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ARMY SUSTAINMENT

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PREDICTIVE LOGISTICS: REIMAGINING SUSTAINMENT ON THE 2040 BATTLEFIELD

IN THIS ISSUE

- 2** **PREDICTIVE LOGISTICS IS THE WAY OF THE FUTURE**
By LTG Christopher O. Mohan
- 4** **EMPOWERING SUSTAINMENT THROUGH FINANCIAL EXCELLENCE**
By Honorable Carol E. Spangler and LTG Paul A. Chamberlain
- 8** **PREDICTIVE LOGISTICS**
Reimagining Sustainment on the 2040 Battlefield
By LTG Heidi J. Hoyle
- 10** **THE C2 FIX INITIATIVE**
What It Means for Sustainment Forces
By MG Michelle K. Donahue
- 14** **HUMAN RESOURCES DATA AND SYSTEMS INTEGRATION WITH SUSTAINMENT IN 2040**
By LTC (Ret.) James J. Galluzzo III
- 16** **BATTLEFIELD ALGORITHM**
Leveraging Predictive Analytics in Contested Environments
By SGM Noel DeJesus
- 20** **ARMY SUSTAINMENT ENTERPRISE'S DELAYED APPROACH TO DATA MODERNIZATION**
By LTC Nate Platz and CPT Bailey K. Smith
- 24** **THE FUTURE POSSIBILITIES OF OPERATIONAL ENERGY**
By SSG Joshua R. Charles
- 28** **MULTIDOMAIN OPERATIONS CHANGE THE ARMY'S APPROACH TO SUSTAINMENT**
By Kirk Jones
- 34** **THE HARDING PROJECT UNLOCKS THE KEY TO KNOWLEDGE**
A Perspective from the First Sustainment Harding Fellow
By CPT Garrett H. Pyle
- 40** **SUSTAINING THE JOINT FORCE IN THE INDO-PACIFIC**
By U.S. Marine Corps Capt. Tyler King
- 43** **THE PREDICTIVE TURN**
Preparing to Outthink Adversaries Through Predictive Analytics
By MAJ Anthony Grajales
- 47** **SUSTAINMENT AS A GLOBAL DETERRENCE**
Pacific Fortitude Displays Enterprise Synergy on the Korean Peninsula
By COL Brian T. Donahue and COL Henry C. Brown
- 53** **DATA-INFORMED DECISIONS ENABLE OPERATIONAL ENERGY**
By CW2 James A. Frye



- 56** **PRECISION SUSTAINMENT**
The Wrong Approach for Tactical Units
By MAJ Brian Mathews
- 60** **STRENGTHENING DETERRENCE IN THE EAST**
Poland-Provided Logistics Support
By CPT James Bath
- 64** **FLOW WARS**
Wargaming Logistics Networks in a Military Tug o' War
By Erica Herzog, Oliver Stein, and Dr. Suzanne DeLong
- 68** **BRIDGING THE GAP**
Effective Training Approaches for Petroleum Units in the Army Reserve
By LTC Jerry M. Cole
- 74** **STRENGTHENING BILATERAL RELATIONS**
The Strategic Role of Surface Deployment and Distribution Command at the U.S. Embassy in Amman, Jordan
By MAJ Benjamin A. Small IV and David A. Wallace
- 78** **SWARM TECHNOLOGY IN SUSTAINMENT OPERATIONS**
By LTC Travis Michelena
- 80** **THE STRATEGIC IMPERATIVE OF INTEGRATING SUSTAINMENT DATA IN MODERN MILITARY OPERATIONS**
By CPT Stephanie Torres
- 84** **BUILDING READY SUSTAINERS WHILE DEPLOYED ON THE KOREAN PENINSULA**
By MAJ Theresa Penrod and CPT Bradley Miller
- 88** **CONDUCTING PORT OPERATIONS**
By 1LT Ryan Bobbitt
- 92** **LEVERAGING EMERGING TECHNOLOGIES IN A BRIGADE SUPPORT BATTALION DURING LSCO**
By CPT George R. Ritchie and WO1 Jose Ortiz
- 95** **INDO-PACIFIC SUSTAINMENT AND THE BATTLEFIELD OF 2040**
By LTC Mark A. Yore and LTC Eric J. Erickson
- 98** **ENABLING RAPID REPAIR CAPABILITY AT ECHELON**
By COL Reginald M. (Garrette) Harris, Hector Rodriguez, and Lara Orechovesky
- 102** **MEETING THE CHALLENGE**
By GEN Ferdinand J. Chesarek

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ON THE COVER

The theme for the winter 2025 issue of *Army Sustainment* is Predictive Logistics: Reimagining Sustainment on the 2040 Battlefield.



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Predictive Logistics is the Way of the Future



■ By LTG Christopher O. Mohan

The battlefield of 2030 will be characterized by increased complexity, uncertainty, lethality, and technological advancements, requiring seamless sustainment across all domains. The proliferation of artificial intelligence (AI), robotics, and autonomous systems will also demand swift adaptation and

support, and adversaries will target supply chains, necessitating resilient and agile sustainment strategies.

However, the digital revolution also presents new opportunities, providing better data collection, real-time analytics, and improved connectivity, enabling predictive logistics to thrive. As the Army prepares for the future battlefield, we must embrace innovative technologies and strategies to maintain our competitive edge.

As outlined in Army Field Manual (FM) 4-0, Sustainment Operations, the Army must anticipate and posture sustainment capabilities to support unified land operations “to enable freedom of action and extend operational reach.” Predictive logistics represents a shift from traditional, reactive sustainment models to a proactive, data-driven approach that allows us to position supplies to ensure the right resources are available at the right time and place.

It all starts with forecasting demand. Algorithms can analyze historical data, current trends, and operational plans for supplies, spare parts, and services. This enables proactive stock management, reducing waste and ensuring critical items are available when needed. For example, the Army can anticipate the demand for specific munitions based on emerging threats and operational requirements, optimizing inventory levels.

Predictive logistics can also optimize the positioning of supplies and assets, reducing response times and enhancing operational agility. By anticipating where and when resources will be needed, the Army can stage them accordingly, mitigating the risk of shortages in critical moments.

Meanwhile, predictive analytics can monitor equipment health, usage patterns, and environmental factors to anticipate failures and

schedule maintenance proactively. This minimizes downtime, extends equipment lifespan, and ensures maximum operational availability. The Army’s fleet of vehicles and aircraft can benefit significantly from predictive maintenance, enhancing readiness and reducing sustainment costs.

Finally, real-time data analysis can optimize supply chain and distribution routes, adapting to disruptions, threats, or changing priorities. This ensures continuous sustainment, even in contested environments.

To accomplish these things, several enabling technologies will underpin the Army’s predictive logistics capabilities. Sensors embedded in equipment, vehicles, and infrastructure will provide real-time data on status, usage, and environmental conditions, feeding predictive algorithms. AI and machine learning will power the analytical engines of predictive logistics, learning from data, identifying patterns, and making predictions. In addition, high-speed, low-latency communications will enable real-time data transfer and analysis, facilitating swift, informed decision making.

Implementing predictive logistics for success on the battlefields of the future will not be without challenges. The Army must address data silos, interoperability issues, and cultural resistance to change. Additionally, we must ensure robust data governance, privacy, and security measures

to protect sensitive information. Through training and education, we must build a data-literate workforce capable of leveraging predictive logistics effectively. Collaboration with industry, academia, and international partners will be crucial to stay at the forefront of technological advancements.

Moreover, the Army must integrate predictive logistics into its doctrine, training, and exercises. FM 4-0 provides a solid foundation, emphasizing the importance of anticipatory and adaptive sustainment. Building on this, the Army must develop specific guidelines and tactics, techniques, and procedures for predictive logistics, ensuring their effective application across the force.

Predictive logistics offers a transformative opportunity for the Army’s future battlefield sustainment. By reimagining sustainment today, we pave the way for the battlefield of tomorrow.

LTG Christopher O. Mohan currently serves as the deputy commanding general and acting commander 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.

Through training and education, we must build a data-literate workforce capable of leveraging predictive logistics effectively.

EMPOWERING SUSTAINMENT THROUGH FINANCIAL EXCELLENCE

By Honorable Carol E. Spangler and LTG Paul A. Chamberlain

The battlefield is changing. By 2040, the speed of operations, technological advancements, the unpredictability of near-peer adversaries, and the fiscal reality of limited resources will require the Army to be agile, creative, and strategic. The Army will undergo transformation in our combat formations and in our sustainment forces. With data analytics and innovation driving transformation, the Army is reimagining sustainment and financial management to support the transformation of our operational forces. Transformation in our finance community is guided by the five-year Army Financial

Management Strategy 2028 (AFMS28), designed to enhance financial and business processes, purchasing power, and financial readiness across the force.

The Fiscal Year 2025 (FY25) Campaign Plan advances AFMS28 with innovative strategies, technologies, and a proactive approach — where anticipation replaces reaction, and readiness remains constant. Army Financial Management & Comptroller professionals are instrumental to this transformation, working alongside Soldiers in support areas and headquarters to ensure operational and fiscal readiness that supports each mission. Every piece of equipment, every meal, every mission — each relies on the readiness the financial community ensures. The FY25 Campaign Plan builds on previous lessons, positioning Army Financial Management to drive mission success with the tools and strategies necessary for future challenges.

Paving the Path with Impactful Achievements

Three years of executing AFMS28 have already brought several critical achievements to the financial management community. These achievements include several new and refined processes that provide the workforce with clear and unifying guidance. We also continue to roll out new systems on the leading edge of technology while retiring legacy systems. Some examples of these achievements include the following:

- Creation of the Army supplemental to DoD Instruction 1300.26, DoD Financial Management Certification Program. As the first Army-level policy for the DoD Financial Management Certification Program, this guidance establishes a standardized approach to training and certifying Army financial professionals, promoting consistency and accountability across all levels of service.
- Deployment of the Resource Manager’s Workspace (RMW) spend plan capability. The RMW tool went live with initial capabilities in FY24, enabling major Army commands to transmit their spend plans directly to the Army Budget Office. This capability is a crucial step toward Army-wide adoption of RMW, which will streamline the Planning, Programming, Budgeting, and Execution System across the Army. Once fully integrated, RMW will improve efficiency, support auditability, and reduce reliance on outdated tools.
- Retirement of the Standard Operation and Maintenance Army Research and Development System (SOMARDS). By retiring SOMARDS, the Army took a critical step in phasing out legacy systems, replacing them with modern, data-driven tools that enhance reporting accuracy and streamline data integration across commands.
- Publishing updates to Army Regulation 11-2, Risk Management and Internal Control Program, and Department of the Army Form 11-2, Internal Control Evaluation Certification. The updates to this foundational regulation and form enhance the Army’s internal controls and audit preparedness. This change provides clear, actionable guidelines for managing and documenting risk, establishing a stronger internal control environment Army-wide.
- Launch of the Audit Integration Executive Council (AIEC) and Headquarters Department of the Army Audit Executive Order 261-23. Establishing the AIEC and publishing the Army auditability plan are significant steps toward a fully auditable Army. These initiatives provide centralized oversight, streamlined audit practices, and guided audit integration across commands, reinforcing the Army’s dedication to transparency and accountability.
- Completion of the Continuous Monitoring Program (CMP). The CMP finalized critical dashboards and metrics, with all test results included in the FY24 Annual Statement of Assurance submission. The program also conducted over 100 process walk-throughs and documented more than 130 key controls, enhancing the Army’s ability to document



MAJ Jesse Bien, U.S. Army Financial Management Command operations training officer, holds training currency used during exercise Diamond Saber at Joint Base McGuire-Dix-Lakehurst, New Jersey, June 8, 2024. (Photo by Mark R.W. Orders-Woempner)

and monitor control activities consistently.

- Streamlined processes through Robotics Process Automation (RPA). Six new automations were introduced in FY24. These automations not only increase efficiency but allow personnel to focus on high-priority mission tasks, minimizing time spent on repetitive, manual processes. Total savings from RPA exceed 119,000 work hours annually.
- Professional development expansion via SharePoint. The one-stop-shop SharePoint site for training and resource

development attracted over 64,000 visits in FY24, underscoring its value as a tool for continuous professional development. This resource supports the growth of a skilled, adaptable workforce, ensuring financial managers are equipped with current knowledge and best practices.

These accomplishments are foundational to AFMS28, creating efficiencies, reducing redundancies, and increasing the agility of the Army's financial management operations. Together, they provide the framework to carry the Army

financial management community through FY25 and beyond.

Securing Financial Readiness for the Future

The FY25 Campaign Plan accelerates progress by empowering the financial workforce, streamlining processes, and aligning with the Army's broader goals in transformation and sustainment. Every decision made within the Army has a direct impact on our Soldiers, and it is the financial management community's responsibility to ensure those decisions are made with clarity, precision, and foresight, and are

fiscally informed. This is achieved through four lines of effort:

1. Enabling the financial management workforce with tools and training.

The FY25 Campaign Plan prioritizes preparing our people for future challenges. Army Financial Management & Comptroller professionals are more than just number crunchers — they are problem solvers and strategic enablers of mission success. Programs such as the Defense Financial Management Certification equip our workforce with advanced skills in artificial intelligence, data analytics, and financial leadership, enabling them to support commanders with real-time insights and accurate forecasts.

2. Effectively resourcing the Army.

Resources are the backbone of Army operations, and our financial teams ensure commanders have the visibility needed for sound resource decisions, whether for daily operations or long-term sustainment. RMW enhances real-time tracking of programmed execution, helping leaders anticipate future needs. As RMW evolves, it becomes more than just a budgeting tool — it ensures that Soldiers on the ground receive timely support.

3. Improving financial operations and achieving sustainable auditability.

Financial accountability is a cornerstone of AFMS28.

Committed to achieving a favorable audit opinion by 2028, we are building a culture of operational accountability where resources are maximized, and every financial decision is transparent. Working with the Army Audit Agency and other stakeholders, we address audit findings and enhance internal controls. Through proactive collaboration and advanced data analytics, the Army anticipates issues before they arise, reducing waste and boosting efficiency.

4. Enhancing and embracing essential financial management systems.

The FY25 Campaign Plan focuses on modernizing the Army's financial systems, with platforms such as the General Fund Enterprise Business System and Advana, ensuring smooth, secure, and efficient financial operations. Through Enterprise Business System-Convergence, the campaign plan integrates financial and logistical data across the Army, making it accessible and actionable for financial leaders Army-wide. Ongoing improvements to RMW and other systems ensure the Army's resource management adapts to meet the demands of an evolving battlefield.

Forging a Future of Financial Readiness

The FY25 Campaign Plan reflects the Army Financial Management & Comptroller community's commitment to meeting future challenges. By investing in people,

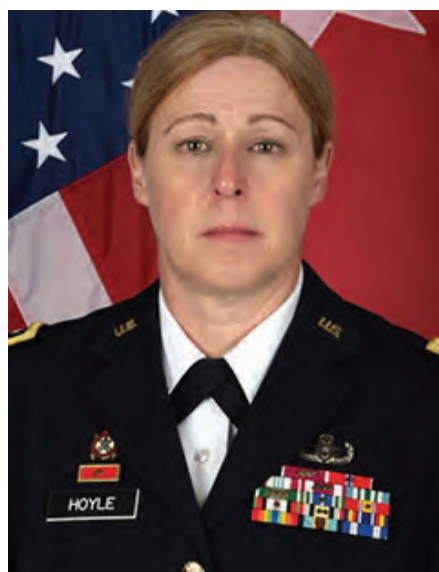
processes, and systems, we are ensuring we have a vital role in Army sustainment efforts. Our mission is clear: support every Soldier, every commander, and every Army leader by maintaining financial readiness at every level. Guided by AFMS28, we are forging a future of financial operations that are efficient and accountable, and we are ready to lead Army financial management forward.

The Honorable Caral E. Spangler serves as the Assistant Secretary of the Army (Financial Management and Comptroller) (ASA(FMC)), the principal advisor to the Secretary of the Army on all matters related to financial management and comptrollership. She has over 39 years of government service. She previously served with the U.S. Marine Corps (USMC) as the Assistant Deputy Commandant for Program and Resources; as the Principal Deputy ASA(FMC); as the Deputy for Budget, Office of the Assistant Secretary of the Air Force (Financial Management and Comptroller); and as the Assistant Deputy Commandant for Resources (USMC). She has a Master of Public Administration degree from Syracuse University.

LTG Paul A. Chamberlain serves as the Military Deputy for Budget, Office of the Assistant Secretary of the Army (Financial Management and Comptroller). He previously served as Director of Army Budget, Headquarters, Department of the Army; as the Director of Operations and Support in the Army Budget Office; and as the commanding general of the U.S. Army Soldier Support Institute at Fort Jackson, South Carolina. His military education includes the Signal Officer Basic Course, Infantry Officer Advanced Course, Special Forces Officer Qualification Course and Language School, Command and General Staff College, and the Industrial College of the Armed Forces - National Defense University (ICAF-NDU). He was commissioned into the Army in 1988 from Clemson University and was assigned as a signal platoon leader. He has a Master of Business Administration degree from Syracuse University and a Master of Science degree in national resource strategy from ICAF-NDU.

Predictive Logistics

Reimagining Sustainment on the 2040 Battlefield



By LTG Heidi J. Hoyle

As we stand on the cusp of a new era in military logistics, the Army is poised to revolutionize the way we sustain

our forces on the battlefield. The year 2040 is not a distant future but an imminent reality, and with it comes the need for innovative, forward-thinking strategies to ensure our Soldiers are equipped, supplied, and supported in the most efficient and effective manner possible.

Predictive logistics represents a paradigm shift in how we approach sustainment. Traditional logistics models have been reactive, focusing on responding to needs as they arise. While this approach has served us well, the complexities and uncertainties of the modern battlefield demand a more proactive stance. Predictive logistics leverages advanced technologies such as artificial intelligence, machine

learning, and data analytics to anticipate requirements before they become critical, thereby enhancing our readiness and responsiveness.

Imagine a future where our supply chains are not just efficient but intelligent. Where sensors embedded in equipment can predict maintenance needs before failures occur, where algorithms can forecast demand for supplies based on real-time data, and where autonomous systems can deliver these supplies precisely when and where they are needed. This is the promise of predictive logistics — a future where our sustainment capabilities are not just meeting the needs of today but are already addressing the challenges of tomorrow.

The journey to this future begins with a commitment to innovation and a willingness to embrace change. It requires investing in the technologies that will drive these advancements and fostering a culture that values data-driven decision making. It also necessitates collaboration across the Army with industry partners and our allies to ensure that our logistics systems are interoperable, resilient, and adaptable to the ever-evolving threats we face.

As the Headquarters, Department of the Army, Deputy Chief of Staff, G-4, I am excited about the potential of predictive logistics to transform our sustainment capabilities. We are already seeing the benefits of these technologies in various sectors, from healthcare to manufacturing, and it is time for the Army to harness this potential to enhance our operational effectiveness.

In the pages that follow, you will read about the pioneering work being done across the Army to bring predictive logistics to life. From the development of advanced analytics tools to the integration of autonomous systems, our Soldiers and civilian workforce are at the forefront of this revolution. Their efforts are not just about improving logistics; they are about ensuring that the U.S. Army remains the most capable and ready force in the world.

As we look ahead to the 2040 battlefield, predictive logistics is

not just a vision for the future — it is a necessity. It is the key to ensuring that our Soldiers have the resources they need to accomplish their missions and return home safely. Together, we can reimagine sustainment and build a future where our logistics capabilities are as agile, adaptive, and forward-thinking as the Soldiers they support.

Join us on this journey as we explore the transformative power of predictive logistics and the role it will play in shaping the Army of the future.

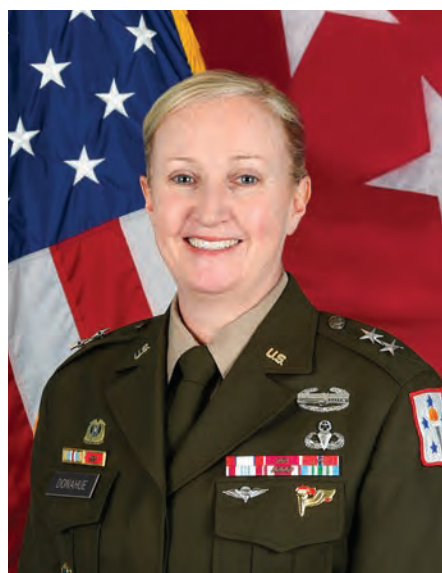
Be all you can be. This we'll defend.

LTG 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.

The year 2040 is not a distant future but an imminent reality, and with it comes the need for innovative, forward thinking strategies to ensure our Soldiers are equipped, supplied, and supported in the most efficient and effective manner possible.

THE C2 FIX INITIATIVE

What It Means for Sustainment Forces



■ By MG Michelle K. Donahue

The Army is facing critical questions about its ability to survive in an increasingly lethal and complex battlefield. Recent lessons from global conflicts underscore the importance of mobility and dispersion to enhance survivability. To effectively conduct command and control (C2) within

these constraints, the Army is reevaluating the systems and networks used within divisions.

The C2 Fix Initiative

The C2 Fix initiative aims to streamline and modernize the communications networks of a division and its assigned brigade combat teams (BCTs). It coordinates across multiple program executive offices and program managers (PMs) to provide the necessary equipment for an updated network focused on C2 on the move (OTM) or at the quick halt (ATQH). Leveraging existing technologies, C2 Fix simplifies operations for lower-echelon units by offering an integrated, deployable network. A significant change within the C2 Fix initiative is the shift to the sensitive but unclassified encrypted environment at the brigade and below levels, which empowers junior leaders that may not have had access to information in a Secure Internet Protocol Router environment.

This network combines current programs of record with commercially available capabilities to improve the commander's access to assured voice communications, a shared common operational picture (COP), and digital fires. Upgrades in satellite communications (SATCOM), leader and vehicle radios, and the COP form the core of these improvements.

New SATCOM capabilities enable smaller command posts to operate with C2 OTM or ATQH configurations. The network relies on a mix of military geostationary satellites and proliferated low Earth orbit (pLEO) satellites, which enhance resilience by providing coverage even if one satellite fails. The closer proximity of pLEO satellites also reduces latency, resulting in quicker data transmission and improved throughput with near-global coverage.

In vehicles and tactical operations centers (TOCs), the Joint Battle

Command-Platform (JBC-P) will be upgraded to the TAK-based Mounted Mission Command (MMC) software, which is interoperable with Android Tactical Assault Kit (ATAK) devices. This software-only upgrade allows for a shared COP across formations, enhancing situational awareness from TOCs to individual devices carried by dismounted Soldiers.

The new capabilities are designed to move C2 closer to the forward tactical edge with lighter, more mobile, and user-friendly equipment. When fully deployed, the C2 Fix initiative will enable smaller, more survivable command posts and an adaptable C2 architecture that supports multiple access points.

Impact on Sustainment Units

As these new C2 capabilities come online, sustainment organizations must adapt their tactics, techniques, and procedures (TTP) to maximize the benefits within their operational areas. C2 Fix has been fielded to units within the 101st Airborne Division and the 25th Infantry Division, and lessons learned from their combat training center (CTC) rotations have provided valuable insights. This transition has presented both opportunities and challenges for sustainment forces, particularly for logistics support battalions (LSBs) and division sustainment support battalions (DSSBs).

C2 Fix has had a positive impact on sustainment units' survivability, integration, and flexibility. For instance, the pLEO terminal, which replaces the larger satellite trailers

formerly housed in brigade support battalions (BSBs), offers greater mobility and reduced visibility with quick setup and teardown times. Additionally, the tactical radio integration kit allows all integrated tactical network variants to function on a single battlefield network, reducing TOC size and enhancing mobility. Assured communications are further bolstered by redundant access to cellular and SATCOM networks, with devices such as the Mobile User Objective System satellite radio and mobile broadband kit, which tap into local or private cellular networks as part of the communications plan. The use of ATAK end user devices, TSM radios, and handheld Army Navy/Portable, Radio, Communication-163 leader radios increase access to data and enhance integration with BCT mission command systems.

With this improved situational awareness and robust communications network, sustainment units have successfully experimented with innovative ways to support their BCTs. The latest edition of Field Manual 4-0, Sustainment Operations, emphasizes sustaining units operating in base clusters, encouraging smaller and more survivable brigade support area configurations. During CTC rotations, units creatively adapted these concepts, leveraging C2 Fix assets to best support their BCTs.

Challenges and Areas for Improvement

Although the C2 Fix initiative improves the communications

infrastructure, some challenges remain when it comes to sustaining the maneuver force during multidomain operations. In current units that have undergone C2 Fix, the vehicles with JBC-P Logistics have not been upgraded to MMC software, which limits data exchanges between sustainment units and the formations they are supporting. Additionally, disparities in the allocation of Nett Warrior (end user devices, mobile Wi-Fi pucks, and leader radios) in sustainment versus maneuver units limits the overall integration of sustainers. Additionally, the current logistics status (LOGSTAT) report included in the MMC software does not compile information at echelon and requires manual entry at each level, increasing planning time and opportunities for error. To increase survivability, units have experimented with their internal TTP and conducted their CTC rotations in smaller base clusters, instead of the larger brigade support area. While the base cluster concept has shown potential, there is a need for additional pLEO platforms to maintain access to critical sustainment enterprise systems and provide enduring support to the BCTs.

Current Initiatives

To address these challenges, U.S. Army Combined Arms Support Command (CASCOM); the Network Cross-Functional Team; the Program Executive Office Command, Control, Communications, and Network; the Maneuver Capabilities Development and Integration



Ssg Devin Sasser, network communications systems specialist, Maneuver Combat Advisor Team 2310, 2nd Security Force Assistance Brigade, configures a microwave satellite terminal to increase tactical communication to support exercise African Lion 2024 in Dodji, Senegal, May 27, 2024. (Photo by SFC Nicholas J. De La Pena)

Directorate; and the Mission Command Center of Excellence have been coordinating revisions to the basis of issue for sustainment brigades, DSSBs, division sustainment troops battalions, and BSBs/LSBs. These revisions aim to increase Nett Warrior allocations in sustainment formations to provide increased access for leaders at the E-6 level and above. CASCOM, in coordination with the Army's Artificial Intelligence Integration Center, the Army Software Factory, and the PMs for mission command and Integrated Personnel and Pay System-Army are actively working on applications to address logistics COP, LOGSTAT and personnel status concerns within the MMC software system. Additional efforts have already begun to pay dividends:

sustainment units are now eligible for MMC software upgrades with help from local Communications-Electronics Command offices. CASCOM will continue close coordination with multiple stakeholders to resolve foreseeable communications challenges, enabling better communication and coordination across dispersed formations.

Moving Forward

As the Army fields C2 Fix and ultimately moves toward next-generation C2, sustainment forces must remain active in testing and evaluation efforts to ensure their needs are considered. With modernization efforts reshaping force structure, doctrine, and technology, sustainment personnel

must continue pushing the boundaries of C2 Fix to ensure it meets the demands of future battlefields.

MG Michelle K. Donahue serves as the commander of the U.S. Army Combined Arms Support Command/Sustainment Center of Excellence at Fort Gregg-Adams, Virginia. She has served as a sustainment brigade commander, support squadron commander, battalion executive officer, battalion support operations officer, battalion S-4, battalion S-2/S-3, and battalion and brigade S-1. She has also served as the 56th Quartermaster General and Commandant of the U.S. Army Quartermaster School at the Sustainment Center of Excellence; Deputy Director for Readiness, Strategy and Operations for the Army's Deputy Chief of Staff/G-4; and Special Assistant to the Director, Army Staff for the 2023 Army Transition Team. A Distinguished Military Graduate, she received her commission in the Quartermaster Corps from Duke University in 1996. She also holds advanced degrees from Georgetown University and the National Defense University.

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 servicemembers 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.

Human Resources Data and Systems Integration with Sustainment in 2040

By LTC (Ret.) James J. Galluzzo III

The Adjutant General's (AG) Corps is the lead proponent with the responsibility and mandate to ensure that human resources (HR) capabilities, as an integral part of the sustainment warfighting function, align with and support the demands of the current and future Army. These HR capabilities must nest and integrate with greater sustainment efforts to continuously transform and meet the needs of the operational warfighter.

After years of operating with analog and dot-matrix-era systems, the Integrated Personnel and Pay System-Army (IPPS-A) is the latest HR information system to leverage vast amounts of Total Army HR information collected at individual Soldier to enterprise levels. HR information and data is often a critical element of predictive analytics, answering Army and leader questions of what happened and how we can improve this process to be more effective. Therefore, we must continue to explore and

leverage emerging technologies to best use this data to understand and enable our most critical weapon system, the Army Soldier.

