day +5, the 142nd DSSB established the DSA inside an urban environment, and the battalion became the first sustainment formation in NTC history to occupy and establish a DSA in an urban terrain. We conducted several more KLEs with the citizens of Kunjhab to establish trust with the local population. Our end state was to incorporate local security into our defense plan to help stop the OPFOR's nightly raids.

We occupied an urban environment to hide our command post from the drone and EW spectrum, hardened our command post, and repelled an enemy force. Each urban area at NTC has Wi-Fi signals, which generate a significant EW signature. The NTC urban cities make for the

perfect terrain to execute command and control while hiding our EW and physical footprint in plain sight from the enemy.

The mayor offered the battalion three buildings to occupy. We initially established our battalion command post in the city's old radio station. We set up the operations center on the second floor and the administrative/logistics center on the first floor. The challenge we faced with occupying a war-torn urban area was power generation. We struggled with establishing lower TI to achieve initial operations capability per our battalion tactical standard operating procedures. After several hours, we made the decision to jump the battalion command post and we concealed it between three semi-trucks inside the city limits. We had all company-sized elements operating using base clusters located 1 kilometer outside the city limits, making the DSA look small and insignificant.

On training day +7, the battalion footprint came under attack by OPFOR nightly raids, which occurred three more times through the conclusion on training day +10. The OPFOR knew the battalion was in the area because they spotted the satellite terminal in the middle of the city. Each time the OPFOR conducted their raids they would search building-by-building, believing the battalion command post was nearby. The OPFOR failed to see that the battalion command post was located in the northeast corner of the city hidden between three semi-trucks and trailers. On the night of training day +10, an OPFOR battalion-sized element co-located with the DSSB inside Kunjhab but did not detect the 142nd DSSB inside the city. Moreover, for the first time in NTC's history, the 142nd DSSB captured and killed the OPFOR battalion, disrupting the OPFOR's ability to counterattack the ABCT.

Conclusion

In conclusion, 1AD completed its NTC rotation. Its organic ABCTs conducted an FPOL to start the rotation. The 142nd DSSB used both hardened structures and terrain to successfully conceal the battalion command post from five OPFOR raids. It also captured an OPFOR battalion-sized element and disrupted the OPFOR counterattack. The 142nd DSSB implemented tactics, techniques, and procedures that created an environment to hide its battalion command post in plain sight.

FM 3-0 states, "commanders account for threats from space, cyberspace, and outside their assigned area of operations (AO) as they develop protection measures." FM 3-0 also talks at length about the importance of survivability. The 142nd DSSB dispersed its formations into smaller base clusters around the city of Kunjhab and placed the battalion command post inside the city to look small and insignificant.

Russian's war of aggression against Ukraine has taught them valuable lessons about survivability in LSCO and hiding their command posts. As a sustainment community, junior leaders must use innovative thinking and terrain to hide command posts in plain sight. NTC provides invaluable training opportunities for platoon leaders, company commanders, and battalion commanders to hide their command posts in plain sight. I encourage each of our sustainment leaders to apply creative thinking and set conditions to enable your command post to be hidden in plain sight. Let us not repeat the mistakes Russia has made on the modern-day battlefield, but instead use terrain to our advantage so that we can both provide sustainment and defend our areas of responsibility.

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AVIATION REFU
PLANNING CONSIDERAT

Limiting Factors

By Lt. Col. Gregory Sterley, Maj. Andrew Keithley, Capt. Joseph Keegan, and Capt. Ian Greer

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According to Joint Publication 3-18, Joint Forcible Entry Operations, air assault operations are a "movement of friendly assault forces ... to engage and destroy enemy forces or to seize and hold key terrain." The maneuver allows ground commanders to mass combat power at critical points on the battlefield, creating multiple dilemmas for the enemy to slow their decision-making and their placement of ground units at a position of relative advantage. The air assault provides enormous amounts of combat power for the ground commander, but the precision that air assault operations require makes them inherently fragile. Any number of contingencies en route to the objective could jeopardize the operation. As a result, air assaults require thorough mission planning to ensure they achieve the effects that ground commanders desire.

With the Army's emphasis on counterinsurgency operations over the past 20 years, air assault operations have largely remained at the battalion level and below. However, recent modifications and changes in operational thinking, as captured in top-level doctrine such as Field Manual 3-0, Operations, necessitate the resurrection of the air assault as a joint forcible entry (JFE) capability for the Army.

The 101st Airborne Division drives the charge with newly approved force design updates that bring a heavy-lift battalion. This allows the division a brigade-level JFE capability, which it lost with the deactivation of the division's second combat aviation brigade (CAB), the 159th CAB. Recently the division conducted a series of long-range, large-scale air assaults (L2A2s) to overcome a two-decade gap in organizational knowledge about division-level rotary-wing JFE capabilities.

Refueling operations, too, have grown with the appetite for L2A2s and continuously prove a point of friction. Forward arming and refueling points (FARPs) require the same level of deliberate analysis and planning to prevent backlogs or stoppages to aviation operations. The most consequential factors limiting FARP operations during L2A2s are insufficient total capacity, insufficient unit capacity, the number of available refueling points, fuel flow, crew duty day, and FARP certification. While the 101st CAB continues to develop tactics, techniques, and procedures to overcome each limiting factor, commanders and planners must understand the risks of their implementation to identify appropriate situations for using them.

Total capacity is the simplest limiting factor to overcome. Adding more fuel-carrying vessels to a FARP site increases the amount of fuel on hand, and not all vessels need to be capable of refueling aircraft if fuel transfer is possible. Adding more M978 Heavy Expanded Mobility Tactical Truck (HEMTT) fuelers is the preferred method of increasing

total capacity at a FARP location, due to their ability to transfer fuel to aircraft. However, the HEMMT has a relatively low capacity, and a fleet of them is not always sufficient for meeting total capacity needs.

Additionally, the lower capacity of the HEMTT and tank rack modules (TRMs) relative to the M969 fuel tanker or bulk-fuel carriers means that more of them are needed to meet the same total fuel capacity as that of M969 tankers and bulk-fuel tankers. This increases the total footprint of the FARP site and makes the sustainment node a larger, more obvious target for enemy forces. Adding bulk vessels, therefore, helps meet total capacity and aircraft requirements while largely reducing the FARP footprint. However, these bulk assets are limited in their operations on the fuel line if they lack an internal pump, and therefore are used to refill M978s with the associated HEMTT Tanker Aviation Refueling System (HTARS) attachment.

With the addition of HEMTTs or other bulk Class III-carrying vessels, planners must conduct more thorough analysis to determine a support package that facilitates the sequence and timing of aircraft serials (groupings) in the mission. To perform this calculus, logisticians must consider unit capacity, or the amount of fuel available to aircraft at a mainline. An implicit assumption in planning for total fuel requirements at a FARP site is that all fuel, regardless of the vessel that contains it, will become usable to an aircraft at some point in the mission. While obvious on the surface, battalion- and brigade-sized support elements must turn this assumption into a fact before mission execution to prevent serious backlogs or even mission stoppage en route to the objective.

Currently, the M978, M969, and TRM stand as the most proliferated and commonly used fuel vessels in the logistics community. However, only the M978 is widely available and capable of transferring fuel into an aircraft with the HTARS. This equipment is commonly found on a distribution or forward support company's modified table of organization and equipment. The Forward Area Refueling Equipment and its variants continue to be an option as well, but its capacity (500-gallon collapsible drums) becomes a planning concern for L2A2 operations.

Support units have several options to overcome unit-capacity limitations, but the two most common techniques are (1) connecting multiple M978s to the same mainline and (2) increasing the number of mainlines above what the largest aircraft serial requires. Either technique, however, brings its own disadvantages. If support elements connect multiple M978s to the same mainline hose, fuelers gain the ability to transfer fuel from bulk vessels into one of the mainline vessels while the other mainline vessel distributes fuel to aircraft. This option, however, generally limits the number of aircraft in each serial because it also limits the number of mainlines available at a FARP. Additionally, support units risk more fuel becoming non-transferrable if anything damages or destroys the main fuel line or any of its valves.

Support units that increase the number of mainlines above what the largest aircraft serial requires gain the flexibility to move aircraft across different mainlines to effectively plan and schedule fuel transfer from bulk vessels to vessels connected to a mainline. This enables continuous fuel transfer to non-active mainlines. It also affords flexibility to the task force commander because it ensures the FARP can accommodate all aircraft in each serial, even if a dispensing vessel or main fuel line becomes inoperative. The support unit does assume risk, however, because as the FARP footprint grows with the addition of mainlines, this makes command and control over the total area more difficult and increases the logistical footprint.

The number of total points (fuel-distributing hoses) on a FARP is the most micro-level analysis planners must undertake to identify support requirements in aviation operations. To ensure all chalks in a serial (platoon-sized units) of aircraft receive fuel without spending time in holding, the number of points must, at a minimum, match the number of chalks in the largest serial. To meet this demand, support units again have two primary

Sgt. Luiyi Genao, a petroleum supply specialist assigned to the 524th Division Support Battalion, 25th Division Support Brigade, 25th Infantry Division, pumps fuel from a fuel servicing truck into a U.S. Air Force F-22 Raptor assigned to the 27th Fighter Squadron, 1st Fighter Wing, during joint refueling operations in support of Valiant Shield 24 at the Tinian International Airport, Tinian, Northern Mariana Islands, June 12, 2024. (Photo by Staff Sgt. Tristan Moore)

techniques: adding more hoses to the same mainline or adding more mainlines with the same number of fuel-distributing hoses. The technique the support unit uses to overcome unit capacity will drive which technique is more suitable to address the number of points.

For elements that increase unit capacity to a mainline by coupling vessels to a single line, adding more points to the mainline decreases fuel flow as the distance from the vessel increases. In cases of heavy-lift aircraft such as the CH-47 Chinook, fuel flow limits the number of feasible points to two per vessel.

In the case of the AH-64 Apache or the UH-60 Black Hawk, four points are generally the maximum. Units that face limitations with this technique should consider adding more vessels to their FARP configuration to maximize flow and throughput, matching the number of fuel-distributing hoses (points) to the largest serial.

For elements that add more mainlines with the same number of points, the greater quantity of mainlines enables throughput via an increased flow rate to a lower number of points from each vessel. Adding more mainlines is a technique that benefits elements who need to decrease aircraft time on the FARP due to mission requirements. Though this technique increases the dependence on logistical infrastructure due to an increased reliance on maintenance of ground equipment, it renders the failure of a single point less impactful to the overall refueling plan. Since both techniques pose risks, the planning process necessitates constant dialogue between platoon, company, battalion, and aviation/sustainment planners to address mitigation techniques.

An additional limitation when setting refuel requirements during aviation operations is total flight time for pilots. Army Regulation 95-1, Flight Regulations, requires units to maintain a crew endurance policy. While the policy is unit dependent, common practice is to limit aircrews to 14 hours per duty day while performing flight-related duties, and to 6 to 8 hours of flight time without an extension, which generally requires O-6 approval.

The precise nature of air assault operations implies inherent risk, and extensions to duty day or flight time introduce fatigue and further increase the risk to the mission and the force. To avoid this constraint, three iterations of L2A2s in the 101st Airborne Division used the cold fuel process, where aircraft stopped their main engines to receive fuel, and reduced their flight time. This afforded the crews an opportunity to rest mid-mission, and effectively increased their alertness during their infiltration into the final objective, the most critical and dangerous part of the air assault. Under these conditions, cold fuel requirements are still time sensitive, and throughput is still one of the largest planning considerations, with the composition of the serial spending the least time shut down and total capacity determining the number of trucks required to support the mission. Cold shutdowns also feed into operational planning because they allow multiple landing-zone landings nearly simultaneously.

The final limitation planners face in large-scale aviation operations is the FARP certifying official. Doctrinally, there is no regulatory requirement that outlines which individuals in an organization can certify a FARP. Army publications such as Army Techniques Publication 3-04.17, Techniques for Forward Arming and Refueling Points, recommend that the aviation safety officer (ASO) or a "commander's designated representative" be the lawful certifying official. However, they frequently use qualifiers such as "should" and "may," indicating the techniques are preferred and not mandatory. As a result, the 101st CAB petroleum standard operating procedure, which permits the battalion safety officer, the ASO, or any command pilot designated by the battalion commander to certify a FARP, stands as the only regulatory document that appoints certifying officials.

Issues arise when non-aviation units seek to certify a FARP. Even in the aviation support battalion, a battalion organic to the CAB with its own aviation maintenance company, pilots in command are hard to come by, and FARP certification can become a significant point of friction if the appropriate personnel are not present before operations. This issue only compounds for non-aviation units as they look to exercise aviation refueling operations, since the only pilots in command within a brigade combat team belong to the brigade aviation element (BAE), who throughout planning are more than likely involved in acting as the liaison for their respective elements. Within the division sustainment brigade, the level of difficulty to coordinate certification only grows because no BAE exists to help coordinate aviation support, let alone self-certify. Due to the lack of regulatory requirements, non-aviation units seeking to support aviation operations should, and legally can, develop their own

procedures to train personnel organic to their organization to certify FARPs.

While total capacity is a non-negotiable factor for planners at the brigade level and above, support units and aviators have flexibility in determining what risk is acceptable during FARP operations. Increasing unit capacity and limiting the number of mainlines at a FARP site are best suited for operations that require continuous, manageable throughput, such as massing friendly forces and assets onto an objective following the initial air assault, during reconnaissance operations where maintaining enemy contact is critical, or during continuous attacks on the enemy. The somewhat smaller footprint increases survivability, which is a critical consideration since a FARP supporting each of these missions would be nearest the enemy.

Increasing the number of mainlines, on the other hand, allows for larger serials to sequence through the FARP without having to wait for fuel. Thus, this is more suitable for heavy-lift aircraft, where fuel flow becomes a limiting factor, or for initial assaults into an objective when the ground force must meet its minimum force to complete its initial actions on the objective.

Hybrid options exist for support commanders as well, such as adding mainlines with relatively low additional unit capacity to a FARP, with a separate high unit-capacity mainline to facilitate maximum destruction and phased attacks as they transition to continuous attacks. In general, however, adding more mainlines is preferable in permissive environments because it enables more flexibility to account for broken equipment. The large footprint of this configuration, though, makes it less ideal for non-permissive or forward activity.

As the Army transitions its focus from counterinsurgency back to large-scale combat operations, aviation operations will continue to grow to meet demands of the division as it becomes the new unit of action. Sustainment leaders must produce thorough, deliberate plans that minimize friction during refueling operations to synchronize sustainment and movement and maneuver warfighting functions. Sustainment planners in the CAB must be aware of refuel limitations, how they affect operations, solutions to these limitations, and the risks that leaders assume in implementing each one. Sustainment leaders at echelon must synchronize their efforts to understand and mitigate limitations of total capacity, unit capacity, the number of points, refueling fuel flow, pilot duty day, and FARP certification. Leaders in the CAB and ground force must acknowledge these limitations and be receptive to potential changes they could drive in the scheme of maneuver. Indeed, the transition to the division as the unit of action will entail a level of coordination not practiced for nearly two decades, but this level of coordination will become necessary as aviation operations continue to grow in scale.

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Featured Photo
Staff Sgt. Buddy Loo, left, and Sgt. Kenley Patadlas, both petroleum supply specialists assigned to Detachment 1, Alpha Company, 3rd Battalion, 140th Aviation Regiment, 103D Troop Command, Hawaii Army National Guard, refuel a UH-72 Lakota helicopter at Schofield Barracks, Hawaii, June 4, 2024. (Photo by Sgt. Justin Nye)

MUNITIONS

MODERNIZATION

The Family of Drone Munitions

■ *By Chief Warrant Officer 4 Michael K. Lima*

The Army Modernization Strategy outlines how the Service will become a multidomain force capable of operating across land, sea, air, space, and cyber domains by 2035. As part of the strategy to deliver a force capable of multidomain operations, the strategy outlines six critical modernization efforts: long-range precision fires, next-generation combat vehicles, future vertical-lift aircraft, air and missile defense, advanced communication networks, and individual Soldier lethality. Prioritizing next-generation munitions has become central to the modernization strategy to ensure land-power superiority. Upgrading major munitions systems such as missiles is essential, but modernization should also address supporting technologies, none more prevalent than drones and the munitions they carry.

Drone Technology

In addition to prioritizing core modernization efforts, the Army is pursuing complementary initiatives. Informed by ongoing conflicts, drone technology and next-generation munitions have emerged as crucial elements. One upcoming category, drone munitions, is revolutionizing modern warfare. Small, unmanned aerial vehicles (UAVs) can carry a variety of explosive payloads, allowing

for precise strikes on enemy positions with minimal risk to frontline forces. The drones usually fall into Group 1 (less than 20 pounds). For larger munitions, Group 2 drones (between 21 and 55 pounds) may need to be used.

The most advanced drones are first-person-view (FPV) drones, which offer a new take on drones and bring a new level of threat, unlike traditional remote-controlled drones, where the pilot uses a bird's-eye view on a screen. An FPV drone is equipped with a camera mounted on the front, transmitting a live video feed to a headset or goggles worn by the pilot. Drones have proved they offer greater flexibility and affordability than traditional airstrikes, operating at lower altitudes and reaching previously inaccessible areas. Though the Army's drone and counter-drone capabilities are a growing priority, senior leaders have rejected calls for a separate drone branch, deeming it counterproductive.

