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BATTLEFIELD SUSTAINMENT

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Soldiers from the 173d Brigade Support Battalion (Airborne) participate in the base defense live-fire exercise Lipizzaner IV in Slovenia on March 13, 2018. See full feature article on page 38. (U.S. Army Photo)

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Battlefield Sustainment Requires Intuition

■ By Gen. Gustave “Gus” Perna



Logisticians and sustainers must understand and implement the art and science of anticipating units' needs on the battlefield.

Battlefield sustainment is both an art and a science; it's ultimately about synchronizing, integrating, and transporting commodities to provide maneuver commanders with freedom of action, extended operational reach, and prolonged endurance.

When it comes to battlefield sustainment, logisticians should pull inspiration from famed hockey player Wayne Gretzky who said, “I skate to where the puck is going to be, not where it has been.”

For logisticians and sustainers, this means ensuring the right commodities are already in place when commanders and their Soldiers need them. It means Soldiers are not wait-

ing for logisticians to catch up to their movements. It means logisticians have anticipated requirements based on their environment, the operation, and the mission.

The science of sustainment is not difficult; it is basic math and computations. A vehicle takes X amount of fuel multiplied by the number of miles expected to be driven. A platoon requires X amount of water for a given amount of hours. The same calculations can be made for ammunition, food, medical necessities, and every other class of supply. Logistics status (LOGSTAT) reports give us these numbers, and like the rulebook in hockey, they are the foundation of our profession.

The art of sustainment, however, requires more thought and intuition. It requires logisticians to understand their environment by studying the terrain and the enemy's position.

It is maintaining battlefield situational awareness and using all available information—from radio chatter to battle update briefings—to anticipate requirements. The art of sustainment is about thinking through how the environment affects the LOGSTATs. In the simplest example, that same vehicle that took X amount of fuel was started early to warm up on a cold day. Therefore, it will require additional fuel and sooner. A hot day with a high operational tempo means that same platoon will go through more water. These atmospheric (the art) are not given to us; we must inherently identify and consider them.

Mastering the art and science of sustainment requires logisticians to rely on their professional military education, training, and experience. A comprehensive knowledge of logistics and sustainment doctrine must

be complemented by a keen understanding of brigade combat team, division and corps requirements during an offensive attack. Extensive tactical experience is invaluable but is all the more valuable when accompanied with a comprehension of how the Army runs at the operational and strategic levels.

During deployment, it is too late to practice battlefield sustainment skills. Logisticians must exercise and engage in tough, realistic training that stresses people and equipment in order to be ready for the next contingency. Only when we merge our sustainment skills with our intrinsic expertise in forecasting, risk analysis, and supply chain management, can we ensure we get ahead of requirements and provide the best value to maneuver commanders.

Ammunition, fuel, and water—to logisticians, these can become simply computations, but they are more than a math problem. They are enablers to readiness. We must get back to our core competencies and basic responsibilities to plan, integrate, synchronize, and transport commodities at echelon in support of the maneuver commander. Future battlefields will require us to anticipate warfighters' needs, integrate logistics support, and respond rapidly with innovation, ingenuity, and agility.

Gen. Gustave “Gus” Perna is the commander of the Army Materiel Command at Redstone Arsenal, Alabama.

The Top Questions From the Field

Army's G-4 answers frequently asked questions about battlefield sustainment

■ By Lt. Gen. Aundre F. Piggee

Next month marks 75 years since my father, Staff Sgt. Roland Piggee, was a part of the Red Ball Express. This truck convoy system delivered supplies to Soldiers who landed in Normandy and were fighting their way into Germany.

To sustain the battle, the Army had 6,000 trucks traveling 350 miles each way to provide consistent resupply to the frontline.

The trucks took a tremendous pounding. They were enemy targets for the German air forces. Equally challenging were the maintenance issues: burned out motors, overheated engines, and worn out tires.

Initially, truck convoys were the only option for resupply, as the Allies had destroyed the French rail system to prevent the Germans from supplying their own troops. The Red Ball drivers contributed as much to winning the war as any unit, something my father was extremely proud of his whole life.