Two HR functions that heavily depend on big data are replacement operations and casualty operations. Big data is an extremely large and diverse collection of information that is far too complex to process with traditional digital applications, and it continues to grow exponentially over time. In large-scale combat operations (LSCO), the volume of personnel information expands. The demand to quickly analyze trends to make recommendations on courses of action in a timely manner increases, while the leader's decision cycle timeline decreases. In a recent U.S. Army Combined Arms Support Command (CASCOM) tabletop exercise focused on replacement operations, the sustainment community acknowledged theater-level replacement operations are not just AG Corps personnel actions, but also require the synergy of, and place demands on, sustainment assets.

This complex problem set requires the enterprise and generating force to identify, manage, transport, house, equip and track individual replacements from the continental U.S. to the unit-level point of need in theater. Theater replacements and in-transit personnel accountability are a challenge for the AG Corps. Although the consolidation of data and improved visualization tools greatly assist us today, there are still gaps we can mitigate through information sharing across the sustainment landscape.

In the same manner, casualty operations in LSCO have similar challenges with data accuracy and timeliness. The current process to capture and input the information is not practical in a sustained environment of greater casualties. It requires ways to integrate automation and artificial intelligence (AI) to develop a materiel solution in our casualty reporting system and processes that are integrated with other Army common operational pictures (COPs) and sustainment information systems.

HR AI integration is still fledgling but has the potential to grow and become a robust capability for the Army. We must dedicate resources toward predictive sustainment, encapsulating all sustainment functions. The development and application of AI and other emerging technology on future battlefields to expeditiously gather and utilize HR information is critical to providing commanders with the sustainment to fight and win.

Project Mercury, the Army Futures Command's software application and web-based sustainment planning tool, generates classes of supply estimates and integrates CASCOM planning factors based on unit information. It must also include HR planning estimates as part of future application development. Additionally, the Artificial Intelligence Integration Center must consider AG Corps elements of the sustainment warfighting function as they identify, synchronize, and accelerate the development, integration, and adoption of effective and timely AI solutions. These efforts will help commanders with data visualization and with informed, data-driven, and comprehensive decision making for the sustainment warfighting function.

The goal moving forward must be shared data to inform not just a COP but also a comprehensive operating picture. Using large language models, which can scrape through pages of data to understand patterns that unfold, represents just one of the emerging technologies the Army can holistically leverage to improve our ability to manage and track

sustainment across the battlespace. For example, within the Mounted Mission Command, IPPS-A's HR Pro Lite is an additional application that can serve as the deployed version of our personnel system of record and as an interface bridge to the IPPS-A to share information about our theater personnel status.

Personnel asset visibility, and especially in-transit visibility of our people on the move, are functions that are essential to support the Army of 2040. Along with knowing where our people are, we must leverage AI and machine learning to help with reach back of essential personnel services and provide efficient support in theater. Commanders need to understand, visualize, command, and direct people on the battlefield. We must share best practices and use cases from the military, academia, and industry to develop these concepts to their fullest potential. However, we must also be aware of, and be prepared for, the likelihood of degraded operations, so we must never be far removed from a manual or analog process if our communications and digital space are interrupted while conducting operations.

The integration of technology must be extensive and designed to bolster HR professionals' capacity to manage numerous tasks. This approach is top-down, not bottom-up. Modernization is crucial to empower higher-level management to oversee functions typically handled by subordinates one or two levels down. This shift will free subordinate HR sections from excessive focus on routine tasks that can be more effectively managed in environments

with enhanced protection, connectivity, and reach-back capabilities.

Our modernization efforts should emphasize practicality and expedience, focusing not on perceived ideal solutions, but on those that enhance normal operations. This includes acknowledging that future HR sections will be smaller, restructuring institutional teaching methods, and adjusting career models and enlisted/officer requirements as outlined in Department of the Army Pamphlet (DA- PAM) 600-3, Commissioned Officer Professional Development and Career Management Officer Talent Management, and DA- PAM 600-25, U.S. Army Noncommissioned Officer Professional Development Guide. Today, we already see the initial steps, as the updated but yet-to-be published Field Manual (FM) 1-0 aligns HR support with the changes in the recently published FM 4-0, Sustainment Operations. With these future concepts and the focus on ensuring that HR operational equities are represented in the sustainment futures planning and development, we will ensure that the Army's personnel systems and structure are aligned to meet the needs of Army 2040.

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Battlefield Algorithm

Leveraging Predictive Analytics in Contested Environments

By SGM Noel DeJesus

As the Army prepares for large-scale combat operations (LSCO), the importance of effective logistics has never been greater. In contested environments, where supply chains are vulnerable to disruption, the military must find new ways to ensure critical resources reach the front lines. One key solution is adopting corporate predictive analytics practices. Corporations have long used predictive analytics to anticipate market trends and optimize their supply chains, allowing them to

remain competitive in ever-changing environments. The military can benefit from these same practices to enhance logistical efficiency, making predictive analytics a critical tool for success on tomorrow's battlefields.

This article examines how the military can adopt corporate predictive analytics to overcome logistical challenges in contested environments. By understanding how corporate models work and applying them to military logistics, forces can enhance operational readiness and

sustainment in the face of adversarial threats. This adaptation is crucial when preparing for LSCO in a global environment that is interconnected.

Predictive Analytics

Corporate sectors leverage predictive analytics to improve customer loyalty, forecast demand fluctuations, and optimize supply chains. By analyzing historical data, businesses can anticipate customer needs and adjust their operations accordingly, thereby reducing operational costs. This enables

companies to remain competitive even when market conditions fluctuate unexpectedly. Similarly, military logisticians can use predictive analytics to forecast future requirements based on data from past missions, environmental conditions, and resource consumption.

In contested environments, where logistics face disruptions from enemy actions or challenging terrain, predictive analytics provides military planners with the foresight needed to mitigate these risks. This strategic

advantage of predictive analytics, especially in regions like the Indo-Pacific, provides an added layer of readiness. By anticipating disruptions, logistics teams can adjust supply lines preemptively, ensuring the timely delivery of essential supplies such as ammunition, fuel, and medical equipment.

Enhancing Decision Making

The military's adoption of corporate predictive models hinges on its ability to harness vast amounts of data, similar to how

corporations predict market trends and optimize their operations. In military logistics, real-time data from drones, sensors, and satellite imagery can be combined with historical data to anticipate supply chain disruptions. This data fusion allows military planners to develop robust contingency plans and respond swiftly to dynamic battlefield conditions.

Predictive analytics improves the military decision-making process (MDMP) by modeling potential

outcomes based on current data. In contested environments, these models enable military planners to identify alternative routes or suggest optimal supply drops to ensure essential resources reach their destinations. This agility in the planning and execution phases is critical for maintaining operational readiness in volatile settings. The ability to predict and plan ensures that military forces are always one step ahead of potential challenges.

The use of predictive analytics to create customized simulations offers data-driven insights into future risks and opportunities. In the corporate world, these tools help businesses forecast market trends and adjust strategies accordingly. This adaptability ensures that companies can not only adapt but thrive amid changing market conditions.

Similarly, military logistics planners can use artificial intelligence (AI) and machine learning (ML) algorithms to simulate various logistical scenarios and prepare for potential challenges, improving the MDMP at both the strategic and tactical levels. These algorithms can process vast amounts of data from past missions, environmental conditions, and resource consumption to

predict future requirements and plan supply routes. In contested logistics environments, predictive analytics allows military planners to allocate resources more effectively and develop real-time contingency

Joint training exercises and multinational cooperation are also critical to ensuring the efficiency of RSOI processes.

plans. This data-driven approach reduces uncertainty and enhances the military's ability to respond swiftly to battlefield conditions. In LSCO, where anti-access/area denial (A2/AD) capabilities present logistical challenges, predictive analytics becomes a critical enabler of operational success.

Leveraging AI and Predictive Logistics in LSCO

In LSCO, logistics often face continuous threats from adversaries. AI and ML algorithms have emerged as powerful tools for transforming sustainment operations by enabling predictive logistics.

These technologies aggregate and analyze vast amounts of battlefield data to forecast supply needs and optimize supply chains in real time. The proactive nature of these AI-driven models, which can anticipate maintenance needs, ensures proactive repairs and minimizes downtime, making their users feel prepared and in control of potential challenges.

This proactive approach helps keep critical equipment operational. Additionally, systems powered by AI, such as drones and autonomous vehicles, enable the transportation of supplies through contested areas without risking personnel. These systems can operate in high-threat environments and provide the military with operational flexibility, allowing for the rapid and safe transportation of supplies.

Strategic Sustainment and Prepositioned Stock

Prepositioned stock plays a key role in the military's ability to sustain operations in contested environments, particularly in theaters like the Indo-Pacific, where near-peer threats such as China pose significant logistical challenges. Prepositioned stock enables the rapid deployment of critical resources, enhancing operational reach and providing a buffer against adversarial disruptions. The Army's prepositioned stock

afloat ensures that critical combat equipment and supplies are available for rapid deployment, even in contested environments.

Strategic sustainment organizations such as Army Materiel Command and the Defense Logistics Agency are essential to maintaining prepositioned stock and ensuring timely transport to where it is needed most. These organizations coordinate complex supply chains, ensuring that resources are positioned for maximum effectiveness. They play a crucial role in managing and distributing prepositioned stock. Additionally, operational contract support (OCS) integrates civilian contractors into military logistics, ensuring that essential sustainment operations continue even in high-threat environments. This integration increases the military's logistical resilience in contested zones.

Overcoming A2/AD Challenges

A2/AD environments present significant logistical challenges, because adversaries use long-range precision weapons, electronic warfare, and cyber attacks to disrupt supply lines. Combined with AI, predictive analytics allows military planners to adjust operations in real time, rerouting supplies and mitigating disruptions. The integration of AI with predictive analytics adds a layer of responsiveness that is essential in modern warfare.

Prepositioned stock further supports rapid deployment and sustainment under A2/AD

conditions, particularly in areas like the Indo-Pacific. By using prepositioned stock and predictive analytics, the U.S. military can ensure its ability to project power and sustain operations, even when supply chains are constantly threatened. For example, the Army's Sagami General Depot in Japan holds critical medical supplies and equipment ready for rapid deployment. These logistical hubs are essential in sustaining forces in hostile environments.

Enhancing RSOI Processes with AI and OCS

Reception, staging, onward movement, and integration (RSOI) processes are essential to deploying forces in contested environments. AI-driven systems can optimize these processes by integrating logistics data from various platforms, providing a comprehensive picture that enhances decision making and resource allocation. This integrated approach allows logistics planners to be proactive rather than reactive in contested environments.

OCS further supplements these efforts by integrating civilian resources into the logistics framework. This ensures that military forces remain flexible and responsive, even when traditional supply routes are compromised. Joint training exercises and multinational cooperation are also critical to ensuring the efficiency of RSOI processes. Allied forces must work together to overcome logistical and language barriers, fostering trust and improving the efficiency of

joint operations. This collaboration enhances the military's ability to sustain operations in contested environments.

Conclusion

As the nature of warfare evolves, so too must military logistics. Predictive analytics and autonomous systems powered by AI and ML provide the tools needed to maintain operational agility, improve decision making, and sustain forces in contested environments. By integrating established and proven corporate strategies and technologies into military logistics operations, the U.S. military can overcome the logistical challenges posed by LSCO and A2/AD threats. The time to act is now. Embracing these innovations will ensure that the military remains ready and resilient, and capable of sustaining operations in even the most contested environments. The ability to predict and adapt will define the future of military logistics, and therefore the future of military logistics will define the outcome of future wars.

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ARMY SUSTAINMENT ENTERPRISE'S DELAYED APPROACH TO DATA MODERNIZATION

■ *By LTC Nate Platz and CPT Bailey K. Smith*



Artificial intelligence (AI) is coming, but not for the tactical Army sustainment enterprise. At least, not until the Army sustainment enterprise formulates a clear and actionable data strategy. In this article we address challenges facing the implementation of AI for predictive logistics and explore opportunities to bridge the gap through internal innovation and partnership with industry. We outline five areas the Army sustainment enterprise must address to fully employ predictive logistics for effect. These are data collection, data storage, data transfer, data analysis, and data visualization.

Data Collection

The Army sustainment enterprise has data in troves — it is just not collected in a standardized or useful manner. The best example of this is Global Combat Support System-Army, where maintenance and supply data is collected in a uniformed manner down to the individual part and vehicle platform. This data is consistent across the Army, which allows for the application of analytical tools for forecasting. Units have demonstrated the value of this data in predicting future equipment readiness, which is a precursor for predictive logistics.

However, the Army does not collect data for other commodities with the same diligence. Fuel, water, and ammunition all lack central databases with standardized data entry across different units and echelons. How the 2nd Stryker Brigade Combat Team, 4th Infantry Division, collects fuel and water data differs from how the 2nd Infantry Brigade Combat Team, 82nd Airborne Division, collects fuel and water data. To enable predictive logistics, the Army must establish data standardization for the collection of critical commodities down to the tactical unit level.

The sooner we standardize data collection in a training environment, the sooner we can implement predictive models. More than 15 combat training center rotations are conducted every year, and commodity consumption data is collected for each unit. Yet, each incoming unit starts from scratch

for consumption projections. We are missing the opportunity to leverage predictive modeling at the unit level. Without collecting and sharing the data across the enterprise, we repeatedly solve the same problem set. By standardizing sustainment data collection across the Army, models can be trained to predict future states. Further, data standardization enables the Army to operationalize data.

If the Army focuses its modernization efforts on data storage, there is an opportunity to overcome the requirement of standardized data collection through the data pipeline. An extract-transform-load process can be added to transform the data that is collected in different structures to the same usable format. While this overcomes the potential headache of developing and implementing Army-wide data collection formats, there is still the requirement of units to collect data. Data cannot be leveraged if it is not collected and stored.

Data Storage

The Army must store collected data in a manner that enables units at echelon to access it and to apply analytical tools to it for staff analysis. Commercial industries have transitioned to cloud-based data storage and have maximized the capacity and usefulness of their previous data storage systems. Cloud-based storage enables secure, decentralized collaboration and allows users to access the data needed to improve analysis.

The Army is also moving in this direction, publishing *The U.S. Army Cloud Plan* in 2022, which directs the Army to “adapt its processes to be more agile, its network to be more resilient, its hybrid public and private cloud environments to be more elastic, IT software design and fielding approaches to be more cloud native, and organization structures and training to be more effective at information warfare.” The establishment of cARMY, a general-purpose cloud environment, is a great place for the Army sustainment enterprise to store all logistics data in a standardized format. This enables units at echelon to access troves of data for analysis; it even provides the opportunity to apply AI and machine learning (ML) tools through cARMY’s instance of the Jupyter Notebook.

Data Transfer

Data transfer is critical for enabling analysis at echelon of ground reporting to allow the rapid and precise application of resources. For Army sustainment and predictive logistics, this means collecting data into a cloud with multiple transport methods. In garrison, this is easy because our cloud instances are stable, and data collection is not in competition with securing a position or maneuvering. It becomes more complicated in combat where a near-peer adversary can employ cyber capabilities to target or intercept data transmissions.

Ideally, tactical units report standardized data formats for maintenance, supply, ammunition,

fuel, and water where it is collected at the brigade level into a cloud database. This database is accessible at echelon, which negates the current model of emailing logistics statuses to higher headquarters and operating from one- or two-day-old data. Once logistics data is input into the cloud, it is accessible at echelon for analysis. This method is similar to the method used by the oil industry. Data is uploaded into a secured cloud from offshore rigs where energy companies can access and use the data at onshore locations. With data standardization, a theater sustainment command can easily analyze the fuel consumption for all units operating in their theater and apply analytical tools and ML into a predictive model that learns as more data is transported into the model.

Data Analysis and Visualization

To employ predictive logistics, the Army sustainment enterprise needs to focus on data and speed. Without consistent and accessible data, we cannot predict a future state. Once the Army standardizes logistics data collection and storage, it needs to rapidly iterate experimentation of predictive models to advance capability toward employing predictive logistics.

Commercial industry relies on ML models and AI to conduct data analysis for decision making. While the Army understands the potential advantages of incorporating ML and AI into data analysis, it currently lacks the software, expertise, and accessible historical data necessary

to integrate the models into daily problem sets. Efforts such as Enterprise Business Systems – Convergence (EBS-C) are attempting to merge and modernize current Army systems by combining them into a single platform at the enterprise level.

Data analysts, engineers, or coders do not currently exist below the division level in Army units. When attempting to conduct data analysis in the Army, units must rely on servicemembers in their formations that have knowledge on data analysis from their own personal interest through formal or informal education outside the Army. In addition to not having trained individuals when attempting to make progress in data integration, Army computers do not have the necessary software to conduct data analysis beyond standard spreadsheets. Interest in data analysis, along with ML and AI, is growing within Army formations, along with a desire to implement it into daily decision making, but a lack of resources to conduct data analysis is slowing or inhibiting progress.

Conclusion

In a perfect world, predictive logistics would enable a commander to have access to visualizations displaying current logistics capabilities of their subordinate units with forecasts for capabilities and commodity levels up to 96 hours in advance. This visualization would update as new data was input into the model, and the commander could then make rapid decisions

about the precise application of resources. Unit logistics status and future status would be available to theater commands and to the industrial base to enable repositioning of national assets with greater efficacy. This perfect world is what predictive logistics could create with the employment of generative AI if we get our data processes correct. Initiatives such as EBS-C are developing a single platform for Army systems and are focused on implementation in 2032. This is where the commercial industry is now. Today, the Army sustainment enterprise remains in 2014. We are a decade behind the commercial industry. The journey to enter 2025 and to build the Army of 2040 enabled by predictive logistics begins with a data strategy and rapid experimentation. We cannot afford to fall further behind.

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*Featured Photo
The Army Prepositioned Stock-5 M1224 MaxxPro mine-resistant ambush protected wheeled vehicles are prepared to be issued to the 44th Infantry Brigade Combat Team at Camp Arifjan, Kuwait, June 20, 2024. (Photo by Joseph Kumzak)*

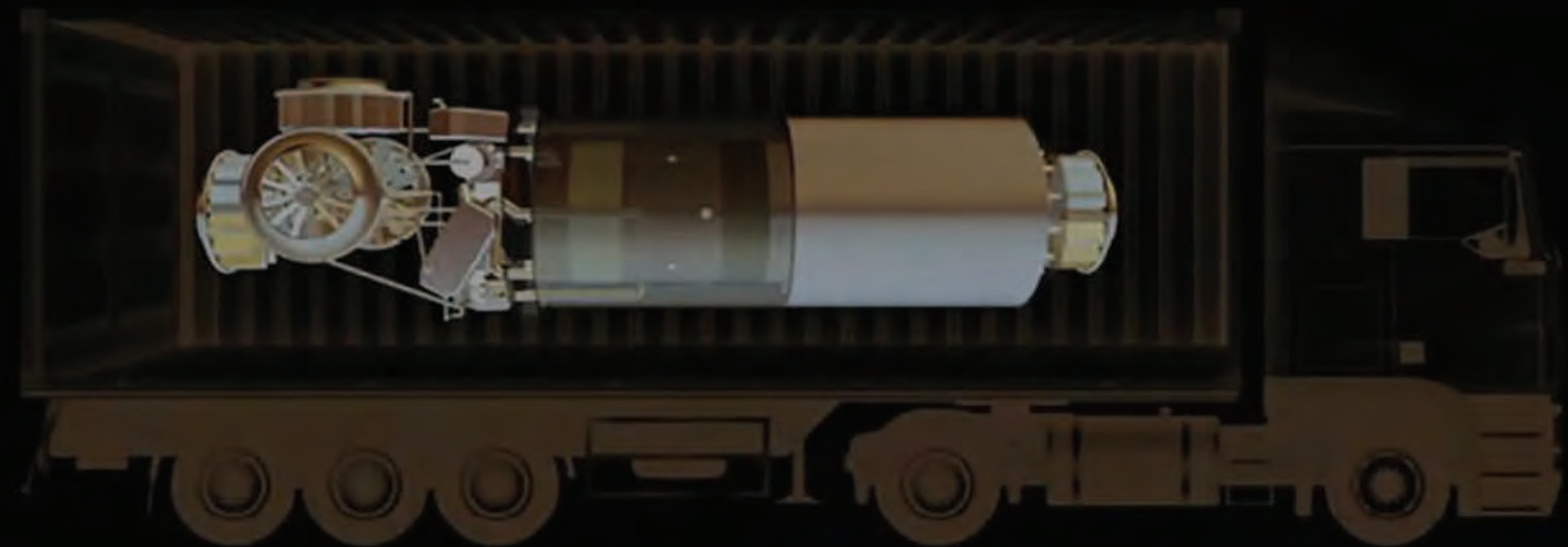
“A primary goal is to harness those products, capabilities, and concepts that decrease demand and reduce movement of energy in the supply chain”.

The Future Possibilities of Operational Energy

By SSG Joshua R. Charles

Fossil fuels, including coal, oil, and natural gas, have been dominant sources of energy for the past 150 years, supplanting whale oil in the late 19th century as the top energy industry. Their widespread adoption occurred because of their high energy density, accessibility, and relatively low cost compared to alternative energy sources. Since the implementation of combustible fuel engines in military equipment, petroleum has been heavily relied on by the DoD. During World War II, with the revolution of armored warfare involving trucks, tanks, warships, and planes, maintaining a steady supply chain of petroleum in a contested environment proved difficult. These difficulties were also seen at the beginning of the Iraq and Afghanistan conflicts, where 80% of the tonnage delivered was fuel and water.

Jet petroleum (JP-8) has been the primary operational energy (OE) source used on the battlefield since 1986 when NATO reached an agreement for a common fuel. As the times have progressed, different means of OE have also



progressed. Transitioning toward cleaner and more sustainable energy sources, such as renewables like solar, wind, hydroelectric power, and nuclear energy, and advancements in energy storage technology, not only addresses tactical and environmental concerns but also enhances energy security by diversifying the energy mix and reducing reliance on centralized fossil fuel infrastructure. This shift can help mitigate the risks associated with disruptions to the fossil fuel supply chain and potentially shape the battlefield for the Army of 2030 and beyond.

What Is Operational Energy?

Before we dive into how OE can help shape the battlefield, we must first understand what exactly OE is. 10 U.S. Code Section 2924 defines OE as “the energy required for training, moving, and sustaining military forces and weapons platforms for military operations. The term includes energy used by tactical power systems and generators and weapons platforms.” What this means is that everything we use to provide power is considered OE, not just fuel. OE sources come in different forms.

A primary goal is to harness those products, capabilities, and concepts that decrease demand and reduce movement of energy in the supply chain. Examples are generators that power tactical operation centers or command posts. These generators are considered OE sources since they provide the energy to power systems. DoD has over 3,000 stock-numbered batteries in the system

in all shapes and sizes. Units often purchase off-the-shelf capability to power up night-vision goggles or laser sights. All the above are part of OE in a military context. Using solar energy to charge equipment or power generators is OE. Hydroelectric sources are also OE. Energy sources directly influencing the training, moving, and sustaining of military forces and platforms are all considered OE.

2022 National Defense Strategy

We need Soldiers and leaders across the force to understand what OE is and is not. The 2022 National Defense Strategy (NDS) talks about how China and Russia are the DoD’s primary focus, since these two near-peer adversaries bring strategic competition to the battlefield. China and Russia are both armed with long-range weapons, significant anti-access/area-denial systems, and substantial cyber capabilities to degrade the ability of the DoD to provide energy to forces and facilities. These adversarial capabilities threaten to undermine the DoD’s ability to deploy, operate, and sustain joint forces. The 2022 NDS also states a future force must “provide logistics and sustainment to continue operations in a contested and degraded environment,” and that DoD will make “reducing energy demand a priority and seek to adopt more efficient and clean-energy technologies that reduce logistics requirements in contested or austere environments.” The question is, how can we achieve the goal of the 2022 NDS?

Army Efforts to Accomplish NDS Goals

Each Service is focused on its own way of accomplishing the goal of the 2022 NDS. Progress is continuously being made toward reducing energy consumption and extending range capabilities. Analyzing the four OE focus areas, the Army is focused on ways to mitigate battlefield impacts within the contested logistics environment. One example of progress is the vehicle-centric microgrid (VCM) prototype unveiled in 2021. As David Vergun writes in his article, “DoD Demonstrates Mobile Microgrid Technology,” on defense.gov, the VCM integrates generation of power directly on tactical vehicle platforms. With this concept of VCM, power can become mobile, providing on-the-go OE to mobile command-and-control assets as far forward on the battlefield as possible. Features include generating up to 100 kilowatts per vehicle or supporting static or on-the-move operations. The VCM enhances lethality and survivability in a near-peer contested environment. By combining multiple VCMs, a tactical microgrid can be established between vehicles and keep operational nodes running, while also connecting to power generating, storage, or distribution systems and minimizing the heat signature. This reduces vulnerabilities to threats while maintaining capability and reducing fuel requirements.

The Army is also experimenting with tactical fighting vehicles. The first hybrid optionally manned fighting vehicle is being designed

to supersede the long-serving and reliable M2 Bradley Infantry Fighting Vehicle platform. A key aspect of this new design is to reduce the liquid logistics demand of armored brigade combat teams. This reduces the number of fuel tankers and the fuel supply point capacity required forward, increasing survivability and reducing targeting opportunities for the enemy along the supply chain. Vehicle enhancements to on-board diagnostics reduce maintenance burdens and increase vehicle readiness.

Two companies are developing prototypes and looking across the platform to develop other demand-reducing capabilities while enhancing subsystems within the hybrid concept. These advances will also reduce the logistical burden in fuel, repair parts, and logistics supply chains. Hybrid electric powertrain designs reduce power consumption, lessening the need for high quantities of fuel required for traversing longer distances.

Industry Partners and TRISO Particle Fuel

The DoD is not alone in finding ways to reduce energy demand. Industry partners are constantly finding ways to improve energy demand reduction and sustainability. One such innovation is Project Pele, which is a revolution in nuclear power. A new ground-breaking nuclear fuel has been developed by the Department of Energy called the Tristructural Isotropic (TRISO) particle fuel. It is the safest way to capture nuclear energy at minimal

risk. Each TRISO fuel kernel is the size of a poppy seed and consists of uranium, carbon, and oxygen encapsulated by three layers of carbon and ceramic-based material that prevent the release of radioactive fission products. Each particle acts as its own containment, making it safe for the battlefield.

TRISO particles do not melt down in high-temperature reactors and can withstand high temperatures in a kinetic explosion, like an artillery strike. The ability to withstand up to 3,100 degrees Fahrenheit makes TRISO a suitable fuel source in a contested environment. This micro-reactor can provide 1 megawatt of electrical power (1 MWe) for three consecutive years at 100% power utilization. Production of 1 to 5 MWe can easily power a division/theater rear area in a deployed environment with almost no heat signature. The transportation is relatively simple because the micro-reactor consists of four 20-foot containers. Fuel pellets are located within the system itself, so deployment and redeployment are fast and leave no nuclear waste.

Thoughts on the Way Ahead

The days of petroleum as the single source of OE on the battlefield are slowly and steadily transforming. As OE evolves, demand reduction paired with new sources of energy, mechanical advances, and distribution methods will transform the DoD to agile, range-extended, demand-reduced, and survivable capabilities the force needs to maintain our edge over competitors. The Army continues

to adapt to an ever-changing battlefield. OE transformation requires fully analyzed planning across Army organization, training, leadership, personnel, facilities, and policy, and especially in materiel, logistics, doctrine, and education. The use of varied energy sources potentially affects the way the battlespace unfolds, both kinetically and non-kinetically. Changes in equipment and supply chains require changes in asset visibility, data analysis, and decision making. These changes must be addressed via the development of energy literacy and education. Understanding energy sources, consumption patterns, efficiency measures, and strategic implementation of energy gives us the edge over competitors, ensuring we can sustain the force in the next large-scale combat operation.

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MULTIDOMAIN OPERATIONS CHANGE THE ARMY'S APPROACH TO SUSTAINMENT



By Kirk Jones

Army sustainment operations are critical to enabling Army freedom of action, extending operational reach and prolonging endurance, which commanders require to succeed during operations. Field Manual (FM) 3-0, Operations, published in October 2022, transitioned the Army's operational concept from unified land operations to multidomain operations. Unified land operations emphasize the integration and synchronization of Army, joint, and other unified action partners during combat operations and shift the Army's readiness focus from counterinsurgency to large-scale combat operations (LSCO). Multidomain operations are the combined arms employment of joint and Army capabilities to create and exploit relative advantages that achieve objectives, defeat enemy



Soldiers assigned to 2nd Battalion, 3rd General Support Aviation Regiment, 3rd Combat Aviation Brigade, transport rigging equipment to a downed Black Hawk in order to rig the aircraft for recovery during Joint Readiness Training Center rotation 24-11 at Fort Johnson, Louisiana, Sept. 19, 2024. (Photo by SSG Dean Johnson)

forces, and consolidate gains on behalf of joint force commanders. Multidomain operations require integration of Army and joint capabilities from all domains to defeat the enemy's integrated fires, electronic warfare, cyber, and air defense systems, and to allow maneuver forces to exploit the resulting freedom of action.