Regardless of the future of drone capabilities, modernization of munitions for drones is a must, particularly the development of drone-dropped and loitering munitions, which are likely to be key elements of future warfare. Ongoing advancements drive this focus on drone-delivered weaponry, such as loitering munitions. While both loitering munitions and drone-dropped munitions deliver explosive payloads from UAVs, they serve distinct purposes. Loitering munitions, armed drones that wait in target areas before crashing into their objective, offer faster response times, potentially lower civilian harm, and reduced manned aircraft risk. Subsets of this category are the munitions-strapped drones that can take on the role of traditional loitering munitions. Drone-dropped munitions are distinct. They are explosives delivered (dropped) by UAVs while offering advantages like precise targeting, reduced risk to pilots, and the potential for faster response times.

The choice between these options depends on the mission's needs and the target's value. The Army's launched-effects program is a separate initiative based on three ranges: the ongoing medium-range option, short range, and long range. These are essentially small drones launched by a larger vehicle mid-flight and can be used for intelligence, surveillance, and reconnaissance or for kinetic effects to strike targets.

Modernization Approaches

When it comes to drone-dropped munitions, three main approaches exist for the short term: leveraging existing munitions (grenades, mortars, mines) for drone-dropping operations or strapped to drones for direct-attack loitering operations, using 3D-printed assembled cases (drone-specific munitions), and using improvised explosive devices (IEDs) such as soda can bombs and Molotov cocktails. The last approach would be to create a new class of drone munitions. Immediate modernization efforts should be directed at the first option, which offers a faster and more economical route. Adapting current munitions designs, reducing development costs, using existing supply chains, and familiarizing military units with them can quickly integrate them with drones.

However, relying solely on existing munitions for drone deployment creates a potential conflict with the evolving requirements of modern warfare. Legacy weapons, designed for traditional applications, may not fully address the needs of a rapidly developing drone ecosystem. Modernization efforts demand munitions that can keep pace with advancements in drone technology, flight range, and payload capacity, which additive manufacturing and 3D printing can offer.

For long-term modernization, the Joint Program Executive Office Armaments & Ammunition would have to manage the development of new drone munitions. This would include funding and overseeing research and development, since the organization would work with other Services, commercial partners, and research institutions to fund projects focused on innovative drone ammunition concepts. Research projects would include new materials, propellants, fuses, and delivery mechanisms for drone-specific munitions. In time, acquisition and testing would require the evaluation of proposals for new ammunition types.

Additionally, the new ammunition types would require extensive testing, and the acquisitions process would have to be managed to ensure munitions were ready for military use. This would include integrating and fielding the new class of ammunition until it were proven and rigorously

Soldiers assigned to the 6th Squadron, 8th Cavalry Regiment, and the Artificial Intelligence Integration Center conduct drone test flights and software troubleshooting during Allied Spirit 24 at the Hohenfels Training Area, Joint Multinational Readiness Center, Germany, March 6, 2024. (Photo by Micah Wilson)

validated to standards that would also need to be developed. Lastly, the deployment to military organizations and the sustainment phase would have to include new equipment training, storage, and logistics for the new munitions. While drone munitions must go through the entire DoD acquisition process, we can take lessons from other nations for modernization efforts.

Drone Munitions

Ukraine created special ammunition for drones and has officially set up a separate category, while Russian industry also started the production of drone ammunition. Both countries are already adapting their current inventory of munitions for drone-dropping from commercial drones. Despite the increased use in the last few years, drone-dropped munitions have lacked a unified standard. Military munitions have been adapted for drone deployment, such as grenades or mortar shells being modified for dropping. However, at the Black Sea Defense & Aerospace exhibition held in Bucharest, Romania, in May 2024, Carfil S.A., a subsidiary of Romania's state-owned defense company ROMARM, unveiled a new family of drone-dropped munitions. These munitions leverage ROMARM's existing range of mortar bombs in various calibers, including 60 mm, 81 mm, 82 mm, and 120 mm. Carfil S.A.'s approach represents a standardization for a national defense firm integrating drone technology into military units.

There are many benefits of a standardized approach, including a reduction of development costs by using proven munitions designs and eliminating the need for new drone-specific munitions. Military units familiar with the munitions can seamlessly integrate them into drone operations, minimizing training and ensuring compatibility with existing stockpiles. Military branches or allied forces using similar drones can share and use compatible drone-dropped munitions or attached munitions, enhancing operational flexibility and

effectiveness. Carfil S.A.'s approach is a blueprint for other defense firms aiming to embrace drone technology. They can streamline development, logistics, and interoperability by prioritizing standardization, leading to a more agile and responsive military force.

Modernization in 3D-printed munitions cases offers greater customization. These cases can be tailored for drones, optimizing weight and overall performance. 3D printing also holds the potential for cost savings on complex designs compared to traditional manufacturing methods. Additionally, it allows for rapid prototyping, facilitating faster design iteration and testing cycles. However, this approach comes with design standardization, approval, and production challenges.

One Ukrainian company that has overcome many of these hurdles is Stalevi Shershni, which translates to Steel Hornets in English. The company sells drone bodies in Ukraine. All ammunition is delivered as assembled cases but without explosives and detonators. A critical area for development in the DoD's additive manufacturing strategy lies in 3D-printed drone munitions cases. This technology holds immense potential for increasing a military unit's flexibility. On-demand production of lightweight, custom-designed cases tailored to specific missions could optimize aerodynamics and specialized battlefield scenarios. While 3D-printed cases offer customization and lighter weight for drone-dropped munitions, this approach requires meticulous design and high-quality materials to ensure safe and reliable detonation. 3D printing introduces uncertainties in strength and consistency, potentially leading to malfunctions or catastrophic accidents.

Lastly, IEDs strapped onto drones have become a growing concern in warfare and have played a significant role in irregular warfare. These weaponized drones offer insurgents and non-state actors a cheap and accessible way to inflict damage and casualties. The ease of attaching IEDs to commercially available drones lowers the technical barrier to their use. The small size and ability to evade traditional air defenses make them challenging to detect and counter. These types of attacks pose significant threats to military personnel and civilian infrastructure, particularly in strategic support areas where collateral damage from explosions can be devastating. The use of IED-laden drones in conventional warfare demonstrates the increasing adoption of irregular tactics as the nature of conflict evolves and as munitions supplies have dwindled. To optimize modernization efforts, the Army should integrate lessons from irregular warfare directly into new tactics, techniques, and procedures development, instead of treating them as a distinct modernization effort.

Conclusion

Modernizing drone-specific munitions requires a strategic balance. Factors like drone capabilities, mission specifics, budgetary priority, and munitions production influence the optimal approach. Adapting existing munitions offers a quicker and more economical path for initial integration, allowing for rapid deployment. However, these munitions might not fully address future needs. 3D-printed cases, while demanding more significant investment in development and logistics, hold immense promise for specialized, potentially lighter munitions. The future of warfare undeniably revolves around drone technology, and the Army must ensure its munitions modernization keeps pace. This necessitates a multifaceted approach: leveraging existing options for initial fielding while investing in 3D-printed solutions to maintain a decisive edge over near-peer competitors in large-scale combat operations and over non-state actors in irregular warfare. As drone munitions become increasingly crucial, the future could see not only a dedicated project office but also the emergence of a distinct category of munitions designed explicitly for drone deployment.

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USING WARGAMES
TO UNDERSTAND SUSTAINMENT IN LSCO

By Maj. Catherine R. Deeter

"We many never know the right answers, but gaming can sometimes help us learn to ask the right questions."

— from Peter Perla's *The Art of Wargaming: A Guide for Professionals and Hobbyists*

Ever since Russia invaded Ukraine in February 2022, the military community has watched the conflict closely, hoping to glean as many insights into large-scale combat operations (LSCO) as possible. One observation is that sustainment in LSCO is often operating within the worst-case scenario, namely, operations that drag on with a high supply requirement across dispersed formations with no safe area. Little expertise for sustainment in LSCO currently exists within the Army, but sustainers must identify the unique challenges LSCO present and develop strategies to address them. A complex and complicated environment is hard to replicate often enough to develop effective strategies. In addition to the study of the ongoing Russia-Ukraine War, sustainers should leverage sustainment-specific wargames to develop the necessary skills for success.

Modern LSCO: A Challenge for Sustainment

Modern LSCO present a unique challenge for the sustainment warfighting function. To address these challenges, we must define what is meant by modern LSCO. Field Manual (FM) 3-0, Operations, defines LSCO according to the large sizes of forces committed against operations and strategic objectives. However, this broad definition could encompass any scenario in which the U.S. commits significant forces to achieve overmatch. This applies to the last 20 years of conflict in the Middle East, a conflict in which the U.S. conducted counterinsurgency (COIN) operations, an entirely different type of war.

Therefore, this paper refers to a more useful definition of modern LSCO proposed by Maj. John Dzwonczyk and Maj. Clayton Merkley in their 2023 Military Review article, "Through a Glass Clearly: An Improved Definition of LSCO." They wrote, "LSCO: combat operations involving two or more general or flag officer-level echelons of command on at least one side maneuvering their commands in support of a campaign against an enemy with comparable tactics and force structure." This proposed definition hints at how sustainment might differ in LSCO from other types of war because it captures the need to consider an enemy that rises to the level of a peer/near-peer threat.

One challenge for sustainment in modern LSCO stems from a lack of experience across the force. Using the definition proposed above, the three latest conflicts that fall into the category of LSCO are World War II, the Korean War, and Operation Desert Storm. The most recent of these conflicts ended 33 years ago, which means few if any U.S. military personnel have concrete experience in LSCO. To compound that, the Army has spent the last 20 years dialed into the COIN range of the competition continuum. This long focus on COIN has led to expertise and a prevalence of strategies aimed at asymmetrical warfare, such as the practice of concentrating sustainment into large hubs. Gaining the experience necessary for success in LSCO will not be easy. Their very nature means that gaining experience through practice at combat training centers requires a large amount of time, units, equipment, and other resources, a costly endeavor that is not quickly replicated. Boardgame-style wargames can potentially bridge these inherent training gaps.

The second challenge for sustainment in modern LSCO is that logistics units are organized and outfitted for a COIN conflict. Before August 2021, operations in Afghanistan and other parts of the Middle East had taken on a steady-state nature. For instance, Soldiers transferred into theater on a consistent deployment cycle and operated from built-up installations. Sustainment operations also reflected the mature nature of the theater. There was an understood safe rear area with no constant threat and with supplies piled into Iron Mountains, i.e., sprawling supply dumps with large units living off them. As the war on terrorism lengthened, the government did what governments do: it looked for ways to save money, placing pressure on the Army to institute lean business practices and maximize the tooth-to-tail ratio (the ratio of one combat Soldier to the number of support Soldiers). Unfortunately, thinning the logistical system so much made it unsuited to the demands of warfare with China or Russia.

Developing and training practical sustainment strategies for LSCO are further challenged by a system heavily weighted with Army Reserve units (78%) instead of active-duty sustainment units. Reserve units are limited by their training events throughout the year and by a lack of a training cycle that combines Reserve and active-duty units. Even if combat training centers perfect division and higher-echelon training through limited rotations, the majority of sustainment officers will not be able to build their experience by repetitively developing and practicing LSCO procedures. Wargames can help investigate what, if any, changes logistics units may need to undergo, and can provide additional training opportunities.

The third challenge sustainment faces in modern LSCO is reframing the idea of correct sustainment. Successful sustainment in LSCO cannot be synonymous with efficiency. To understand why, we must first acknowledge the definition of efficient as capable of producing desired results with little or no waste. On its face, this sounds like exactly the right goal for a sustainment enterprise. However, in an LSCO environment where logistics are actively and consistently under threat, efficiency makes sustainment vulnerable to unintended gaps. Rather than efficiency, LSCO sustainment must focus on being effective and resilient. Most important, the Army must recognize there will be no single correct method of sustainment for LSCO. The efficient nature of logistics in COIN may work during some phases of an LSCO campaign, but during other phases it may require accepting possible waste or increased costs to ensure effective sustainment. Experimenting within wargames allows sustainers to understand the difference between efficient and effective practices, and when each is more useful.

Why Wargames?

Wargames are a useful tool. In the Army, the term wargame is most often associated with the practice of simulating a course of action during the military decision-making process. FM 5-0, Planning and Orders Production, defines a wargame as "a disciplined process, with rules and steps that attempt to visualize the flow of an operation." Historically, wargames have played a central teaching role in the military academies of America, Germany, France, England, and Japan. During World War II, Germany successfully employed their version of wargaming, Kriegsspiel, during active combat to effectively respond to American attacks on the German Siegfried Line. The German wargame accurately predicted American actions and reduced German analysis and reaction time. Wargames are well established as tools to assess plans before and during operations. However, their use in the sustainment warfighting function can and should be expanded.

In this article, wargame refers to the broader category of board-based games that focus on military operations within a specific context. For instance, a board game might allow lieutenants to practice multiple tactical strategies against an enemy embedded within a forest. The lieutenants play against each other and must react to the real-time decisions of their opponents. The advantage of this type of wargame is that it is focused on a specific learning objective and does not require players to first craft the game they wish to play.

These kinds of wargames provide many other advantages. A wargame is a safe-to-fail environment that allows players to experiment with the accepted practice and with bold or out-of-the-box strategies without the fear of real-life consequences. This experimentation lets players investigate what works, what does not work, and why. With repetition, players can develop an understanding of their own and their enemy's options in a given situation, allowing them to extrapolate in similar scenarios. A player who spends time investigating different scenarios will enter a real-life situation with a toolbox of actions and options to apply.

Wargames support how the human brain is optimized to recognize patterns. It is the first biological computer, synthesizing stimuli from the environment to make assumptions about what is there, what is changing, and above all, what that means. The more the brain studies patterns related to a topic, the further along the spectrum of understanding the brain moves, from intellectual understanding to intuitive understanding. Wargames are designed to reflect the reality of war.

The more wargames are developed around the subset of LSCO war, the more scenarios military sustainment officers can study.

Lines and Webs: One Wargame Solution

Recently developed as a part of the thesis of a student at the U.S. Army Command and General Staff College (CGSC), Lines and Webs is a board-based wargame that supports investigating sustainment strategies for LSCO. This wargame models multiple systems for sustainment in an LSCO environment to allow players to practice with their complexities. Lines and Webs pits modern, linear logistics against a proposed web-like system. Players fight for control of key ports on a node-and-link map using comparable combat power that replicates the challenge of a peer/near-peer enemy.

This wargame is designed around four key elements: opposing sustainment models, contested logistics, a panopticon battlefield, and innovative technology. As the core design, the wargame opposes a traditional linear sustainment system (high throughput, but minimal flexibility of fewer higher-capacity units) against a proposed web-like system (lower throughput, but more resilient through numerous but smaller elements). The contested logistics environment is portrayed by using special cards to replicate the vulnerability of sustainment nodes and lines of communication as high-value targets. This forces players to consider how they balance combat operations with the protection of their sustainment assets. Lines and Webs incorporates mini drones and visibility of player pieces to replicate the panopticon nature of an LSCO battlefield. This forces each player to operate in an environment where every action is seen and evaluated. Finally, this wargame replicates near-future combat that includes innovative technologies in development that provide military officers with options for managing their sustainment in novel ways.

During development and multiple tests, Lines and Webs proved useful for investigating the tradeoffs of using the sustainment systems (short-term efficiency or long-term resilience). Unexpectedly, neither system proved perfectly ideal for LSCO. Instead, players were able to identify the risks associated with each system and posit how they might employ each system at different points during operations. The wargame also underscored the importance of understanding how sustainment drives tempo. Players experienced the push and pull between maneuver and sustainment and quickly felt the importance of managing their sustainment, not only during the relevant phases, but also by planning multiple steps ahead.

Lines and Webs and other wargames designed in a similar way can provide persistent and repetitive learning opportunities that can be done in a structured environment (with oversight by more-experienced sustainers) or individually. Depending on the focus, wargames can investigate both tactical and operational sustainment challenges.

Conclusion

LSCO require sustainment systems, leaders, and planners who have the skills to adapt to an ever-changing environment. Many of these skills can and will be developed through the traditional military training system (field problems, combat training centers, etc.). However, wargames can help develop those skills when money, time, or space are not available to replicate a complex and complicated environment. The wargame Lines and Webs is one example of a wargame that bridges this gap. Similar wargames can and should be developed for the same purpose. The military sustainment community should encourage and invest in the development of sustainment wargames oriented around problems of interest to the community. Increased awareness of the Master of Military Arts and Sciences wargame program and a partnership between division logistics/sustainment commands and the Department of Simulation Education at CGSC are great first steps toward that end.