As was true for Gen. George Patton's Army, battlefield sustainment is and always will be key to our Army's success. Since we are in the midst of a major transformation, I have received a lot of feedback from Soldiers about improving our sustainment operations across the battlefield. Their input is valuable to me. I think it would be beneficial to all sustainers if I answer a sampling of recent inquiries from our units in the field:

What impact will multi-domain operations have on sustainment operations?

A multi-domain fight will be considerably different from the way we have fought over the last 18 years. In fact, it will be more like our World War II efforts. What's old is going to be new again, to an extent. Sustainment

operations must be ready on all levels: land, air and sea—as it was for my father's generation. Additionally, new threat considerations must also include cyber and space. And adding further complexity is the fact that we may encounter these threats simultaneously.

It would be dangerous to focus our efforts in one area and not adjust resources continually to address dynamic changes in the environment. The team at CASCOM came up with an easy-to-remember, yet all-encompassing, way to think about what logisticians need to do: the acronym SPIDERWEB.

It spells out a great checklist: be SELF-SUFFICIENT; practice PRECISION logistics; have INTEROPERABILITY with our sister partners and allies; be DIVISION-focused; be good at EXPEDITIONARY logistics; include REGIONAL resources; be WIDELY-dispersed; ENABLE mission command with enterprise resource planning systems; and have BALANCED forces.

In an actual spider web, strands are independent, but connected. It's strong and resilient. If we can do that on a battlefield, it's a good position to be in.

How can we better enable Soldiers to create solutions using today's technology on the battlefield?

If you look at the last 100 years of innovation, you see that in the first 50 years, the military led industry in technology developments. But in the last 50 years, the roles have been reversed—industry has led the military.

There are many commercially-available technologies that would allow us to do our job better on a multi-domain battlefield, and we are trying to employ them.

3-D printers are one example.



A multi-domain fight will be considerably different from the way we have fought over the last 18 years. In fact, it will be more like our World War II efforts.

Select commanders in the field can invest up to \$10,000 of their operating budgets for 3-D printers. If Soldiers print a part or tool, they can incorporate the specifications in an Army-wide digital repository so others can replicate it. The best ideas come from Soldiers just trying to maintain the equipment.

It has been a priority in Army headquarters to get rid of excess equipment, but on the National Guard side we only have a limited number of Soldiers who can make it happen. Can you elaborate on what needs to be done and why?

It has been a priority of our Army for several years to turn in and redistribute excess equipment. It should be a priority for every commander.

The process is beneficial to units turning in the equipment because the Army maintenance standard is 10/20 (This refers to the level of maintenance outlined in technical manuals 10 and 20 series.). Even if your Guard unit is not using the equipment, Soldiers in the motor pool have to maintain it.

If it's excess, turn it in. It frees up time and resources to do things that could improve readiness.

It saves supply efforts that could be put toward readiness and modernization efforts. That is a win for the Guard.

Our 2019 goal is to turn in 325,000 pieces of equipment. As we modernize and replace equipment, we will have more excess. Recently, I visited Fort Stewart, Georgia, where they are fielding the new Joint Light Tactical Vehicle.

But, just as important to them was turning in 450 excess Humvees so they could focus on the new JLTV. That is the focus we need from all commanders.

What are the Army's plans to ensure units are properly equipped to manage increased distribution requirements in large-scale combat operations?

The Army made a decision to move transportation (prime movers for troop movement) and fuel distribution assets to echelons above brigades a few years ago to restructure Brigade Combat Teams (BCTs).

We are well aware of the challenges this has created at the tactical level. We are working on addressing them.

One way is through our efforts to redistribute the equipment being turned in and moving it to high-priority units that would be the first to deploy.

Another is to purchase new equipment as we modernize the Army. We have included more resources in the budget to do so. In a large-scale operation, we also will have help from our new Logistics Civil Augmentation Program (LOGCAP V) contract to augment the Army force structure.

There has been discussion to extend BCTs' unit basic loads (UBL) from three to seven days of supplies. From our experience, we are a long way from being able to accomplish that, particularly when it comes to bulk water. Can you discuss the strategic goal?

To meet our goal of having BCTs sustain themselves beyond our current timeframe without a resupply, we have to be creative in reducing demand.

This will involve upgrading vehicles to be more energy efficient. We are aiming for a 30 percent improvement in fuel consumption.