This change in operational concept required a revision to the Army's keystone sustainment publication, FM 4-0, Sustainment Operations, and has implications across the sustainment warfighting function. This change starts with revitalizing Army doctrine and training to meet the demands of conducting sustainment during LSCO in a contested operational environment. FM 4-0 reinforces the requirements for sustainment forces to overcome potential adversary actions from home station to forward locations. FM 4-0 shapes doctrine across the sustainment enterprise by aligning sustainment doctrine with FM 3-0. To meet

the challenges of multidomain operations described in FM 3-0, FM 4-0 discusses sustainment tasks across the four levels of warfare in the Army's strategic contexts, describes requirements for predictive logistics as a means to deliver precision sustainment, addresses the command and support relationships for integration across multiple headquarters, incorporates a discussion on sustainment in a maritime environment, and discusses leadership and training requirements for sustainment units.

The revision of FM 3-0 expanded the levels of warfare to four. The strategic level of warfare now consists of both the national strategic and the theater strategic levels. Along with the operational and tactical levels, these levels link tactical actions to achieve national objectives. The levels of warfare are conceptual, without finite limits or boundaries. They do, however, correlate to specific activities and responsibilities required to be

performed at each level. They help commanders visualize the relationships and actions required to link strategic objectives, military operations at various echelons, and tactical actions.

FM 4-0 highlights a series of tasks executed within the sustainment warfighting function that enable the continuous provision of sustainment across the levels of warfare and executed within the Army's strategic context of competition, crisis, and armed conflict. Operations conducted during competition include sustainment tasks for setting the theater and conducting military engagements. Setting the theater describes activities conducted to establish favorable conditions in the operational area for the execution of strategic plans. Military engagements during competition can reduce tensions and may preclude conflict while establishing agreements and partnerships that can be beneficial during operations. During crises, the theater Army receives rotational forces and prepares for follow-on operations.

Combatant commands tailor rotational forces based on the type of operation, geographic location, operational environment, and potential threat. In preparation for follow-on operations, sustainment plans and logistics estimates are refined, and initial distribution operations begin in response to the crisis. During conflict, sustainment forces begin execution of support plans. Support plans are designed to achieve operational objectives during LSCO by enabling freedom of action, operational reach, and prolonged endurance. The shift to LSCO requires rapid delivery of sustainment in comparison to counterinsurgency operations because of the increased operational tempo, increased lethality, and consumption of fuel, ammunition, and repair parts.

FM 4-0 describes the requirement for efficiency and the optimization of resources in the delivery of sustainment. It describes the importance of precision sustainment enabled by the delivery of sustainment through predictive logistics tools and sensors.

Precision sustainment is the effective delivery of the right capabilities at the point of employment, enabling

a commander's freedom of action, extending operational reach, and prolonging endurance. Precision sustainment also employs economy and ensures sustainment resources are provided in the most efficient manner so that the employment of assets achieves the greatest effect possible. It is conducted by a sustainment enterprise resource planning and decision support system employed at echelon. Precision sustainment is enabled by predictive logistics and includes the capabilities and decision support tools to improve readiness.

Predictive logistics provides the capabilities and decision support tools designed to improve operational readiness in multidomain operations. It is a system of sensors, communications, and applications (data support tools and data visualization) that enables quicker and more accurate sustainment decision making at echelon from tactical to strategic. For example, units can use the information received from predictive logistics applications to predict commodity replacement rates and request replacements before they are needed. Given the expected lethality of LSCO, those decisions allow the precision sustainment delivery of those replacements to the right location in the most efficient manner possible. Autonomous distribution also aids in providing efficiency during precision sustainment by allowing vehicles to operate for longer periods while reducing personnel requirements for those vehicles.

The revision of FM 4-0 expounds on the operational relationship of sustainment headquarters at echelon. It shifts from an organization-based discussion of sustainment headquarters to an echelon-based discussion, aligning sustainment roles, missions, and functions with corresponding operations at the levels of warfare. It also captures the tenets identified in FM 3-0 that leaders must build into all plans and operations to improve the probabilities of success. Additionally, commanders must take risks to defeat the enemy and achieve their objective at acceptable cost. These actions are imperatives that Army forces must take to succeed in a multidomain environment. FM 4-0 describes sustainment implications for each tenet of Army operations (agility, convergence, endurance, and depth) and discusses sustainment implications for

each imperative described in FM 3-0. This allows for integration and synchronization of sustainment across echelon headquarters.

FM 3-0 tenets and sustainment considerations:

- **Agility**
 - Employ sustainment capabilities and rapidly reorganize for follow-on support.
 - Rapidly emplace, execute operations, and disperse to avoid detection.
 - Understand, decide, act, assess, and adapt support to achieve favorable conditions.
- **Convergence**
 - Understand support capabilities from different domains and employ in ways that generate advantages.
 - Integrate sustainment capabilities where employment is most effective.
 - Synchronize employment of sustainment

- capabilities to achieve desired effects.
- **Endurance**
 - Set the theater.
 - Improve interoperability with allies and unified action partners.
 - Sustain employment of combat power through land, air, and maritime capabilities.
- **Depth**
 - Improve infrastructure for force projection.
 - Expand influence and support capabilities with allies and unified action partners.
 - Understand capabilities to achieve advantages.

FM 3-0 describes adversary capabilities and capacities to contest U.S. forces and operations in and outside the continental U.S. throughout deployment, employment, sustainment, and redeployment. Sustainment commanders and staffs must therefore plan and execute sustainment within a contested logistics environment



Training operations for the 2024 Global Medic Exercise are shown Aug. 14, 2024, on North Post at Fort McCoy, Wisconsin. (Photo by Scott T. Sturkol)

with the assumption that sustainment forces are always under observation and in contact through all domains.

FM 4-0 describes the requirement for sustainment forces to prepare for continuous visual, electromagnetic, and influence contact with adversaries. Army sustainment forces must maintain dispersion and remain as mobile as possible to avoid presenting themselves as targets to the adversary's systems. FM 4-0 describes the requirement for sustainment forces to disperse for survivability, mass for effects, and disperse again during LSCO. If sustainment forces are required to remain static longer than short periods of time, those forces must harden their posture, employ military deception techniques, and mitigate signatures to increase survivability.

Since sustainers must be prepared to contend with adversary actions across all five domains, FM 4-0 introduces a new chapter on sustainment operations in a maritime environment. This chapter provides an overview of the planning considerations for conducting maritime sustainment operations. Key planning considerations for maritime sustainment operations include employment of Army watercraft and countermeasures. For example, adversaries may employ mines or submarines to interdict watercraft operations. Sustainment planners must be prepared to coordinate with joint and allied partners for assistance in securing sea lines of communications. An example of joint and allied capabilities includes use of mine sweeping, aerial reconnaissance, and sensor technology to identify and mitigate threats. The maritime chapter concludes with discussion on sustaining LSCO, executing reception, staging, onward movement, integration operations, and conducting theater sustainment operations in maritime-centric environments.

Sustainment operations require leaders at echelon to employ mission command and make decisions at the lowest level. Therefore, FM 4-0 includes a new chapter on leadership and training for sustainment operations. This new chapter highlights the importance of leadership during sustainment operations and the training required for sustainment units to operate and survive. The chapter begins with a discussion of the operations

process, its importance to sustainment commanders, and their role in the operations process. Using the operations process, sustainment commanders drive the detailed planning necessary to understand, visualize, and describe the operational environment through staff collaboration, developing end-states, and identifying risks. This allows sustainment commanders to make critical decisions to lead and direct synchronized and integrated operations. This chapter also describes how sustainment commanders use operational art to develop strategies and operations to organize and enable tactical forces' mobility and responsiveness in an ever-changing contested operational environment.

In conclusion, the Army's shift to multidomain operations demands new approaches to sustainment operations within contested and complex environments. FM 4-0 integrates and synchronizes Army sustainment with the doctrine outlined in FM 3-0. FM 4-0 introduces sustainment tasks for all levels of warfare, describes requirements for predictive logistics as a means to precision sustainment, and discusses the relationships, roles, missions, and functions for sustainment integration at echelon across multiple headquarters. It also incorporates a discussion on sustainment in a maritime environment and the leadership and training requirements for sustainment leaders.

Kirk Jones serves as the senior doctrine developer of Doctrine Division in the Combined Arms Support Command at Fort Gregg-Adams, Virginia. He has a Bachelor of Science degree from Norfolk State University and was commissioned as a lieutenant in the Ordnance Corps.

Featured Photo
Army air traffic controllers assigned to Foxtrot Company, 2nd Battalion, 3rd General Support Aviation Regiment, 3rd Combat Aviation Brigade, install a power cable to a generator during Joint Readiness Training Center rotation 24-11 at Fort Johnson, Louisiana, Sept. 15, 2024. (Photo by SSG Dean Johnson)

THE HARDING PROJECT UNLOCKS THE KEY TO KNOWLEDGE

A Perspective from the First Sustainment Harding Fellow

■ By CPT Garrett H. Pyle



The truth that existed for Sun Tzu remains true today: knowledge is power and the ultimate key to success on the battlefield. However, the transfer of that knowledge has evolved over time. At the beginning it was through word-of-mouth, then through written recordings. For generations the accessibility of written knowledge improved throughout the world. Knowledge is increased and creativity and

innovations grow when information is widely shared. The Army clearly understood this because each branch devised its own professional journal over time to share knowledge and increase an understanding of their function.

The Continued History of Army Sustainment

Logistical operations are no different, and in 1968, the Department of the Army began the initiative to create a professional

“If you know the enemy and know yourself, you need not fear the result of a hundred battles. If you know yourself but not the enemy, for every victory gained you will also suffer a defeat. If you know neither the enemy nor yourself, you will succumb in every battle.”

— Sun Tzu, *The Art of War*

journal for logistics. A pilot edition (MAR-APR 1969) was created for the final layout and sections approval. While this edition was never officially published, with hardcopies only existing in the Army Sustainment University Library, it showcases the beginning of 55 years of publication for the *Army Sustainment Professional Bulletin*. At the beginning, *Army Sustainment* was titled *Army Logician*, with the first official edition publishing SEP-OCT 1969.

Throughout the 55 years thus far, *Army Sustainment* has covered everything from the Vietnam War, Cold War, War on Terror, technology innovations, and an ever-changing formation landscape across the force, to name a few.

Army Sustainment remained in print from 1969 to the summer of 2023 before going fully digital. During the 314 printed editions (not including the pilot edition), *Army Sustainment* underwent a

variety of changes. At first it was called *Army Logician*, often referred to as *ALOG*. The editions from SEP-OCT 1984 thru MAR-APR 1987 were even titled *ALOG* on the covers. In 2009, on the 40th anniversary of the bulletin, *Army Logician* changed to *Army Sustainment*. 2013 was the only year to have only five editions printed before 2019 when *Army Sustainment* went from six to four editions a year. In 2022, *Army Sustainment* went from naming the editions by

months to seasons. Then, in the summer of 2023, *Army Sustainment* printed their final edition. From that moment on, all *Army Sustainment* articles would solely be available online for the individual Soldier to read. Another chapter in the way we transfer knowledge began.

This is just a brief overview of *Army Sustainment* with some facts that were previously unpublished. For a more thorough history of *Army Sustainment* before 2009, refer to the 30th anniversary issue (JAN-FEB 1999) and the 40th anniversary issue (SEP-OCT 2009), available online in *Army Sustainment* archives (<https://asu.army.mil/alog/backissues.html>). These contain multiple articles that highlight the progression and developments of *Army Sustainment* from 1969 to 2009.

The Launch of the Harding Project

It had not even been a full year after *Army Sustainment* went fully digital before the next significant development began. The launch of the Harding Project ushered in a new age of how Soldiers share and consume knowledge. It is an initiative of the Chief of Staff of the Army, GEN Randy A. George, to renew the Army's professional journals through the Harding Project. The project is focused on ensuring that the journals provide the force with content that is relevant, high quality, and accessible. Two of the major efforts to accomplish this intent are the creation of a single point of reference website for all branch

journals and staffing the journals with military editors-in-chief called Harding Fellows.

Line of Departure Website

Launched on October 11, 2024, the Line of Departure website provides a single access point for all branch journals that is easy to navigate, web-first, and mobile-friendly for all users. The content is available in HTML, downloadable PDFs, and audio files. Thus, every Soldier of every rank will be able to consume the information in the manner of their choosing. The link for the website is <https://www.lineofdeparture.army.mil/>.

Soldiers can now read articles while waiting in line at the chow hall, waiting for their turn during the monthly uranalysis, or as part of their weekly leader's time training. Not only are they able to read the articles, but they can listen to them as well. So, when Soldiers are at the gym, driving, or cooking dinner, they can be listening to an article and consume that knowledge. This website meets Soldiers where they are.

Another prime aspect of the Line of Departure is that all the Army's professional journals are located there. The website is constantly fed by each of the journals, so there is always new content. This broadens our overall knowledge and understanding by reading articles from other branches. This opportunity truly enables us to know ourselves and our enemy.

If you are interested in a specific topic, you can search key words and

the website populates every article that contains those words, no matter the source. For instance, if you search "port operations," the results will show you articles from the engineer, aviation, sustainment, and signal journals, to name a few. No longer does this information exist in a vacuum, nor is it separated by branch. It is no longer just contained at the senior level either. The most junior Soldier can be reading these articles, and then write about the innovations they themselves have discovered that will benefit the entire force. Now we are fully using the power of information to increase our knowledge and lethality.

The website does not just contain articles. It also provides a platform for all the Army podcasts. These podcasts enable Soldiers to gain greater understanding on current topics that they are passionate about. Lastly, each journal page provides submission guidelines specific to that journal. Here writers can find information on what the journals are looking for in submissions and how to submit. If a writer needs additional assistance, they can use the "Professional Military Writing Special Edition" of the *Military Review*, September 2024, which is directly linked on the website. This edition provides guidance on how to write professionally, how to start a writing program at your unit, how to foster dissent, and tips for getting published. All these initiatives on the Line of Departure are fully supported by the military editors-in-chief of the journals, the Harding Fellows.

The Harding Project

What is the Harding Project?
The Harding Project is the Chief of Staff of the Army's initiative to revitalize the Army's journals and renew professional writing.

Why are writing, discourse, and the Army's journals important?

- The Army's journals link leaders to winning wars by stimulating and disseminating military thought.
- Engaging in professional discourse enables rapid adaptation of experiences and ideas to keep pace with the changing character of warfare.
- Better writing skills improve broader communication skills.

How can YOU integrate the Army's journals into your unit?

- Read, discuss, and share relevant articles.
- Develop unit writing programs.
- Strengthen the profession by contributing to the branch journals.

Harding Fellowship

As part of the launch of the Harding Project, each branch center of excellence selected an individual to serve as their professional branch journal's military editor-in-chief. They serve alongside their civilian editors to work to renew the Army's journals and increase our ability to share this knowledge. The Harding Fellowship is officially titled the MG Edwin "Forrest" Harding Fellowship to honor MG Harding,

who renewed *Infantry* and the *Infantry Journal* in the 1930s. The first cohort of Fellows officially assumed their duties during the summer of 2024.

The Harding Fellowship has been codified as an official Army Broadening Opportunity. MILPER Message 24-321, published in August 2024, formally describes the program as follows: "The MG Edwin 'Forrest' Harding Fellowship

is a competitive, 36-month program consisting of a 1-year accelerated master's degree program at the William Allen White School of Journalism and Mass Communications at the University of Kansas for Active Component captains, non-commissioned officers in the grade of E8, and warrant officers in the grade of CW4. Upon completion, Fellows will then serve as editors-in-chief for the branch journals at their respective center

of excellence for a two-year term. The Harding Fellowship produces leaders who strengthen the Army profession with their deep expertise in branch matters and superior communications skills.”

The Fellows bring to the journals current firsthand experience that was otherwise missing. This enables them to be the prime candidates to help drive change and ensure the journals connect with the force. After their two-year utilization, they have become experts in their branch and have gained unmatched communication skills that they can take back with them to their operating units.

Harding Fellowship at Army Sustainment: From Simple Beginnings to Editor

Little did I know that the path that would lead me to being a Harding Fellow was started all the way back in my childhood. When I was in the 4th grade, I created a class paper that I would pass out weekly to my classmates. On some regular white copy paper, I would tape articles that I found interesting from magazines or newspapers, created my own puzzles and math problems, put the lunch schedule for the week, added some interesting or random facts, and included any upcoming events for the school. Then I would make copies to hand out. It was a very simple and creative way to learn about journalism at a young age.

My next experience came when I was deployed to Atlantic Resolve in Poland from 2018–19. As a first

lieutenant, I was with the 49th Transportation Battalion (Movement Control), which oversaw all the movement operations into and out of eastern Europe. I personally oversaw the customs clearance part of the operation and saw issues with the program, which drove me to write and publish an article to highlight the issues and present solutions. I wanted units arriving to theater to be aware of what they may face when attempting to cross borders on convoys. Thus, I published an article titled “CCO Operations: Atlantic Resolve’s Achilles Heel” in the Spearhead Newsletter, Volume XV, Issue 2, APR–MAY 2019. The Spearhead Newsletter is the Transportation Corps’ official newsletter. *Army Sustainment* is the official publication for the overall logistics branch. I will never forget the conversation I had with my battalion S-3, then MAJ Michael McDaniel, when he was reviewing my draft for the article. He told me that when I publish this, I will probably find myself writing again for the Army. I did not believe him at the time, but truly how correct he was.

Prior to assuming my role as the Harding Fellow, I was an instructor in the Logistics Captains Career Course and was overseeing the writing department. At first, very little was known on the Harding Project, and it was thought that this role would just be an additional duty. That very quickly changed, and I was selected as the first Harding Fellow for the Sustainment Center of Excellence. It truly has been a rewarding experience, and I have learned more than I could

have ever imagined from my civilian counterparts on journalism and publishing. They have created a well-oiled machine that produces a world-class professional journal quarterly. It truly is an honor to be part of this team.

To take *Army Sustainment* to the next level, I have started multiple initiatives in my short time thus far with the team. The fall 24 edition saw the implementation of the “Did You Know?” and “Captains Career Corner” sections. This winter 25 edition contains the new “Blast from the Past” and this “From the Military Editor-in-Chief” section. These initiatives are designed to increase our audience and create focus areas within each publication for the sharing of knowledge.

Additionally, I have broadcasted the Harding Project and Line of Departure website across the Fort Gregg-Adams installation. The goal is to ensure that every Soldier is aware of the program and how to access the website. The next step is the creation of a podcast for *Army Sustainment*, which will provide opportunities to discuss hot topics in the sustainment world. Soldiers across the world will be able to directly listen to the conversations I will have with sustainment leaders. These are just some of the initiatives, with many more in the works.

With the Harding Project, Knowledge Is Endless

No longer is the sharing of knowledge restricted to word-of-mouth or printed resources to which

some Soldiers may not have access. The Harding Project has not only renewed the Army’s professional journals, but it has also unlocked the key to the ultimate transfer of knowledge across all branches and ranks. Now, Soldiers can consume knowledge from any professional branch journal in the manner of their choosing.

Sun Tzu’s point on knowledge is just as relevant today as it was when he wrote *The Art of War*. To be lethal, you must be able to communicate. To communicate, you must have the knowledge about what you are trying to communicate. This knowledge about yourself, and in our case the enemy, is paramount to success on the battlefield. Thus,

we must never cease to write, read or listen, and share knowledge. If you are developing a new way to conduct sustainment operations, reviewing a historical battle for lessons learned that can be applied today, or have lessons learned from a recent combat training center rotation, then write about them. We can no longer exist in vacuums. The professional journals will only be as beneficial to this transfer of knowledge as the articles submitted to them.

Technology is ever changing, and the manner in which we share knowledge is always evolving. We must continue to keep pace with these advancements, so that the sharing of knowledge is never

hindered. The key to our success in the next conflict rests with our ability to share knowledge before the conflict starts.

CPT Garrett H. Pyle is currently the Military Editor-in-Chief for the Army Sustainment Professional Bulletin and has been selected as the first Sustainment Center of Excellence Harding Fellow at Fort Gregg-Adams, Virginia. He joined the Army Reserves in 2012 as an O9R (Simultaneous Membership Program Cadet) where he simultaneously attended ROTC at Washington & Jefferson College where he commissioned in 2016 in the Transportation Corps. He graduated with a Master of Arts degree in transportation and logistics management from American Military University. He is an Honor Graduate of both the Transportation Officer Basic Course and Logistics Captains Career Course.

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Getting started:

- How-to guide**
This special edition of *Military Review* provides tools to improve writing, methods for unit leaders to inspire professional discourse, and guides to publishing
- Individual**
“How to Write an Article” by Capt. Theo Lipsky
- Unit Level**
“How to Develop and Run a Unit Writing Program” by Lt. Col. Jay Ireland & Maj. Ryan Van Wie
- Publishing**
“Your Draft Is Done, Now What? Working with an Editor” by John Amble

Line of Departure

Military Review Writing Guide

SUSTAINING THE JOINT FORCE IN THE INDO-PACIFIC

■ By U.S. Marine Corps Capt. Tyler King



The U.S. Indo-Pacific Command (USINDOPACOM) area of responsibility (AOR) encompasses land, air, and sea domains from the coast of California to the western borders of India. The Indo-Pacific is the most diverse geopolitical and socioeconomic region in the world. It contains 38 nations, houses 60% of the world's population, and includes over 3,000 languages. This immense AOR also covers 52% of the world's surface and is the DoD's largest combatant command. The vastness of this theater and the distance between key areas of interest create a logistical problem set that the DoD has not had to deal with since World War II. Since the culmination of the island-hopping campaign in 1945, there has been a parabolic shift in technological advancements, which has had drastic implications for the conduct of warfare. These rapid changes have increased the lethality of long-range weapon systems, and exponential increases in computing power have brought artificial intelligence and electromagnetic sensing capabilities to the forefront of the operating environment.

The adversary's weapon engagement zone (WEZ) has expanded well beyond the horizon. Not only will maneuver elements of the joint force be located inside the WEZ, but an extensive percentage of both the sustainment force and the command and control infrastructure will be forced to operate in an environment in which they will be both sensed and targeted.

Sustainment in the USINDOPACOM AOR largely depends on the DoD's ability to close the distance and time between widely dispersed friendly units. To be successful, the joint force must establish forward-deployed supply repositories, leverage commercial logistics networks and open market contracts, and enhance the presence and mobility of our unmanned surface fleet.

Forward Deployed Supply Repositories

The DoD must leverage and expand allied partnerships in USINDOPACOM to establish supply repositories at key forward locations within the first and second island chains. Prepositioning key classes of supply such as food, water, fuel, and repair parts will drastically reduce the burden on the sustainment force and will limit the need for surface connectors in support of sustainment missions. A previous Army training circular (TC), TC 31-29/A, U.S. Army Special Forces Caching Techniques, describes caching as a solution to "help solve the supply problems of long-term operations conducted far from a secure base." This tactic is used by Special Forces and can be extrapolated to help in sustaining the joint force at large. The first step in successfully establishing and managing these sites is through political agreements between countries, security cooperation exercises, and multilateral training between partner nations. By conducting routine exercises with allied countries such as the

Philippines, Korea, and Japan, it appears the U.S. is maintaining the status quo with regularly scheduled training in the AOR. However, the joint force can covertly begin establishing these sites throughout the island chains in places like Pulau, Indonesia, and Micronesia. These cache sites will incur a sunken cost for all stored Class I, III, and IX. This cost is both variable and scalable, depending on the combatant commander's guidance based on how many they would establish and the size of each. The force must accept this as a potential loss if the sites are discovered by an adversary or local civilians before maneuver elements use them, or if they are destroyed through hostile fire or prepping the battle space.

Leverage Commercial Logistics Networks

Sustaining the force efficiently and effectively is not something the DoD can do alone. It will be imperative to leverage and ease restrictions on the contracting process so the joint team can take full advantage of commercial logistics networks. This includes procurement of commercially available technology, contracted use of commercial supply lines, and host-nation service contracts.

Although the DoD has started the transition to using local assets and commercially available technology, barriers to entry remain, especially with contracting lead time. Government contracts frequently take anywhere from three to nine months or longer

from the identification of a need to final procurement. In a rapidly changing battlefield, this timeline is not feasible. In the Marine Corps, the smallest tactical unit assigned contracting officers is a Marine logistics group, composed of approximately 10,000 Marines.

To effectively sustain the warfighter, the contracting process must be delegated to the small-unit level. This will allow maneuver units to use the local economy to aid in sustaining their unit. By having an individual at the company level who can write contracts as a collateral billet, there is no cost for increased manpower. Instead, the cost will be borne by additional training in the procurement process, thus easing the requirement at the group level when individuals are not co-located and do not have an accurate common operating picture of the situation on the ground.

Enhance Unmanned Surface Vehicle Fleet

The Navy's current unmanned fleet is not adequate to sustain the joint force against a pacing threat in the Pacific. Additional resources must be allocated for military assets that cannot be stockpiled or commercially procured. These end items include munitions, vehicles, and communications equipment. To functionally sustain the force across the Indo-Pacific, the DoD must invest in enhancing its unmanned surface vessel (USV) fleet. The entire Navy currently has four USVs that, according to the Congressional Research Service, are

“equipped with sensors, weapons, or other payloads, and can be operated remotely, semi-autonomously, or (with technological advancements) autonomously.” All four USVs remain in the experimentation phase of their employment.

The failure to incorporate sustainment into the mission set of the USV squadrons is a missed opportunity. Using USVs for sustainment allows the bulk of the naval fleet to focus on kinetic and strategic operations in the AOR. Small and maneuverable USVs eliminate the need to establish an iron mountain of supplies, an easy adversarial target. A fleet of sustainment USVs will lead to faster transit, more responsive sustainment, and a decreased risk the force. The Navy's fiscal year 2025 budget requests an additional \$338.4 million for research and development of four USV programs that vary in size and scale. The Navy will also bear an additional cost to train operators and mechanics and the maintenance costs associated with each USV.