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Featured Photo
Maj. Jim Mehr and Dr. James Sterrett play-testing an early version of Lines and Webs at Fort Leavenworth, Kansas, on Jan. 23, 2024. (Photo by Maj. Catherine Deeter)


09

MAKING 3,000 LOOK LIKE 30,000

By Col. Ned Charles Holt

U.S. Army Japan (USARJ) serves as the theater gateway for U.S. forces responding to crises in the Indo-Pacific region. Inside USARJ, the 10th Regional Support Group (10RSG) supports the theater Army in competition and crisis. 10RSG's primary missions are reception, staging, onward movement, and integration (RSOI); base operating support-integrator (BOS-I); contingency sustainment; and managing theater ammunition stocks for U.S. Army Pacific. The 10RSG headquarters (HQ) is on the island of Okinawa, and its two battalions, the 35th Combat Sustainment Support Battalion and the 10th Ammunition Depot, are over 500 miles north on the mainland of Japan.

During the competition and crisis phases, 10RSG has limited assigned forces and operates without follow-on forces for extended periods, which can exceed their capability. USARJ conducts several annual bilateral exercises with the

Japan Ground Self-Defense Force (JGSDF): Orient Shield, Yama Sakura, and North Wind. These exercises provide opportunities for 10RSG to experiment with concepts to support significant forces with limited personnel.

In 2023, the U.S. Army, JGSDF, and the Australian Defense Force (ADF) participated in Yama Sakura 85 (YS 85). Participating units from the U.S. included the 11th Airborne Division, 7th Infantry Division, I Corps, and from the ADF, the 1st Australian Division. YS 85 was a command post exercise that included over 1,500 service members from the U.S. Army and ADF and approximately 5,300 members from the JGSDF. Training occurred throughout central and northern Japan, with training sites dispersed 500 miles from Tokyo in the south to Hokkaido in the north. The training focused on increasing interoperability for the three nations to respond to large-scale combat and crisis.

During YS 85, 10RSG demonstrated its exceptional capabilities by supporting over 1,500 service members with fewer than 100 Soldiers, resulting in a tooth-to-tail ratio of 15:1. This remarkable feat, surpassing the U.S. Army's ratio of 1:4 (1 combat arms Soldier to 4 support Soldiers) during the Iraq War, is a testament to 10RSG's efficiency and effectiveness in providing sustainment support. The goal of this paper is not to suggest that a 15:1 ratio is the new norm, but that 10RSG has found many innovative ways to drive down the requirement in future operations. There is a substantial difference between supporting an exercise and a large-scale combat operation. However, it must be noted that even if the support element for YS 85 had been tripled, there would have been substantially more support forces than were used in previous conflicts.

All efforts were synchronized and nested to maximize the use of limited resources to reduce training distractors and ensure the continuity of the operation.

Reducing the tail, the requirement for sustainment Soldiers, provides flexibility, reduces costs, gives the commander more tooth, and increases operational reach. Even with a small support package, 10RSG provided all support categories, including billeting, laundry, transportation, and field feeding, from the arrival of the advance party to the departure of the trail element. A small sustainment package allowed the commander to reprioritize available resources to maximize training with minimal personnel and budget impact, allowing 10RSG to train and rehearse on its assigned wartime missions.

To support the exercise, 10RSG operated four RSOI and BOS-I sites across northern Japan, a tactical command post (TAC) on the mainland of Japan and the main command post (MCP) 1,000 miles south in Okinawa. The TAC was responsible for all support operations for YS 85 and for managing all non-exercise activities that 10RSG was supporting on the mainland of Japan. The TAC was the single source for reporting all personnel, equipment, and supply statuses to reduce redundant reporting and flatten command nodes. The 10RSG TAC had the authority to reposition any personnel, supplies, or equipment without consulting the MCPs to flatten the command-and-control structure and increase its effectiveness.

Lt. Col. Koishi Hiroshi, Japan Ground Self-Defense Force member, briefs U.S. Army Soldiers and JGSDF members about supply routes and resources during a bilateral sustainment brief at Camp Sendai, Japan, Dec. 10, 2023. (Photo by Spc. Nolan Brewer)

10RSG engineered each logistics task force (LTF) separately to support the unique mission at the base camps. All RSOI and BOS-I nodes were established a week before the start of YS 85 and operated continuously until the training audience departed Japan. Each LTF had a core group of specialists that included the following, at a minimum:

- Officer in charge (OIC; branch and rank immaterial).
- Noncommissioned officer in charge (NCOIC; branch and rank immaterial).
- Transportation specialist.
- Personnel specialist.
- Communication specialist.
- Supply specialist.

With this basic structure, LTFs could be scaled up or down as needed, but each could account for personnel and equipment, provide life support, and run a base camp. With this structure in place, LTFs managed all types of support, such as tactical field feeding, JGSDF acquisition and cross-servicing agreements (ACSAs), base life support (BLS) agreements, and contracting. A commissioned officer is not required to oversee an LTF. In previous North Wind exercises, an engineer master sergeant and a chief warrant officer served as the LTF OIC/NCOIC for different years.

The 10RSG operated with fewer than half the personnel used in Iraq through a disciplined approach that was process focused and started with the Army's eight-step training model. It also included the following:

- LTF leader certification program that provided:
  - Multiple touchpoints with the 10 RSG command team.
  - Deliberate planning coupled with rehearsals and wargaming.
  - Flattened command and control that provided leaders at echelon with the necessary authorities, resources, and

U.S. Army Soldiers and Japan Ground Self-Defense Force members practice sling load operations during Orient Shield 23. (U.S. Army photo)

budget required for mission.
- Host nation support and contracting.
- Vertical integration with USARJ staff (G-1, G-3, G-4, and G-6) and horizontal integration with U.S. Army Garrison (USAG) Japan and 403rd Army Field Support Brigade (AFSB) to ensure unity of effort.
- Most important, it included the trust of the supported unit and USARJ.

The genesis of this change was the reliance on the leader certification program for the LTFs. Six months before execution, 10RSG assigned a lead OIC and NCOIC to the exercise. This leadership team was responsible for all aspects of planning, resourcing, and execution, along with an after-action review and a recommendation for changes to the unit tactical standard operating procedure manual and the LTF handbook.

With the help of the S-3 and support operations, the OIC and NCOIC lead 10RSG through a detailed military decision-making process. When the course of action was approved, the OIC and NCOIC coordinated with the host nation. Training audiences were spread from Alaska, Hawaii, and Japan, and USARJ did an in-depth rehearsal of the concept.

Before the lead-up to the mission, the LTF led conducted site surveys, attended every joint exercise life cycle (JELC), prepared and presented every significant product for the event, and conducted all rehearsals. The 10RSG command team was involved at every level, from receiving the mission analysis brief, participating in course-of-action development and selection, and ultimately approving the mission. 10RSG dedicated a significant amount of time and energy to wargaming and analyzing every step of the operation to ensure mission success. During the planning and

rehearsing phase, the LTF leadership identified potential friction points, resources and authority challenges, and the manning for each LTF node.

The JGSDF provided the bulk of support to YS 85 through ACSAs and BLS agreements. The JGSDF had liaison officers (LNOs) embedded in the 10RSG TAC and local LTFs. These LNOs helped keep the operation together when the operation was adjusted or when weather affected training. This support was more cost-effective than contracting; it maximized local resources, reduced contractor and support fratricide, and increased interoperability between the two nations' armed forces.

This level of cooperation did not occur in a vacuum. All YS 85 planning efforts were integrated through USARJ staff and were aligned with units participating in and supporting the exercise. During YS 85, USAG Japan and the 403rd AFSB provided over-the-horizon support, and their efforts were crucial to the exercise. All efforts were synchronized and nested to maximize the use of limited resources to reduce training distractors and ensure the continuity of the operation. A standard operating picture, steady information flow, and liaisons from all organizations enabled the TAC and LTFs to synchronize the RSOI and BOS-I support for over 1,500 service members and civilians who came from two countries with 30 points of debarkation. All converged on four locations in Japan. Operations can quickly become desynchronized without flat communications and a combined operations cell. During the reception phase of YS 85, the USARJ G-4 transportation section and the USAG Japan bus cell worked hand in hand to manage this complex mission.

No matter the plan or intentions, effective operations are built on trust between people and units. This concept is understood by 10RSG because it is geographically isolated from units that participate in the exercises (Alaska, Washington state, Hawaii, and Australia) by vast distances and the International Date Line. The unit and USARJ work tirelessly to build and maintain trust between the theater Army and itself. Trust starts with interactions at all JELC events, working groups, rehearsals, and wargames. But the bedrock of trust is delivering the agreed-upon services every time.

No two exercises or operations are the same. Still, several truisms can be transferred to a larger audience to reduce sustainment manning and increase the effectiveness of support operations:

- Choosing the right leader and maintaining command engagement through every step of the operation.
- Conducting mission analysis and wargaming.
- Gaining and maintaining the trust of higher HQs and supported unit.
- Reducing inefficiencies and redundant reporting requirements.
- Mission command that gives leaders at the echelon all the tools and authorities to make decisions without input from higher HQs.

In conclusion, 10RSG provides world-class sustainment support to coalition forces at a tooth-to-tail ratio uncommon in the U.S. Army. 10RSG's low tooth-to-tail ratio is only possible because of the trust of their HQ, USARJ, the training audience, dedicated and professional officers, warrant officers, and NCOs, along with long-range planning and training that includes all elements of the command. The payoff is better-trained teams and units, trust in the formation and from division-supported units, reduced costs, and a more effective operation.

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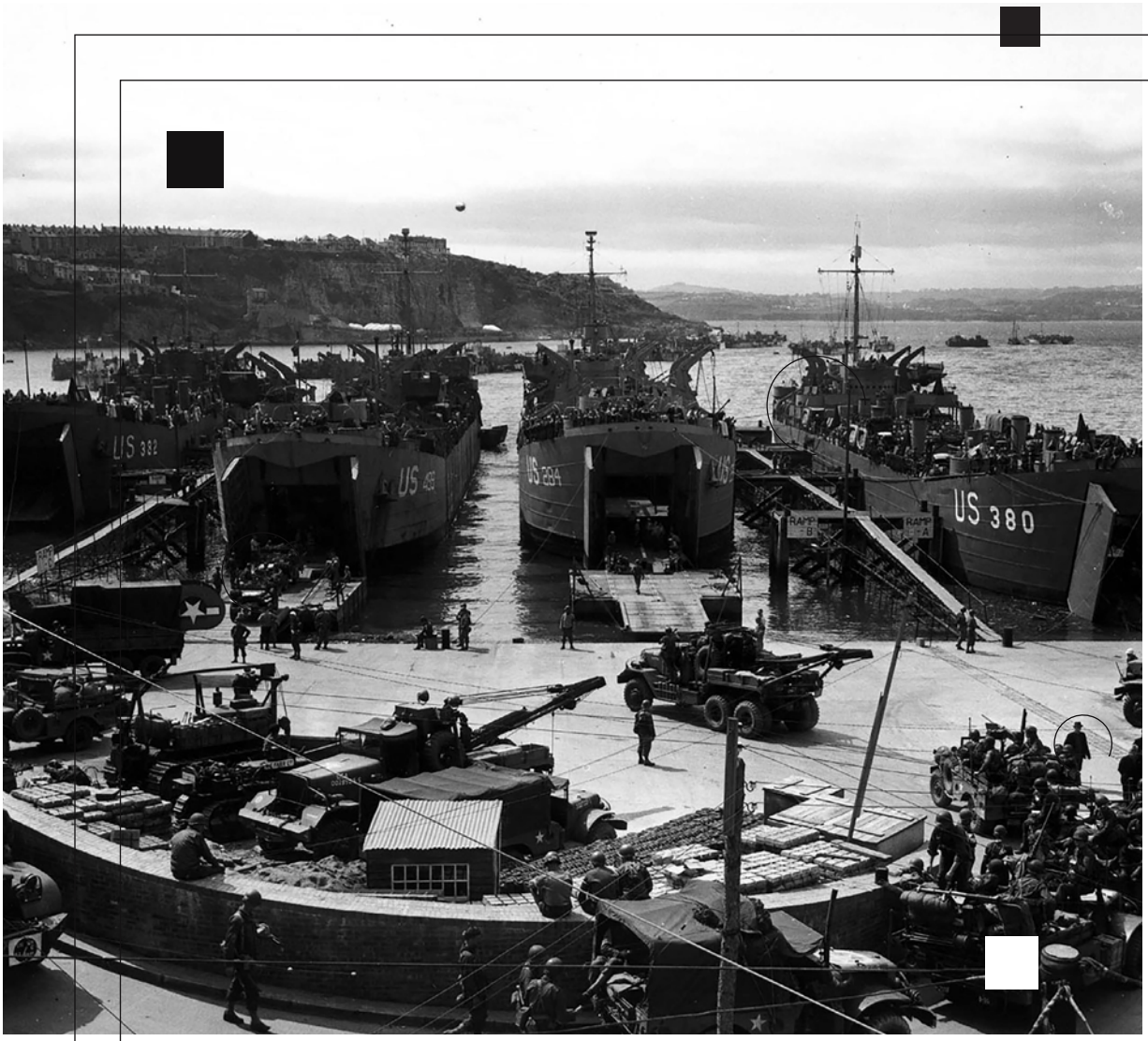
Featured Photo
U.S. Army Soldiers from 10th Support Group and Japanese Ground-Self Defense members work together to upload various types of equipment onto a Landing Craft Utility at Naha Port, Okinawa, Japan. (U.S. Army photo)

AUTOMATED VESSEL SELECTION

AND COMBAT LOAD PLANNING

By Maj. William Kirschenman, Dr. Brandon McConnell, and Dr. Russell King



In large-scale combat operations (LSCO), the U.S. must move and maneuver forces through intra-theater and inter-theater modes of transportation. This complex challenge requires efficient integration of routing, scheduling, sequencing, and loading of personnel, equipment, and supplies. Threat forces exacerbate these demanding requirements through efforts to hinder the flow of friendly forces. Contested landing zones, whether they be ports or beaches, are the starting point for a landing force's ground combat operations. It is imperative that the landing force expeditiously off-loads in the prescribed order of priority to support the planned scheme of maneuver. Embarkation planners must closely address certain factors when considering off-loading a landing force in a contested environment.

The U.S. military has not conducted LSCO against a near-peer threat since the Korean War and World War II. Since then, most military conflicts have used well-protected debarkation ports or landing zones, such as Saigon and Da Nang during the Vietnam War or various ports in Saudi Arabia, Kuwait, and Bahrain during the Gulf War. What happens when the U.S. military must instead flow forces from intermediate staging bases (ISBs) or other protected ports for the final leg of movement through a contested port or landing zone for ground combat operations?

Joint Publication 3-02, Amphibious Operations, describes combat loading as "a loading method that gives primary consideration to the facility with which troops, equipment, and supplies can be unloaded ready for combat," emphasizing the necessity of detailed planning that focuses on the off-loading phase. Efficient combat loading is paramount to allow the landing force the best opportunity to conduct its anticipated tactical operation upon debarkation. While administrative loading may be more appropriate when debarking at ISBs or well-protected ports and landing zones, contested ports or landing zones require combat loading. The U.S. will not consistently have the luxury of uncontested debarkations when it faces near-peer threats in the future.

The Integrated Computerized Deployment System (ICODES) is "the single DoD system to complete load plans for sealift, airlift and rail" per the Defense Transportation Regulation. Digital agents provide intelligent assistance by checking and notifying the planner of violations of various constraints based on information such as cargo placement, a vessel's trim and stability impact, and accessibility. Each vessel's embarkation planner can easily import cargo sets and manually adjust the stow plans to meet constraints.

The ICODES Single Load Planner is a remarkable capability that allows a vessel's embarkation planner to create a viable loading plan with the corresponding reporting and networking capabilities for accountability throughout the embarkation process. Even with the levels of assistance and automation this system provides, automatically generated loading plans still require manual adjustments to meet constraints, or planners must stow equipment and generate loading plans from scratch.

Load plans are made per individual vessel, even though synchronization across a large landing force and multiple vessels may be required. These limitations create issues with configuring load plans that synchronize the priorities and restrictions required of a large landing force of diverse subordinate elements. This force may need to be carefully split across various vessels to balance concepts such as maintaining element unity or spreading equipment across vessels for risk mitigation.

Problem

What if we could automate the entire vessel-loading process without requiring manual cargo positioning adjustments to provide feasible loading plans that satisfy all constraints? Vessel, equipment, and loading constraints are known, and the landing-force staff can provide orders of priority for off-loading equipment.

What if we have a large landing force and must conduct combat spread loading across a set of candidate vessels? What subset of candidate vessels should we use? What is the corresponding assignment of landing-force elements and equipment for these vessels? And what are the specific loading configurations that maintain the landing-force commander's order of priority?

Soldiers from the 1st Infantry Division and supporting units off-load vehicles and equipment onto Omaha Beach at Normandy, France, at low tide during the first days of Operation Overlord in June 1944. (Photo by USCG MoMMc3 Arthur DeLorenzo)

What if there are separate orders of priority for landing-force elements and the equipment within those elements, and we want to load all of an element's equipment closely together or spread it across multiple vessels to balance the placement of a critical security asset at the landing zone?

The Army sustainment community, supported by academia, should lead an effort to design a methodology that will use landing-force commanders' priorities for subordinate elements and equipment. We need a methodology that will automate combat loading for a large landing force into available vessels in a way that keeps element integrity while ensuring the force can off-load quickly into respective combat formations and continue to follow-on tactical objectives.