Water was a problem for us in Afghanistan, a land-locked country. If we had a portable system for on-site water bottling, it would have significantly reduced our transportation requirements, and it would have been healthier and cheaper.

It has been 10 years in the making, but we are in the final testing for an Expeditionary Water Packaging System that will help teams sustain themselves.

We know the focus on counter-insurgency in the last two decades has resulted in gaps in logistics. Can you elaborate on how we are fixing the gaps in preparation for large-scale operations?

We have fixed many gaps by going back-to-the-basics of moving and maintaining equipment. In Europe, we are practicing moving heavy equipment that we had not moved since the Cold War.

We have developed new leaders who are engaged and focused. They have had more opportunities to practice because of increased training, including additional multinational exercises.

We have new doctrine. We have expanded our Army prepositioned stocks and are configuring them to be combat ready. We have improved our supply of spare parts with a common authorized stockage list, so combat teams can take with them a mobile supply of readiness-driving parts.

We are working on developing autonomous distribution systems, both aerial and ground, that would increase resupply throughput, reduce the number of drivers, and increase force protection by reducing risk.

A lot of hard work is going into closing the gaps. It has been worth the effort as we continue to build readiness. But it's not over. We will need to do more if we ever need our version of a Red Ball Express.

Lt. Gen. Aundre F. Piggee is the Army Deputy Chief of Staff, G-4. He oversees policies and procedures used by U.S. Army logisticians.

Sustaining the Future Fight

■ By Maj. Gen. Rodney D. Fogg, Brig. Gen. Douglas M. McBride Jr., and Maj. Graham Davidson

The principal role of the Army's sustainment war-fighting function is well established in doctrine. It is to provide support and services to "ensure freedom of action, extend operational reach, and prolong endurance." The implication is as clear as it is true; without such support, the warfighter cannot effectively generate and apply his full combat potential when decisively engaged with the enemy. The complexity of warfare during large-scale combat operations (LSCO) will increase significantly beyond that of the counterinsurgency fight, and the importance of sustainment operations to success will likewise increase.

The Distribution Challenge

Sustaining the battlefield during LSCO will be an extraordinary challenge, especially given the complexity of Multi-Domain Operations (MDO) against a peer competitor. A depot-based supply system with "iron mountains" of supplies will not work in the next fight. We must focus instead on improving our ability to accurately forecast and precisely deliver what the warfighter needs during high-volume, high-intensity operations.

The increased demands of simultaneous, geographically dispersed operations require more sophisticated planning and coordination to account for rapidly advancing units within a highly contested environment. In order to achieve precision and responsiveness, all sustainment elements must be inextricably integrated and synchronized early in the planning process and throughout operations.

The sustainment plan cannot merely be consulted by maneuver units just before execution. The plan must be synchronized in time and space to achieve the effects required by the warfighter at echelon.

The distribution challenge during LSCO is less about supply availability and more about the availability of transportation assets to deliver a high volume of supplies with precision to the right unit at the right time and at the right location.

Following the invasion of Normandy in 1944, the Third Army advanced eastward across France in pursuit of German forces while facing intense force-on-force combat operations. To maintain the pursuit, the Third Army's fuel demand was an average of more than 350,000 gallons a day.

To sustain the Allied advance, the Army consolidated trucks from various units, including infantry battalions, to form a 6,000 vehicle fleet famously known as the Red Ball Express. Despite the Red Ball Express efforts, Patton's Army was immobilized for nearly two months, unable to extend its operational reach during a time of relative advantage. This immobilization was due to inefficiencies and deficiencies in the supply chain, which created a cascading effect within the Third Army, causing shortages of ammunition, clothing, rations, and other key commodities as winter was approaching.

To put the Third Army's fuel consumption in perspective, 350,000 gallons of fuel a day will support three modern armored brigade combat teams—the maneuver arm of one heavy division—during high-intensity LSCO. This does not include enough fuel for aviation or other units in the division support area and the division consolidation area, let alone an entire field army with multiple corps.

This example highlights that today's Army requires a robust distribution network with distribution assets that support precision delivery of a vast amount of materiel and equip-



The principle of simplicity must not lead to the belief that sustainment operations are simple; they are not.

ment on the battlefield. Simply put, we cannot win with inaccurate forecasting, inefficient distribution, or simple plans.