Conclusion

To logistically support the joint force across the sheer vastness of the Indo-Pacific, the DoD must establish prepositioned cache sites through agreements with partner nations, decrease restrictions on the contracting process, expand commercial logistics networks, and enhance its commitment to the USV fleet. The USINDOPACOM AOR presents a myriad of challenges to the joint force. At the forefront of

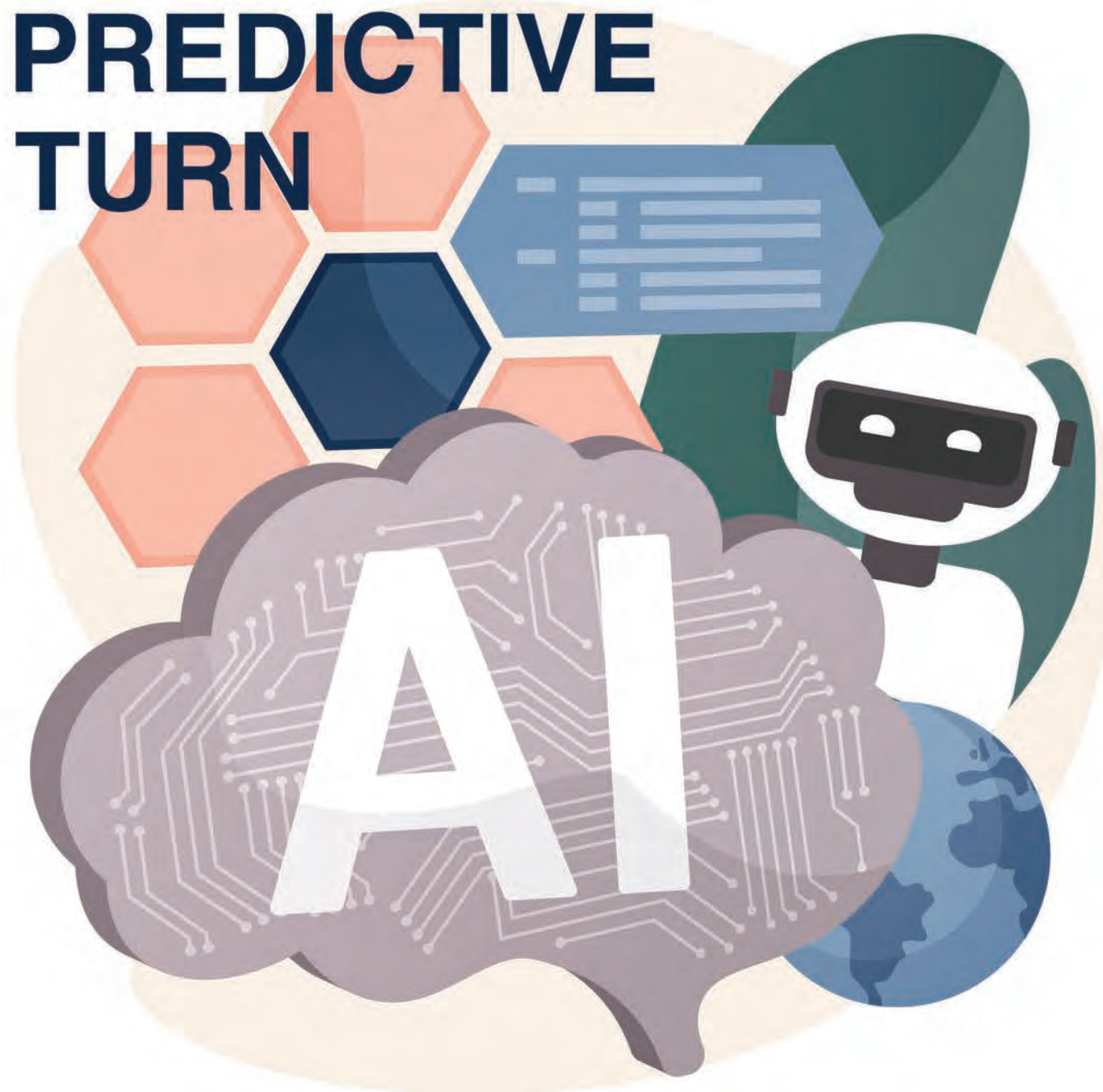
that problem set is how the DoD sustains the warfighter across 75 million nautical miles. The sheer distance to be covered is far too great for any one Service or any one country. Advancements in near-peer technology and capability sets expand the adversary's WEZ and put the U.S. Armed Forces at a greater risk, at a far greater distance. The joint force faces profound provocation by a pacing threat in the Indo-Pacific, and the DoD must act now to effectively sustain the warfighter in future conflict.

U.S. Marine Corps Capt. Tyler King is currently a student in the Logistics Captains Career Course at Army Sustainment University in Fort Gregg-Adams, Virginia. He previously served as a platoon commander and operations officer with Truck Company, 1st Marine Division, and as the battalion S-4 at Marine Corps Forces, Pacific. He is a graduate of the Marine Corps Logistics Officer Course and The Basic School. He has a Bachelor of Science degree in mechanical engineering with a concentration in technology innovation. He is currently pursuing a master's degree in business administration.

The Captains Career Corner contains 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.

*Featured Photo
A Soldier assigned to 2nd Infantry Brigade Combat Team (Airborne), 11th Airborne Division, takes a knee on Malamute Drop Zone in Joint Base Elmendorf-Richardson, Alaska for Arctic Aloha, Oct. 15, 2024. (Photo by SPC Brandon Vasquez)*

THE PREDICTIVE TURN



Preparing to Outthink Adversaries Through Predictive Analytics

■ By MAJ Anthony Grajales

In 1999, Bill Gates's book *Business@the Speed of Thought* predicted technology like the internet, email, and desktop business programs would transform industries. Gates argued that these tools should be part of a digital nervous system, connecting every facet of a business to boost capabilities and accelerate responsiveness in the fast-paced digital world. Today, the Army faces a similar revolution. While we have discussed integrating artificial intelligence (AI), predictive analytics, and quantum computing, these tools are not just for automating existing processes. Instead, they should help us outthink our adversaries by enabling faster, more informed decisions in an increasingly complex world.

Yet, challenges remain. Despite the promise of predictive analytics to revolutionize distribution, route planning, and transportation management, many tactical units still find it challenging to grasp and use these tools. As the Army integrates advanced algorithms, there is a growing gap between the technology's potential and its practical application on the ground. That is why it is crucial for leaders to start preparing now. This article offers sustainment leaders insights into predictive analytics, along with practical steps to help navigate implementation challenges and spark innovation. While it is easy to view predictive analytics as just a forecasting tool, its true value lies in boosting our strategic agility, helping us stay in control and to

secure an edge through foresight rather than just automation.

Driving Predictive Power

The Army has invested greatly in predictive analytics. According to Training and Doctrine Command Pamphlet 525-4-1, The U.S. Army's Functional Concept for Sustainment 2020-2040, predictive analytics is meant to be about risk reduction and decision support. As the operational environment and adversaries change, the question becomes, "What risks and decisions is the U.S. Army trying to predict?"

To unlock the true potential of predictive analytics, sustainment forces need to begin with the basics: understanding and using the right data. It is essential for logistics officers to know what data they are collecting, analyzing, and using to guide decisions, which can vary across echelons. Typically, sustainment units focus on four core questions:

1. What capabilities are currently available/anticipated?
2. How much does the supported unit require?
3. Can the supporting unit meet those needs?
4. How can sustainment be delivered without interruption?

These questions reveal underlying issues, risks, and crucial decision points.

From Predicting to Preempting

The real potential of predictive analytics is not just in forecasting

what may happen, but in using those insights to disrupt adversaries before they have a chance to act. In this sense, military logistics is transforming from a reactive to a proactive discipline. Instead of merely responding to crises or challenges as they arise, forces can position themselves strategically to neutralize threats before they materialize.

Consider the following scenario: During recent hurricane planning and preparation, the 3rd Division Sustainment Brigade at Fort Stewart, Georgia, used open-source AI to track incoming hurricanes and plan convoy support centers to preposition nodes. This predictive system identified an emerging pattern of road traffic, mandated evacuation routes, potential flood zones, and supply chain activity that suggested prepositioning capabilities into two specific support regions. Instead of waiting for the hurricane to occur and reacting accordingly, units were preemptively staging supplies, conducting troop-leading procedures, and even integrating additional units much more rapidly. However, the goal is not just to predict and prepare but to act in a way that forces an enemy to react, creating a cycle in which the adversary is always on the back foot. This hurricane planning highlighted how these lessons could be applied against an enemy.

Predictive analytics, in this sense, becomes a tool for outmaneuvering rather than simply outpacing. It offers a way to control the tempo

of operations by forcing the enemy into a series of reactive moves, all while keeping one step ahead.

The Enemy and Predictive Analytics

The OODA loop — observe, orient, decide, act — is central to predictive analytics in military operations, emphasizing speed and adaptability. By accelerating the observe and orient phases, predictive analytics helps leaders anticipate moves in the decide phase, enabling preemptive actions that disrupt the adversary's decision-making cycle. In logistics, this means predicting supply needs and positioning resources in advance, ensuring forces are always equipped. Ultimately, the goal is not only efficiency but also a sustained advantage, where decisions are driven by foresight and an understanding of likely enemy actions.

To use predictive analytics against our enemies, leaders must understand what actions in their operational environment require faster decision making. Utilizing the four core questions mentioned above is a start, but more depth is needed. Sustainment officers must begin to use data now to outthink the enemy. This does not require fancy software

or proprietary data tools. The easiest recommendation for sustainers is to understand simple analytics such as trend analysis, moving averages, and simple linear regression.

Trend analysis can be as straightforward as using a spreadsheet to plot historical data

As the Army integrates advanced algorithms, there is a growing gap between the technology's potential and its practical application on the ground.

and identify patterns. During the 3rd Division Sustainment Brigade's participation in Austere Challenge 24, it was found that enemy forces were destroying M1 Abrams and M2 Bradleys faster than anticipated, while Paladins and Apaches remained untouched. This insight highlighted the need

to coordinate with the maintenance section for improved battle damage assessment and repair for maneuver platforms. Additionally, sharing this data with the S-2 and division planners enhanced the planning and positioning of Paladins and Apaches for effective counterattacks.

Moving averages help reveal actual data trends by smoothing out outliers. For example, during a recent warfighter exercise, the support operations (SPO) section tracked fuel consumption over five days and noticed sharp increases on two days. The moving average was adjusted to help sustainment units balance demand with available fuelers, but another insight emerged. The spikes resulted from dynamic task organization changes, adding Stryker and armor units while removing light infantry. This revealed an overlooked planning factor: dynamic task organization changes can significantly affect sustainment needs,

requiring units to respond even more rapidly to ensure consistent support.

Simple linear regression models can be applied in a spreadsheet to find correlations between an independent and a dependent variable. For instance, during garrison operations, the division

sustainment support battalion's SPO transportation section analyzed whether the mission type impacted the maintenance status of vehicle platforms. In this case, the mission was the independent variable, and maintenance status was the dependent variable. After tracking bumper and line item numbers on specific missions over 60 days, they found that forklifts sent to motor pools often went non-mission capable the next day. Research revealed that mislabeling of loads led to forklifts lifting overcapacity items, damaging their hydraulics.

These three analytics — trend analysis, moving averages, and linear regression — help leaders identify patterns, plan for uncertainty, and uncover correlations, which drive actionable improvements within a unit. By mastering these tools, sustainment leaders can better understand predictive analytics, which is crucial for effectively integrating AI. This foundational knowledge will enable the use of AI to transform battlefield operations by 2040.

Challenges to Realizing the Predictive Turn

While the Army acknowledges the benefits of predictive analytics, significant challenges remain in its implementation. At the platoon, company, and battalion levels, units often struggle with data collection, aggregation, and analysis; limiting the accuracy of predictive models. Despite numerous challenges, this issue requires immediate attention. Soon,

sustainment leaders will be asked to create a concept of support that extends operational reach, endurance, and freedom of action more rapidly than ever.

Proficiency in predictive analytics is essential. While guessing its battlefield potential by 2040 may seem like science fiction, learning data analytics today could spark a revolution in military thought. As technological advances create more complex challenges, such as contested logistics, congested networks, limited suppliers, and dwindling resources, sustainment leaders will need innovative solutions. Embracing predictive analytics can enhance visibility, automate processes, and improve management efficiency, ultimately enabling leaders to anticipate adversaries' moves and disrupt their strategies.

Looking Ahead: The Future of Predictive Logistics

As military logistics continues to evolve, the use of predictive analytics will only grow more sophisticated. We can envision a future where logistics networks are so finely tuned that they can respond to shifting conditions in real-time, preemptively rerouting supplies, repositioning personnel, and dynamically adjusting strategies based on the latest data inputs. This is made possible by advancements in algorithms that change and create running estimates more quickly to enhance decision-making processes. Imagine running the military decision-making process in minutes thanks to predictive analytics and AI.

This is a serious upgrade for decision making.

But the ultimate goal is not just efficiency or speed, it is strategic dominance. With these tools, the Army can efficiently preposition wartime stock, posture forces far forward, and integrate with host nation support and multinational corporations. It all begins with understanding the data now.

This is the true promise of predictive analytics. It is not just faster decision making or more efficient operations, but the ability to foresee, anticipate, and outmaneuver. In the future battlespace, the side that can predict the future more accurately and act on those insights more decisively will hold the upper hand.

Conclusion

As the military embraces the predictive turn, logistics will increasingly be about more than just moving supplies. As Bill Gates foresaw, technology goes beyond using email to communicate; it is about the connection it enables to create a competitive edge. Today's Army calls on us to harness predictive analytics to wage war at the speed of insight.

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Pacific Fortitude Displays Enterprise Synergy on the Korean Peninsula

■ By COL Brian T. Donahue and COL Henry C. Brown

In an ever-evolving global landscape, the ability to rapidly deploy is not just a military requirement: it is a deterrence. The Army's global competitors are kept at bay not just by firepower but by the sheer efficiency of its deployment strategies, known as the strategic mobility triad, which consists of strategic airlift, sealift, and prepositioned

stocks. Each element of the triad supports the National Military Strategy by projecting military power anywhere in the world. Central to this is the Army prepositioned stock (APS) program, a synchronization of multiple logistics enterprises that ensures swift deployment, especially to pivotal regions such as the U.S. Indo-Pacific Command (USINDOPACOM). Integration of



A medic with the 4th Battalion, 70th Armor Regiment, 1st Brigade Combat Team, 1st Armored Division, out of Fort Bliss, Texas, loads a medical set case onto an armored personnel carrier at the Army Prepositioned Stocks site in Korea, known as APS-4K, during Operation Pacific Fortitude. (Courtesy Photo)

the Pacific Fortitude exercise, a deployment readiness exercise, with APS-4 showcases this capability on a grand scale.

Pacific Fortitude tests a unit's readiness to quickly deploy and integrate overseas while also showcasing several key capabilities. It highlights the Eighth Army's overall readiness; the 19th Expeditionary Sustainment Command's (ESC's) and the U.S. Army Materiel Support Command-Korea's (MSC-K's) efficiency in reception, staging, and onward movement (RSO); the 2nd Infantry Division's (2ID's) ability to execute and integrate gunnery operations; and the 403rd Army Field Support Brigade's (AFSB's) speed and quality in issuing APS-4 equipment. This smooth and effective process underscores the excellence of the sustainment

enterprise led by the 19th ESC in the Republic of Korea and emphasizes the crucial role of sustainment in global military strategy.

Background

Eighth Army, 19th ESC, and 403rd AFSB play critical roles in posturing fight-tonight readiness by maintaining and preparing APS, which are integral to the Army's ability to deter and rapidly project power in the USINDOPACOM. APS-4 is strategically stored military equipment and supplies that allow the Army to rapidly respond to a variety of military and humanitarian operations across the globe. These stocks are positioned in key locations to ensure that the Army can quickly project combat power and respond to crises, particularly in regions where speed is crucial due to the distance from

the continental United States (CONUS). This readiness was recently demonstrated when APS resources were used to support operations related to Russia's invasion of Ukraine, showcasing the strategic importance of APS in upholding U.S. and allied interests abroad.

This capability is crucial for maintaining a state of readiness that matches the pace of potential conflict escalation, ensuring that the Army can respond to any contingency with decisive action.

The vast distances involved make the rapid deployment capability provided by APS-4 even more crucial, ensuring that forces can transition from a state of readiness in CONUS to active operations outside CONUS with minimal delay. This capability is a cornerstone of the Army's commitment to maintaining a robust presence in the USINDOPACOM, supporting stability and defense commitments in the region.

Concept of the Operation

Pacific Fortitude encompassed a comprehensive validation of several areas, with a focus on issuing a battalion's (BN's) combat systems and equipment within a span of one week and employing them in live fire exercises at the Rodriguez Live Fire Complex near the border of North and South Korea. The process included staging, serial number verification of major end items, weapons, and sensitive items, with an overarching aim to refine procedures post-exercise based on captured metrics.

This extensive operation unfolded over a 30-day period and involved key units in planning, coordination, and execution. The 4th BN, 70th Armored Regiment (4-70 AR), 1st Armored Brigade Combat Team, 1st Armored Division (1/1 AD), from Fort Bliss served as the tactical unit gaining the equipment. Pacific Fortitude further tested the 19th ESC and MSC-K's ability to execute RSO, including logistics support area (LSA) operations and rail and ground movement control of all APS-4 equipment from Camp Carroll to Camp Casey. There was follow-on movement by the Korean Service Corps (KSC) BN's 7th Heavy Equipment Transportation Company, and Class V issue and field maintenance

support through over-the-horizon tele-maintenance from the field maintenance support division in MSC-K's Combat Power Generation Center.

Stakeholding forces included the following:

- Releasing unit: 403rd AFSB's APS-4 BN — AFSBn Northeast Asia (NEA).
- Gaining tactical unit (GTU): 1/1 AD, 4-70 AR; U.S. Army Forces Command (FORSCOM); Eighth Army; 2ID/Republic of Korea-U.S. Combined Division; 19th ESC; MSC-K; 498th Combat Sustainment Support Battalion (CSSB); 25th Transportation Battalion (TB); 6th Ordnance Battalion; KSC BN; 1st Signal Brigade; 65th Medical Brigade; and the U.S. Army Medical Materiel Agency- Korea.

This operation highlighted the intricate collaboration and coordination required to execute complex readiness exercises. It further showed that the sustainment enterprise in Korea is an example of the Regional Sustainment Framework at work today.

Planning

The initial stages of APS-4 issuance revolved around meticulous planning, including detailed rehearsal of concept (ROC) tabletop exercises (TTXs), pre-deployment site survey, and daily updates on the overall status from planning to execution. This coordination involved key players like the Eighth Army, 19th ESC, MSC-K, Military Surface Deployment and Distribution Command, and the 403rd AFSB.

Eighth Army ROC Drill

The Eighth Army's ROC was critical for aligning sustainment strategies across multiple echelons. This ROC drill was essential for the successful execution of reception, staging, onward movement, and integration (RSO&I) operations, enabling the efficient and timely issuance of APS-4.

Prior to the ROC drill, a comprehensive terrain walk at APS-4 key nodes was conducted with planners from Eighth Army, 2ID, 19th ESC, and the U.S. Army Garrison (USAG) Daegu. This step was crucial

for stakeholders to understand the operational terrain and equipment issue process and synchronize property accountability and readiness.

A detailed synchronization matrix was developed, detailing the RSO&I activities from the units' departure from CONUS to their integration into the Korean theater of operations. The identification of advanced party personnel was highlighted as significant, stressing the importance of having skilled individuals to manage the detailed APS-4 equipment inventory before signing for the equipment, which enabled the 19th ESC and MSC-K's ability to execute RSO&I.

Discussions during the ROC drill and the guidance provided by the Eighth Army's commanding general also focused on the logistical complexities of traffic flow and equipment management post-issue. The 19th ESC, through 25th TB, was charged with orchestrating movement coordination and control, establishing vital staging areas for linehaul and rail operations. This collaboration was key to the seamless transfer of equipment from storage to operational staging areas.

The ROC drill brought to light the need for a robust command and control communications infrastructure across all RSO&I nodes. The lack of onsite classified

communication networks at APS-4 storage sites necessitated coordination with the 1st Signal Brigade to ensure the deploying unit had the required systems for planning.

The 19th ESC also led a TTX at APS-4 sites to further harmonize logistics support activities. This exercise prepared for any potential logistical challenges ahead of the Pacific Fortitude and pre-deployment site survey, while demonstrating Eighth Army's commitment to readiness by ensuring that units are equipped for rapid deployment and operational success.

Pre-deployment Site Survey and Synchronization

The Eighth Army's liaison officer (LNO) team had a clear mission: to ensure the seamless integration of forces. The team was a diverse group of specialists, poised to coordinate a multifaceted operation involving various Army units. The team, representing a spectrum of Army logistics and command elements, including Eighth Army, 19th ESC, and AFSBn-NEA, was divided into four functional groups, each

responsible for critical aspects of the operation. They navigated an initial setback due to a delayed deployment order, which compressed their planning timeline but did not deter their progress.

The first team set foundational plans at 1st AD headquarters, liaising with counterparts to establish timelines and coordinate the intricate sequence of pre-deployment activities. The second team focused on

harmonizing the movement plan with the 2ID's training methodologies, crucial for priming logistics and supply accounts for the operation.

Simultaneously, the third team engaged with 1st AD staff to refine logistics processes and address equipment readiness. Meanwhile, the fourth team worked with the FORSCOM team to ensure the exercise's assessment objectives aligned with the strategic goals.

Throughout the pre-deployment phase, the LNO team adeptly managed a series of requests for information from a variety of stakeholders. They fine-tuned the APS-4 equipment drawdown list, validated transport requirements, and finalized the details for the advanced party flights, underscoring the extensive coordination required for the operation.

This preparation culminated in a well-prepared system supporting the 4-70 AR's pre-deployment activities, which remained on schedule despite initial delays. The collaborative effort between FORSCOM, Eighth Army, 1AD, 19th ESC, and the 403rd AFSB epitomized the Army's meticulous planning and operational adaptability. The proactive adjustments to the execute order, training objectives refinement, and ongoing readiness assessment underscored the responsive and resilient nature of the military force.

Preparation and Execution

In the critical days leading up to D-Day, the enterprise worked together to set conditions for RSO&I at the speed of war. AFSBn-NEA prepped and staged the equipment at appropriate staging areas to increase speed of issue. The company set's issue chief spearheaded operations from the logistics operation control center, situated strategically near the issue staging area. 19th ESC, MSC-K, and USAG Daegu established tactical command and control nodes across the peninsula, stood up an LSA on Camp Carroll, postured movement control teams, and worked with Republic of Korea counterparts to ensure Class V was available for employment of the APS-4 set at multiple live-fire ranges.

The process began with an alert exercise, ensuring all teams were primed for the task ahead. An operation order

briefing to key leaders marked the commencement of the issue phase. This proactive approach by AFSBn-NEA ensured that all necessary equipment was properly staged for issue.

The 19th ESC received the 4-70 AR personnel and equipment at Osan Air Base and seamlessly transitioned them to the 498th CSSB's LSA at Camp Carroll and later adjusted to direct movement of inbound personnel and equipment to the Rodriguez Live Fire Complex when conditions were set. The 19th ESC executed mission command for the operation, handling the staging in the combined rear area or Area IV (southern region of South Korea) and managed the onward movement toward the tactical assembly or Area I (northern region of South Korea).

This phase was a testament to synchronicity and efficiency, with the GTU being seamlessly equipped and ready to move to their training area by a synchronized sustainment enterprise effort between the 19th ESC, 403rd AFSB, MSC-K, and the garrison commands. Concurrently, the 2ID began integrating the new equipment and personnel, a crucial step in maintaining the flow of operations.

The success of this phase was marked by all equipment being released at the 10/20 maintenance standard and officially transferred to 4-70 AR. The process was validated when combat systems were employed at ranges in Area I.

The Return and Reset Operations

The return and reset phase of APS-4 equipment, spanning approximately 10 days, involved the meticulous coordination of redeployment activities. The unit returned to Camp Carroll with equipment methodically moved by rail and linehaul, coordinated and executed by the 25th TB. The 19th ESC ensured command nodes were again established, including LSA operations and critical movement control locations.

Upon the arrival of 4-70 AR, the 19th ESC led the effort in staging and preparing equipment for its return. This process included comprehensive joint inventories and technical inspections, culminating in the final acceptance of the equipment into the Global Combat

The proactive adjustments to the execute order, training objectives refinement, and ongoing readiness assessment underscored the responsive and resilient nature of the military force.

Support System-Army (GCSS-Army) by the APS-4 property book officer.

The reset phase was a collaborative effort between AFSBn-NEA and the MSC-K. This critical stage involved a thorough basic issue item/component of end item/sets, kits, and outfits inventory, alongside joint preventative maintenance checks and services of the identified equipment. To save money, all necessary repair parts were identified before the end of the fiscal year, and the total costs were submitted to the Eighth Army.

The culmination of this phase was marked by the equipment being restored to a state of 10/20 maintenance standard, ready for long-term storage and future use. This reset process ensured the sustainability of the APS-4 assets and the effectiveness of a deployment system, highlighting its issue and return. With assistance from Army Materiel Command strategic enterprise logistics enablers from U.S. Army Tank-automotive and Armaments Command, Communications-Electronics Command, Aviation and Missile Command, and Joint Munitions Command LARs from AFSBn-Korea, the APS-4 equipment was thoroughly maintained and returned. Key steps like joint inventories, technical inspections, and intricate property data transfers via GCSS-Army were carried out to ensure equipment readiness.

Lessons Learned and Conclusion

The orchestration of deployment readiness exercises with APS-4 is a testament to the Army's commitment to swift, efficient preparedness. These operations, characterized by meticulous planning and precision, not only showcase logistical prowess but also fortify the Army's position as a formidable force capable of addressing emergent threats worldwide. Key lessons included the following:

- Torch and advanced parties are critical to APS draw at the speed of war.
- ROCs with the sustainment enterprise, including the garrison commands, are critical to success and must be replicated in crisis and contingency.
- The nested commitment and shared understanding by the sustainment enterprise on the peninsula enable flexibility in the RSO&I process, which is crucial to meeting critical timelines.

- The sustainment enterprise in Korea aligns well with the Regional Sustainment Framework and is a tested group that is ready to fight tonight if deterrence fails.

Looking to the future, the Army's unwavering dedication to readiness through APS initiatives continues to strengthen international peace and stability. Pacific Fortitude displayed the power and synergy of the sustainment enterprise in Korea. It highlighted that the 19th ESC and the aforementioned commands are committed to fight-tonight readiness and are well postured to provide support on the peninsula and regionally.

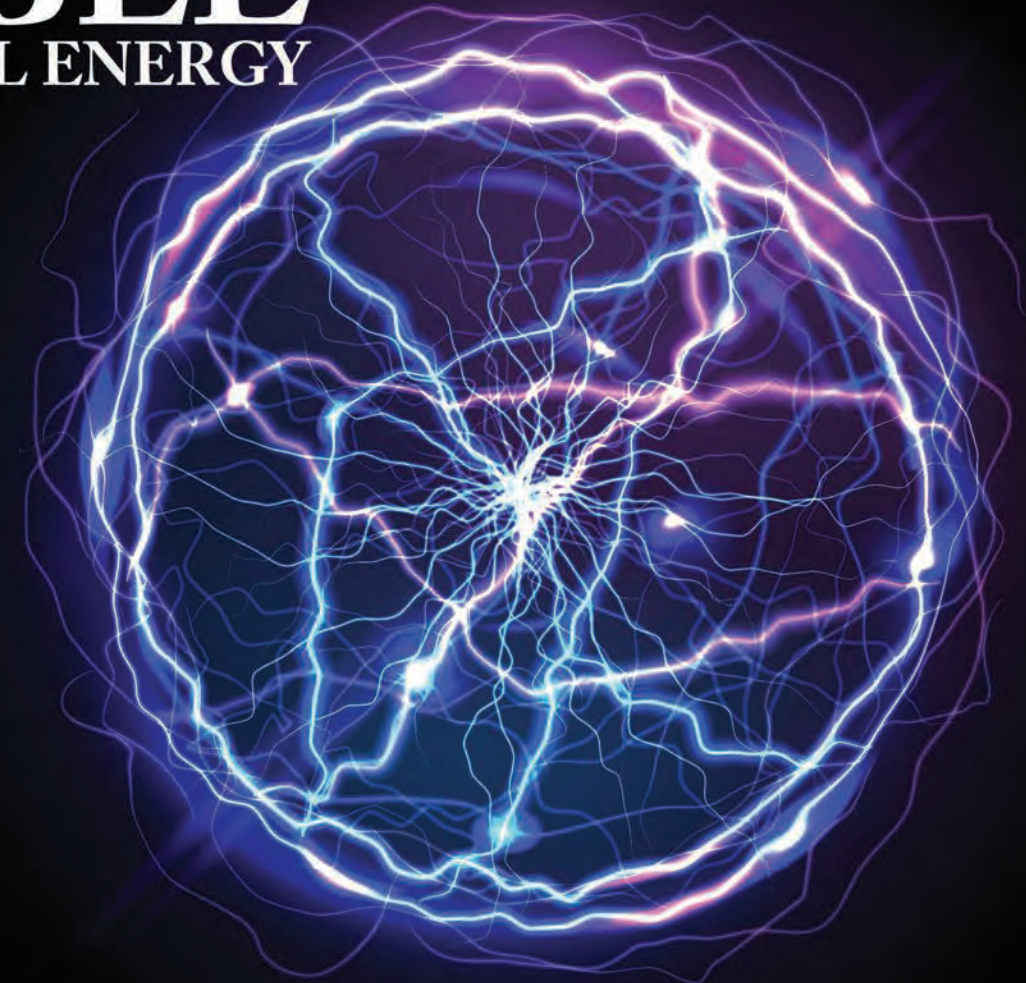
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Featured Photo
Soldiers assigned to 4th Battalion, 70th Armored Regiment, 1st Armored Brigade Combat Team, 1st Armored Division, carry out Preventive Maintenance Checks and Services and equipment inventories on M1A2 Abrams at the Army Prepositioned Stocks site in support of a deployment readiness exercise at Camp Carroll, South Korea, July 26, 2024. (Photo by SGT Eric Kestner)

DATA-INFORMED DECISIONS ENABLE OPERATIONAL ENERGY

By CW2 James A. Frye



Operational energy (OE) management is crucial for ensuring the readiness of armed forces in contested logistics environments. This necessitates efficient resource allocation across various branches of the DoD. Currently, limited tracking and forecasting capabilities hinder the ability to allocate resources strategically. A nested approach

using commercial off-the-shelf (COTS) software and hardware integrated with military equipment could address this challenge. This integration would facilitate real-time data collection on fuel demand, capabilities, and burn rates, enabling demand-driven supply management.