How can a set of available vessels be selected and combat-loaded to maximize a landing force's flexibility to meet changes in its tactical plan? A group of subordinate elements constitute a large combat force, and these groups must fight cohesively, requiring them to be loaded close together to off-load efficiently into a combat formation. The group also has equipment-level loading

priorities to ensure it can organize into a desired sequence or order of movement for the tactical situation upon off-loading. Groups may also have different priority levels, introducing the need to prioritize certain equipment groups ahead of others. These equipment groups may need to be loaded onto a single vessel or across multiple vessels while considering the various levels of prioritization. The ability to identify and combat load vessels while adhering to these various levels of prioritization allows a landing force commander to maximize the combat effectiveness of their forces upon off-loading in a contested environment.

Vision

We suggest creating a model that uses advanced algorithms and intelligent automation to assist landing-force and embarkation planners while rapidly providing vessel selection and combat-loading configurations that will maximize flexibility to meet changes in the tactical plan upon off-loading in a contested environment. The model will select an appropriate subset of available vessels, given the landing force's anticipated tactical operation and equipment that must be loaded, while accounting for commander-driven prioritization requirements. The model will then provide plans that optimize vessel selection, sequencing, and combat-loading configurations by considering landing-force element-level priorities, equipment-level priorities within those elements, and group unity while enabling efficient off-loading into a desired order of movement.

Conclusion

During the war on terrorism, the U.S. military conducted operations as the primary airpower. We have since shifted to preparation for future conflict with a near-peer threat in a highly and constantly contested environment. In LSCO, the U.S. military cannot rely on continuous air superiority. It must rely on pulsed operations with windows of superiority and efficiency with off-loading combat forces at contested ports and landing zones. Staging forces near a contested port will not be an option. Army sustainers will have a clear role in working with landing-force commanders to create a deliberate combat-loading plan to quickly off-load, assemble into an order of movement that supports the scheme of maneuver, and continue to the next objective.

This prioritized loading model aims to enhance embarkation and logistics planner capabilities and provide the landing-force commander with a detailed loading plan that reduces risk to mission upon off-loading. Instead of spending hours planning complex loading configurations of large equipment sets across various vessels while maintaining prioritization requirements, planners will have a model that quickly generates multiple courses of action that provide excellent loading solutions that meet all constraints and requirements to promptly evaluate, refine, and utilize. These courses of action give landing-force commanders a viable combat loading plan that maximizes their ability to off-load quickly into combat formations while preserving combat power and rapidly orienting the force to follow-on objectives.

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Dr. Brandon McConnell is a research associate professor in the Industrial and Systems Engineering Department at North Carolina State University (NCSU). He is a former Army officer with multiple combat tours in Iraq. He was commissioned as a lieutenant in the Infantry Branch from the U.S. Military Academy. He holds a Ph.D. in operations research from NCSU.

Dr. Russell King is the Henry L. Foscue Distinguished Professor of Industrial and Systems Engineering (ISE) at North Carolina State University. He previously served as director of the Center for Additive Manufacturing and Logistics and is currently the director of Graduate Programs for the ISE department. He received his Ph.D. in industrial engineering from the University of Florida.

Featured Photo
In preparation for the invasion of Normandy, Soldiers from the 1st Infantry Division load artillery equipment aboard Task Force 122 Landing Ship, Tanks, at Brixham, England, on June 1, 1944. (Photo by U.S. Army Technician 5th Grade Bill Nehez)

Army Prepositioned Stock and Ready and Agile Logistics

Enable Success at DEFENDER 24

By Capt. Michael J. Mastrangelo

Over the last five years, the Army has demonstrated logistics readiness and agility by deploying on short notice to undeveloped locations to protect U.S. interests abroad. While the Army's ability to respond in crisis remains at the forefront of public perception, there is a growing emphasis on the importance of agile logistics systems, specifically the ability to project combat power anywhere in the world on a shortened timeline.

Army prepositioned stock (APS) provides commanders with the confidence to use prepositioned equipment to conduct wet-gap crossings required in areas such as the Suwalki Gap. The Suwalki Gap is a small area that separates Belarus, a Russian ally, and Kaliningrad. The Suwalki Gap provides a strategic advantage in collective security and deterrence. The geographic position

of the countryside referred to as the Suwalki Gap also serves as the borderline between Russia and the Baltic members of NATO.

The DoD retains the ability to mobilize combat power due to the key programs in the strategic mobility triad: airlift, sealift, and APS. APS is arguably the most vital portion of the strategic mobility triad for short-notice response mobility and deployments, especially when assessing the need for capabilities that meet the requirements for operations in the European region.

Prepositioned unit sets are serviced and maintained under the APS program. Army field support brigades (AFSBs) manage the unit sets. Responsibility for specific unit sets is further disseminated to battalions by their modified table of organization and equipment (MTOE). For example, each battalion within an AFSB maintains and issues unit sets aligned with the arriving battalion and company MTOE. Each APS site is given a number to identify the location and theater provided for the combatant command (COCOM) as a capability in warfighting and training mobilization. The program can also sustain the warfighter during the initial phase of contingency operations. These capabilities underscore the National Defense Strategy's need for resilient and agile logistics in what are becoming heavily contested regions worldwide.

The implementation of wet-gap crossings into NATO exercises, such as DEFENDER, has increased the need for ready equipment used in specific operations. The strategic mobility triad makes the capability of deploying a unit on short notice to conduct a wet-gap crossing possible. Units would find it difficult to bring the equipment required to conduct wet-gap crossings from their home stations.

DEFENDER is a joint training exercise designed as a show of force to test capabilities throughout the European region. A reflection of the positive impact was recently demonstrated by 20th Engineer Battalion's participation in DEFENDER 24. APS sets allowed the unit to focus on deploying personnel by air movement — the quickest method — and reduced the movement timeline by eliminating the need to bring equipment from home stations.

The 405th AFSB was recognized recently for its ability to maintain engineer and bridging equipment and to move it from storage to an issue site in theater. This allows a deploying unit to arrive and receive ready equipment for an upcoming training exercise. The importance of prepositioning the proper equipment in the correct location was emphasized in the DEFENDER 24 exercise.

As part of DEFENDER 24, the 43rd Multi-Role Bridge Company (MRBC), 20th Engineer Battalion, deployed in mid-April and began drawing prepositioned equipment. The prepositioned unit sets were moved from Belgium to Poland in

preparation for DEFENDER 24. 43rd MRBC drew a combination of equipment, primarily focused on Improved Ribbon Bridges (IRBs) and bridge-erection boats. These items of equipment are in the 43rd MRBC's MTOE but would have presented significant challenges for movement on a deployment timeline. By early May, the 43rd MRBC could emplace a full enclosure of IRBs and build rafts for a wet-gap crossing. The wet-gap crossing was conducted with NATO allies, and over 16 days, they moved more than 400 pieces of equipment belonging to four different NATO allies. The equipment ranged from armored vehicles to artillery. Additionally, they moved personnel swiftly and effectively. The joint crossing and bridging operation demonstrated the Army's proficiency in conducting complex maneuvers while emphasizing its ability to operate seamlessly in a joint environment with NATO allies.

During DEFENDER 24, APS was put to the test through various training exercises. Overall, agile logistics demonstrated the capabilities of the Army to conduct exercises ranging from joint forcible entries to wet-gap crossings. After arriving in Europe, organizations began drawing from the prepositioned unit sets designed to outfit them for their organic capabilities. DEFENDER 24 proved the ability to project combat power on short notice and to put troops in the right place with the right equipment.

During competition, APS allows the Army to maintain readiness with its primarily continental U.S.-based force. Additionally, it provides COCOM commanders with a baseline of capabilities as combat power is projected into their theater. Agile logistics are crucial in the decision-making process of combatant commanders and Army leadership. Maintaining forward and ready equipment, munitions, and materiel increases the speed and flexibility of the Army during times of cooperation, competition, and conflict, which allows the Army to protect critical assets against future threats.

By strategically positioning vital equipment and supplies, APS ensures that U.S. forces can respond to emerging threats in designated locations. The European region serves as a prime example for analysis. Geographic challenges as significant as the Suwalki Gap prove it is imperative to ensure the correct amount of bridging assets and equipment remain in theater. Prepositioning stocks in strategic locations ensures that Soldiers have the right equipment and materials in the right location to win on the battlefield.

Capabilities that provide combat-ready equipment create an advantageous position for U.S. troops to respond from various locations around the globe. They also enable units designated to serve as immediate response forces to train and prepare for rapid deployment. This allows specialized units to conduct unique operations essential to the designated area of operations. Aligning these prepositioned sets and sites, such as bridging equipment, in the European theater clearly defines the analysis required to employ agile logistics programs successfully. The program bridges the gap between logistical readiness at home stations and establishes a ready theater able to receive large amounts of troops. At its core, APS is a force multiplier, significantly reducing deployment timelines and enhancing deterrence capabilities.

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Featured Photo
West Virginia National Guard Soldiers from the 1st Squadron, 150th Cavalry Regiment, and contractors from the 405th Army Field Support Brigade's Coleman Army Prepositioned Stocks-2 worksite in Mannheim, Germany, conduct a joint inventory of APS-2 cavalry regiment equipment set at an APS-2 Equipment Configuration and Hand-off Area at the Libava Training Area in Libava, Czechia, at the start of DEFENDER 24, May 2. (Photo by Cameron Porter)

EMBRACING THE AUTOMATED ROUTE RECONNAISSANCE KIT

IN U.S. EUROPEAN COMMAND

A Lesson in Nesting a Warfighting Capability Across Multiple Functions

By Maj. Darryl W. Kothmann

The Automated Route Reconnaissance Kit (ARRK) is a little-known capability outside the engineer regiment. It has incredible potential to positively affect other warfighting functions. Using the ARRK to survey the area of operation (AO) of the AO Victory distribution network improved the delivery of commodities to regionally aligned forces (RAF) and served as a passive route refinement asset. Simply put, the 3rd Division Sustainment Brigade's (3DSB's) employment of the ARRK synchronized mobility, distribution, and route refinement, greatly increasing shared understanding of the AO and ultimately creating safer conditions for Soldiers and civilians.

While deployed as the RAF division sustainment brigade assigned to V Corps in AO Victory, 3DSB executed frequent distribution missions across more than 3,000 km and eight countries. 3DSB provided distribution support to two RAF divisions, Security Assistance Group – Ukraine, and multiple brigades in Eastern Europe and the Baltic States. The diversity of military and governmental agencies governing 3DSB's movements provided a diverse problem set, particularly for the movement of military vehicles and commodities.

Movement throughout each country in AO Victory is governed by National Movement Coordination Centres (NMCCs). The NMCCs are responsible for arranging clearances for all troop movements and frequently direct the exact route a convoy will take. The rules and regulations for governing the selection routes are just as diverse as the roadway conditions from country to country.

Roadway conditions and traffic regulations not only vary between countries but are also diverse within a single country. Roadways in Poland, for example, frequently fluctuate between cities and villages. Rural areas are often restrictive and complex to navigate with military equipment. The heavy trucks, trailers, and recovery assets used by the DSB further frustrate the infrastructure constraints experienced throughout AO Victory. By the time drivers and vehicle commanders become familiar with the obstacles along their assigned portion of the distribution network, they are replaced by another RAF unit who must experience the same learning process. Failure to adopt a common operating picture (COP) between stakeholders further complicates the process.

3DSB identified a lack of shared understanding between the RAF DSB, the NMCCs, and the other RAF units operating in AO Victory. There was no assembled COP of which routes constituted the distribution network. Additionally, routes selected by the NMCC often contained obstacles unsuitable for the type of equipment necessary to execute the mission. Military vehicles often exceeded the height restriction imposed by an overpass or the turn width available on an intersection. Poorly selected routes resulted in vehicle accidents, damage to equipment, risk of injury to personnel, and the delayed delivery of commodities. 3DSB identified a need to properly assess the status of each route to produce a distribution COP between stakeholders.

Two ARRKs were requested by 3DSB from the U.S. Army Engineer Research and Development Center (ERDC). The primary components of the ARRK include a Toughbook computer and dashboard camera. Both are simple to install on any vehicle. All Soldiers and military occupational specialties can be trained to use the ARRK without engineering experience. The ARRK passively collects data on roadway conditions and obstacles as a vehicle travels. The data is sent to ERDC and compiled into a file. The brigade's geospatial intelligence (GEOINT) analysts can transcribe ERDC's file onto a map. With the ARRK on hand, 3DSB began formulating a plan for employment.

3DSB planned to integrate the ARRK into existing distribution missions to collect data on obstacles throughout the distribution network. Route data is collected to build a COP of the distribution network used by 3DSB, the NMCCs, and other RAF and NATO units. Each route within the distribution network receives a name that all stakeholders can use as a reference. Additionally, ARRK data is used to advise the NMCCs on route selection for planned convoy movements. Initial collection through existing

distribution missions was successful, resulting in increased demand for additional collection.

Actual employment of the ARRK eventually drifted from integration into existing distribution missions to non-tactical vehicle (NTV) movements planned specifically for data collection. Limiting the ARRK to existing missions degraded the frequency and speed at which the ARRK could collect information. NTVs can travel longer distances, require fewer stops, and can navigate obstacles better than 3DSB's heavy equipment. NTVs are also not limited by an NMCC's dictated route and can collect information on proposed alternative routes. With the ARRK now resourced and missions specifically designed for data collection, 3DSB was armed to begin compiling the distribution COP.

The ARRKs collected data throughout AO Victory on roadway width, underpasses, chokepoints, restrictive turns, bridges, and other obstacles along routes. Data from ERDC was processed by the brigade S-2 shop and their assigned GEOINT analysts. The S-2 named routes between nodes, selected alternative routes for recommendation to the NMCCs, and compiled all route names into a single distribution network COP for AO Victory. The COP was presented to NMCCs and command posts at echelon with the goal of achieving shared understanding and implementation throughout AO Victory.

Once adopted, the distribution COP for AO Victory will assist the NMCC in selecting the most appropriate route for the type of equipment assigned to a convoy. The distribution COP will provide RAF and NATO units with a planning resource for moving personnel and commodities throughout AO Victory. The COP will reduce the number of incident reports and accidents, ultimately creating safer conditions for both Soldiers and civilians in the AO. The COP also creates a common language for route planners and command posts at echelon in the AO. All objectives are made possible by the ARRK.

The ARRK is easy to resource, train, and employ. Unfortunately, it is a capability primarily employed by engineers. Engineer designation or knowledge is not required to request the ARRK from ERDC. Points of contact and information on requesting the ARRK are available on ERDC's website. ERDC will mail the ARRK directly to the requestor, who can inventory and sign for the equipment remotely. The engineer regiment owes the warfighter a better understanding and general knowledge of the ARRK capability, especially those serving in the sustainment and intelligence communities.

3DSB used the ARRK in AO Victory to complete a survey of a massive distribution network in less than three months. The positive implication for other theaters is obvious and profound. The COP made possible by the ARRK synchronizes mobility with distribution by exploiting the most underrated collection asset in the engineer inventory. The output is shared understanding of the AO and a safer operating environment for our Soldiers and partners. Additionally, 3DSB's new knowledge of the AO improved the brigade's readiness if the theater were to escalate to armed conflict. When assessing on-hand capabilities, Soldiers should consider the implications for other warfighting functions to maximize a capability's potential.

Maj. Darryl Kothmann currently serves as deputy district commander of the U.S. Army Corps of Engineers Galveston District. He has served in the 2nd Armored Brigade Combat Team, 3rd Infantry Division, Fort Stewart, Georgia; the 3rd Security Force Assistance Brigade, Fort Cavazos, Texas; the 68th Engineer Construction Company, 36th Engineer Brigade, Fort Cavazos; and the 173rd Infantry Brigade Combat Team (Airborne), Vicenza, Italy. He is a graduate of the Army's Sapper Leader Course and is certified as a project management professional. He holds a Master of Science degree in geological engineering from Missouri University and a Master of Arts degree in operational studies from the Command and General Staff College.

ADDRESSING THE KNOWLEDGE GAP I

N OPERATIONAL CONTRACT SUPPORT

By Maj. Tiffany Rupp

The needs of our military have always exceeded our organic capability. To fill this gap, contractors have provided essential services such as food, medical aid, transportation, and intelligence. Their contributions, often unsung, have been instrumental in our operations. In fact, contractors have been a crucial part of our military history since the Revolutionary War. Yet, today, we still struggle to use contract support efficiently. As the U.S. military shifts toward focusing on large-scale combat operations and reducing overall personnel strength, how do we plan for an anticipated increase in contract support and prepare our leaders for this future fight?

The 3C Operational Contract Support (OCS) course slots are postured in the brigade and higher formations, but junior leaders are exposed to contract support as early as the company level. This gap in experience often leads to the unit suffering through insufficient or incorrect services or equipment. Additionally, the position of a 3C slot does not guarantee a 3C-trained leader. An Integrated Personnel and Pay System-Army pull from fall 2023 shows that 3C positions account for 0.1% of our total strength, with fewer filled and even fewer deployable.

We often burden our leaders with conducting contracting operations without providing them with the proper training. Our own Army Techniques Publication 4-10, Multi-Service Tactics, Techniques, and Procedures for Operational Contract Support, states that the G-4/S-4 is responsible for operational contract support. Additionally, this includes developing Annex W (OCS), managing contractor-acquired property, contract synchronization and performance reports, and coordinating contractors authorized to accompany the force movement. Without proper training or experience, required activities are often left with a gap in services or supplies while contract support is reworked.