Requirements for Data-Driven Decisions for the Next Fight

10 U.S. Code Section 2926,

Operational Energy, says the Secretary of Defense “shall ensure the types, availability, and use of operational energy promote the readiness of the armed forces for their military missions in contested logistics environments.” The Secretary of Defense must also staff the ability to ensure OE in a contested logistics environment, i.e., an environment “in which the armed forces engage in conflict

with an adversary that presents challenges in all domains and directly targets logistics operations, facilities, and activities in the United States, abroad, or in transit from one location to the other.”

The larger aperture of allocating resources, in this case fuel, in a contested environment is to ensure energy availability to the DoD branches will prove to be vital. Currently, there is no high-level tracking and forecasting to ensure the ability to allocate resources to the centers of gravity at the right time. This would take a nested effort of all branches to use the available COTS software and hardware and integrate them into military equipment. This integration would allow data on fuel demand, fuel capabilities, and the unit’s fuel burn rate to be tracked to ensure supply met demand.

Indo-Pacific Contested Logistics Concerns

Contested logistics in the DoD, particularly in the Indo-Pacific, is a growing concern due to the likelihood of conflict with strategic rivals. In her winter 2024 article in *Army Sustainment*, “Keys to Contested Logistics in the Indo-Pacific,” MAJ Tanya Leonard writes that the region’s complex geography and contested environment pose significant challenges for the joint force and its partners. The Indo-Pacific contains more than half the world’s population, covers half the Earth’s surface, and includes archipelagos, oceans, and seas. It also hosts near-peer competitors

China and Russia. Consequently, it is a top priority theater for the DoD.

Leaders are actively addressing these challenges, as seen in Secretary of the Army Christine Wormuth’s focus on logistics at the 2022 Association of the United States Army conference. Wormuth urged the joint logistics enterprise and commercial industry to leverage emerging technologies for enhanced capabilities in the region. Additionally, she tasked Army Material Command with strategic and operational leadership and assigned Army Futures Command dedicated to contested logistics. Given the expanding military capabilities and influence of near-peer competitors, effectively managing contested logistics will be critical for future operations in the Indo-Pacific.

Vignette on the Rapidity of Resource Usage

During World War II, U.S. forces ran out of fuel, while the Korean and Vietnam wars had logistics that were stretched or challenged in their own myriad ways. In a 100-hour stretch during the Gulf War, the logistical fuel line could not keep up with a further push.

In a personal experience monograph from 1993, LTC Joseph Thomas highlights the persistent issues stemming from inaccurate fuel forecasts during the Gulf War, despite the presence of fuel reserves for temporary sustained

operations. He stressed the need for each Service to reassess its forecasting techniques to eliminate the root cause of distribution problems. Overstated fuel forecasts during the conflict underscored the importance of accurate forecasting, necessitating comprehensive training for personnel and strict enforcement of mandatory reporting protocols. To address these challenges, the DoD should develop and enforce a standardized forecasting algorithm across all Services.

Similar challenges were observed during the Thunder Runs to Baghdad in the 2003 invasion. Commanders were compelled to implement a tactical pause starting on March 21, 2003, as the 3rd Infantry Division encircled Najaf. Critical supplies, notably fuel and ammunition, began to dwindle, prompting the division’s 230 fuel tankers to establish refuel points and commence refueling operations under fire.

These issues highlight the critical importance of accurate data for stakeholders and decision makers to safeguard operations. While the supply of energy resources during the Gulf War was not critically jeopardized within the initial 100 hours, logistical constraints became apparent after four days of sustained operations. As evidenced by experiences at combat training centers, units often find themselves in need of unforeseen supplies, such as water, fuel, food, or ammunition, after just one week.

Transportation Command Ascertains Global Bulk Fuel Mission

U.S. Transportation Command has taken over global bulk fuel management and delivery, aiming to improve fuel movement and distribution for the DoD. The goal is to enhance the DoD’s ability to rapidly supply fuel to troops worldwide. This singular entity will be able to execute the Secretary of Defense’s OE management, streamline planning, and create synergies across the spectrum of operations. It is posited that such solutions will be implemented across the DoD, with their priority being over the separate military branches, ensuring resourcing is viable for the full spectrum of military operations for tomorrow’s fight.

SPEARHEAD Project as Test Bed

Strategic, Predictive, and Enhanced Analytics for Readiness (SPEARHEAD) is an origin project to create the benchmark for data-informed decision making and to help enterprise asset distribution. The package of technology will be tested in Valiant Shield 2024 and Balikatan 2025. As a product suite, it is a multicomponent fuel system that integrates data analytics, machine learning models, artificial intelligence, and sensors to predict and monitor fuel operations in a contested logistics environment. The system furnishes a robust logistics pipeline aimed at enhancing efficiency and bolstering readiness through real-time visibility. It strategically coordinates ordering

and fuel distribution to optimize force projection and logistical reach. Additionally, it facilitates the strategic placement of fuel and movement of assets, while also streamlining fuel-distribution planning through optimization and automation.

This package is a solution to challenges that include enemy targeting of critical supply chain components and communication networks, disruptions caused by severe natural events, and the tyranny of distance. This system is a great broad stroke for the solution to DoD-level problems.

Solutions for Tactical-Level Resourcing

Several COTS solutions exist that can be implemented for resourcing at the tactical level to increase awareness and dissolve the fog of war for leaders. A system such as TacFuels, which was used to monitor fuel farms in Bagram Airfield, is one such solution that could be implemented into the wider array net of systems such as SPEARHEAD.

Systems such as TacFuels that can monitor fuel distribution points with sensors can save several man-hours, thereby reducing the need for manpower and increasing personnel safety, while creating accurate real-time accounting of the fuel. Systems that linked to track fuel usage with vehicles would be a great asset to decision makers, as leaders in combat training centers have seen firsthand.

Conclusion

In summary, data-driven decision making is crucial for optimizing OE management within the military. Implementing a unified approach using COTS solutions and standardized forecasting methodologies can greatly enhance resource allocation and provide decision makers with better common operating pictures. This can be further improved by integrating fuel-process modeling, predictive algorithms, and sensors to automate an actionable operational dashboard. Ultimately, achieving agile resource usage in contested logistical environments is a primary goal for the DoD as an enterprise, and adopting such solutions marks a tangible starting point for addressing this complex problem set.

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The Wrong Approach for Tactical Units

■ By MAJ Brian Mathews

This edition of *Army Sustainment* challenges the reader to imagine the battlefield of 2040. The expectation is that by this not-so-distant future, sustainment brigade and support battalion commanders will have an integrated, real-time, common operating picture sourced from a myriad of sensors in every vehicle, at regional supply points, and back to the nation's depots. Theater commanders will have complete awareness from the foxhole to the defense industrial base to precisely manage supply levels and align transportation assets. High confidence in the data will enable resupply convoys, or more likely autonomous resupply drones and mules, to arrive at the logistics resupply point exactly when and where the maneuver commander planned it. The exact and seamless integration of logistics into combined arms maneuver will prolong endurance, extend operational reach, and maintain freedom of action. If this sounds too good to be true, that is because it is. The Army's sustainment community should prioritize resilience over precision for operational and tactical units.

The label "precision sustainment" made inroads in our vernacular over the past few years. It gained so much support that it was added as a new term in the most recent version of Field Manual 4-0, Sustainment Operations, and is a line of effort unto itself within the Army's Contested Logistics Cross Functional Team. The previous issue of *Army Sustainment* did a fantastic job developing our collective understanding of the opportunities and challenges to applying precision sustainment with examples from the U.S. Indo-Pacific Command.

Fundamentally, precision sustainment leads to predictive logistics and is the ultimate manifestation of logistics delivered at the right place, at the right time, with the right quantity. This article argues that the sustainment enterprise is falling short by failing to bifurcate precision sustainment principles between the strategic and the tactical level of logistics. Precision sustainment is the right approach for the industrial base. However, implementing precision sustainment at the tactical level will lead to a supply chain that is not resilient in the face of an adversary's actions. This brittleness will lead to operational failures.

Precision sustainment is the Army's label for a business practice that has been around for decades, commonly known as just-in-time (JIT) logistics. JIT originates from Japanese manufacturers who faced supply shortages following World War II and needed to optimize manufacturing processes to survive. The JIT concept proliferated across Japan's mega-corporations in the 1970s following the global oil shocks from the Yom Kippur War. These companies sought to optimize the manufacturing supply chain by moving raw materials from the source location to its manufacturing center, then to post-production processing, and finally to the client in an efficient process. This removed waste and reduced costs.

Costs savings were a result of the company's ability to manage the entire supply chain. For example, a company with an established predictive source of supply for its raw materials can reduce costs by only paying for one warehouse to hold these goods before manufacturing. The warehouse is optimized to hold exactly the amount of material needed for the next production period. If the company does not have a consistent source of supply, then it may choose to pay for multiple

warehouses to capture additional supply during seasonal surge periods. This increase in storage cost is a direct result of not having a predictive source of supply. JIT originated in manufacturing but has now spread across numerous business functions, including finance, marketing, and management. Precision sustainment is the application of JIT to the sustainment warfighting function as an operational approach.

The impact of COVID-19 on the global economy is the JIT case study logisticians can use to understand the shortfalls of applying precision sustainment for operational and tactical units in contested environments. In its World Development Report 2022, the World Bank Group found that COVID-19 “triggered the largest global economic crisis in more than a century.” U.S. real gross domestic product contracted by 31.4% in the second quarter of 2020, the largest recorded decline ever. As of May 2021, 34% of U.S. small businesses had closed since the beginning of the pandemic. Business activity slowed and small businesses closed because they were not resilient to a shock in their operating environment.

While not perfectly comparable, these impacts are reflective of those that will be felt across the joint

logistics enterprise in a contested environment. Any shock is magnified and has cascading effects because precision sustainment removes excess slack across every node in the supply chain. This leads to system paralysis that will cost the joint force days and weeks in a conflict. A precise supply chain is designed to save money. A resilient supply chain is designed to meet its objectives. Because no

A precise supply chain is designed to save money. A resilient supply chain is designed to meet its objectives.

tactical unit’s concept of support will survive a 30% reduction in capacity, it calls into question the approach of precision sustainment. We know our adversaries will challenge our ability to execute sustainment; thus, we should build resilience over precision.

A resilient sustainment concept can also be drawn from business best practices. Resilient companies have redundancy in key functions that allow them to absorb shocks, thrive in new environments, and maintain functionality when challenged. These organizations outperform their peers and capture market share. Some ways that resilience may manifest

in the Army of 2040 is through the duplication of logistics capabilities across time, space, and organizations, leveraging cloud-based infrastructure to mitigate threats to critical single nodes and implementing hybrid sourcing and delivery mechanisms, which leverage commercial and partner force capacity.

A natural tension exists between both extremes of an overly precise concept and a wasteful but resilient concept. This is where professional logisticians will make outsized impacts for their organizations. The sustainment community should apply and advocate for precision sustainment when prudent but acknowledge that it is not a solution for every echelon. Precision

sustainment is warranted and best suited for resource-constrained environments where most variables are known and predictable. It will lead to operational failures if applied in combat at the operational and tactical levels of war.

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STRENGTHENING DETERRENCE IN THE EAST



Poland-Provided Logistic Support

■ By CPT James Bath

Since the start of hostilities between Ukraine and Russia in 2014, including the Russian seizure of the Crimean Peninsula, the U.S. military has steadily increased its presence in NATO countries along Europe's eastern flank, sending regionally aligned forces (RAF) to these areas

to bolster commitments with NATO allies and deter aggression.

However, the financial burden on taxpayers and the impact on RAF unit operational readiness rates have been significant. In 2017, the U.S. Government faced a dilemma: how to reduce spending while maintaining a

strong military presence in Eastern Europe to support NATO allies and partner nations. The solution was to use taxpayer dollars more efficiently by investing in NATO partnerships, thereby enhancing deterrence with minimal U.S. financial involvement. This led to an innovative approach: training host nation militaries to

maintain U.S. equipment. Thus, the Poland-Provided Logistic Support (PPLS) initiative and the strategic placement of Army prepositioned stocks (APS) in Poland were born.

Since 2014, the Polish government has significantly increased its military spending from \$10.35 billion to \$16.57 billion annually, allocating 4% of its gross domestic product (GDP) to NATO. Poland has invested heavily in U.S. arms and equipment, including M1A1 and A2 Abrams main battle tanks, F-35 Lightning stealth multirole combat aircraft, and MIM-104 Patriot surface-to-air missile defense systems. With these upgrades, Poland has become a highly active NATO member, one of the few to recently increase its military GDP. Given its strategic central location on

Europe's eastern flank, the decision to establish a new APS site in Poland was a logical step. This move not only enhances NATO's readiness but also fortifies Poland's defense capabilities amid growing regional tensions.

In 2017, the U.S. Government initiated discussions with NATO and the Polish government about establishing an APS worksite in Poland, resulting in an agreement in 2018. Planning for the world's newest APS worksite began that year at an estimated cost of 82 million Euros (\$91 million). Construction started in 2019, with an initial completion target of 2021. However, due to COVID-19 delays, the project was completed in October 2023. The total cost, covered by NATO, amounted to 212 million Euros (\$232 million).

With the completion of the APS-2 worksite, the U.S. Army announced the activation of its newest Army field support battalion, AFSBn-Poland, which is responsible for providing mission command and oversight of all APS-2 equipment at the site. Almost simultaneously, the Polish Air Force activated the 33rd APS Battalion in October 2023. With much of the APS-2 equipment moved from the Coleman APS-2 worksite in Mannheim, Germany, to the Powidz APS-2 worksite in Poland, the training of PPLS began in July 2024.

The concept of PPLS is straightforward. The challenge is to reduce U.S. financial costs associated with funding a large, contracted workforce or establishing



Poland-Provided Logistic Support personnel from the Polish military's 33rd Army Prepositioned Stocks Battalion receive training on the M1A2 SEPv3 Abrams main battle tank from training facilitators from U.S. Army Tank-automotive and Armaments Command at the Powidz APS-2 worksite, Sept. 13, 2024. (Photo by CPT James Bath)

a major U.S. Army organization at a new installation in Poland. This installation needs to be robust enough to maintain enough APS-2 vehicles and equipment for a modernized armored brigade combat team (ABCT) while also enhancing NATO's current deterrence posture in Eastern Europe.

The solution is to provide an Army advanced individual training-level program to the host nation's military, equivalent to the training U.S. Soldiers receive. Additionally, as the Polish military purchases modern equipment such as M1A1 and A2 Abrams tanks from the U.S. to replace its aging Soviet-era stocks, this U.S.-provided training to PPLS personnel at the Powidz APS-2 worksite adds significant value to Poland.

At the APS-2 site, the PPLS, once fully operational, will handle all maintenance and operational requirements for the APS-2 equipment with minimal involvement from U.S. Army Soldiers, Army civilians, or U.S. contractors. At that point, the relatively small AFSBn-Poland workforce will oversee operations to ensure quality assurance and maintain mission command of the site and APS-2 operations. By reducing the presence of U.S. military personnel or contractors at the APS-2 site and using a large Polish military workforce instead, U.S. taxpayer dollars are saved while resources are available to properly maintain and store the U.S. Army APS-2 equipment.

This concept, though great on paper, brings its own challenges. Neither the U.S. nor NATO has ever executed this concept. No military has ever trained another country's military workforce to maintain an ABCT's worth of equipment on a NATO-funded worksite.

For that reason, this program's success will forever stand as an example for others in the future, according to LTC Omar McKen, the commander of AFSBn-Poland.

"While the U.S. military has partnerships across the world, including many countries in Europe, U.S. and local national civilians make up the workforce at each APS-2 location," said McKen. "To my knowledge, this is the first time we will employ a foreign active-duty military force to maintain our equipment full time. This will stand as a proof of principle that will set the stage for the establishment of similar conditions across NATO, and as the AFSBn-Poland's motto states, 'This is the Way.'"

The Polish military demonstrated their dedication to this concept by creating the 33rd APS Battalion, which recruits Polish soldiers and airmen trained to maintain APS. The 33rd APS Battalion consists of about 450 to 500 personnel recruited from all Polish military installations. To be assigned to the 33rd APS Battalion, Polish servicemembers must take and pass an advanced English language course. Language differences have proven to be a challenge

for both AFSBn-Poland and the 33rd APS Battalion. Additionally, PPLS military and local national personnel provide real property oversight, including site security, maintenance, cleaning, carpentry, welding, and painting.

"For our team, the main challenge lies in the language barrier, so the training must be thorough, technical, and comprehensive. Identifying any knowledge gaps while respecting the Polish forces' existing expertise will be difficult, at first," said SGM Olimpia Valdez, the AFSBn-Poland senior enlisted advisor. "Once the Polish servicemembers pass the English language course, they sort into their follow-on PPLS training. These sections are heavy and light wheeled equipment, heavy and light track equipment, armament, limited C5ISR, and supply and supply support activity (SSA) sections."

Polish servicemembers train according to their assigned section or shop. This training corresponds to U.S. Army military occupation specialty (MOS) training, such as 91B for the wheeled shop, and 91A for the heavy-track shop. They use the MOS equivalent to 91P/91M/91H for the light-track shop, 92Y for the supply section, and 92A for the SSA.

The training program includes eight to 12 weeks of classroom instruction followed by 16 weeks of supervised reinforcement training with contracted instructors from the U.S. Army Tank-automotive and Armaments Command

(TACOM) and the U.S. Army Communications-Electronics Command (CECOM). The program also includes working with field service representatives onsite for up to a year for targeted troubleshooting. Program Manager Abrams, Program Executive Office Howitzer, TACOM, CECOM, and Tobyhanna Army Depot develop the training plans based on the shop or section. These organizations also hire and fund the training facilitators, instructors, and translators for the 14-month training program, which is estimated to cost \$42 million.

The 33rd APS Battalion servicemembers gain the knowledge, expertise, and experience to maintain a wide range of U.S. Army equipment through this integrated classroom and hands-on training. They work on the M1A2 SEPv3 Abrams main battle tank, the M109A7 Paladin 155 mm self-propelled artillery system, and all the Army's logistics and engineer support equipment. PPLS training involves diagnosing faults, conducting services, replacing engines and transmissions, ground hopping engines, road testing vehicles, ordering parts, inventorying government equipment, and performing all tasks associated with Level 10 and 20 maintenance.

"The training facilitators and I are impressed by how quickly the Polish soldiers and airmen learn as the training courses progress. Their enthusiasm in their day-to-day actions, despite the ever-present

language barrier, is remarkable," said George Palmer, the Powidz APS-2 worksite director.

The Polish government pays the salaries of their servicemembers and assigns the Powidz APS-2 worksite as their permanent duty stations for up to 10 years, ensuring continuity of force. By 2026, the U.S. Government is expected to reduce its financial costs by 90% when the temporary contracted workforce transfers the entire maintenance mission at the APS-2 site to the PPLS. The knowledge, experience, and expertise gained in training will ensure the PPLS is fully qualified to maintain the various systems at the site.

"This training will undoubtedly strengthen the bond between the U.S. and the Polish militaries and governments, as well as NATO," said Palmer. "By engaging in joint understanding of U.S. military equipment, some of which is already common to the Polish forces, we enhance interoperability and cohesion and ensure seamless operation of the APS-2 site. This collaboration fosters a sense of unity and shared purpose, reinforcing our collective defense commitments and enhancing our ability to respond to threats as a unified front."

John Glasgow, AFSBn-Poland deputy to the commander, adds, "The joint training initiative sends a clear message of solidarity and commitment. It demonstrates the U.S. and Polish governments' dedication to strengthening defense capabilities to ensure regional stability and security.

This initiative also underscores the importance of NATO's role in maintaining peace in Europe, highlighting the alliance's readiness to support its member nations."

"Providing this training to our NATO partners enhances their readiness and capability, which in turn contributes to the overall deterrence strategy," McKen said. "By improving their skills and integrating them into joint operations, we send a strong signal to potential adversaries that our forces are well prepared and united. This readiness acts as a powerful deterrent because it demonstrates our ability to respond effectively to any threat. Nothing says we are here to stay more than this. Our allies and enemies know that we are stronger together, and the concept we are employing will be the standard for the future."

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Featured Photo
Poland-Provided Logistic Support personnel from the Polish military's 33rd APS Battalion go through a training program that includes 8-12 weeks of classroom instruction followed by 16 weeks of supervised reinforcement training and up to a year with field service representatives onsite for targeted troubleshooting of APS-2 equipment. Taken Sept. 13, 2024. (Photo by CPT James Bath)

FLOW WARS

Wargaming Logistics Networks in a Military Tug o' War

■ By Erica Herzog, Oliver Stein, and Dr. Suzanne DeLong

“The NFcL model’s goal is to evaluate the effectiveness of various logistics network configurations across multiple scenarios.”



With rapid globalization and technological advancements manifesting at rising rates, the complexity of logistics networks has increased exponentially. This is most evident in the military sector where the Army is creating interconnected systems and sensors across various domains. With logistics networks having increased in their complexity due to challenges in maritime environments, the tyranny of distance, finite infrastructure, and contested environments, new and improved networks are just as vital now and in the future as they were in World War II. This article describes how important this new model is in shaping and navigating logistics networks for 2040 and beyond.

Model Overview

The Network Flow Contested Logistics (NFcL) model is a logistics planning tool designed to simulate logistics network operations by sea, air, and land between and within a contested theater of operations. The model’s goal is to evaluate the effectiveness of various logistics network configurations across multiple scenarios. It is intended for use when a logistics network is contested, or otherwise under stress or disruption, to determine where the model is vulnerable and resilient. The NFcL model can simulate an uncertain environment of distribution points to determine the optimal flow of supplies, minimize the impact of disruptions to the military supply chain, and ensure the continuity of operations and wargame alternative scenarios and their impact on the logistics network. When the optimal flow cannot be achieved due to disruption or a contested environment, users can identify courses of action to find a solution where maximum or nearly maximum flow potential is achieved.

Model Development

The NFcL model was developed initially to study the effects of Army theater-level contested logistics in the 2040 timeframe. Under sponsorship of the Army Futures Command’s Futures and Concepts Center Directorate of Concepts, the modeling began as a contested logistics board game from the Center for Naval Analyses, which was later modified for use in the Army’s Future Study Program. The model matured from its initial versions

of spreadsheet-based simulations into a more complex network flow model with more detail. During this process, the modeling improved to provide visualization of supply flow and to model different types of supplies and transportation modes with higher fidelity.

An interactive graphic user interface allows users to make changes directly in the model and see results immediately (like manipulating the network structure and supply method distribution). The updated model is structured to host multiple types of supply classes, such as fuel and ammunition, while simulating what types of transports are preferred for the stipulated type of supplies. Its versatility is predicated on the multiple data ingestions it uses to predict requirements for best case sustainment scenarios. As sustainment capacity is computed using the supplies and transports being modeled, a resulting max flow metric is calculated.

Assumptions and Optimization

As model enhancement progressed, the team researched premises that provided the most accurate depiction of what assumptions were accepted as certain and truthful regarding how joint force combatant commands relate to logistics operations worldwide. The model, therefore, assumes strong and credible relationships between allied countries, with a focus on integrated deterrence to increase capability, improve interoperability, and strengthen trust. It considers all classes of supply and includes features such as alternate ports for sea, air, rail, and basing, and what methods are optimal for evacuating casualties. The model optimizes flow by routing supplies to ports and zones with the highest given weights. The weights are determined by factors such as numbers of units requiring supplies, reachability from a neighboring port, proximity to zones requiring supplies, and zones with adequate supplies present. In a future contested environment, optimizing transportation routes will help reduce fuel consumption, save time, protect and mitigate supply assets from adversarial targeting, and improve the logistics process.

Model Objectives

The model has three main objectives: analyze the impact of forecasted logistics demand on a contested

network, assess the network's capacity, and quantify the model's results to understand the logistics network and to be able to make future improvements.

The analysis of forecasted logistics demand on a contested network reveals several key considerations. First, it is essential to assess whether the current number of transports and facilities can sustain present and future demands between network nodes. This involves evaluating the capacity and efficiency of the logistics infrastructure. Once the network structure (i.e., nodes) is identified and supplies are known, the model contains an algorithm to determine viable sets of transports that meet the supply and network requirements. Second, the resilience of a network flow system against disruptions can be determined through a course of action analysis, which helps in understanding the network's ability to adapt and recover from potential disruptions. Additionally, identifying critical distribution points within the network is crucial, since these are pivotal for maintaining the flow of goods and services. Lastly, pinpointing potential chokepoints is necessary to anticipate and mitigate any areas where congestion or delays could significantly impact the overall efficiency of the logistics network.

Characterizing the capacity of a contested logistics network involves several critical steps. The highest volume of goods that the network can efficiently handle must be determined. Exploring various network configurations and examining options for optimal network nodes are essential to ensure that the logistics network is robust and efficient under contested conditions. Identifying transportation requirement force pools is also crucial, because it helps in understanding the resources needed to maintain and enhance network operations. Additionally, the effects of technological improvements, such as automation and robotics, on the contested logistics network must be considered. These advancements can significantly enhance the efficiency, speed, and reliability of logistics operations.

Analyzing the model's results involves several key aspects. Assessing network nodes' access and usage provides insight into the efficient use of each node.

Evaluating the capacity of these nodes is crucial to understanding their ability to handle current and future demands. Visualizations of demand and forecasted demand flows help identify patterns and potential bottlenecks within the network. These modeling results can reveal vulnerability points within the network, highlighting areas that are most susceptible to failure or inefficiency under contested conditions. Consequently, these insights are vital for developing strategies to enhance the resilience and robustness of the logistics network while making future model improvements.

Functionality

Despite the ongoing complexity of logistics operations, the NFcL model is user friendly and designed for non-technical personnel. It accepts inputs such as network nodes, inventory levels, demand, storage capacity, network flow capacity, transport pools, and transportation routes. Users can freely add or remove any data point. This allows the model to run on a turn-by-turn basis, adjusting results and outcomes iteratively.

The NFcL model allows for the selection of transportation nodes for forces deploying to and returning from certain locations that best sustain the military unit. It also allows a selection of pathways to achieve sustained logistics in a contested area, and the evaluation of multiple strategies to understand the impact of the contested environment on units; on sea, air, and land transports; and on resources. The model can also provide visual representations of supply flows and transportation routes under various conditions.

The NFcL model is also designed to simulate scenarios at the strategic, operational, and tactical levels. It provides insights into node and transport usage, helping to estimate the significance of new and existing nodes and transports, and suggesting ways to improve simulation results. As users manipulate the data to account for locations of units, transports, and efficiency of supply resources or port capacities, users can adjust the model to obtain the decisions or results they desire. At strategic levels, decision makers can weigh the model's maximum throughput to plan

for contingencies, enhance operational efficiency, and make better-informed decisions during conditions of uncertainty or degradation. At the operational level, sustainers can plan where to preposition supplies and sustainment assets to improve efficiency or capacity. Finally, at the tactical level, Soldiers and teams can strategize quickly on how best to distribute supplies to ensure tactical units receive their supplies efficiently and with minimal disruption.

Relevance of Network Flow

The military's global all-domain concept continues to evolve at unprecedented rates, with services investing in advanced warfare technologies. As newer technologies pervade the battlespace, managing an already-diverse supply chain becomes a game changer.

The potential benefits of an effective network flow are numerous. Primarily, if the network model can mitigate the effects of disruption in a contested environment, risk to the force is minimized and the military supply chain can move supplies more rapidly, with more reliability, and with increased supply-chain resiliency. A well-designed network flow model can plan for disruptions and devise strategies to mitigate them.

Insights and Future Work

The NFcL model has been applied to theaters of interest, providing insights on port usage and transportation requirements. It offers insights on the relative usage of each port, its proximity and relevance to other nodes, the potential for primary and secondary port substitution, and the challenges of supplying land zones and ports farther from the coasts.

Future work on the model includes adjustments for more accurate measurements of each port's capacities, more sophisticated routing heuristics, analysis on the effects of automation, and more efficient and effective resource allocation, including resource efficiencies using multi-modal transport methods. The most significant changes will likely involve new methods for delivering and interdicting supply shipments, such as electric and autonomous vehicles, deliveries via drone, and smart ports. The effects of technological enhancements, such

as automation and robotics, will also improve network flow outcomes to the extent possible given the model's capacity for data inputs.

The integration of these advancements not only optimizes network flow but also plays a crucial role in critical scenarios as military leaders and staff plan logistics operations in an overtly complex future environment.