The OCS course provided by the U.S. Army Combined Arms Support Command (CASCOM) at Fort Gregg-Adams provides leaders with the tools to perform OCS-related duties such as drafting and reviewing performance work statements (PWSs), quality assurance surveillance plans, and coordinating with local contracting officers. Completing this course provides a 3C identifier to help place trained personnel in duty positions that require OCS responsibilities. Priority for this training is given to those placed in or projected for 3C-identified slots due to limited seats. Scheduling and funding can prevent leaders from attending this two-week course before assuming OCS-related duties.

Leaders can explore other avenues to familiarize themselves with OCS outside the CASCOM-provided resident course. Although it does not produce the 3C additional skill identifier, Joint Knowledge Online (JKO) provides computer-based learning courses on OCS. The JKO OCS course is a four-phase series in which leaders learn about commercial capabilities, fundamentals, and planning, coordinating, and executing OCS.

This self-paced virtual option is free for the organization and aids in mitigating the knowledge gap until the leader receives the CASCOM-led training.

The Army's procurement.army.mil site provides an interactive guide to OCS through the Contracting Compass application. Leaders start their OCS roadmap by selecting supplies, services, construction, or major system acquisitions. The interactive guide walks users through contract packet requirements, research, and special considerations. This site provides users with templates and examples for contract requirements packets. Users can pull a PWS template, sample, or contract review board toolkit, to name a few resources.

Below are some tips for success in OCS based on feedback from expeditionary sustainment commands and lower echelons.

Know Your Subject Matter Experts

Seek those who are 3C trained or contact your local contracting support brigades or Mission Installation Contracting Command. Seeking expertise helps build the contract requirements packet to ensure you meet all the steps. This decreases the likelihood of your packet being returned for corrections, which puts your timeline to receive supplies, services, or equipment within the timeframe you need them.

Take Time to Understand the Basics

Understanding the procurement acquisition lead time (PALT), contract packet requirements, and funding is critical. Understanding the basics can alleviate frustrations across all entities involved in contracting. The PALT provides planning guidance to determine when you should start building your requirements based on the type of service, equipment, or supplies that you request.

The person who briefs the requirements must be prepared to answer questions related to the requirements, how the activity developed the requirements, how the contract will be monitored, and what the impacts will be if the contract is not approved.

If you understand the packet requirements, you can involve the subject matter experts (SMEs) early. For example, if you are tagged to build a requirements packet to construct a facility, seek out the engineers early. Understand that for some requirements, you may have to meet certain requirements outside your realm of understanding, such as building code requirements. Seeking this help and expertise early increases the likelihood that your request will be approved and that you will receive what you need or want.

Know Your Requirements

Know your requirements well and be prepared to participate in working groups and approval boards. Conduct internal quality assurance/quality control before you submit your packet for approval. Preparedness and the ability to

Replicated partner force role players receive individual team instruction during Operation Combined Victory, on Camp Atterbury, Indiana, Aug. 4, 2023. (Photo by Spc. Hans Williams)

speak on your requirements increase your chances of receiving funding approval. The person who briefs the requirements must be prepared to answer questions related to the requirements, how the activity developed the requirements, how the contract will be monitored, and what the impacts will be if the contract is not approved.

Contract support will continue to be part of our daily operations and future preparations. The Army currently has a gap in what OCS knowledge is required and what is possessed. We can set ourselves up for success by familiarizing ourselves with OCS and by guiding our leaders toward the multiple tools at our disposal. If tasked with OCS responsibilities or building a requirements packet, refer to the tips. Know your SMEs, understand the basics, and know your requirements. Contracting is a great tool to expand capability and mitigate shortfalls, but we must understand it and use it efficiently as good stewards.

Maj. Tiffany Rupp is currently the support operations officer at Army Field Support Battalion-Liberty. She is a recent graduate from the Army Command and General Staff College, Kansas. She previously served as the Security Force Assistance Command G-4. She served as a company commander in 1-82 Attack Battalion, 82nd Combat Aviation Brigade. She worked in the Operational Contract Support/Host Nation Support branch of 19th Expeditionary Sustainment Command in Daegu, Republic of Korea. She holds a Master of Operational Studies degree from the Army Command and General Staff College, a Master of Science degree in industrial/organizational psychology from the University of Phoenix, and is Lean Six Sigma Black Belt certified.

Featured Photo
Contracted replicated partner force role players, left, sign for equipment with Capt. Anthony Hall, 3rd Battalion, 353rd Regiment, prior to Operation Combined Victory on Camp Atterbury, Indiana, Aug. 4, 2023. (Photo by Spc. Hans Williams)

TRANSFORMING MAINTENANCE FOR THE ARMY OF 2030

The Technician Badge

■ *By Command Sgt. Maj. (Ret.) Jason E. Decker and Master Sgt. Oswaldo Maldonado*

Amid a rapidly evolving global security landscape, the Army finds itself at a crossroads, demanding a profound transformation to meet future challenges such as near-peer threats in large-scale combat operations (LSCO) and fifth-generation warfare in multidomain operations (MDO). Part of this transformation includes the creation of the Technician Badge, a replacement for the Mechanic's Badge, which will transform today's maintainers into the technician of the future. This article provides a comprehensive exploration of the who, what, when, where, why, and how of the Technician Badge initiative, focusing on the benefits for the Army's ordnance professionals.

The Technician Badge initiative is a direct response to the evolving needs and challenges the Army faces. This initiative is tied to several of the Chief of Staff of the Army's focus areas. It is also tied to developing our sustainment warfighting professionals to be technically proficient in support of LSCO. It is part of an effort to transform continuously. Since the initiative is tied to both the U.S. Army Training and Doctrine Command and the operational Army, it is all about strengthening the Army profession, in and out of the institutional domains. It is a manifestation of the call to think outside the box. The initiative is also aligned with the Army's visionary outlook for 2030 and beyond. The goal is to produce versatile technicians with a comprehensive understanding of a wide range of systems, technicians who can transcend the confines of battlefield geography where they may be the only maintainer in the immediate area.

The central focus of the Technician Badge initiative is initial-entry and junior enlisted Soldiers, whose roles are pivotal in shaping the Army's maintenance and munitions force as we approach 2030. Initially, it will encompass the entire spectrum of Army career management fields (CMFs) 89, 91, and 94. However, the opportunity exists for the initiative's expansion to include other centers of excellence and branches, such as Quartermaster, Aviation, and the Transportation Corps (TC), thus broadening the scope of career opportunities available to Army personnel.

Technician Badge Replaces the Mechanics Badge with an Achievement Program

The Technician Badge is purposefully designed to acknowledge and reward the exceptional skills possessed by drivers, maintainers, technicians, specialists, repairers, and special equipment operators. Eligible individuals are Soldiers who exhibit a high degree of expertise in operating and maintaining motor vehicles and equipment, as enumerated in Army Regulation 600-8-22, Military Awards. The current standards for the Driver's Badge will remain the same, but the Technician Badge leaves room for the TC to determine how it may further define expertise for CMF 88 in the future.

The formal approval of the Technician Badge occurred on July 5, 2023. The first Technician Badges were awarded in February to 53 ordnance Soldiers at the U.S. Army Ordnance School on Fort Gregg-Adams, Virginia.

Several influential military leaders have commented on the significance of the Technician Badge initiative. Lt. Gen. Ross Coffman, Deputy Commanding General, U.S. Army Futures Command, envisions a dynamic alignment between the Army and corporate industry. This alignment aims to create a synergy where both entities mirror each other's efforts in shaping the Army of 2040.

Gen. Edward Daly, while serving as the commanding general of U.S. Army Materiel Command, placed emphasis on the criticality of sustaining equipment and systems on the future battlefield. He underscored the ongoing transformation of the Army and the need to adapt to a rapidly changing security environment.

Brig. Gen. Steven L. Allen, the Chief of Ordnance and Commandant for the U.S. Army Ordnance School, articulates the initiative's core objective. He says this initiative seeks to craft more knowledgeable Soldiers, who are adept at assessing and maintaining complex platforms, who and thereby bolster support for LSCO.

The goal is to produce versatile technicians with a comprehensive understanding of a wide range of systems, technicians who can transcend the confines of battlefield geography where they may be the only maintainer in the immediate area.

A Focus on Experience

In the civilian sector, industry certifications typically require two years of intensive institutional training coupled with an associate degree in applied science, entailing the acquisition of eight to ten certifications for entry-level technicians. Conversely, the Army's approach places greater emphasis on experience.

Within CMF 89 (Ammunition), over 15 proponent-approved certifications offer Army personnel a diverse spectrum of professional growth opportunities. CMF 91 (Mechanical Maintenance) offers over 85 proponent-approved certifications, further enhancing the skill set of Army technicians. CMF 94 (Electronic Maintenance) introduces over 35 proponent-approved certifications, contributing to the versatility of Army maintenance personnel.

The technician's journey begins with the Basic Technician Badge, awarded after a Soldier accumulates 12 months of military occupational specialty (MOS) experience in an operational environment and completes one certification in accordance with the applicable CMF or MOS listing on Credentialing Opportunities On-Line (COOL).

The next level is the Senior Technician Badge. It is conferred after achieving 24 months of operational experience and after acquiring at least four certifications in accordance with the applicable CMF or MOS listing on COOL.

The highest level, the Master Technician Badge, is awarded after

achieving 48 months of operational experience and after acquiring at least seven certifications in accordance with the applicable CMF or MOS listing on COOL.

Why This Is Needed

Traditionally, the Army has incentivized Soldiers to become self-taught lifelong learners and to seek higher education for self-development. The traditional paradigm of self-development through higher education prioritized earning degrees. However, Army Doctrine Publication 6-22, Army Leadership and the Profession, teaches that leader development is a mutually shared responsibility across three domains: the institutional force (education or training institutions), the operational force (organization or unit), and the individual. In the past, centralized selection boards were instructed to give preference to leaders who had earned a degree.

While this resulted in many highly educated NCOs, generally the degrees obtained did not necessarily align with their CMF or the career map in Department of the Army Pamphlet (DA PAM) 600-25, U.S. Army Noncommissioned Officer Professional Development Guide. Nor did the tuition assistance money spent on those degrees always generate a return on investment for the Army with practical and applicable skills relevant to military service. The Army Leader Development Strategy's individual domain motivates the service member to respond to the challenge of self-improvement in a way that aligns with their CMF.

For these reasons, the Technician Badge represents a shift in the paradigm of self-development. It incentivizes technicians to seek out certifications and technical skills that are directly applicable to their field. This results in NCOs with knowledge, skills, and attributes that make them the most qualified and technically proficient in their CMF. It also increases veterans' post-service marketability, which also can be a selling point in recruiting.

The Ordnance Corps is leading the way with updates to DA PAM 600-25 and centralized board guidance that will reinforce this new approach and reward Soldiers for becoming technical experts in their fields. This initiative symbolizes a significant step toward shaping the Army of 2030 and beyond. While addressing immediate operational needs, this initiative also equips Soldiers with highly marketable skills that facilitate a seamless transition to civilian life.

While also shaping the NCOs into the future, this initiative will benefit the ordnance warrant officers because it perfectly nests into the prerequisites and preferred qualifications that were modified in 2022 to support the Chief of Ordnance's vision for how ordnance professionals support the Army of 2030 and LSCO in support of MDO. With the goal of increasing the technical depth of future warrant officers, the Technician Badge will further assist in developing and fostering the technical skills of junior Soldiers and NCOs and will assist in identifying the most technically skilled professionals to transition into the Ordnance Corps' warrant officer cohort.

A Focus on the Future

The introduction of the Technician Badge represents a watershed moment in the transformation of the Army's maintenance and sustainment capabilities that is perfectly in keeping with the visionary insights of military leaders and the ever-evolving nature of modern warfare. The Technician Badge modernizes Army self-development and incentivizes technicians to seek out certifications and technical skills that are directly applicable to their field, resulting in technically proficient NCOs who can build readiness in an evolving global security landscape. The Technician Badge lays the framework for the recruiting, training, talent management, and equipping of ordnance professionals who will conduct field-level maintenance, munitions operations, and protection tasks in 2030 and beyond. These ordnance professionals are the technicians of the future.

Command Sgt. Maj. Jason E. Decker is a native of Iron Mountain, Michigan. He enlisted in the National Guard in 1996. While attending Northwestern Technical College in Green Bay, Wisconsin, he enlisted in the Army. He has served in numerous leadership positions, including senior mechanic, maintenance control sergeant, battalion S-4 supply NCO in charge, first sergeant, senior NCO maintenance advisor, and command sergeant major.

Master Sgt. Oswaldo Maldonado is a native of New York City, New York. He enlisted in the Army in 2001 while he was attending New York University Polytechnic as an aerospace engineering major. He has served in numerous leadership positions, including senior mechanic, maintenance control sergeant, battalion S-4 supply NCO in charge, first sergeant, sergeant major of training development at the U.S. Army Ordnance Corps and School, and the Commander's Initiative Group for U.S. Army Ordnance Corps.

The Challenge to Sustain and Maintain a Modernizing and Innovating Army

■ *By Capt. Abigail Tomkovich*

With the transition from counter-insurgency to large-scale combat operations, the environment in which we prepare to conduct missions, the capabilities of the threat, and the types of units that execute the missions are rapidly changing their focus and modernizing equipment. As the Army innovates and explores new areas of operation, an obvious but rarely spoken problem comes to the forefront of every logistical mind: How do we support the units based on the environment and structure in which they operate?

The Secretary of the Army, the Honorable Christine E. Wormuth, stated in March 2023 that the Army's six modernization portfolios are long-range precision fires, next generation combat vehicles, future vertical lift, the network, air and missile defense, and Soldier lethality. With the additions of multidomain operations (MDO) included in Field Manual 3-0, Operations, and the Secretary of the Army's comments to the Committee on Armed Services, it is evident that the Army's modernization efforts will continue to challenge the capabilities of the sustainment and maintenance units. Our combat arms and combat support units are testing new innovative equipment, and sustainers and maintainers must be ready to support all aspects of the equipment in new and challenging environments. Additionally, Gen. James E. Rainey, Commanding General of U.S. Army Futures Command, notes that the Army must continuously transform and adapt to advances in technology. A logical consequence of continuous transformation is continuously changing maintenance and support.

It may be time for the Army to reconsider modernizing from the one-size-fits-all mentality and instead organize the support units by their area of operation (AO) and the mission of the unit in MDO.

Personnel Structure

With retention rates decreasing throughout the Army, it is sometimes difficult to ascertain the needs versus the wants of Army support units. With the publication of the most recent Army structure, it is evident the Army is growing and modernizing. However, this is just the beginning for sustainment. With numerous units across the Army, such as the Stryker Medium Caliber Weapon System upgrade, autonomous vehicles, medium- and long-range precision fires testing, indirect fire protection capability testing, and many more, the implied task is that Army sustainers and maintainers must provide support with their current military occupational specialties (MOSs) and their current modified tables of organization and equipment.

The types of MOSs and the ratio between service members and mission is a careful balance that more times than not is impossible to predict or perfect. When a unit receives a modernization fielding, it is crucial to ensure the sustainment and maintenance aspect of the fielding is secured before fielding the equipment. The worst thing we can do for warfighters is give them an upgraded piece of equipment without the capability to sustain and maintain it, much less an upgraded item that does not work.

AO and Mission of Unit

The AO in which a unit executes its mission also plays a vital role in how the unit needs to organize itself. A unit with a European Command AO will need to be set up differently than a unit with a Pacific Command AO. The sustainment trains will function differently and will require different types and numbers of MOSs to ensure the mission is supported properly and in a timely manner.

The mission of the unit is the most important factor to consider when trying to align the personnel strength of a support unit. A unit may operate the same piece of equipment and may have the same line unit structure. However, they may spread their units out differently, and the tempo at which they fight may be different as well. It is important that the support unit be able to adapt to the unit they support to ensure warfighters do not exceed the capabilities of their supply chains.

Equipment Structure

With the increasing focus on air-defense asset testing across the Army, the allocation of a support unit's equipment may not be adequate to the equipment they are testing. The array of basic support unit equipment needs to be spread throughout the globe. The lack of available new support equipment prevents support

units from adding assets to their fleets. This causes units to submit more requests for support than usual. Although some units may have the correct number of capabilities, the maintenance requirements may lag behind due to a long lead time on parts or a lack of available equipment to repair the fault.

The AO and mission of the unit play vital roles in the array of equipment used by the unit. If the unit's mission is surrounded by infrastructure, its bulk fuel requirements will be lower than those of a unit in a more rural environment. The potential threats of the area will also play a role in the unit's equipment.

MOS Specialty Training vs. Contractor Requirements

One could argue that one of the biggest friction points in the maintenance world right now is over contracted maintenance. Like any support strategy, the pros and cons are endless. But we, as the subject matter experts, must decide if the pros outweigh the cons as a long-term solution.

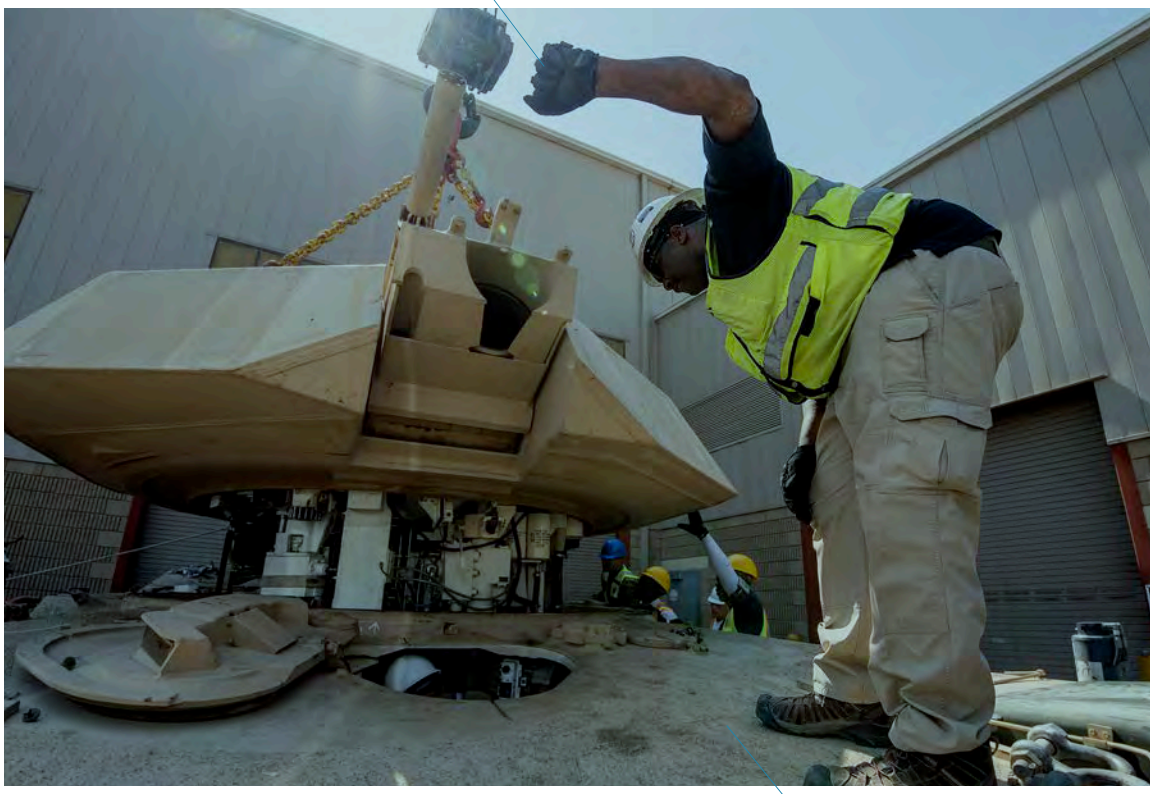
The job of maintenance is not to slow down or prevent the success of the warfighter. However, if, in the long term, progress must slow down for maintenance to catch up (i.e., training on modernizing or innovating technology), then I believe the risk is worth the reward. Similar to the evaluation of personnel and equipment for the unit, sustainment is based on the mission and the efficiency of the current MOSs to learn the new maintenance strategy. The Army Chief of Staff, Gen. Randy A. George, stated at the 2023 Association of the United States Army Conference that delivering ready combat formations and continuous transformation were two of his top priorities.

In the world of modernization and innovation, we need to continue to always bring up the question no one wants to hear: How do we sustain and maintain this piece of equipment? The expectation should never be to hear an answer immediately. Instead, we must continue to ask and consider this question as we continue to modernize and increase the lethality of the fighting force. The criticality of a clearly articulated answer to this question cannot be overstated. The bottom line is that if we cannot sustain and maintain a piece of equipment, it is useless to the warfighter.

Capt. Abigail Tomkovich serves as a support operations planner in the 3rd Expeditionary Sustainment Command at Fort Liberty, North Carolina. She previously served as a support company commander in the 1st Multi-Domain Task Force stationed on Joint Base Lewis-McChord (JBLM), Washington. Before that, she served in the 555th Engineer Brigade at JBLM, in 82nd Airborne Division at Fort Liberty, and in the movement control team at Camp Henry, South Korea. She holds a Bachelor of Science degree in nutrition from the University of Alabama.

It is important that the support unit be able to adapt to the unit they support to ensure warfighters do not exceed the capabilities of their supply chains.

Enhancing the Handling of **Army Pre-Positioned Stock-5** by Improving the Performance **of Contracting Officer's** Representatives



By Lt. Col. Kafui Avotri, Anthony Cobb, and James Haas

Army Field Support Battalion-Kuwait (AFSBn-KU) is responsible for the receipt, maintenance, storage, and issue of Army Pre-Positioned Stock-5 (APS-5) in the U.S. Central Command theater. Currently, APS-5 consists of 47,266 pieces of equipment valued at approximately $2.5 billion, and the supporting contract is valued at approximately $150 million. Contracting officer's representatives (CORs) assigned to AFSBn-KU are charged with the oversight of this contract. Most AFSBn-KU CORs arrive in Kuwait with zero previous exposure to contract oversight. To improve COR performance, AFSBn-KU developed and implemented creative solutions in the selection, training, and continued development of its CORs that improved a key performance metric by 87%.

AFSBn-KU personnel consist of active-duty Soldiers and Department of the Army civilians (DACs) assigned to Camp Arifjan for a one-year permanent change of station tour, U.S. Army Reserve Soldiers deployed for nine months from the Army Reserve Sustainment Command, and Defense Contract Management Agency (DCMA) quality assurance specialist (QAS) civilians deployed for eight months. This diverse population brings a wealth of experience and a wide variety of baseline knowledge regarding COR roles and responsibilities. Reserve and DCMA personnel will typically rotate in teams with identified replacements, while active-duty military and DACs are spread across the calendar year with less consistency and predictability.

Changes to Army manning guidance can compound normal personnel turnover, leading to newly assigned personnel arriving with little to no transition time with existing team members and occasional gaps lasting six to 12 months. The personnel churn, varying backgrounds, and onboarding time needed for a new COR to perform at the necessary level result in an environment where CORs may only execute their duties to standard for four to six months before the entire process starts again. This ultimately impacts the consistency of surveillance being performed across the contract's period of performance.

Most uniformed personnel assigned to the battalion are senior NCOs who have developed the appropriate leadership and technical and tactical skill sets to ensure mission success. The role of a COR is foreign to nearly all new personnel. Being a COR requires a mindset shift from "make it happen" to "observe and report." The COR has no direct control of the daily mission accomplishment for which the contractor is responsible. Daily duties of a COR vary widely and include conducting surveillance on assigned performance work statement (PWS) lines, reviewing contract deliverables and reports, and processing contractor requirement packages. The COR cannot employ many tools that made them successful Soldiers to influence the contractor to accomplish the mission without risking an unauthorized commitment for which they can be held personally financially liable. This requires an understanding that a COR can be successful even if the contractor fails. This concept may conflict with a new COR's ethos and personal measures of success.

AFSBn-KU CORs, even those with prior COR experience, are almost universally new to the APS environment. For example, Technical Manual 38-470, Storage and Maintenance of Army Prepositioned Stock Materiel, specifies the maintenance requirements for APS equipment, including the respective service intervals and required checks. With few exceptions, these service intervals are every 24 to 48 months with a 30-day check while dealing with supplies in storage, depending on whether the equipment is stored outdoors or indoors. CORs and all AFSBn-KU personnel must rapidly develop an understanding of APS requirements and procedures to effectively perform their duties.

The baseline Army COR certification process does not appropriately prepare non-contracting experts to oversee an APS contract. COR training consists of 36 hours of computer-based training provided by Defense Acquisition University and 4 hours of classroom training provided by the regional contracting center (RCC). After completion of this training, a QAS from the RCC performs a COR validation on their understanding of presented material. If the candidate passes the validation, he or she is designated a COR by

Sgt. 1st Class Robert Ford, quality assurance for tanks, 401st Army Field Support Battalion-Kuwait, watches as contractors at Army Prepositioned Stocks-5 work to lift a 30-ton turret, Camp Arifjan, Kuwait, Sept. 23. (Photo by Kevin Fleming)

the administrative contracting officer (ACO).

AFSBn-KU observed negative trends with newly designated CORs following designation, including monthly surveillance checklists being rejected by the RCC for administrative errors, poor linkage between contractor action and the contractual requirement they failed to meet, and inconsistent or inaccurate evaluation of contractor performance over multiple reporting periods. Root cause analysis indicated CORs were assigned to surveillance in areas unfamiliar to them, a lack of the experience needed to understand and analyze contractual documents and associated PWS information, and a lack of organizational understanding of process and procedure that inhibited proper surveillance and oversight. Faced with these challenges AFSBn-KU developed and implemented a supplemental COR program for the battalion, the Contracting Officer Representative Academy. This involved using the DCMA QASs as coaches to provide the CORs with support and guidance before assuming their responsibilities.

The COR Academy was developed and implemented as an informal training program to bridge the gap between formal training and practical performance of COR duties. The COR Academy is a five-day course (approximately 16 hours, which can be condensed into two days if necessary). The Academy considers all the training the CORs have received and translates it into the effective use of the skills they have learned in the performance of their COR duties. The COR Academy focuses specifically on the APS-5 contract, showing CORs the contractual documents, PWS, resulting checklists, and the quality assurance surveillance plan to ensure they understand what these products are and how to use them effectively to monitor the contractor. They are taught surveillance techniques to effectively evaluate contractor performance and the administrative and documentation requirements unique to COR personnel.

This course has proved successful in flattening the learning curve for new CORs and has decreased the amount of time it takes a COR to be able to competently perform their duties to one month or less. Approximately 25 Soldiers and civilians have completed the COR Academy since its first iteration in early 2023. At any given point in time there are approximately 35 to 40 Soldiers and civilians in AFSBn-KU.

Following the COR Academy, all new CORs perform a complete walkthrough of their PWS lines with a DCMA QAS. This is done to ensure that the COR fully understands the requirements contained within their checklists and that they can provide effective oversight of their assigned areas. These walkthroughs are repeated periodically with the battalion leadership to facilitate feedback on the CORs' performance and to improve content covered in the COR Academy.

QASs also perform spot checks of battalion CORs' monthly work products before submission to the RCC. CORs are assigned a QAS as their group coach to provide continued assistance and expertise during their assignment. These steps have resulted in less rework and a better overall surveillance product while decreasing frustrations and increasing effectiveness.

One key metric indicating the program's success is a reduction in the average processing time of a corrective action request submitted by a COR to the RCC from 115 days in April 2023 to 15 days in January 2024, an 87% decrease. This indicates a significant improvement in the quality of objective evidence of contract performance deficiencies that CORs are submitting.

Recognizing the expertise provided by DCMA's augmentees, the 401st Army Field Support Brigade, AFSBn-KU's higher headquarters, submitted a request to Army Sustainment Command to increase the authorized number from three to six. The DCMA personnel bring existing contract surveillance experience far beyond that of uniformed personnel. They can often manage multiple PWS lines that do not require subject matter expertise in a logistics information system such as Global Combat Support System-Army, maintenance, supply, or other areas linked to a military occupational specialty. This enables the battalion to align its military and DAC personnel against the more technical contract lines, ideally with multiple individuals on the same line, providing both breadth and depth to surveillance duties.

In support of progress made with the COR Academy, AFSBn-KU established weekly meetings with the RCC ACO to review new and ongoing issues, share best practices or new ideas, and ensure both organizations are working together to ensure proper oversight of U.S. Government resources. This open dialogue has flattened lines of communication and, alongside the innovative solutions implemented by AFSBn-KU, has laid the foundation for improved performance and auditability in a resource-constrained environment.

Organizations with similar contractual oversight requirements can benefit from developing their own tailored training package to effectively onboard and maximize the talent within their formations. The AFSBn-KU contracting management officer can provide the APS-5 COR Academy products as an example starting point for units.

Lt. Col. Kafui Avotri currently works at the Defense Logistics Agency Energy in the Mobility Fuels Division - Direct Delivery Fuels as a deputy division chief. He deployed with the 401st Army Field Support Brigade from October 2022 to July 2023 as the contract management officer for Army Field Support Battalion-Kuwait. He holds an MBA (with concentration in global business management) and a professional certification in contracting (Defense Acquisition Workforce Improvement Act level 3). He is a member of the Defense Acquisition Corps and the Army Acquisition Corps.

Anthony Cobb is a lead quality assurance specialist with the Defense Contract Management Agency in Baltimore, Maryland. He is currently deployed as a part of the Contingency Response Force program to U.S. Army Garrison Poland. He has a Bachelor of Science degree in organizational management from the University of La Verne. He retired from the U.S. Navy in 2015 after 25 years of service.

James Haas is a quality assurance specialist with the Defense Contract Management Agency in Lynn, Massachusetts. He is currently deployed as a part of the Contingency Response Force program to Camp Buehring, Kuwait. He has an engineering and technical management foundational certification from the Defense Acquisition University.

Featured Photo
A contractor with Army Prepositioned Stocks-5 directs a crane operator to briefly stop lowering a 30-ton turret onto an Abrams M1A2 so others could check its alignment to the mount, Camp Arifjan, Kuwait, Sept. 23. (Photo by Kevin Fleming)

21st CENTURY MAINTENANCE

Tobyhanna Army Depot Provides Full-Spectrum Support to the Joint Warfighter

■ *By Justin Kucharski and Danielle E. Weinschenk*

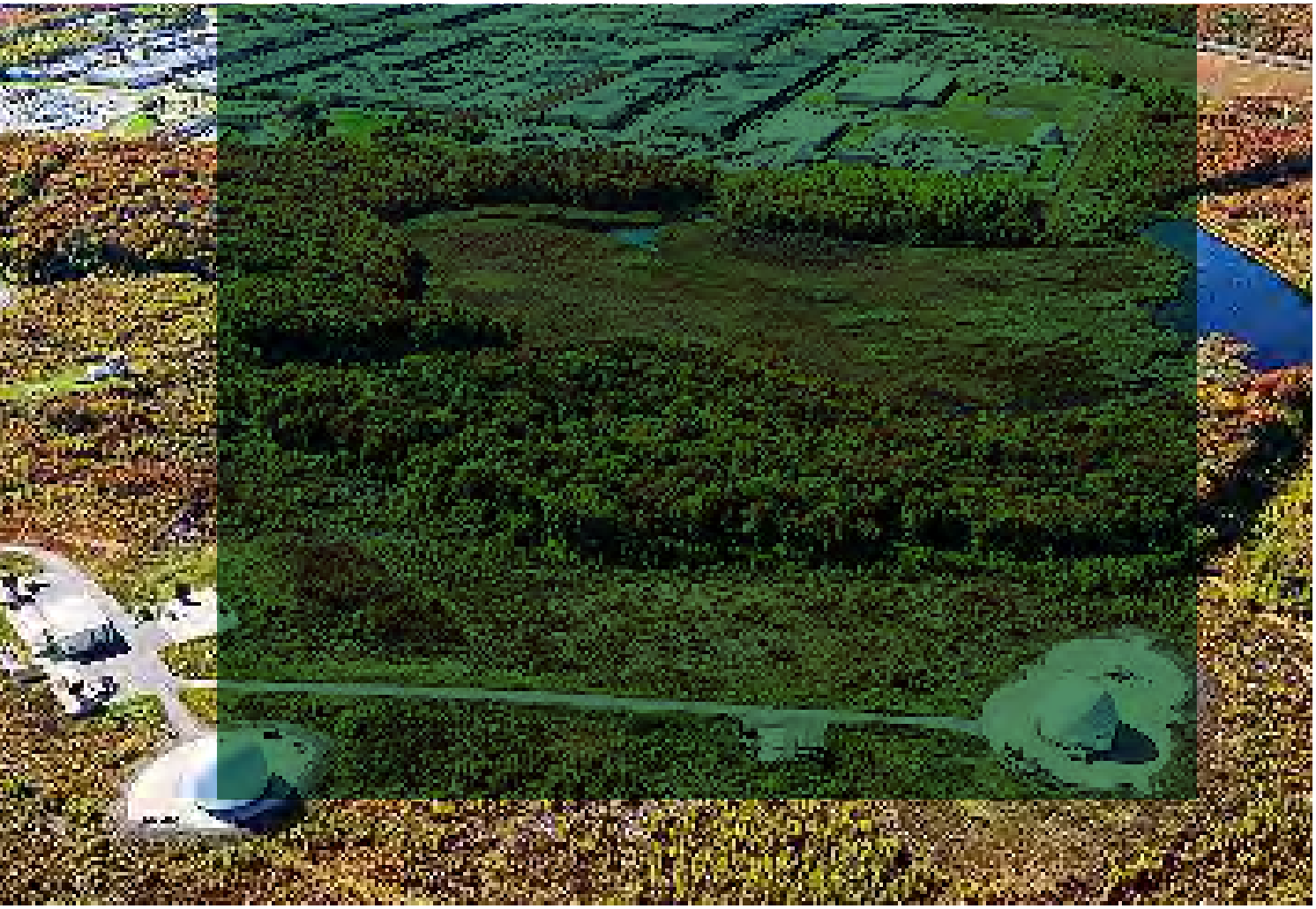
It is no secret that the goal of any organic industrial base (OIB) installation is to equip and sustain the joint warfighter in support of military operations, fulfilling the Army's goals for transformation and readiness. For more than 70 years, Tobyhanna Army Depot (TYAD) has taken that mission and made it uniquely its own. Not only does the installation strive to be the best value for the warfighter, but it prides itself on providing first-rate customer service. At TYAD, there is no work without customer collaboration. This multifaceted, novel approach has elevated the concept of depot maintenance and makes TYAD an in-demand provider of command, control, communications, computers, cyber, intelligence, surveillance, and reconnaissance (C5ISR) readiness services across the DoD.