Summary

The NFcL model can help expedite the movement of supplies in times of military conflict, where the timely delivery of supplies can often determine the outcome of a mission. By determining the strengths and weaknesses of the supply chain, the NFcL model can ensure that the right resources reach the right place at the right time. Moreover, the model can enhance the reliability and resiliency of the supply chain from beginning to end. When potential bottlenecks are addressed proactively, the model can ensure that the supply chain remains unaffected by external disruptions. This, in turn, contributes to the overall resiliency of military operations, enables more accurate planning, and improves the network's logistical capabilities. Consequently, as the Army gears up and prepares to train and execute the 2040 warfighting design, the need for a robust and efficient network flow model is more pressing than ever.

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BRIDGING THE GAP

Effective Training Approaches for Petroleum Units in the Army Reserve

■ *By LTC Jerry M. Cole*

Given the complexity of training U.S. Army Reserve (USAR) petroleum units (RPU) and the limited training days available to Component 2 and 3 units, it is imperative that commanders of these units make the most of every available moment. Fortunately, the Army enterprise provides a wealth of resources to assist leaders in training Soldiers and units across the entire Regionally Aligned Readiness and Modernization Model (ReARMM).

The USAR includes 93% of quartermaster (QM) petroleum support battalions, 84% of QM petroleum support companies, 90% of QM petroleum liaison detachments, all petroleum pipeline and terminal companies, and all QM groups (petroleum and water), which will evolve to theater petroleum and water groups. Therefore, trained RPUs are critical for addressing unique challenges over the horizon. These units play vital roles in enabling a commander's freedom of maneuver in large-scale combat operations (LSCO) by providing uninterrupted petroleum support across the battlefield. However, this exceptional capability necessitates the need for highly trained units.

Challenges in Training Petroleum Units

The problem of training RPUs arises from the disparity in the number of training days available for USAR component Soldiers. By statute, USAR

component Soldiers are authorized 29 days of annual training and 48-unit training assemblies (UTAs). Due to time constraints, it may be difficult to fulfill all the training requirements related to mission essential task (MET) performance steps and measures or to prepare unit members sufficiently for petroleum operations.

RPU may have limited functional equipment for petroleum operations training. Finding appropriate training locations and ensuring the facilities satisfy their specialized needs are also challenging.

Training RPU properly requires awareness, a proactive approach, and the leveraging of available resources that enhance individual and collective competencies.

This article identifies training resources and tools for RPU commanders in planning and executing effective training across the ReARMM cycle.

ReARMM Cycle

ReARMM is the force generations model by which the Army produces prepared forces and makes them available to combatant commands (CCMDs). USAR units transition through five phases during ReARMM: modernization, individual, crew, and squad (ICS), year 1; training, ICS, year 2; collective training (CT), year 3 and year 4; and mission, year 5.

During years 1 and 2, RPU focus on ICS online training and available schoolhouse resources such as the Training and Doctrine Command (TRADOC) Sustainment Knowledge Network (SKN); the Combined Arms Support Command (CASCOM) Army Sustainment Resource Portal, which features several QM 92F virtual trainings and interactive videos; and the Petroleum & Water Officer Course (PWOC), formal instruction on senior-level petroleum and water management.

During years 3 and 4, the most valuable training and resources available are the Petroleum Operations Sustainment Training (POST), formerly known as the U.S. Forces Command Petroleum Training Module, which provides a suite of petroleum hands-on training courses; and the QM Liquid Logistics Exercise (QLLEX), an

Army and Defense Logistics Agency-Energy (DLA-E) exercise that trains petroleum units on bulk petroleum transportation and distribution.

During year 5, RPU that are prepared for their wartime mission can participate in CCMD overseas deployment training (ODT) exercises. Conducted within a host nation, an ODT exercise is a bilateral/multilateral exercise focused on deployment, employment, and interoperability with allies and partner forces.

Units must ensure that their training programs align with the requirements of each phase. The training and resources available for RPU enhance and align those units at any phase in the ReARMM cycle.

The training tools and resources that RPU should use during each ReARMM phase are discussed below.

Modernization, Years 1 & 2 (ICS)

During the modernization phase in year 1, USAR units modernize, which may include force structure changes and prioritization of equipment reset, as well as fielding and equipping new equipment and required training. Units focus on retraining individual Soldiers in specific training tasks and enrolling them in professional military education and additional skill identifier (ASI) institutional curriculum.

During year 2, USAR units focus on individual and team training. Individuals can complete technical recertification and ASI courses, such as the 92L Petroleum Quality Analysis System-Enhanced refresher course, the 92F fuel handler's refresher course, and the R8 PWOC. These refresher courses are incredibly beneficial for RPU Soldiers because they are designed to re-familiarize petroleum supply specialists and laboratory specialists with essential Army regulations, technical bulletins, Army training publications, and safety standards that govern bulk petroleum operations, the safe operation of refueling equipment, and the operation of quality assurance.

Strategies to enhance the training of RPU during the modernization phase are online training resources available through the SKN SharePoint site. These online tools are

the most fundamental instruments for teaching petroleum Soldiers in the digital world. These online resources educate Soldiers on the required skills and abilities that petroleum Soldiers must possess and maintain. Skills outlined in Soldier Training Publication (STP) 10-92F15-SM-TG, MOS 92F Petroleum Supply Specialist, cover general petroleum operations, fuel tank vehicles, bulk petroleum operations, and pipeline operations. The STP outlines the military occupational specialty training requirements that the petroleum Soldier should review to enhance their understanding and ability to retain critical tasks. These key competencies and training tasks can be studied often and easily.

The SKN SharePoint site provides comprehensive technical resources on petroleum operations, including equipment, vehicle, petroleum laboratory, and quality assurance training. The petroleum references and operations planning tools encompass a range of Army technical literature and regulations, military standard documents, and calculation tools. Soldiers should know about these knowledge centers and regularly use them during UTA and drill periods to improve their comprehension of petroleum operations. Soldiers can engage in self-study or group study during UTAs under the guidance of NCO leadership.

The SKN SharePoint site also has online digital training enablers, which provide instructional training videos on the 92L Petroleum Laboratory Specialist skill sets.

TRADOC is responsible for overseeing and running the SKN SharePoint site. The Petroleum and Water Department at the U.S. Army Quartermaster School is responsible for managing certain materials included within it.

Officers in years 1 and 2 can improve their knowledge by attending the PWOC. All RPU are required to send their officers to the PWOC training at Fort Gregg-Adams, Virginia. The PWOC is the most advanced petroleum and water management training available in the Army. This course equips individuals with the necessary expertise and understanding to effectively carry out responsibilities related to petroleum and water logistics management in various roles, including staff and managerial positions. The course lasts for eight weeks, and the Army officer is designated as R8 (for example, 90A92R8) after completing it.

The significant advantage in having all officers in an RPU complete the PWOC and obtain the R8 designation is that these leaders will then be equipped to provide instruction and guidance to their formations. The R8-designated petroleum officer has undergone extensive training in the most up-to-date petroleum resources, references, and advanced training in petroleum operations, fuel system supply point (FSSP), pipeline operations, and staff petroleum and water operations training. As a result, they possess a wealth of knowledge and can develop training programs tailored to their units. The highly skilled

The significant advantage in having all officers in an RPU complete the PWOC and obtain the R8 designation is that these leaders will then be equipped to provide instruction and guidance to their formations.

R8 petroleum officer can train and improve the entire RPU or sustainment staff.

For the more virtually inclined petroleum specialist Soldier, there is the CASCOM Army Sustainment Resource Portal, which features several QM 92F virtual training and interactive videos. The videos, which can be downloaded or streamed, provide practical guidance on operating equipment during petroleum operations. Examples of the virtual training resources pertinent to the 92F are the videos on the heavy expanded mobility tactical truck, FSSP, modular fuel system and pump rack module, inland petroleum distribution system (IPDS), etc. The videos are procedural and virtually describe the step-by-step process to safely and efficiently operate equipment used during petroleum operations.

Soldiers do not need a common access card to access training that covers 27 different 92F virtual training resource lessons during UTAs. This convenience puts the Soldier in control of their learning journey. The virtual training resources cover a wide range of equipment operating steps and procedures for the 92F Petroleum Supply Specialist Soldier. This comprehensive coverage instills confidence in Soldiers, preparing them to correctly operate equipment during petroleum operations.

Train, Year 3 to Year 4 (CT Event)

In years 3 and 4, the unit transitions to CT activities related to the unit mission essential task list (METL).

Using POST is a valuable training strategy for RPUs during this phase. POST offers extensive hands-on instruction options, including training on the assault hose line, FSSP, IPDS, tactical petroleum terminal (TPT), early entry fluid distribution system, refuel on the move, forward arming and refueling point, and additional bulk distribution/retail systems as specified by commanders' training objectives. POST has recently added petroleum rail tank cars training to complement training possibilities for RPUs.

RPUs travel to Fort Barfoot, Virginia, to undergo hands-on training with POST instructors and other units as part of their two-week AT. POST supplies the training

equipment systems for comprehensive instruction at no cost to the unit.

The POST program provides unit commanders with a refined and developed training plan using their METL assessments to determine the level and frequency of technical and tactical training. Most beneficial, POST provides realistic tactical and technical fuel training based on the commander's assessment. The commander can focus on particular METL performance steps and measurements. During training, POST instructors offer valuable guidance, oversight, and instruction to the RPU while conducting petroleum operations. POST offers RPUs a distinct chance to enhance their CT proficiency in their METL. Additionally, RPUs can request that TRADOC, or two-levels up within their command, provide external evaluators to attend the unit's POST training when an official assessment of METL is needed. POST also offers scenario-based fuel training for group and battalion petroleum staff.

POST provides mobile training teams (MTTs) that can be deployed to designated places to deliver specialized instruction on petroleum operations and a laboratory-based curriculum to Soldiers. The training programs, whether conducted in person, online, or by MTT, are provided at no cost to the unit.

RPUs conduct CT exercises in the annual QLLEX, which is an Army exercise that trains petroleum units on bulk petroleum transportation and distribution. During the exercise, RPUs work with the DLA-E team to train on various petroleum handling, discharge, and transportation functions. During the exercise, RPUs replace the commercial supply-chain transportation capabilities with USAR transportation and petroleum support capabilities.

During QLLEX, RPUs train on specific METs and their collective task. A QM petroleum support company trains on establishing the petroleum tank farm TPT, conducting bulk petroleum storage operations and petroleum distribution operations. The QLLEX provides opportunities for training on the collapsible fabric fuel tank (CFFT) site preparation, including the layout and

placement for the major items of equipment in the FSSP, such as the collapsible tanks, the pumps, and the filter separators. A petroleum pipeline and terminal operating company has a storage and issue section, which performs similar functions as the bulk storage section within the petroleum support company. During QLLEX, the pipeline and terminal company trains on establishing and managing the petroleum terminal operation. DLA-E-capitalized fuel is transported from defense fuel supply point locations to QLLEX FSSPs.

RPUs must continue to engage in the yearly QLLEX, which trains units on fuel support missions, enabling emergency preparedness. The QLLEX adds value to RPUs by allowing units to train on FSSP setup, petroleum terminal operations, and recovery. The QLLEX provides ample time and space for Soldiers within an RPU to properly lay out and set up an FSSP CFFT with all associated manifolds, pumps, and filter separators.

Mission Year, Year 5

During mission year 5, the unit is prepared to conduct overseas deployments in support of contingency operations or to participate in an ODT exercise supporting a CCMD. An ODT exercise provides RPUs with increased levels of preparedness and readiness. This is achieved through the unit's involvement in a four-year joint exercise life cycle, focusing on bilateral/multilateral operations in Pacific Pathways or Defender Europe. The RPU gains the opportunity to establish relationships with the CCMD team and to support participating units and host nation partners.

The CCMD conducts ODT exercises, which provide comprehensive and dynamic training opportunities for RPUs. Coordinating and participating in an ODT exercise requires extensive planning and alignment over several years. A high level of dedication and focus is required for the successful execution of an ODT exercise. RPUs (and higher commands) should actively pursue participation in ODT exercises due to their eventual integration into U.S. Indo-Pacific Command (USINDOPACOM) and European Command (EUCOM) exercises in the upcoming years as QLLEX evolves.

CCMDs are preparing for LSCO and operations involving near-peer competition, requiring specific theater bulk petroleum capabilities for uninterrupted petroleum support across the battlefield and seas. Since the majority of petroleum units are in the USAR, RPUs must train to execute joint logistics over-the-shore and joint petroleum over-the-shore in the USINDOPACOM island chains. RPUs also train to execute rail tank car operations in NATO countries throughout EUCOM.

Conclusion

This article emphasizes the critical training resources needed to prepare RPUs at various stages of the ReARMM cycle. Leveraging these resources, RPUs can surpass other units in their knowledge of petroleum operations. It is imperative for RPUs to use these resources, given the time constraints. RPU commanders must carefully select and conduct training to equip their Soldiers for petroleum operation activities.

Training RPUs is a demanding task that requires significant time and resources. However, providing effective training is paramount because it directly influences the preparedness and effectiveness of these units in supporting petroleum operations. The Army enterprise provides an array of resources and tools that can significantly enhance RPU training. By using these resources, RPU commanders can take charge of their company training programs and deliver impactful training that equips their personnel to support and execute petroleum operations accurately, fulfilling their duties and contributing to overall mission success.

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*Featured Photo
Petroleum supply specialists (92F) put together a fuel pipeline during the construction phase of the U.S. Army Forces Command Petroleum Training Module at Fort Barfoot, Virginia, April 19, 2023. (Photo by MSG Benari Poulten)*

STRENGTHENING BILATERAL RELATIONS

The Strategic Role of Surface Deployment and Distribution Command at the U.S. Embassy in Amman, Jordan

■ By MAJ Benjamin A. Small IV and David A. Wallace

The Military Surface Deployment and Distribution Command (SDDC) at the U.S. Embassy in Amman, Jordan, is not just a part of the enduring partnership between the U.S. and Jordan; it is the cornerstone of this relationship. It showcases the power of efficient logistics in bolstering bilateral relations. Within the Defense Cooperation Agreement (DCA) framework, both nations have forged a comprehensive alliance, a testament to the strength of the partnership, grounded in shared values of mutual security, economic growth, and regional stability. At the heart of this collaboration lies the unique and pivotal role played by the SDDC, whose operations transcend mere transportation and port management to embody a strategic nexus of cooperation and synergy.

Understanding the multifaceted significance of the SDDC's mission in Amman is crucial. By exploring the intricate network of activities orchestrated by the SDDC, we uncover a tapestry of interconnected initiatives that not only streamline the flow of goods and personnel but also foster trust, resilience, and shared prosperity between the U.S. and Jordan. This, in turn, contributes significantly to regional peace and economic growth.

Brief Overview of the SDDC

The SDDC is a vital DoD component. It is crucial in overseeing and facilitating the complex process of deploying and distributing military personnel, equipment, and supplies globally. With its headquarters at Scott Air Force Base in Illinois, the SDDC coordinates strategic transportation planning, port operations, and surface transportation management—all essential to meeting the U.S. military's mobility requirements. This global reach and operational depth underline the SDDC's importance and strategic role.

With a mission focused on ensuring the timely and efficient movement of military assets, the SDDC collaborates closely with various military branches, government agencies, and commercial partners to orchestrate the seamless logistics and distribution of resources critical to military operations, exercises, and contingencies. Leveraging a diverse network of transportation assets, SDDC can facilitate the rapid

deployment and sustainment of forces across the globe, enabling the U.S. military to project power, respond to crises, and achieve national security objectives.

Beyond its operational functions, the SDDC also plays a crucial role in supporting humanitarian missions, disaster relief efforts, and other non-combat operations where logistical expertise and transportation capabilities are essential. By maintaining readiness, rapid response capabilities, and a high level of logistical support, the SDDC contributes significantly to the overall effectiveness and readiness of the U.S. military in fulfilling its missions.

The SDDC is a linchpin in the intricate machinery of military logistics, ensuring the smooth and efficient movement of resources that underpin the nation's defense capabilities and global engagements. Through its dedication to excellence in transportation management and distribution services, the SDDC is committed to enabling the U.S. military to meet the challenges of a dynamic and ever-evolving security environment with precision, agility, and effectiveness.

Overview of the DCA between the U.S. and Jordan

The DCA between the U.S. and Jordan is a significant bilateral agreement. This agreement enables various collaborative activities, including joint military exercises, training programs, defense-related technologies, and information exchange. By formalizing and institutionalizing their defense relationship, the U.S. and Jordan can enhance their mutual security interests, promote regional stability, and address common threats such as terrorism and extremism.

One key aspect of the DCA is the provision of military assistance and support from the U.S. to Jordan. This assistance includes transferring military equipment, providing training and advisory support, and sharing intelligence and best practices in counterterrorism, border security, and defense capabilities development. Through this cooperation, the U.S. and Jordan can strengthen their defense capabilities and improve their ability to respond to regional security challenges.

The DCA, supported by the role of the SDDC, serves as a cornerstone of the defense partnership between the two countries. By fostering closer military ties, sharing resources and expertise, and promoting interoperability, the agreement enhances the security of both nations and contributes to regional stability in the Middle East.

The Role of the SDDC in the U.S.-Jordan DCA

The SDDC plays a crucial role in facilitating the logistical aspects of military cooperation between the two countries. As a central subordinate command of the U.S. Transportation Command, the SDDC is responsible for the strategic deployment, distribution, and sustainment of U.S. forces worldwide. Specifically, the SDDC may work closely with U.S. and Jordanian military authorities to plan and execute the transportation of equipment and supplies needed for joint training exercises, military operations, or humanitarian assistance missions. This could involve coordinating the shipment of vehicles, weapons, and other equipment and arranging for the movement of personnel and support staff between the two countries. By leveraging its expertise in strategic transportation and logistics, the SDDC helps ensure that the necessary resources are in place to support the objectives outlined in the DCA between the U.S. and Jordan.

Facilitating Military and Commercial Shipments

The SDDC facilitates military and commercial shipments. It leverages its expertise in transportation and logistics to ensure the efficient movement of goods and personnel within the U.S.-Jordan DCA.

Here are some critical aspects of the SDDC's role in this partnership:

- Strategic planning. The SDDC works closely with military and government partners to develop strategic transportation plans that support U.S. objectives in the region. This includes coordinating the movement of troops, equipment, and supplies to and from Jordan.
- Efficient transportation. The SDDC leverages its expertise in transportation management to ensure

that goods and personnel are moved efficiently and cost effectively. This includes coordinating all modes of transportation — sea, air, and ground — to meet mission requirements.

- Logistics support. The SDDC provides logistics support to ensure that the right resources are in the right place at the right time. This includes managing inventory, warehousing, and distribution processes to support military operations in Jordan.
- Customs and border clearance. The SDDC assists in navigating customs and border clearance procedures to facilitate the smooth movement of goods and personnel across international boundaries. This is crucial for ensuring timely delivery and avoiding logistical delays.
- Coordination with commercial partners. The SDDC works closely with commercial shipping companies and other transportation industry partners to leverage their expertise and resources. This collaboration helps ensure that military and commercial shipments are handled efficiently and effectively.
- Emergency response. Besides supporting routine operations, the SDDC plays a crucial role in emergency response situations, such as natural disasters or other contingencies. The command can quickly mobilize resources to provide humanitarian assistance and support to affected areas.

The SDDC's expertise in transportation and logistics is essential for facilitating both military and commercial shipments within the U.S.-Jordan DCA, contributing to the success of military operations and strengthening the partnership between the U.S. and Jordan.

Promoting Economic Growth

The SDDC significantly promotes economic growth in Jordan under the DCA. Here is how:

- Facilitating trade and commerce through efficient logistics. The SDDC's expertise in transportation and logistics is instrumental in facilitating trade and commerce in Jordan. By ensuring efficient movement of goods and materials, the SDDC helps reduce transportation costs, minimize delays, and

streamline supply chains. This, in turn, enhances the competitiveness of businesses in the region and promotes economic growth. Efficient logistics also attracts more business operations.

- Supporting economic development projects. The SDDC's support extends beyond transporting goods and personnel. The command can also play a role in supporting economic development projects in the region. Whether providing logistics support for infrastructure projects, facilitating the movement of construction materials, or assisting in the deployment of personnel for development initiatives, the SDDC contributes to the successful implementation of projects that drive economic growth in Jordan.
- Enhancing regional investment opportunities. Efficient logistics and transportation infrastructure attract regional investment. By enhancing transportation networks and streamlining logistics operations, the SDDC helps create a more conducive environment for businesses to invest in Jordan. Improved transportation infrastructure can reduce barriers to entry, lower operational costs, and make the area more attractive for domestic and foreign investors. This, in turn, leads to job creation, increased economic activity, and overall growth in the local economy.

The SDDC's role in promoting economic growth in Jordan under the DCA is crucial. By facilitating trade and commerce through efficient logistics, supporting economic development projects, and enhancing investment opportunities, the SDDC contributes to building a more robust and sustainable economy in Jordan.

Maintaining Regional Stability

The SDDC plays a multifaceted role in maintaining regional stability under the DCA. Through its expertise in transportation and logistics, the SDDC contributes to various aspects essential for promoting regional stability.

- Providing logistical support for peacekeeping operations. By efficiently coordinating the movement of troops, equipment, and supplies to

areas where peacekeeping missions are conducted, the SDDC ensures the timely deployment and sustainment of peacekeeping forces. This support enables peacekeepers to fulfill their mandates effectively, address conflicts, and contribute to overall regional stability.

Furthermore, the SDDC's involvement in peacekeeping logistics helps to build trust and cooperation among participating nations. The SDDC directly promotes peaceful resolutions to conflicts and maintains regional stability by supporting peacekeeping operations.

- Enhancing crisis response capabilities. In times of crisis, whether a natural disaster, humanitarian emergency, or security threat, the SDDC's capabilities are essential for enhancing crisis response efforts in the region. The command's ability to quickly mobilize resources, coordinate the transportation of relief supplies, and provide logistical support is critical for effective crisis response and management. By bolstering crisis-response capabilities, the SDDC helps to mitigate the impact of emergencies, save lives, and alleviate suffering in affected communities. This proactive approach to crisis management contributes to the population's well-being and enhances overall stability by reducing the potential for destabilizing events to escalate into more significant conflicts.
- Strengthening partnerships with other regional stakeholders. The SDDC significantly enhances partnerships with other regional stakeholders, including military forces, government agencies, and international organizations. Through collaborative efforts on transportation and logistics initiatives, sharing best practices, and coordinating resources, the SDDC helps build solid relationships and fosters mutual trust among regional actors. By working closely with regional stakeholders, the SDDC contributes to a more integrated and cohesive approach to security and stability.

Summary

The SDDC plays a critical and multifaceted role within the U.S.-Jordan DCA, serving as a cornerstone in fostering robust bilateral relations between the two

nations. Through its efficient logistical operations and strategic coordination, the SDDC facilitates the seamless movement of military assets, equipment, and personnel between the U.S. and Jordan, bolstering defense capabilities and interoperability while reinforcing the bonds of friendship and cooperation between the two countries.

Moreover, the SDDC's contributions extend beyond defense and security, encompassing a wide array of commercial shipments that underpin economic growth and vitality in the region. Furthermore, the SDDC's operations within the framework of the DCA contribute to bilateral cooperation and play a significant role in promoting regional stability and security.

The SDDC's steadfast commitment to excellence and its pivotal role within the DCA exemplify how effective logistical support and supply chain management can serve as a force multiplier to advance shared goals and interests. By fostering strong bilateral relations, facilitating military and commercial shipments, driving economic growth, and promoting regional stability, the SDDC stands as a testament to the power of cooperation and collaboration in building a more secure, prosperous, and interconnected world.

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David A. Wallace is an Army retiree and is a managing director at a consultancy agency in Manama, Bahrain. He holds a Master of Business Administration degree in supply chain, shipping, and logistics management from Universidad Católica San Antonio de Murcia. He is a graduate of the Ordnance Basic Officer Leader Course and the Combined Logistics Captains Career Course.



SWARM TECHNOLOGY IN SUSTAINMENT OPERATIONS

■ By LTC Travis Michelena

Autonomous drone use is the next revolution in military technology, and it is not just the maneuver forces that benefit.

In current manning configurations, logistics units struggle with balancing security with sustainment operations. Convoys require outside security support or pull internal assets to man available turreted platforms. Support areas maintain a perimeter with vehicles or foxholes, using fuelers, maintainers, cooks, and drivers in a constant rotation. With additional manning unlikely in the near future, drone technology may provide an equipment security solution to support the personnel shortfall.

In large-scale combat operations (LSCO), early detection is key to the survivability of our sustainment forces. Emerging drone swarm technology has shown promise in providing continuous autonomous monitoring to maximize our ability to detect and respond to threats. In partnership with the Lincoln Laboratory at the Massachusetts Institute of Technology, the DoD deployed an array of over 100 autonomous Perdix drones, capable of maintaining flight for 20 minutes and speeds up to 70 mph. Each drone works in conjunction with the others without requiring separate control. This swarming technology can provide continuous mission accomplishment without persistent human input. Since the first swarms

took flight nearly a decade ago, the technology has rapidly advanced, with drones offering a vast array of support to military operations.

With combat operations at the forefront of swarm technology adaptation, can this growing military revolution also help secure our sustainment operations?

Convoy Operations

Our logistics vehicles are built for a specific function: hauling bulk supply. They are not technology-laden or sensor-equipped, and most lack even the basic battlefield tracking devices. Dedicated security platforms are limited, often supplanted by adding ring mounts to logistics vehicles to provide weapon system support.

While it is unlikely that weapon-capable drones will make their way to sustainment units any time soon, passive support drones could provide extended visual and sensor capability along the increasingly vulnerable supply lines in LSCO. A package of small drones could be roof-mounted to a logistics platform and connected to the vehicle battery, serving as both a charging station and a launch platform. Several drones would be airborne at all times, autonomously moving in parallel and in front of the convoy, providing visual or infrared information back to the parent vehicle. Each drone would return to recharge while another would be launched, all while the convoy would remain in motion.

Extended convoys would employ several drone packages throughout the convoy, all working in conjunction to provide a bubble of live information. Detected potential threats could be examined, avoided, prepared for, or dealt with. In the case of enemy action or other stoppages, the drones could relay live visual context to improve the convoy commander's and the security force's critical and immediate situational awareness. With convoys stretching for a mile or more from front to end, with the added difficulty of turning semi-truck systems around on narrow roads, early warning and live information are critical for convoy survivability.

Support Area Perimeter Security

Convoys are not the only vulnerable logistics elements. In

LSCO, the expansive support areas are prime targets. Our adversaries know that even small attacks can disrupt support operations or destroy supplies destined for the front lines. Currently, our support area perimeters are manned with available crew-served weapons and sustainment personnel. Early warning relies on vigilant Soldiers with binoculars and night-vision devices. Drone swarm technology would provide a continual monitoring capability far beyond the limited visual perimeter of the manned positions. Given the static nature of the support area, the drones could be as simple as micro unmanned aerial vehicles with limited range and payload, operated and monitored from a base defense operations center (BDOC) as part of the support area headquarters element.

A swarm of small sensor drones would work in continual rotation, flying out to monitor an area with visual or infrared detection responsibilities, alerting and circling identified threats, and returning for recharge autonomously. Like a robotic vacuum cleaner, a drone sweeps an area in a set pattern along the outer reaches of the support area. If necessary to clear airspace for helicopter operations, the BDOC could designate a no-fly zone to keep the drones at a safe distance. This capability allows support areas to tuck into the tree line without sacrificing line of sight, extending the early warning visual and sensor range well beyond what a Soldier can provide.

Future

Are drones ready to conduct these security operations right now? We are much closer than you might imagine. However, swarm technology currently seems to be hyper-focused on countering unmanned aircraft systems and offensive capabilities in support of front-line units and has yet to actively pursue the security needs of our under-equipped and vulnerable sustainment elements.

Leveraging swarm technology to provide extended monitoring capability to our convoy operations and support areas would be highly beneficial in relieving some of the need for augmented security support and would increase the survivability of our sustainment elements. The technology will continue to evolve and trickle down the military food chain, and perhaps one day, drone swarms will provide sustainment units with an active kinetic response to any threat. But for now, at least they can help us see what we are getting into.

LTC Travis Michelena serves as the plans and exercises chief in the 79th Theater Sustainment Command Forward Element in Vicenza, Italy, in support of sustainment operations throughout Africa. An ROTC graduate from Tennessee Tech University, his career includes Army watercraft with 7th Transportation (Expeditionary), command of a forward support company in the 4th Infantry Division, observer controller/trainer and headquarters and headquarters company command with First Army, and Surface Deployment and Distribution Command battalion S-3 and executive officer in Europe. He has had deployments to Iraq for long-haul transportation operations, Afghanistan for security forces assistance, and Haiti for humanitarian aid operations.