Tobyhanna's unparalleled capabilities include full-spectrum logistics support for sustainment, overhaul and repair, fabrication and manufacturing, engineering design and development, systems integration, post-production software support, technology insertion, modification, foreign military sales, and global field support to our joint warfighters.

"Team Tobyhanna is the jewel of the organic industrial base," says retired Maj. Gen. Robert L. Edmonson II. "Their ground-breaking methods ensure warfighters across the world are equipped to be all they can be." Edmonson is the former commanding general of the U.S. Army Communications-Electronics Command (CECOM), TYAD's higher headquarters.

Transition to Sustainment Support

While the traditional depot maintenance model sees sustainment providers as hands off until the workload officially transitions, TYAD works closely with original



equipment manufacturers (OEMs) and program management offices (PMOs) even before a depot source of repair (DSOR) is announced. Each program has a dedicated project manager to monitor the transition to sustainment, charged with working with the PMO/OEM and a cross-functional team of peers across the depot to ensure TYAD can exceed customer expectations.

"We don't wait for a perfectly wrapped package to arrive on our doorsteps the first day the work is available to us," says Michael Sherin, head of the Intelligence, Surveillance, and Reconnaissance Engineering Division. "TYAD works proactively with OEMs and PMOs to lay the groundwork for a successful transition to sustainment. Our support is truly from cradle to grave."

TYAD supports the AN/TPQ-53, a counterfire target acquisition radar that identifies and tracks mortars, rockets, and artillery. The radar, developed by an OEM, is in its first version. Subsequent versions will transition to sustainment in 2026. TYAD personnel are already working closely with the OEM and the PMO to provide organic support and gain institutional knowledge vital for successful overhaul missions on the variants in coming years. This future-focused approach benefits all involved — especially the joint warfighter, according to Depot Commander Col. James L. Crocker: "By working closely with the PMO and OEM on the AN/TPQ-53, Team Tobyhanna can ensure we provide the very best support possible, and ensure our warfighters experience minimal system downtime. Our efforts directly impact the readiness of the U.S. Armed Forces."

Dozens of pre-production initiatives are currently underway to prepare for the formal arrival of all four variants of the AN/TPQ-53, including repair support for the system's critical Octapack transmit/receive module.

Part of the AN/TPQ-53's antenna, the Octapack is a high-failure item that is not readily available within the supply chain. This poses a serious issue for current and future users of the AN/TPQ-53.

Depot personnel sprang into action after learning about the Octapack issue, quickly setting up a screening process to identify reparable parts that could be used for cross-leveling. Sherin notes that the effort was critical to the asset's overall readiness: "Because Octapacks fail often and are no longer in production, Tobyhanna's repair and return program keeps the AN/TPQ-53 running, which means warfighters in the field consistently have the equipment they need." He adds that TYAD is supporting a similar effort for AN/TPQ-37 amplifier modules to support readiness needs for partner nations, which has resulted in more than $60 million in cost savings.

Innovative Technology Centers

Technology centers can be found across TYAD and serve as a way to optimize operations. Although the concept of a technology center may not be new, TYAD's approach to the concept is on the forefront of innovation.

Instead of being sorted by individual system, TYAD's technology centers are consolidated in terms of technology commonality. By co-locating depot personnel by technology instead of system designation, personnel are not functionally siloed. This allows for simultaneous execution of projects with increased personnel efficiency. Technology centers benefit all parties involved: production floor employees gain the opportunity to work on a variety of assets and build stronger relationships across the organization; support personnel are positioned at the point of use for instantaneous collaboration and problem-solving; and customers benefit from a workforce that is increasingly well rounded and equipped to develop processes in a low-risk, high-reward atmosphere. The concept is enthusiastically supported by depot leadership, especially first-line leaders.

As many are aware, supply chain constraints are a serious issue across the OIB as a whole. As is the Tobyhanna way, this issue is tackled head on. One mission of the technology center is to find creative ways to use existing unserviceable assets. For example, depot personnel can reclaim parts of only semi-functional systems to create a completely operational one. TYAD is proactive in its work, not only because that is best for the warfighter but because it is what customers expect.

Customer Relationship Management

A world-class business such as TYAD could not operate without customers to drive the workload. The customer motivates depot artisans to devise new and creative methods to best support our nation's warfighters.

At TYAD, customers are so much more than numbers in a spreadsheet. From the very beginning, working relationships are constructed to show partners exactly what depot personnel can perform. Being involved in the process early helps inform customers to shape sustainment requirements, best approaches to stand up capability, and options for support so the program can hit the ground running when it is time. This is unlike traditional depot maintenance where problems are not addressed until the system has already arrived on the doorstep.

Personnel at the depot champion cooperative relationships as early as possible to ensure PMOs and other customers can streamline the transition to sustainment process and access the vast capabilities possessed by depot employees. Participating actively in the transition to sustainment allows TYAD to plan accordingly for every aspect of the sustainment strategy before the workload even arrives. This strategy establishes strong bonds between stakeholders and allows for meaningful and efficient repair processes, which are established well in advance of their actual need.

TYAD's Strategic Initiatives Office (SIO) personnel provide full-scale support to customers before, during, and after DSOR decisions. They also serve as the project managers during the transition to sustainment and are considered the depot's experts in the public-private partnership process. SIO personnel report that the effort to manage customer relationships pales in comparison to the return on investment.

Expansive Radar Testing Campus

With more than 300 engineers in its workforce, TYAD can support all the technical needs of its customers. Possessing an agile and expansive radar campus, the organization provides testing in support of its current programs and customers. It can also work with OEMs, PMOs, and other customers to provide testing for their equipment in all stages of development through public-private partnerships.

Tobyhanna's radar campus rivals that of the OEMs who manufacture the equipment. It includes near-field and far-field ranges and multiple radomes for weather-independent, year-round testing capability. The depot's remote location deep in the Pocono Mountains in northeastern Pennsylvania experiences minimal 5G interference, providing an optimal location for a variety of testing needs. The location is rapidly growing thanks to a modernization effort that will further expand Tobyhanna's radar campus.

James Wisnewski, chief of TYAD's Public Works Division, says that in 2026, "Tobyhanna will embark on a major military construction project to expand our electromagnetic frequency range. The project will result in the construction of new facilities and will also provide upgrades to our existing facilities, to include the addition of a new test site with two outdoor test pads and four additional outdoor test pads to complement our current infrastructure."

James Dominick, TYAD's AN/TPQ-53 pre-production transition team leader, says the depot's focus on the transition to sustainment is a recipe for success, especially for the in-demand radar system. He adds, "By integrating a team consisting of logisticians, engineers, production personnel and the OEM, we collectively executed a highly successful organic transition of a state-of-the-art radar platform.

Lt. Col. Marcella Duncan, product manager of multi-mission surveillance systems (M2S2), has praised the depot's support of the AN/TPQ-53: "TYAD is a comprehensive service provider for the AN/TPQ-53 and AN/TPQ-50 radars — a one-stop shop. They offer a full range of services from the design phase through transition to sustainment, ensuring continuous support. They serve as our 'Radar Center of Excellence.' Our partnership with TYAD, CECOM, and the OEM ensures the M2S2 product office delivers and maintains the best capable radars for the warfighter."

Edmonson adds, "The work being performed at Tobyhanna epitomizes the Army's motto, 'This We'll Defend.' They recognize the importance of ensuring our warfighters are well equipped and ready to fight, all while taking pride and accountability in their efforts. They continually redefine the meaning of traditional depot maintenance, all in the name of providing the absolute best for our people out in the field."

TYAD's extraordinary workforce, modernized facilities, and extensive technical capabilities can support the readiness needs of every customer. TYAD's active-array testing site is the only organic test range that replicates the capabilities of OEMs.

TYAD is a recognized leader in providing world-class logistics support for C5ISR systems across the DoD. Tobyhanna's corporate philosophy, dedicated work force, and electronics expertise ensure the depot is the joint C5ISR provider of choice for all branches of the Armed Forces and industry partners.

Justin Kucharski serves as a public affairs specialist at Tobyhanna Army Depot. He has successfully completed developmental assignments within Tobyhanna Army Depot's Strategic Initiatives Office and Command Group. He has earned Operations Security Level II certification. He holds a Bachelor of Arts degree in digital media and broadcast production from Marywood University.

Danielle Weinschenk is a public affairs officer at Tobyhanna Army Depot. She has earned Lean Six Sigma (LSS) Black Belt Certification, an LSS Green Belt Certification, and various public affairs-related certifications from professional organizations. A graduate of the Pennsylvania State University and Champlain College, she holds a Master of Science degree in human behavior and organization development with a concentration in positive organization development.

Featured Photo
The Powder Smoke Ridge radar campus at Tobyhanna Army Depot, Pennsylvania, includes near and far-field ranges with two radomes for weather independent, year-round testing capability, specialized test pads, and an antenna pattern range. (Photo by Thomas Robbins)

STRENGTHENING THE FOUNDATION

Elevating the Sustainment Staff to New Heights

By Col. Michael K. Barnett and Maj. Robert Mathis

As the Army transitions from counter-insurgency operations to large-scale combat operations (LSCO), it is imperative to focus on training our formations with the necessary skills to deliver combat ready formations in the multidomain operations (MDO) environment. The pacing challenge of China, the acute threat of Russian overt aggression, and other threats from North Korea, Iran, and violent extremist organizations have degraded traditional advantages (e.g., assured lines of communication and uncontested command and control) to deploy, fight, and win our nation's wars and support civil authorities.

Moreover, the Army, and in particular the sustainment community, must prepare and train for force projection in a contested operational environment. Through open collaboration across the sustainment enterprise, skills such as theater opening, setting the theater, and protection and deception operations, along with the military decision-making process, must be integrated into individual and collective training exercises. To address emerging threats and prepare sustainment units for the challenges of LSCO, the Sustainment Exercise and Simulation Directorate (SESD), a Combined Arms Center subordinate, co-located with the U.S. Army Combined Arms Support Command at Fort Gregg-Adams, developed the Sustainment Simulation Staff Training (S3T) concept. This concept represents a significant step toward innovative, low-overhead, and low-cost training methods that maximize limited time and resources to address emerging challenges in MDO and better prepare staffs for sustainment operations in an LSCO environment.

Sustainment units, recognized throughout the Army as one of the most hyper-modular formations in existence, encompass a wide range of job specialties:

- Ordnance: maintenance, ammunition, explosive ordnance disposal, safety.
- Quartermaster: supplies; mortuary affairs; subsistence; petroleum, oils, lubricants, and water; field services.
- Soldier Support Institute: adjutant general, finance, Noncommissioned Officer Academy, music, postal.
- Transportation: strategic deployment and distribution, movement control, air and sea ports, motor transportation, watercraft, rail.

The diverse array of specialties across the sustainment enterprise creates a high demand for their services and resources, which in turn impedes their ability to train collectively as a unit and as a staff. The implementation of the Regionally Aligned Readiness and Modernization Model (ReARMM) in 2020 replaced the sustainable readiness model, directing sustainment units at all levels to transport, receive, and distribute equipment and personnel in support of modernization requirements. The transition to LSCO reveals significant doctrinal, organizational, and planning gaps that S3T should examine while preparing sustainment forces for LSCO challenges.

Recognizing these challenges, SESD has identified several training opportunities for sustainment units preparing for participation in large collective training events, such as warfighter exercises and command post exercises (CPXs). These opportunities primarily revolve around the following areas at the battalion to corps echelons:

- Staff systems and processes optimized for LSCO.
- Rapid decision-making and synchronization process.
- Battlefield knowledge management.
- Effective battle rhythm.
- Staff mission command information systems proficiency (primarily command post computing environment common operational pictures) by staff section.
- Joint operations/sustainment.
- Multinational interoperability.

To address these training gaps, the SESD developed the S3T concept. The goal is to provide sustainment staffs across multiple echelons with the necessary tools to increase skills and knowledge, increasing proficiency for the systems and processes required to inform commanders to enable the "decision dominance and overmatch we need to deter competitors and potential adversaries" on today's multidomain battlefield," as then-Army Chief of Staff Gen. James C. McConville put it in a hearing before the Senate Armed Services Committee in 2021. Using a framework of a facilitated discussion, S3T employs a series of vignettes and training scenarios tailored to a unit's specific exercise or training objectives, to ask open-ended questions that impose stress on the staff's analysis of systems and processes. By utilizing this transformative initiative, S3T can begin bridging gaps in readiness caused by staff and leader turnover and other challenges.

The S3T concept is versatile enough to support various military units, including expeditionary sustainment commands (ESCs), theater sustainment commands, division rear command posts, and brigade and battalion sustainment staffs. This training concept does not require complex computer-based systems or specific equipment, making it adaptable to meet the unique needs of units across the total Army.

The initial pilot of S3T helped prepare the ESC for an upcoming deployment. It was tested in coordination with the 364th ESC commander and several members of the general staff, including the command sergeant major, the chief of staff, and the support operations chief.

The ESC staff faced numerous training challenges before mobilization that included personnel turnover, a new commander, and limited training time. To address these challenges, SESD conducted a three-day event, covering the following focus areas: commander and SESD expectations, area of responsibility brief, battle rhythm review and analysis, CPX expectations, and vignette development. Initially designed to support CPX preparation, S3T was modified to meet the training goals of the 364th ESC, effectively filling training gaps within their staff before deployment. Collaboration across

staff sections in designing the final training product fostered ownership and commitment among the leaders of the unit. Ultimately, S3T and 364th ESC produced a comprehensive training plan for the remaining battle assemblies, improving their readiness for deployment and serving as a successful proof of concept for the S3T pilot.

The S3T concept is designed to enhance military training and readiness. Below are examples of S3T concepts nested in the CSA's focus areas.

- **Warfighting**: The S3T concept allows for the customization of scenarios to meet the commander's training objectives, including highly specialized mission sets in contested environments and scenarios that stress systems in a disrupted, disconnected, intermittent, and low-bandwidth environment.
- **Continuous transformation**: Mission command and control is vitally important to the concept of continuous transformation. The S3T concept supports mission command by providing staffs with comprehensive education on knowledge management, adaptive battle rhythm, common operational picture, staff systems and processes, and more. The intent of S3T is to prepare staffs to assume any mission, any time, in any environment.
- **Strengthening the profession**: S3T provides unit leaders with the necessary tools and knowledge to boost their confidence and competence to empower leaders to excel in their roles and contribute to the growth and success of their profession.
- **Delivering ready combat formations**: The S3T concept aids commanders in developing scenarios that allow staffs to rehearse multidomain sustainment in a contested operational environment. Additionally, S3T supports development of modular plans with sufficient agility and flexibility to prepare the deploying unit. The SESD recognizes the potential of S3T in achieving decision dominance, leveraging internal knowledge and experience to develop comprehensive training packages tailored for sustainment units at different echelons, to address critical mission objectives of each unit.

Future S3T training packages will include vignettes and a recommended master scenario event list to enable sustainment planning and allow staffs to rehearse realistic sustainment challenges, improve understanding of their systems and processes, refine their standard operating procedures and battle drills, and expedite the analysis of critical information that the commander requires for decision support and any additional training objectives the commander requires. An adept and cohesive staff should provide the commander with greater flexibility to make decisions faster than the adversary, and predict future sustainment needs ahead of emerging requests.

In conclusion, the S3T concept serves as a vital bridge to address the capabilities gap in sustainment formations, exacerbated by the demands of ReARMM and maneuver support requirements. SESD, through its expertise in S3T, serves as a force multiplier, enhancing decision dominance and assisting sustainment staffs in transitioning from reactive sustainment to predictive sustainment. Through the use of the S3T concept, sustainment units preparing for mobilization or deployment can overcome challenges, optimize their operations, and ultimately contribute to the overall success of military operations in LSCO.

Col. Michael K. Barnett currently serves as the functional area models and SIMS officer for the director for the Sustainment Exercise and Simulation Directorate at Fort Gregg-Adams, Virginia. He is a graduate of Norwich University, the U.S. Army Command and General Staff College, and the U.S. Army War College.

Maj. Robert Mathis serves as an exercise division team lead for the Sustainment Exercise and Simulation Division at Fort Gregg-Adams, Virginia. He has previously served as a platoon leader, executive officer, and commander of various armored units, battalion S-3 and observer controller/trainer, and a brigade AS3 simulations officer. He was commissioned as an Armor Officer, later attended the Maneuver Captain's Career Course, and the Command and General Staff College. He has a bachelor's degree in business administration and marketing from the University of Mississippi.