The Strategic Imperative of

INTEGRATING SUSTAINMENT DATA

IN MODERN MILITARY OPERATIONS

■ By CPT Stephanie Torres

In the evolving landscape of contemporary warfare, the integration of Army sustainment information with maneuver and intelligence operations is crucial to enhancing operational effectiveness and supporting informed decision making by maneuver commanders. Army doctrinal publications observe that poorly planned or executed sustainment can cause mission failure. As the Army moves toward replicating industry-leading emerging technologies, the role of predictive logistics in modernizing sustainment practices shows a promising horizon where efficiencies from data integration vastly enhance commanders' decision making. In this promising future, the prevalent issue lies in our current doctrine and practices. To link present execution with the requirements of emerging technologies, the Army must undergo a cultural shift that opposes the traditional information silos and promotes information integration and data-driven decision making.

Introduction

The complexities of modern warfare demand a sophisticated approach to sustainment that transcends traditional operational boundaries. As MG Mark T. Simerly emphasizes

in his "Predictive Logistics in Data-Driven Sustainment" article in the fall 2023 issue of *Army Sustainment*, effective use of sustainment data is critical for achieving decision dominance in future conflicts. Historical precedents, such as the Soviet invasion of Finland in 1939, Operation Barbarossa in 1941, and others highlight the consequences of inadequate sustainment integration. For instance, during the Soviet invasion of Finland, a lack of logistical foresight resulted in significant troop shortages and equipment failures, crippling operational effectiveness. The recent Russia-Ukraine war further underscores the necessity for robust logistical support aligned with maneuver operations, exemplified by Ukraine's adaptive sustainment strategies amid challenging conditions. Conversely, a fast cultural adaptation to data leverage and convergence significantly enhances visualization and decision making in a way that sets leading industry peers apart from one another within markets and similarly promises to set adversaries apart by a wide margin in future conflict.

The Role of Predictive Logistics

Modernization efforts within the Army are increasingly adopting predictive logistics, leveraging technologies such as artificial intelligence and machine learning to forecast supply chain requirements and identify potential disruptions. For instance, the Integrated Personnel and Pay System-Army (IPPS-A) combines personnel

management with real-time data analytics, enabling commanders to foresee personnel shortages and optimize resource allocation, a far more efficient way than the traditional method of manually updated analog or digital personnel status reports. Similarly, the Global Combat Support System-Army (GCSS-Army) integrates supply chain management with maintenance tracking, allowing for a predictive approach to logistics. GCSS-Army, like IPPS-A, allows for industry-quality precision on asset visibility and predictability. These digital systems of record, along with other emergent technologies, such as sensors, significantly reduce ambiguity, increase efficiency, and produce data that can be leveraged toward better sustainment predictability, execution, and decision making.

Practices such as the ones mentioned above can be seen in action today in the civilian sector by several market-leading corporations. Through employment of advanced technology, these firms anticipate demand, optimize inventory levels, and, most important, exploit efficiencies and visualization in pursuit of better decisions and execution. By adopting similar industry methodologies, the Army can enhance its maneuver agility. This will ensure that units have timely access to critical supplies and resources, and that commanders have a better understanding of holistic unit statuses, leading to decisions that are faster, more precise, and more successful than ever before.

Army Field Manual (FM) 2-0, Intelligence; FM 3-0, Operations; and FM 4-0, Sustainment Operations, underscore the importance of embedding sustainment considerations within planning processes, fostering a more adaptable and responsive force. For example, FM 4-0 details frameworks for sustaining operations in various environments, emphasizing the need for commanders to integrate sustainment plans with operational objectives and timelines. FM 2-0 also establishes that for commanders to best understand the operational environment, it is critical for maneuver, intelligence, and sustainment information to be fully integrated. In other words, for these technologies to excel in producing complementary and reinforcing effects in support of the maneuver commander, and for their benefits to pay off in modern battlefields against similarly equipped adversaries, the data-driven integration cultural glidepath must shift concurrently, not consequentially, with emergent technology employment.

The OODA Loop and Sustainment Integration

The observe, orient, decide, act (OODA) loop serves as a vital framework for understanding how sustainment data can inform operational decision making. Organizations such as leading industry firms and other highly efficient organizations are not successful solely due to their equipment or technologies. In fact, many of these capabilities are widely available, and are often shared

by their peers. What sets these leading organizations apart from others is a culture of data sharing and integration that expedites their movement through decision cycles in support of faster, yet more accurate, decisions that increase their probability of success. The integration of sustainment data enhances each phase of this cycle.

Observe

During the observe phase, comprehensive sustainment data illuminates unit capabilities, resource availability, and operational constraints. Early integration of this data during the military decision-making process provides commanders with a holistic view of personnel, supply status, and maintenance requirements. For example, a brigade commander might use a common operational picture (COP) to track real-time ammunition supplies, vehicle readiness, and personnel health metrics. This visibility enables proactive adjustments to operational plans, such as reallocating resources to units projected to face higher engagement levels. However, in today's culture, data silos during planning and execution often inhibit this integration, leading to missed opportunities for optimizing operational effectiveness. Prominent examples of this are in most tactical operation centers' layouts where maneuver and intelligence planners often reside disconnected from sustainment planners. These data silos result in separate maneuver and sustainment COPs that would otherwise complement each other and would provide a holistic picture if integrated.

Orient

Orientation requires translating sustainment data into actionable insights that enhance situational awareness. Commanders must assess risks, identify support requirements across operational phases, and understand the ramifications of sustainment constraints on mission objectives. For instance, during exercises, commanders could use predictive analytics to evaluate current logistics statuses or projections and adjust operational timelines, task organization, or tasks to units based on sustainment data. An illustrative example of this is the use of the logistics status (LOGSTAT) report, which provides insights into the current state of logistics and maintenance. During the 2003 invasion of Iraq, commanders who effectively used LOGSTAT reporting to assess logistics and personnel readiness maintained operational momentum against a dispersed enemy. By harnessing data versus relying on human input, and by integrating the data with intelligence reports, commanders could adjust strategy in real time based on facts, thus mitigating risk and increasing the chance of mission success.

Decide

In the decide phase, informed resource allocation and task prioritization hinge on a comprehensive understanding of current and projected sustainment capabilities. By synchronizing sustainment data with operational plans and intelligence estimates, commanders can align decisions with logistical realities. For example,

planners can employ advanced data analytics to determine optimal resource distribution based on real-time logistics data. Through accurate data on personnel, supplies, and maintenance, embedded into the projected synchronization matrix, units can achieve just-in-time (JIT) resourcing. JIT emphasizes minimizing waste and optimizing resource allocation based on real-time demand.

Adopting a similar philosophy in military logistics can help ensure that resources are allocated efficiently. This practice would ultimately enhance mission success by placing the right number of resources against accurate requirements. JIT practices embedded into operational culture would also maximize the efficient use of transportation and storage capacities through leaner processes. For example, by knowing the exact requirements of a unit, we could ensure only the required assets were allocated to those requirements. Proficiency in these practices would yield a vast payoff, especially in OEs with critical resource constraints, such as deployed environments with ammunition and transportation restrictions and other resource limitations.

Act

Once decisions are made, sustainment data enables commanders to monitor plan execution and adapt as necessary. Real-time data tracking facilitates proactive management of personnel, critical platforms, supplies, and logistics, allowing commanders to

respond dynamically to changing battlefield conditions. For example, a battalion commander might use GPS-enabled logistics systems to monitor supply movements, enabling timely adjustments to supply routes or distribution points in response to evolving threats.

Moreover, the integration of predictive logistics empowers leaders to anticipate logistics needs and adjust resource allocation proactively. For instance, if a primary supply route becomes compromised, commanders can quickly reroute assets and adapt their operational approaches to minimize disruptions. Civilian industry uses advanced routing algorithms and predictive analytics to optimize delivery routes in real time, a methodology the military could adapt for enhancing operational logistics in general, and even more so in chemical, biological, radiological, or nuclear threats. Additionally, the employment of future maintenance and liquid sensor technology could assist commanders in predicting the risk of mission failure by way of maintenance or supplies, widening the decision-making gap in favor of risk mitigation.

Conclusion

The imperative for integrating sustainment data into military operations has never been more critical, and its margin of payoffs has never been greater. As the Army prepares for future conflicts, leveraging emerging technologies to enhance sustainment transparency will provide maneuver commanders

with the comprehensive situational awareness necessary to dominate the battlespace. By actively harnessing and integrating sustainment data, military planners can significantly improve the speed and accuracy of decision-making processes. The path to victory in the Army of 2040 depends on our commitment to the innovative integration of logistics with operational and intelligence frameworks. Only by breaking down traditional information silos and fostering a culture of integrated data-driven decision making can the Army ensure its forces are equipped to meet the challenges of future warfare.

CPT Stephanie Torres currently serves as the First Army Division West commanding general's aide de camp. Previous assignments include operations officer, 15th Brigade Support Battalion; forward support company commander, 1st Battalion, 8th Cavalry Regiment; and support operations plans officer, 2nd Armored Brigade Combat Team, 1st Cavalry Division; logistics officer, United Nations Command Security Battalion-Joint Security Area in Panmunjom, South Korea. She has served in sustainment, armor, and infantry formations, deployed to Iraq and Afghanistan in 2007 and 2009, and has conducted two regionally aligned forces missions to U.S. Indo-Pacific Command and European Command. She holds a Bachelor of Science degree in criminal justice with Homeland Security specialization from Saint Leo University and is in the process of obtaining a Master of Business Administration degree in supply chain management from the Florida Institute of Technology.



BUILDING READY SUSTAINERS

While Deployed on the Korean Peninsula

■ *By MAJ Theresa Penrod and CPT Bradley Miller*

The prospect of American forces operating in large-scale combat operations (LSCO) is becoming increasingly probable with the current global political climate. While deployed with the Korea Rotational Force (KRF), sustainers from a Stryker brigade combat team (SBCT) can build the readiness required to win in LSCO and the Indo-Pacific region by taking advantage of unique training opportunities on the Korean Peninsula. Sustainers across 2nd SBCT, 4th Infantry Division (2SBCT, 4ID), capitalized on these opportunities while serving with KRF-13 by maximizing a complex training environment, conducting sustainment operations across extended distances, and building

lasting partnerships with the Republic of Korea Army (ROKA) forces.

Training Overview – Collective Sustainment Training for KRF-13

Prior to deployment, 2SBCT, 4ID, executed rotation 23-03 at the Joint Readiness Training Center (JRTC) to certify unit readiness for

the KRF-13 rotation. Rotation 23-03 highlighted the need to further train the dispersion of sustainment assets and the decentralization of command-and-control elements to allow the brigade support battalion (BSB) to operate successfully in base clusters. The survivability and redundancy of sustainment assets are critical in prolonging endurance during LSCO. While deployed on

KRF-13, 704th BSB's staff and command team designed a training event tailored to the unique variables experienced in the Indo-Pacific region while incorporating lessons learned during JRTC.

704th BSB executed a two-week training exercise at the Rodriguez Live Fire Complex (RLFC) to certify platoon leadership and train

company mission essential tasks (METs). The exercise was nested within 2nd Infantry Division's (2ID's) Command Post Exercise (CPX) III. Operations included a brigade support area (BSA) validation with base defense operations, platoon situational training exercises (STXs), sustainment gunnery, and combined training with ROKA partners while facing a live opposing force. External

evaluators from the 2ID Sustainment Brigade observed staff processes and BSA base defense operations. Following the training event, 704th BSB met the criteria to be assessed as trained in all five METs. This training provided tactical stimulus similar to a combat training center to increase readiness while maximizing the opportunities unique to the Korean Peninsula.

Building Realism into the Training Environment

Training within the mountainous landscape of Korea provided realism to collective sustainment training. 70% of the Korean Peninsula is mountainous and densely vegetated. Off-road mobility corridors are extremely limited, forcing mounted elements to use canalizing routes to bypass impassible terrain. Training areas come at a premium on the Korean Peninsula for both U.S. and ROKA forces. 2ID worked tirelessly with 704th BSB staff to provide a majority of the training areas at RLFC for the exercise. The terrain at RLFC forced 704th BSB to establish two BSA base clusters from the onset of the field exercise. One cluster focused on distribution and supply assets, while the other held service and support assets. Executing a base cluster concept within complex terrain strained internal capabilities to organically defend multiple locations while providing support to 2/4 SBCT.

704th BSB's requirement to sustain a static base defense for two base clusters included 10 stationary crew-served fighting positions and

one dismounted quick reaction force per site (one team-size element). In addition to ground-mounted systems, a Stryker BSB organically has four mounted protection platforms within the base companies to provide flexible security to the BSA and to sustainment convoys. To augment the security posture, 704th BSB also flew a small unmanned aerial vehicle twice daily as part of the information collection plan and to provide early warning. Field trains command posts were also integrated into the base defense for base clusters to improve the defensive posture.

The mountainous and canalized terrain also highlighted the limitations of organizational equipment, specifically communications equipment and distribution assets. The load-handling systems configured to maximum carrying capacity must be taken into account, forcing units to consider finding alternate routes with reduced grade in theater. Communication for meetings and operation order publication was limited to Joint Battle Command-Platforms because the mountainous terrain inhibited line-of-sight radio systems. Elements of the battalion staff and communications equipment were dispersed between base clusters to build communications redundancy and improve the interoperability of decentralized command elements.

Nesting 704th BSB's training during the 2ID's CPX-III provided theater-specific opportunities to exercise full communications capability from frequency modulation, upper

tactical internet, and the Combined Enterprise Regional Information Exchange System (CENTRIXS)-K (K being the designation for South Korea). 704th BSB's S-6 created redundant communications with 2ID throughout the exercise by establishing tactical satellite and high-frequency communications equipment. Moreover, a logistics synchronization held between the 194th Division Sustainment Support Battalion (DSSB) and 704th BSB support operations synchronized all sustainment forecasting requirements fulfilled by 194th DSSB to build a realistic, multi-echelon sustainment architecture. CPX-III provided 704th BSB staff with a relevant scenario to train the military decision-making process with realistic tactical friction and operational tempo.

Tyranny of Distance: Preparing for Extended Ground Lines of Communications

Executing realistic training across the Korean Peninsula requires operating over extended ground and air lines of communication. Extended ground lines of communication (GLOCs) are an inevitable variable for the LSCO environment. 194th DSSB provided Class I support from Camp Humphreys during collective training, 95 miles from RLFC by ground convoy. Inter-peninsula ground convoys navigate the civilian infrastructure through multiple city centers when traveling from south to north, including Seoul. This variable restricts GLOC mobility in a contested environment within the Indo-Pacific region.

The 2nd Combat Aviation Brigade executed aerial delivery resupply, flying Class IX repair parts 73 miles. Pilots transported repair parts over densely populated terrain to deliver them at 704th BSB's BSA. Operating with an extended GLOC highlighted gaps in 704th BSB's stateside training, such as the requirement for building the principle of anticipation into logistical forecasting and maximizing the economy of routine distribution operations to reduce sustainment traffic for both ground and air lines of communication.

Working with Allied Partners: Win as a Total Force

704th BSB conducted combined training with the 16th Logistics Support Battalion (LSB) of the ROKA to exercise combined communication capabilities, distribution operations, and recovery operations with each organization's fleet. Signal assets from both organizations conducted a cross-force communications exercise using ROKA and U.S. radios to allow ROKA communication with U.S. elements. Class III bulk distribution assets conducted bulk-to-bulk transfer training between U.S. and ROKA equipment. Maintainers from both organizations cross-trained on heavy recovery assets such as the U.S. Modular Catastrophic Recovery System and the Korean K1 Armored Recovery Vehicle. Company C, 704th BSB, executed a combined Role II exercise with the 16th Mechanized Infantry's medical company. 704th BSB and 16th LSB overcame the friction created by a lack of redundant

radio communication systems by placing a liaison officer within each unit's tactical operations center. The adjacent headquarters provided dual capability with CENTRIXS-K systems using equipment issued to the rotational force from Korean equipment sets to create a shared common operating picture.

Future Sustainment Training on the Peninsula

Nesting battalion training within a division CPX provided context and theater focus. Further realism and interoperability are achieved by nesting ROKA collective training events with the KRF to simulate a truly combined battle space. Incorporating both ROKA and U.S. training areas encourages further coordination between partners to synchronize efforts within a shared operational environment. Requesting access to ROKA training areas also provides greater flexibility when planning a dynamic base defense with alternate base cluster locations and nesting defensive graphic control measures with adjacent units.

U.S. forces at the tactical echelon must continue to integrate with our ROKA partners through shared training exercises and security cooperation activities. Creating routine opportunities to conduct combined training events will reduce the friction experienced at the battalion level to integrate staff functions and planning. Sustainers with the KRF can build proficiencies across all assigned METs with creative solutions to collective training and allied partnership

collaboration. By taking advantage of the unique opportunities afforded on the Korean Peninsula, the KRF can build the readiness required to fight and win in an LSCO environments.

MAJ Theresa Penrod currently serves as the battalion operations officer for 704th Brigade Support Battalion (BSB) and currently attends U.S. Army Command and General Staff College at Fort Leavenworth, Kansas. She is a graduate of the Field Artillery Basic Officer Leadership Course and the Maneuver Captains Career Course. She has served as a fire direction officer, platoon leader, aide-de-camp, company commander, executive officer, and battalion operations officer. Her assignments have included the 2nd Armored Brigade Combat Team, 3rd Infantry Division (ID); the 4th Division Sustainment Brigade; the 2nd Stryker Brigade Combat Team (SBCT), 4ID; and 704th BSB, 2SBCT. She holds a Bachelor of Arts degree in Chinese-Mandarin language and literature from the University of North Georgia.

CPT Bradley Miller currently commands Alpha Company "Wolfpack," 704th Brigade Support Battalion, 2nd Stryker Brigade Combat Team, 4th Infantry Division. He previously served in distribution and maintenance leadership roles within the 1st Brigade Combat Team, 101st Airborne Division (Air Assault). He is a graduate of the Ordnance Basic Officer Leader Course and the Combined Logistics Captains Career Course at Fort Gregg-Adams, Virginia, and Air Assault School and Pathfinder School at Fort Campbell, Kentucky. He holds a Bachelor of Science degree in mechanical engineering from Southern Illinois University Edwardsville.

Featured Photos
Left: SPC Joshua Miller of A/704BSB clears an obstacle at the CBRN lane during Platoon STX at Rodriguez Life Fire Complex, Pocheon, South Korea in October 2023. (Photo by Chaplain (CPT) Christopher Smith)

Middle: Medics from C/704BSB evacuate casualties from H FSC during the day iteration of Platoon STX at Rodriguez Life Fire Complex, Pocheon, South Korea in October 2023. (Photo by Chaplain (CPT) Christopher Smith)

Right: Certified Wheeled Recovery Specialists (H8) from B/704BSB train in inter-partner recovery operations with 16th Logistics Support Battalion at Rodriguez Life Fire Complex, Pocheon, South Korea in October 2023. (Photo by Chaplain (CPT) Christopher Smith)



CONDUCTING PORT OPERATIONS

■ *By 1LT Ryan Bobbitt*

As a new infantry lieutenant, I thought I knew what the first few years of my career would look like. I would spend a few months in the operations and training staff section (S-3), get a platoon, and become an executive officer (XO) or even a specialty platoon leader. But on my first day at the 5th Battalion, 20th Infantry Regiment, my battalion XO dragged me into the logistics and sustainment staff section (S-4). What was initially supposed to be “a couple of weeks to help them catch up on some work” very quickly turned into a couple of months. Before I knew it, I was the S-4 officer in charge (OIC).

The battalion was about to participate in Orient Shield 2023, a yearly joint exercise between the U.S. and our Japanese allies. We were going to Japan. This exercise was a trial by fire in my new role. Between sustaining the battalion and managing life support contracts and purchases abroad, I gained tons of experience and learned new things daily. Port operations are the most critical, costly, and high-risk part of deploying a unit across the Pacific. If a unit cannot successfully deploy its equipment, it does not matter how good its operations or sustainment planning are. It is a critical mission, and we must know how to do it well. And somehow, with no experience in this subject, I found myself responsible for the success or failure of this small part of our bigger mission. Ensuring success at a port cannot be guaranteed. Still, with proper planning and preparation, you

can get your unit’s equipment where it needs to be on time and safely.

The first step in ensuring success at the port is assembling the correct team to execute and manage operations. The OIC and NCOIC are responsible for the operations. You need at least one Soldier qualified as a unit movement officer (UMO), preferably an officer or senior NCO. Several UMO-qualified Soldiers are a must for larger operations. A designated UMO rep from each subordinate unit is the best way to manage large battalion or brigade movements. The team needs hazardous material (HAZMAT) certifiers. The number of HAZMAT Soldiers needed depends on the number of HAZMAT containers you have. Vehicle crews are the bulk of your workforce. Having the correct number of crews to drive vehicles (and ground guide) around the port and on/off ships is necessary to ensure your load rate is high enough. Everything at the port costs money. It costs money to keep the ship docked, to keep vehicles parked on the docks, and to pay the countless workers around the clock. This money is not coming directly out of your pocket, but for every minute wasted, the Army is paying a bill, and someone will want answers.

The second step is having the correct paperwork at the port. Whether you are embarking or debarking, your paperwork should look very similar. You must have several copies of your unit deployment list (UDL). This complete UDL should include transportation control numbers

(TCNs), bumper numbers, models, nomenclature, dimensions, and serial numbers. Out of all this information, the one that matters the most is the TCN. The TCN controls everything. It is a unique code that each piece of equipment gets, and that is how load plans are built.

In addition to the UDL, you or someone on your team needs to have access to the website Transportation Coordinator’s Automated Information for Movements System (TC-AIMS). TC-AIMS is the unclassified system where units provide their inputs for movements and deployments. The battalion S-4 or UMO can help get you this access. TC-AIMS is how UDLs are constructed; every piece of equipment is built into this system and added to the UDL. Nothing should change during port operations on the UDL, but it can be a helpful tool to pull data if needed.

A designated HAZMAT-certified Soldier needs to have the required paperwork for every HAZMAT container. At a minimum, this paperwork needs to include a DD Form 2890, DoD Multimodal Dangerous Goods Declaration; a safety data sheet; and an Emergency Response Guidebook. HAZMAT on rail or linehaul also needs to have a DD Form 626, Motor Vehicle Inspection (Transporting Hazardous & Sensitive Materials). The HAZMAT representative at the port needs to have at least five copies of each. Every sensitive item container has a corresponding DD Form 1907, Signature and Tally Record, which

shows a chain of responsibility for the containers. A member of the port team needs copies of this form as well. The DD Form 1750, Packing List, records the contents of each container. Again, you need copies of these. While it is essential to have hardcopies, it is incredibly beneficial to use a shared drive or another Army system to store these files digitally. Everyone at the port will want copies of this paperwork, so the team needs to know where to pull the paperwork from in case you run out.

Like airliners at an airport, ships have delays. Sometimes they arrive early; sometimes they arrive late. Unlike an airport, no monitors or signs show you exactly when and where your ship will arrive. It is essential to remain flexible. There is too much that

is out of your control for you to always stay exactly on the timeline. There are plenty of things that are within your control. Working at a port, similar to working at a railhead, is not exciting for most, especially for your young Soldiers who spend long days driving, walking, and dealing with countless inconvenient problems. Many of these young Soldiers do not always see the immediate importance of what you are doing. As with any Army operation, it is crucial to provide priority, task, purpose, and the why. Setting these conditions early, with good NCO support, will significantly alleviate many headaches.

While you can scramble to get another driver to the port or fix some paperwork on the spot, the one thing you cannot fix is lost equipment.

You must track everything. You need to know where each container and vehicle is parked. You need to know when and where they are being loaded. On the back end, you need to know what vehicles are convoying, what vehicles are getting loaded on rail, and what vehicles are being moved by commercial line haul. Everything must be tracked and recorded. For larger moves, it is inevitable that, at some point, someone will lose contact with a piece of equipment. When this happens, the port OIC will probably be the first to receive a phone call. It is imperative that, just like in tactical operations, you have a cell responsible for battle tracking 24/7. Depending on the scale of your move, your battalion S-3 shop should have some young lieutenants and captains perfect for this job.



Soldiers assigned to the 25th Infantry Division and the 623rd Movement Control Team, alongside U.S. Marines, conduct port operations in preparation for Salaknib 24 in Subic Bay, Philippines, April 5, 2024. (Photo by SGT Jared Simmons)



Australian Army M1A1 Abrams main battle tanks and vehicles are unloaded from the USAV SSGT Robert T. Kuroda at Tanjung Perak Port in Indonesia during Exercise Super Garuda Shield 2023. (Photo by Australian Defence Force CPL Dustin Anderson)

The OIC and NCOIC need to stay very closely tied with their point of contact (POC) at the port. In Japan, there was a Japanese civilian who saved me many times. Having a good relationship with your POC should not start when you get there. You need to get in contact early. Early contact sets you up for success. At most ports, the civilians rule all. It does not matter how squared away you think your paperwork is. If they say no-go, it is a no-go. This is another essential thing to emphasize to your entire team at the port. A Soldier and a port civilian fighting about a DD 1750 is the last thing you need.

Your POC is not always a civilian; it could be a Soldier working full-

time at the port or a mobility warrant officer. Regardless, there is one person you are given upon arrival who has the answers to all your questions. They know the vessel timeline, and you must get this timeline quickly to do your backward planning. As mentioned above, this timeline changes often, so it is essential to ask daily about any changes. You need to have at least one daily touchpoint with your POC. They can answer your questions, provide guidance, and prioritize the next day's tasks. More important, they tell you if you are on or off track.

Port operations are not difficult to conduct. With the correct team and the right paperwork, you can fix any

problem that arises. If you manage your equipment and prioritize safety and control, the rest will fall into place.

1LT Ryan Bobbitt is currently a platoon leader in the 5th Battalion, 20th Infantry Regiment, out of Joint Base Lewis-McChord. He graduated and was commissioned at the University of New Hampshire. He spent eight months as the battalion S-4, deploying his battalion to multiple training exercises including Orient Shield 2023 and the National Training Center.

Featured Photo
SGT Anthony Villegas and SPC Shelvin Tait, assigned to 1-258 Field Artillery Regiment, oversee the unloading of a Light Medium Tactical Vehicle during port operations in Gabes, Tunisia, April 21, 2024. (Photo by CPL Genesis Miranda)

LEVERAGING EMERGING TECHNOLOGIES

IN A
BRIGADE
SUPPORT
BATTALION

DURING LSCO

■ By CPT George R. Ritchie and WO1 Jose Ortiz

During large-scale combat operations (LSCO), ammunition managers are responsible for their distinctive skill set of operational planning, explosive safety, logistics coordination, and meticulous inventory accounting. However, they must do so in a degraded environment with a peer or near-peer enemy looking for the Modular Ammunition Transfer Point (MATP) and having the capabilities to strike it. Recent technological advances present an opportunity for the Army to refine its logistics processes and stay one step ahead. This is particularly important in environments where rapid decision making and adaptability are crucial. Integrating tools like cloud-based systems, real-time communication platforms, and advanced data analytics can significantly improve the management of resources and personnel.

During National Training Center (NTC) rotation 24-09, the 1st Armored Brigade Combat Team (1ABCT) participated in comprehensive training to validate mission-essential offensive and defensive operations tasks. This also marked the first time a brigade support battalion (BSB) used the Standard Army Ammunition System (SAAS) at NTC since October 2020. The MATP introduced Starlink, a cutting-edge remote internet provider. This provided three positive benefits: it increased the MATP's expeditionary capabilities, allowed the use of Army logistics systems, and offered another means of communication to make information flow more robustly. For

the Army to enhance its logistics system, embracing technology and programs like Starlink rather than restricting them is imperative.

Expeditionary Capabilities

Minimizing the MATP's footprint and reducing its displacement time are keys to making the MATP expeditionary. The current method of using the very small aperture terminal (VSAT) to connect to the Nonclassified Internet Protocol Router Network (NIPR) via satellites has several key drawbacks. First, sections that do not frequently use it may find the setup daunting due to its technical difficulty. These terminals are typically found in the maintenance and supply operations sections. Generally, ammunition specialists receive relatively minimal training on the system. Sections that regularly use the terminals rely on 92A automated logistics Soldiers or subject matter experts may take 30 to 45 minutes to set up the system, time which may not be available during LSCO. Second, the current method occupies too much space for its less-than-optimal output, which may be sluggish and restricted. Furthermore, ammunition sections like the one in 1ABCT support operations (SPO) simply do not have enough authorized VSATs to distribute while performing dispersed operations and must rely on other units within the organization.

Starlink, in contrast, offers unmatched capacity for uninterrupted communications, especially in the harsh desert environment of Fort Irwin, California. Starlink satellites

provide superior communications because of their low orbit and coverage. Most satellite internet services use geostationary satellites that orbit above 35,000 km/21,747 miles, causing high latency that impedes high data rate activities. Starlink satellites orbit at about 550 km/342 miles and cover the globe. Their low orbit significantly reduces latency to around 25 milliseconds compared to over 600 milliseconds from geostationary satellites.

Considering this, the MATP section of 1ABCT observed that the Starlink system offers exceptional power and space efficiency. The mobile satellite can be assembled and disassembled by untrained personnel within 10 minutes, fitting into a 24-inch by 16-inch case. Its performance was exceptional during eight tactical displacements, enduring extreme temperatures of 127 degrees Fahrenheit continuously with a strong, uninterrupted signal. Additionally, it survived a wind gust that caused a fall from a 20-foot container, continuing to perform when other systems failed.

Army Logistic Systems

The BSB's ammunition managers coordinate operational strategies with mission requirements, mitigate risks, enforce stringent safety protocols, and oversee training and audits. Additionally, these managers supervise the MATP, which manages, transfers, and distributes ammunition during military operations. Many platforms and programs have been developed over the years to better assist ammunition managers

in streamlining how we sustain logistics operations, such as the Total Army Ammunition Management Information System, a web-enabled system that generates ammunition requirements; the National Level Ammunition Capability, which ensures a global understanding of ammunition quantities and types by storage location; and the SAAS. The SAAS is perhaps the most underused, despite its value to ammunition-management operations. The SAAS enables timely, precise, and nearly real-time Class V information during operations. Key factors in its underuse are accessibility and connection latency.

Due to its initial introduction in 1970, the common misconception is that the SAAS still uses the cumbersome metal briefcase and standalone computer of the past. However, the advent of cloud-based solutions has allowed improved real-time asset visibility. 1ABCT's implementation of Starlink incentivized the SAAS's use even further. With Starlink, accessing the SAAS was straightforward for implementation during both offensive and defensive strategies and in tactical maneuvers throughout the NTC 24-09 rotation. It allowed for real-time updates and coordination despite the conditions of the training environment. It enabled a more adaptive and responsive flow of Class V and information to and from the forward line of own troops.

The MATP section was not the only one using Starlink. The maintenance section used its own

Starlink at a separate node to access systems such as the Global Combat Support System-Army and the Army Enterprise Systems Integration Program. This gave SPO unprecedented NIPR access and the tools to make the support and continuous readiness of the maneuver units possible, despite operating out of four geographically dispersed nodes that continuously relocated.

One More Communication Tool

As with any Army system, contingencies must be implemented to ensure information reaches its destination, even when primary means fail. 1ABCT SPO's use of Starlink was another technique besides primary, alternate, and contingencies such as the joint battle command platform, frequency modulation radios, and VSATs. Starlink was an asset because it could be set up quickly and because it matched the speed and reliability of the other methods while adding increased capability through its ability to access Army logistics systems. Additionally, the limited number of VSATs and trained personnel to use them and the geographically displaced nature of 1ABCT's rotation enabled Starlink to shine even when other methods failed. Through this, redundancy was achieved, and the continuous flow of supplies forward was enabled. Ultimately, more reliable, expeditionary, and simple systems will add value to the organization.

Conclusion

Integrating emerging technologies such as Starlink within the BSB during

LSCO has demonstrated immense value in surmounting communication and logistical challenges. Starlink's capability to provide continuous, low-latency internet access in austere environments significantly enhanced the operational efficiency of the MATP and other critical systems, including the SAAS. This adaptability and advanced ammunition-management tools have improved real-time coordination, asset visibility, and overall combat readiness. As the Army advances its logistics infrastructure, adopting these technologies will ensure operational success and maintain unimpeded movement during decisive actions.

CPT George Ritchie currently serves as the deputy support operations officer for 1st Armored Brigade Combat Team, 3rd Infantry Division, and attended its National Training Center and Atlantic Resolve rotations. He graduated from Augusta University with a Bachelor of Arts degree in political science and commissioned as an Ordnance officer. He was assigned to 317th Support Maintenance Company, 18th Combat Sustainment Support Battalion, 16th Sustainment Brigade, at Baumholder, Germany, where he served as a platoon leader, maintenance control officer, and battalion S-4. During that time, he served in seven multinational exercises in countries across Europe, including Kosovo, Ukraine, Romania, and France. His military education includes Ordnance Basic Officer Leader Course and the Logistics Captain's Career Course.

WO1 Jose Ortiz currently serves as the brigade ammunition warrant officer for the 1st Armored Brigade Combat Team at Fort Stewart, Georgia. He has served the Army for 16 years, notably as an ammunition technician supporting logistics operations. He graduated from Central Texas College with an Associate of Applied Science degree in business administration with honors. He plans to attend the University of Arizona Global Campus to earn a Bachelor of Arts degree in business administration. His military training includes Support Operation Phase 2, the Warrant Officer Basic Course, and Air Assault.

INDO-PACIFIC SUSTAINMENT AND THE BATTLEFIELD OF

2040



was at the forefront of technology in 2007, one would be at a severe disadvantage relying on that version of the device today. One of the Chief of Staff of the Army's priorities is Transformation in Contact (TiC). To inform the battlefield of 2040 and TiC, we must revise the acquisition process to invest in capabilities versus a specific type of equipment, test and train with the latest technology, reduce the size of the associated logistics tail, and leverage predictive logistics capabilities.

Acquisition Process

At times, we build requirements based on current and emerging technology, and by the time we field the equipment, train our Soldiers to use it, and employ it in combined training exercises, the technology is out of date. Technology evolves so quickly. To keep pace, we must reimagine the acquisition process to enable units at echelon to continually transform in contact. To remain competitive, we need the ability to rapidly acquire the latest fill-in-the-blank capability and discard equipment that no longer provides the required capability.

We all have that friend who takes pride in having the oldest smartphone known to man, or even a flip phone. Although we applaud our friend for being fiscally responsible, he or she is behind the technological power curve and potentially a less effective Soldier. The ability to provide our Soldiers with the latest and greatest technology to increase lethality is not a new idea. So why have we not changed the acquisition process?

Although there have been modifications and authorities granted within the acquisition process, the change required is hard. It will require the DoD's approval and, in some cases, congressional legislation. Furthermore, our pacing threats' capabilities have rapidly increased, and our ability to keep pace has proven increasingly difficult. The operational environment has and will continue to rapidly change, and we must prioritize the need to modify our processes accordingly.

Test and Train the Latest Technology

Our methods of training with new equipment must change. The ideas of adding training to a professional military education, sending a mobile training team, and even training-the-trainer models will not keep up with the pace at which technology will continue to evolve. We must leverage our most prized weapon system and the comparative advantage we have over other militaries — our people, or more specifically, our NCO corps.

To transform in contact, we need to receive new capabilities with little more than manuals and training videos. Recent lessons learned in Ukraine display a military's ability to rapidly field, train, and employ new capabilities. Our younger Soldiers today grew up in a tech-savvy environment and can quickly adapt to new versions, updates, and complete changes to a capability. TiC may require a different approach to risk and trust that our leaders at echelon can test and train new capabilities in a safe and measured approach. Some

technologies or capabilities, such as the new XM7 rifle, may require modifications to firing ranges or different ammunition to conduct training, but we must not slow down the acquisitions or fielding processes for equipment that requires training modifications. Although we strive to provide predictability through quarterly and semi-annual training briefs, we must continue to adapt and remain flexible to incorporate innovations in training and testing in our training plans.

Reduce Logistics Tail

To reduce our logistics tail we must look at new ways of delivering all commodities throughout the battlefield. In many places where we may be called to fight in the Pacific, we will not have the ability to execute the large logistics convoys we grew accustomed to in Iraq and Afghanistan due to terrain and risk. Using the latest manned and unmanned aerial delivery capabilities or watercraft capabilities will be necessary to meet the requirements in the Pacific. Additionally, Army prepositioned stocks that support the Pacific must be repositioned and accessible west of the International Date Line to decrease the requirement for unit equipment and the tyranny of distance in the Pacific. Not only will this reduce the time to equip our forces in crisis and conflict, it will also provide opportunities to reduce the cost of training during operations for the Army and the joint force. Most important, as warfighting requirements and capabilities are built, we must ensure parts can be 3D printed at the lowest possible echelon

and remove the term “long-lead parts” from our lexicon. Additionally, testing and certifying our partners and allies' 3D printing capabilities would increase interoperability and mitigate supply chain concerns.

If the supply chain becomes a significant constraint to a capability, then decisions to shift funding to a new capability must happen rapidly. Contracting capabilities to fill a requirement gap due to the inability to organically support it will continue to be a mitigating factor that must be operationalized through predictive logistics analysis tools. As the Army continues to modify and lean logistics formations through the Army structure process, it is imperative to increase our interoperability with our allies and partners in the Pacific. By increasing interoperability and capitalizing on foreign military sales, we can reduce our organic logistics tail, creating opportunities for increased mobility and the ability to plug into local supply chains.

Predictive Logistics

As stated earlier, it is nearly impossible to accurately predict the battlefield of 2040. That said, we do know that the sustainment requirements in the Pacific will quickly exceed the Army and joint force's sustainment capabilities if they are not synchronized. In recent years, the U.S. Indo-Pacific Command has acknowledged this sustainment gap and has increased the capabilities of the Pacific Command Deployment and Distribution Operations Center. However, matching requirements to all available movement options

involves searching multiple systems, using battle rhythm events, and a lot of human interaction. We must use artificial intelligence (AI) to match movement requirements to all available joint options.

Our systems must know the current maintenance status, the historical reliability of a platform, and the risk if that platform is destroyed or if the capability is not delivered, with minimal human interaction. AI may inform commanders that an unmanned aerial delivery option is the best option to reduce the risk of losing a ground platform and availability. There are many examples of the underuse of our transportation assets due to a lack of visibility or synchronization, and AI can significantly increase our transportation efficiency.

Commanders will always ultimately make decisions regarding risk, but AI can minimize the margin of error and provide immediate data analysis to arm leaders to make rapid decisions. However, an overreliance on artificial intelligence to enable predictive logistics could lead to atrophy in logisticians' ability to conduct analysis and build quality running estimates, which could prove detrimental if predictive analysis systems are compromised or fail.

Conclusion

TiC is creating what our Army and sustainment will be in 2040. If we do not continue to acquire, test, and continually update our capabilities to match the dynamic changes to emerging technology,

we will struggle to keep pace with threats in the Pacific and around the world. Reducing our logistics tail and maximizing predictive logistics AI capabilities must occur to conquer the tyranny of distance in the Pacific and the speed of conflict. Lastly, we must trust our leaders to quickly adapt and train new capabilities without the formal prescriptive training we are accustomed to in the Army. Our people in the Army and joint forces are our comparative advantage, and they will continue rising to the challenges by transforming in contact.

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*Featured Photo
Carpenter Son, a general cargo ship, pulls into port during Exercise Balikatan 24 at the Basco Port in Basco, Batanes, Philippines, May 4, 2024. (Photo by SSG Tristan Moore)*

Enabling Rapid Repair Capability at Echelon

■ *By COL Reginald M. (Garrette) Harris, Hector Rodriguez, and Lara Orechovesky*

As we execute continuous modernization, maintenance complexities should be deliberately elevated over time, allowing Soldiers to execute rapid repair capability. At a basic level, newly fielded equipment must be Soldier-sustainable on the contested battlefield while still being accountable in systems of record from the joint strategic support area (JSSA) to the tactical edge.

As the Army executes one of the most significant reorganizations and technical innovations in its history, we must set the conditions necessary to understand the readiness of our formations in real-time and provide Soldiers with executable repair requirements at echelon. Currently, the maturation of enterprise sustainment is a deliberate, conditions-based process governed by the acquisition framework, making it outpaced by

modernization. This increases the risk of new equipment being absent from today's equipment status report and constrains a commander's ability to elevate maintenance or supply challenges to the Army's understanding. The capacity to rapidly provide overwhelming capability to Soldiers and formations in contact must be inherently balanced with sustainment to benefit Soldiers at the tactical edge. Within the continuous transformation framework, the Army must account for both programs of record (PORs) and non-PORs within existing enterprise resource planning (ERP) systems. Employing an adaptive sustainment framework, we lay the foundation to enable a simple and adaptive sustainment tail for the warfighter while providing commanders with a means to report total unit readiness.

Recognizing the increased threats our near-peer competitors pose, the Army is responding through significant innovation enhanced by industry.

Although it is imperative that we execute swiftly to retain our combat edge, we must acknowledge and address the challenges that accompany any innovation. In the past, technological change was extremely slow — technology our ancestors gained during their youth remained central even in older age. However, today's generations witness significant change multiple times in their lives. The high speed of innovation is a double-edged sword, providing profound opportunity to rapidly advance Soldier capability yet introducing challenges for the sustainment warfighting function.

Additionally, when capitalizing on the advancements available with increased commercial solutions, we must acknowledge and address the corresponding concepts surrounding obsolescence, velocity of obsolescence, and planned obsolescence. Velocity of obsolescence is the rate of speed at which an innovation and/or the competitive advantage of an innovation loses its value. As technology continues to become faster and cheaper, companies can quickly release products and grow their market. This increases the rate of innovation, which in turn accelerates obsolescence. Planned obsolescence is the strategy of building obsolescence into products by limiting consumer ability to repair a product or replace individual parts, or by

simply making it cheaper to buy new. Some people argue this is not just a corporate business practice but is driven by today's consumers and their desire for ever-evolving technology.

Accepting today's reduced product lifecycles to increase Soldier lethality is not a fundamental negative. However, to believe that sustainment remains unaffected and can continue to operate under existing models only serves to increase risk by reducing the Soldier's ability to sustain modernized capability.

Provisioning and maintenance must evolve in line with modernization. If not, we run the risk that Soldiers will be unable to execute repair capability or receive forward support.

Army Techniques Publication (ATP) 4-33, Maintenance Operations, states that the "primary purpose of Army maintenance is to ensure unit readiness by maintaining weapon systems and equipment in a fully mission capable status for immediate and continuous employment in complex and highly lethal environments." The ERP systems, Global Combat Support System-Army (GCSS-Army) and the Logistics Modernization Program (LMP), are the driving factors behind Army equipment sustainment maintenance and logistics. Available at all echelons, GCSS-Army is the system of record for executing field maintenance in the Army. It makes Soldier requirements visible from the tactical edge back to the JSSA.

Without this accountability, Soldiers lack the necessary means to retain combat readiness through supply operations, maintenance management, and organic industrial base support for both hardware and software. Additionally, as authorized data sources for key reporting systems, such as unit status reports and Status of Resources and Training System reports, GCSS-Army and LMP must have accurate and reliable data. This is critical to providing Army senior leaders with the full spectrum of information required to make decisions involving unit readiness.

Although the primary focus appears to be modernization, key leaders recognize the corresponding need for a paradigm shift in sustainment. Assistant



SGT Caelib Gustafson, an M1A2 Abrams tank mechanic assigned to Comanche Company, 4th Battalion, 6th Infantry Regiment, helps guide the crane operator as they lower an engine into the body of an M1A2 Abrams tank at the Townsville Field Training Area, Townsville, Australia, Aug. 9, 2023. (Photo by SPC Charlie Duke)

Secretary of Defense for Sustainment Christopher J. Lowman unveiled a new Regional Sustainment Framework (RSF) aimed at generating a rapid readiness regeneration capability. Acknowledging the rigidity and vulnerability within the current sustainment strategy, the RSF looks to augment traditional strategies to improve readiness under a contested environment by bringing together existing and potential maintenance, repair, and overhaul capability and capacity closer to the forward point of need.

As new capability is rapidly fielded under modernization for use in large-scale combat operations (LSCO) and highly mobile environments, Soldiers must have the logistical capability to repair and/or replace equipment, regardless of whether it is POR. Current and projected fiscal constraints combined with recognition of overreliance on contractor logistics

support (CLS) are driving senior leader decisions to reduce CLS obligations. These factors make the need to increase Soldier self-sufficiency imperative.

Incorporating a temporary catalog of approved requirements can facilitate the accountability and reportability of a new capability. Additionally, leveraging integrated logistics support managers and rapid parts provisioning teams for urgent capability and mid-tier acquisition pathways provides an opportunity to address the challenges associated with sustainment upfront and early. This combination of resources from both acquisition and sustainment enterprises creates the best opportunity for informed discussions and data-driven decisions pertaining to overall capability sustainment strategy, be it field-level repair actions, provisioning requirements, or maintainer authorizations and skills. Applying this adaptive strategy across all

acquisition pathways mitigates short-term risk and lays the groundwork for an enterprise supply chain targeted at initial, critical requirements that can iterate to an enduring strategy should capabilities transition to POR.

In addition to employing a collective approach for modernization and sustainment, we must also consider implementing a simpler, more basic repair capability with initial fielding, allowing sustainment to keep pace with continuous transformation by reducing provisioning requirements before fielding. While the current process requires all field-level and sustainment-level maintenance actions to be accounted for in support of equipment fielding, the return on investment under modernization is quickly diminishing. Factoring in contested logistics and LSCO, the ability to provide simplified, rapid-repair capability at the tactical edge becomes more valuable than providing the full spectrum of two-level maintenance. As stated in ATP 4-33, “Maintenance conducted as far forward as possible is a combat multiplier central to operational success.” Shifting thought to an initial one-level maintenance concept focused on field-level and Soldier capability allows us to balance provisioning requirements with rapid fielding. As a result, the Soldier is afforded the tools, technical manuals, and key parts required to maintain readiness, even at the tactical edge, as well as the ability to report equipment readiness status, ensuring stakeholder visibility and prioritization of effort.

With primary emphasis in recent years on a rapid and/or adaptive acquisition framework to enhance Army readiness and combat effectiveness, we have inadvertently increased risk within the sustainment enterprise. Consequently, the sustainment warfighting function must evolve by generating an adaptive sustainment framework to meet the challenges of advancing technology and the changing character of warfare.

By acknowledging the mismatch between the pace of modernization and current sustainment processes, we allow ourselves to enable a targeted and more viable sustainment framework that minimizes risk to the warfighter. Additionally, accepting the rapid pace

of innovation and the likelihood that today’s products are not the enduring, repairable products of previous generations allows us to embrace a balanced approach to both acquisition and sustainment. Through early integration of an adaptive sustainment approach across the acquisition pathways, we not only lay the foundation for long-term strategy, but create a near-term mechanism for sustained readiness through Soldier-driven repair.

Shifting provisioning strategies to target critical requirements necessary to support prioritized capability for rapid repair at the tactical edge streamlines provisioning and pulls sustainment under continuous transformation. Incorporating POR and non-POR systems within GCSS-Army and LMP establishes a necessary foundation that empowers the warfighter with an effective sustainment tail; it also provides commanders with the ability to communicate overall unit readiness accurately. With a holistic understanding of unit readiness across the full spectrum of capability, the JSSA is postured to swiftly respond to maintenance and supply actions, ultimately ensuring the lethality, safety, and readiness of our operational force.

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early morning hours on December 26, 1776, which led to victory over the British at Trenton. However, two weeks prior to this offensive, a logistics breakdown by the British forces turned the tide of battle and enabled Washington to recoup his forces, reverse the situation in New Jersey, and revitalize the American Army.

On December 9, 1776, General Cornwallis and the British Army, close on the heels of the retreating American Army, finally reached the Jersey side of the Delaware River, only to be stopped by lack of boats. General Washington had taken the precaution of securing or destroying all boats and watercraft on the Jersey shore before crossing to the Pennsylvania side. Therefore, for a purely logistics reason — the lack of essential means of transport — an important phase of the New Jersey campaign came to an end. The British advance was halted.

In those early days of our Army, forceful, able men achieved good results in logistics operations in spite of the handicaps. On the whole, the balance — more often than not — tipped in the direction of unsatisfactory results, due to problems of untrained personnel, shortages of transportation and lack of financial resources and organization.

As the Army grew and matured through the years, the value of logistics planning and organization became more apparent. One hundred and sixty-eight years after the crossing of the Delaware, the “Crusade

in Europe” began with logistics considerations fully recognized from the beginning.

The challenge to the logisticians in 1944 was to sustain the landings on Normandy beaches and buildup an adequate supply base to support an expansion of the beachhead. With French ports in German hands, logistics planners had foreseen the need for floating pier facilities and met the challenge with unsurpassed performance. A month after the invasion began the millionth Allied soldier went ashore in France. And, equally important, ten days later the millionth ton of stores was landed, including nearly 300,000 Allied vehicles.

“From D-plus-2 onward,” General of the Army Dwight D. Eisenhower commented, “except for the great storm later in June, there was never any real danger of our maintenance failing, and the armies never went short of food for men or ammunition for the guns. On July 1, the chief administrative officer was able to report that the commanders in the field had complete freedom of action so far as supply arrangements were concerned.”

After the breakthrough from the beaches, sustaining the on-rushing armored columns also was a formidable task. This was solved with the introduction of the “Red Ball Express” transportation system which helped achieved victory.

Korea, the Cuban Crisis, and Vietnam added further challenges to

the logistician. Carrying the major portion of logistics operational responsibilities for the Army since 1962 has been USAMC. By its size and magnitude of effort, it qualifies as the training ground for Army logisticians, both military and civilian. From customer assistance offices in oversea areas, where the requirements of the user are analyzed on the spot, to research laboratories, where concepts developed by U.S. Army Combat Developments Command are tested for possible adoption, there is unlimited opportunity and challenge in USAMC for the professional logistician.

Project Management

Project management, a fertile training ground for logisticians, has been and will continue to be a way of life at USAMC. This provides a means for spotlighting projects and systems which are important in terms of national urgency, complexity, or high-dollar value. Project management — vertical management — is a proven means of attaining mission objectives — of getting visibility on important programs in terms of cost and need.

Additionally, there are many who feel that general officer selections of the future, especially in the logistics area, will place considerable weight on project manager experience. The job provides a wealth of experience, ranging from research and development, procurement and production, management, and funding to supply and maintenance in the field. In short, it provides — in a relatively short period — training

in those requisites needed by the logistics manager of tomorrow. I urge all who are interested in a career of logistics to serve a tour in a project management office.

Because of the virtually unlimited scope of activities under the USAMC banner calling for a multiplicity of skills and talents, job incentives and job satisfaction are necessary at all levels. Within USAMC the young military officer of today will find his opportunities for professional training and growth limited only by his talents. For example, a young lieutenant from Reserve Officers’ Training Corps ranks, who was responsible for operation of an experimental satellite communications test terminal, said of his rewarding experience — and the experience of other young officers — in USAMC: “Our experience here has given us a new look at the advantages of a military career. We might make more money outside, but in civilian industry we would have had to accumulate years of experience and seniority before we could hope for such positions of responsibility and authority.”

We have been successful in obtaining from the Department of the Army a priority for military personnel equal to that of the training base. This is a very high priority indeed, second only to our Vietnam effort. The results will be an infusion of high-quality supervisory talent in sufficient numbers to insure more effective management of our resources.

For the civilian logistician in USAMC, increasing attention is being placed on career programs, providing for orderly progression to top levels. We are also stressing the need for continuing education programs to stay abreast of changing technology. Since assignment to USAMC, I have become increasingly aware of the heavy responsibilities carried by USAMC civilian employees. A major objective of the USAMC reorganization plan is to provide a better grade structure for USAMC headquarters, as a necessary first step for command wide improvement.

Training of the work force throughout the Army Logistics System also will assist us in meeting the logistics challenges of the 1970s. A first-class training program is, in itself, a boost for better motivation. It is vital to morale, to our ability to innovate and to our understanding of the advantages of automation. We must send more of our potential leaders to first-class schools. Our middle managers must be prepared to assume greater responsibility and our technicians kept continually abreast of changing technology. Thus, we must find ways and means of doing our work with a reduced work force so that time can be provided for this vital training mission.

Responsibility and authority of our defense logistics managers will become increasingly important in the 1970s, when limited manpower, materiel, and money are the order of the day. The task of senior

staffs will then be — as now — to allocate shortages where they are least likely to hurt. I call it “stretch management.” At the other end of our logistics pipelines are thousands of using units. If unit commanders recognize the great national effort to provide them with their needs, they will utilize the assets with care and economy. The result can be startling. If \$100 of savings by one unit is multiplied by 1,000 units, and this becomes a way of life, big savings can be achieved.

The exercise of care and economy of logistics resources at the unit level must be augmented by disciplined management systems at higher levels. We are fortunate that this “era of challenge” to do more with less coincides with an era of management revolution based upon the use of high speed computers.

The automation of the national inventory control points (NICP) under National Automatic Data Processing Program for USAMC Logistics Management (NAPALM) will revolutionize NICP operations beginning in July 1970. The system’s design is now well along. More than 500 dedicated people are actively engaged in perfecting it. This program goes into test at the U.S. Army Aviation Systems Command in December of this year. At the same time, we are designing System-Wide Project for Electronic Equipment at Depots — Extended (SPEEDEX) for our depots. Here again, considerable progress is being made. Results of these systems will give us a visibility over our operations never

before achieved. They will permit management to more effectively use resources allocated and allow a closer association with our customers than has been the case heretofore.

We have designed sophisticated equations or models for computer assistance in force planning, force accounting, and manpower and logistics control at the top level in Washington. Computerized systems for the division, corps, and army levels are being provided for the same purpose in the field. We are designing management information systems to correlate and analyze data and to isolate problem areas.

Logisticians of the 1970s must be ardent enthusiasts for automation in all its forms. Our physical plant is run down. It must be revitalized with the latest automated machine tools and mechanized equipment. We have not yet begun to tap the managerial potential of automatic data processing. We must seek “investments for savings,” with short amortization periods, so we may continue to perform our mission with sharply reduced resources. Indeed, we must be able to increase substantially our mission effectiveness.

In the management area, the logistics family has much homework to do. Most of the legitimate criticisms we are now receiving can be traced to inadequate or inept supervision. We must perfect our procedures and controls; insist on their faithful execution; be alert to devise better procedures; be willing

to put in long hours of study and analysis to insure better performance. There is no shortcut to managerial excellence. Our workers throughout the Army Logistics System are our most precious asset. They should have a sense of pride in their work, their organization, and their mission. They must be kept abreast of what we are trying to do so that they can be part of it. Zero defects will not be achieved by exhortation alone. It takes leadership, training, understanding, and insistence on quality performance through inspection and supervision.

Success, in the final analysis, will be determined by our collective effort. We need virtuosos — but only as expert members of the orchestra. Each organizational element in the Army logistics structure has its own interests, but each element also needs a fierce pride in the logistics achievements of the Army as a whole since our common effort is devoted to one purpose — serving the soldier in combat.

Today’s logisticians are moving toward management challenges in a world of fantastic evolution. However, the challenging complexities of modern logistics management are well within the trained logistician’s ability to handle. The challenge of the 1970s will require flexibility in thought and action; a level of confidence by the public and our superiors that we can handle the job; and continuing effort by all to update our thinking, our management techniques, our attitudes and our ability to

communicate intentions and actions accurately and effectively.

This prescription for our logistics ills contains nothing new or radical. It is similar to the call of a football coach for harder drill in fundamentals of the game. The coaching staff seeks harder and cleaner blocking and tackling, better charging, alertness, complete knowledge of offensive and defensive patterns, and complete adherence to team play. A sustained team effort will give Monday morning quarterbacks little to criticize of our performance, as we meet “The Challenge of Our Times.”

GEN Ferdinand J. Chesarek was promoted to full general and became the second commanding general of the U.S. Army Materiel Command on March 10, 1969. He graduated from the U.S. Military Academy and commissioned as a second lieutenant in 1938. He served as the commanding officer of the 28th Field Artillery Battalion, 8th Infantry Division, in World War II in Normandy, Northern France, Rhineland, and Central Europe. He then served as a legislative officer in the Logistics Division of the War Department's General Staff and as assistant to the chairman of the Munitions Board at the Pentagon. He served with the Eighth Army in the Korean War, commanding the 5th Artillery Group. He served as the chief of the Military Personnel and Manpower Division at the Office of the Deputy Chief of Staff for Logistics and as the military assistant and executive officer to the Assistant Secretary of Defense for International Security Affairs. He was the chief of staff for the U.S. Army Communications Zone, Europe, and chief of staff for the U.S. Army Southern European Task Force, after which he became the commanding general of 4th Logistical Command. He was the Assistant Deputy Chief of Staff for Logistics. He became Comptroller of the Army in 1966. He was appointed senior U.S. Army member for the Military Staff Committee of the United Nations. He served as the commander of Army Materiel Command until his retirement on October 31, 1970. He received a Master of Business Administration degree from Stanford University. He also attended the National War College and the advanced management program at Harvard University. He passed away on November 20, 1993.

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