Sustaining & Maintaining

the Army's Modernization Efforts

By Master Sgt. Anthony Cainion

The modern battlefield is an ever-evolving landscape, characterized by rapid technological advancements and shifting tactical paradigms. To maintain dominance and ensure mission success, the Army has embarked on an ambitious modernization journey. As a senior supply sergeant, I have witnessed firsthand the crucial role of logistics in sustaining and maintaining these modernization efforts.

Embracing Technological Advancements

The Army's modernization strategy relies heavily on integrating cutting-edge technologies into its operational framework. From advanced weaponry and communication systems to autonomous vehicles and artificial intelligence, these technologies are designed to enhance our combat effectiveness and operational efficiency.

However, the introduction of new technologies presents unique challenges for sustainment. The supply chain must adapt to accommodate these advanced systems, ensuring that the right parts and components are available when and where they are needed. This requires a robust logistics network that can swiftly respond to the demands of modern warfare.

Enhancing Supply Chain Resilience

The resilience of the supply chain is paramount to sustaining modernization efforts. It is essential to develop a logistics infrastructure that can withstand disruptions and maintain a steady flow of supplies. This involves diversifying supply sources, implementing predictive maintenance, and leveraging data analytics to anticipate and mitigate potential bottlenecks.

Moreover, fostering strong partnerships with industry stakeholders is crucial. By collaborating with defense contractors, technology firms, and other key players, we can ensure a continuous supply of cutting-edge equipment and support services.

Training and Development

The success of the Army's modernization efforts hinges on the proficiency of its personnel. As technologies evolve, so too must the skills of our Soldiers. Comprehensive training programs are essential to equip our troops with the knowledge and expertise required to operate and maintain modern systems.

From a supply perspective, this means investing in the education and development of our logistics personnel. By providing them with the tools and training necessary to manage sophisticated supply chains, we can enhance their ability to support the Army's modernization objectives.

Lifecycle Management

Effective lifecycle management is a cornerstone of sustaining modernization efforts. It involves not only the acquisition of new equipment but also the maintenance, repair, and eventual disposal of aging systems. A proactive approach to lifecycle management ensures that our forces are always equipped with reliable and up-to-date technology.

This requires meticulous planning and coordination between various stakeholders, including logistics personnel, maintenance teams, and procurement officers. By adopting a holistic approach to lifecycle management, we can optimize the longevity and performance of our equipment.

Budgetary Considerations

Modernization efforts are inherently resource intensive. Balancing the need for cutting-edge technology with budgetary constraints is a delicate task. It is essential to prioritize investments that offer the greatest return in terms of operational capability and sustainability.

As a senior supply sergeant, my role involves advocating for efficient resource allocation and ensuring that our logistics operations are cost effective. This includes identifying opportunities for cost savings, streamlining processes, and maximizing the utility of existing assets.

Conclusion

The Army's modernization efforts are critical to maintaining our strategic advantage and ensuring mission success in an increasingly complex world. Sustaining and maintaining these efforts require a multifaceted approach that encompasses technological adaptation, supply chain resilience, personnel training, lifecycle management, and prudent resource allocation.

As we forge ahead, the role of logistics in supporting modernization cannot be overstated. By embracing innovation, fostering partnerships, and investing in our personnel, we can build a resilient and responsive logistics framework that underpins the Army's continued evolution. Together, we will ensure that our forces remain equipped, prepared, and ready to face the challenges of tomorrow.

Master Sgt. Anthony Lamar Cainion serves as the brigade S-4 NCO in charge (NCOIC) for 2nd Armored Brigade Combat Team, 1st Cavalry Division, at Fort Cavazos, Texas. He previously served as the support operations NCOIC for the 703rd Brigade Support Battalion, 3rd Infantry Division (ID); first sergeant for A Company, 703rd Brigade Support Battalion, 3rd ID; and inspector general NCOIC for 3rd ID. He has a Master of Science degree in supply chain management from St. Thomas University and is currently finishing his doctorate in business administration from Liberty University.

SMART LOGISTICS

Navigating the AI Frontier in Sustainment Operations

By Maj. Sharlene Tilley

The U.S. Army is creating innovative ways to advance the sustainment warfighting function (WfF) in the multidomain operations (MDO) environment of 2028. Army sustainers will continue to explore the possibilities of artificial intelligence (AI) and how it can reduce the many shortfalls within the supply chain and resupply the Army and joint forces. Senior sustainment leaders will need to address three major challenges: material, organizational, and doctrinal gaps within the sustainment WfF. Our sustainment capabilities lack tactical mobility, tactical fuel distribution, and Army pre-positioned stocks (APS) in a contested environment.

Russia's invasion of Ukraine underscores real-life supply and support challenges, including transporting supplies, a lack of realistic training, a lack of effective sustainment planning, and a delay in the production of defense industrial materials such as ammunition and artillery shells. Leveraging AI and intelligent automation presents

substantial opportunities to address material, organizational, and doctrinal gaps in the sustainment discipline. By doing so, U.S. joint and multinational forces can position themselves for victory against our near-peer adversary, China.

The Indo-Pacific theater presents unique challenges for U.S. joint forces, allies, and multinational forces. However, the Army must be able to sustain large, dispersed forces far from home. Wars can be won or lost based on a military's ability to conduct logistics operations. If the U.S. were involved in a conflict with a peer enemy, such as China, we would be in a similar situation as the one we faced in World War II. Under the influence of a new operational concept, MDO, the Army continues to move forces globally in preparation for large-scale combat operations (LSCO). The U.S. must address modern-day logistics for the Army in the Pacific, and how the Army can support the U.S. joint forces in the next conflict there.

Modern Warfare: Sustainment Challenges During the Russian Invasion of Ukraine

The Russia-Ukraine War proves that the U.S. Army can no longer depend on uncontested sustainment. There are multiple reasons Russia is suffering major losses and has been unable to win the war.

First, poor planning and inaccurate logistics projections: Russia's logistics failure almost caused a potential culmination period due to the lack of critical supplies during the early stage of the campaign against Ukraine. This was solely due to Russia's attempt to rapidly invade Ukraine within a few days before critical logistic resources were depleted. Repair, maintenance, and supply distribution have been other crucial issues for Russia throughout the conflict. Operating in a contested environment put Russia in a battle with supplies and resources. Due to the lack of rail support in Ukraine, Russian ground vehicles failed to move fuel, munitions, spare parts, and other materials quickly and efficiently to forward-deployed units. The delay in lines of supply and communication could not withstand the long distance of combat pushes. The Russian military vehicles used for supply pushes were unsuitable and were not properly protected from counterattacks by Ukrainian forces.

Second, poor assumptions about Ukraine's tactics against the Russian military: Seizing and holding territory were major Russian objectives. This included integration of combined arms combat power, i.e., land and air power, and long-range fires. Russia was unable to prevent foreign assistance to Ukraine, and so Ukraine received weapons, munitions, fuel, and other aid from foreign nations.

Third, poor evaluation of Ukraine's command and control nodes: Russian military leaders and intelligence personnel failed to accurately perform cyber attacks and electronic warfare against Ukraine's critical infrastructures and high-value targets. This gave Ukraine more leverage to communicate and continue fighting against Russian aggression. Russia's poor execution of domain warfare captures the many challenges the country underwent in the invasion of Ukraine. The U.S. needs to develop a strong industrial base using AI and autonomous systems (AS) to prepare for LSCO in the Indo-Pacific. The Army must also modernize its support capabilities to withstand demands within MDO.

LSCO in the Indo-Pacific

In the last five years, the Army refocused its lens toward large-scale combat that will take place through multiple domains in preparation for interactions with peer and near-peer threats. The premise of the Army's MDO concept is that commanders must understand what their forces will contain and must operate in all domains during ground combat. The Army's next battlefield will be a fight for land and space but unique regarding supporting and sustaining LSCO.

Implementation of AI and AS for Sustainment in MDO for LSCO

AI is crucial in LSCO in a maritime environment. It involves essential processes and procedures from all sustainment elements, including the national defense industrial base. Near-peer threats to logistics units can limit the deployability and availability of resources to and from the operational environment. As stated in Field Manual 4-0,

Sustainment Operations, enemy threats can exploit critical vulnerabilities and weaknesses of the sustainment forces through information, intel, and disruption of systems across multiple domains (air, land, maritime, space, and cyberspace). Modern technology and AI present far more lethal threats, such as hypersonic missiles and armed drones, which can cause major destruction.

Army sustainment capabilities lack the tactical mobility and tactical distribution of fuel and APS in a contested environment. AI and AS have presented many opportunities for the Army supply chain. AI gives units, down to the battalion level, the ability to leverage the capabilities needed to improve supply chain management, resource distribution, mobility, and planning and preparation. Though AI has its concerns and challenges between human integration expertise and automation, cybersecurity, and the ever-changing environment, AI is still a robust tool for Army sustainers.

Applying AI will include doctrine, organization, training, material, leader development, personnel, and facilities, while mainly focusing on the material, organization, and doctrine. One example of a material solution is implementing AI-operated small-range boats that could improve travel time from large vessels to shore in a large region such as the Indo-Pacific. The process would include AI-optimized operations and capabilities in the warehouses during the production and distribution of these small-range boats. Therefore, AI would be used as a material solution as well. AI will have the ability to forecast demands for the equipment and parts in demand, allowing the warehouse to have better visibility, reducing costs, and decreasing the chances of unavailability or shortages.

Another example of a solution is the increase in supply production and distribution in the supply warehouses using AI to record data, providing real-time accurate information and analytics, and reducing delays in critical resources in crucial environments like the Indo-Pacific. AI can track and handle more tasks in industrial production from logistic support to reconnaissance in any given combat operation.

Adjusting to AI and AS can be time-consuming and expensive. Human interaction with AI is always needed to provide knowledge-based experience and information. China has AI capabilities that parallel those of the U.S. Therefore, the U.S. Army must continue to be innovative about the way AI is used throughout the WfFs and to maintain the advantage in MDO during LSCO. Autonomous weapon systems and AI weapons programming can engage targets, control missile systems with advanced targeting capabilities, and operate drones for reconnaissance and surveillance. AI prevents risk to human lives by transporting, delivering, and navigating supplies in dangerous environments.

The concept of using AI/AS in sustainment is to develop innovative solutions to predict a unit's need for combat power capabilities, readiness, and resources. The goal of AI is to align abilities with human capabilities, particularly in the decision-making process in planning for sustainment needs. In the last five years, AI has been the leader in industrial production. AI technology in product design, maintenance operations, and product assembly has given the DoD a new level of innovative ways to move products rapidly, effectively, and efficiently from the warehouse to the battlefield. AI provides the visibility of supply chain demands, inventory, distribution, and forecasting of critical combat power while allowing the human interaction of accurately managing production and data-based analysis.

China continues to increase its ability to control digital logistical database platforms and to delay support or disrupt critical logistics operations in any area of operation, costing lives and preventing operational reach. For example, China has a logistical network, the National Public Information Platform for Transportation and Logistics (LOGINK), which is a worldwide data platform with access to ports and maritime transport systems that provide shipment tracking, data management, and other services free of charge. The use of AI can assist in protecting from disruption of logistical support from data platforms like LOGINK and prevent malicious attacks through logistics convergence.

Logistics Convergence

Maritime domains require planners to consider operational reach and the impact of space and time on reinforcements for deployed units. One of the ways the Army does this is through a logistics convergence. The Army's definition of convergence is an outcome created by the concerted employment of sustainment capabilities from multiple domains and echelons against combinations of decisive points in any domain. For logistics in maritime operations, convergence plays a vital role by providing the time and space for precise logistics to support the warfighter in any combat operation.

Near-peer adversaries China and North Korea can disrupt logistics operations from ship to shore, particularly the intermediate staging base (ISB) to the logistical vessel. Army logisticians have the responsibility to continue supporting the forces through a small lens of opportunity with pulse logistics through convergence windows. Aircraft and small unmanned aerial systems can assist in detecting enemy capabilities in the area and provide horizon support for critical movements in the water or on land. The space domain includes satellite capabilities that can assist with the divergence plan to temporarily confuse the enemy, allowing a small amount of time for the theater sustainment command, Army watercraft systems, and security to position themselves to deploy personnel onto the shore. These types of operations require precise training. The cyber domain can disrupt communications temporarily, giving the time needed to make necessary movements from the coast to the ISB without giving away the route and location of the operational environment.

Further Research

Here are a few recommendations for further research:

- Generate battlefield data analysis that assesses logistical gaps, potential reasons for capabilities and supply shortfalls, and predicts adjusted consumption rates.
- Provide logistics package needs, route data, and battlefield considerations by allowing AI and AS to create randomized route planning and transportation tables.
- Develop more efficient AI for the defense logistical systems and logistics capabilities at ports or in warehouses.
- Create a function that would allow planners to submit a roster, vehicle set, or lift capabilities, and ask it to create sustainment packages before missions.
- Use AI to process, produce, and deliver demand for crucial parts in contested environments.
- Produce a fleet of AI-operated 3D-printed boats that can be stationed at ports or onshore for quick deliveries. The advantages of using 3D-printing technology to create these boats are numerous. There is no material waste because any unused material can be recycled. Customized boat parts make the boats lighter in weight, which in turn makes them faster than traditional ships.

Conclusion

Leveraging AI and AS will address the material, organizational, and doctrinal gaps in the sustainment discipline and can lead to overall victory against a future near-peer adversary. The significant gaps in the Army's ability to successfully sustain the force in a contested environment are incredibly challenging and complex. However, the Army is taking steps to bridge these gaps by leveraging AI capabilities. Army leadership is on the right path to sustain the fight in the Pacific with near-peer adversaries.

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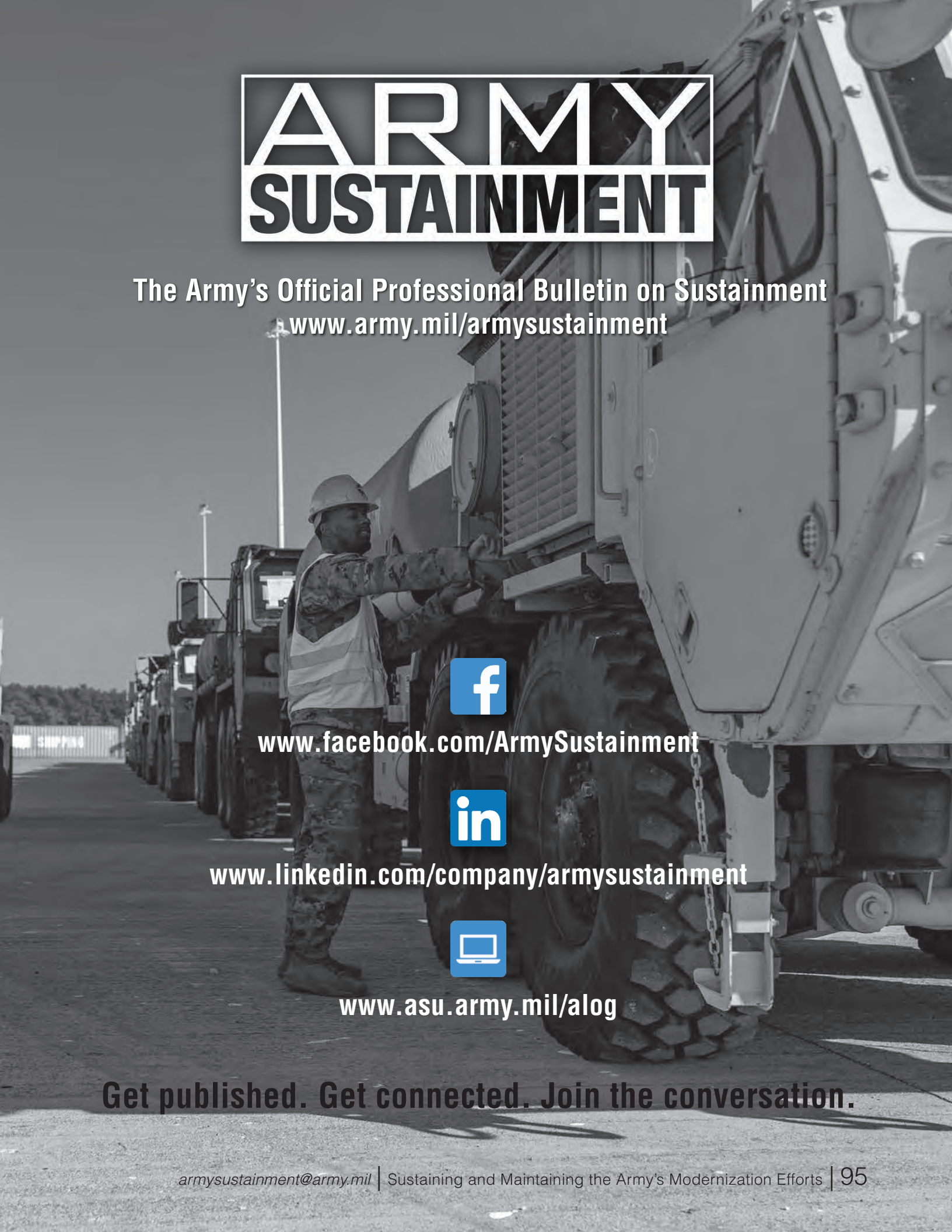
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