The scale and scope of LSCO present significant challenges to our distribution networks, particularly when establishing continuous, rapid resupply to the forward line of troops and beyond. Many variables affect our ability to achieve precision and speed in sustaining the warfighter. Some of these challenges include reduced operational readiness of sustainment platforms, unpredictable turnaround times at points of delivery, stressed and targeted communications networks, combat attrition, combat loss, sabotage to key transportation infrastructure, congestion within our lines of communication, dispersion of units causing longer lines of communication, and increased security requirements to defend dispersed base clusters. None of these are simple problems for sustainers to solve.

Is Simplicity Still a Principle of Sustainment?

The difference between victory and defeat on the battlefield largely depends on the Army's ability to marshal, transport, and distribute large quantities of supplies while maintaining the forward momentum of personnel and equipment. This is achieved through continuous integration and synchronization of sustainment activities in support of the unit commander at echelon.

Our sustainers must operate as a unified team, from the strategic support area in the continental United States through the joint security area to the foxhole. This involves meticulous coordination to ensure resources are delivered to the point of need. Operating within functional stovepipes will render formations vulnerable to enemy interdiction while suboptimizing the ability to deliver critical supplies to the warfighter on time and on target.

Orchestrating all the diverse sustainment activities is complex in nature. The sustainment infrastructure

on the battlefield during LSCO will be multifaceted, consisting of multiple nodes, modes, and routes as well as redundant communications that provide our adversaries with multiple dilemmas to solve across the sustainment warfighting function.

Leveraging all aspects of sustainment to ensure that there is no single point of failure that prevents the delivery of critical supplies and services to the warfighter is critical to this effort. These aspects include the effective use of air, land, sea, inland waterways, and autonomous air and ground platforms where feasible.

In the air, sustainment operations will include fixed and rotary-wing aircraft providing air evacuation and air-land, airdrop, sling-load, and precision-guided deliveries of supplies and equipment. Delivery using air assets will be the norm rather than the exception. On land we will use multiple roads, rail networks, and pipelines to deliver goods and services to the point of need. We will also use watercraft to deliver supplies and equipment by way of seaports, rivers, canals, and off-the-shore opportunities. Included in our sustainment planning will be deception plans that are integrated at the operational and tactical levels.

The LSCO operating environment is highly dynamic and consists of multiple formations with unforeseeable interdependencies that emerge simultaneously across multiple domains. Inherently, this type of sustainment problem set will be complex; however, complexity within the sustainment warfighting function should not have a negative connotation.

Simplicity as a principle of the sustainment warfighting function may be difficult to achieve on the modern battlefield—especially if sustainment is not fully integrated in the appropriate mission command systems. It is important that we integrate our sustainment operations with other warfighting functions and ensure our staff design and staff processes are fully immersed with the warfighter.

We must exploit technologies such

as artificial intelligence, enterprise resource planning systems, and available prognostic analytical tools to enable accurate demand forecasting and achieve better responsiveness. While we will strive to build simplicity into our processes and procedures where it can be achieved, we cannot underestimate the complexity of the modern battlefield and the corresponding sustainment system that it will demand.

Security During LSCO

During counterinsurgency operations in Iraq and Afghanistan, coalition forces have enjoyed dominance across all domains with minimal threat of enemy activity overrunning critical logistics nodes. The joint operations area had a green zone with fixed and fortified forward operating bases and combat outposts where security was often outsourced or enhanced by contracted personnel or host-nation support.

In LSCO, security will not be outsourced and sustainment units will require security plans that account for operations that Field Manual 3-0, Operations, describes as “more chaotic, intense, and highly destructive than those the Army has experienced in several decades.”

Our units must be trained and proficient at defending their assigned areas. First and foremost, sustainment units will be responsible for their security. There will be no green zones; all domains will be contested. Both supporting and supported leaders must fully appreciate and understand the security measures required to secure logistics nodes and various lines of communications during LSCO.

The support area command post at echelon will play a central role in coordinating and synchronizing security assets to clear and secure key logistics nodes. These operations include prioritizing fires, route clearance, close-air support, and intelligence, surveillance, and reconnaissance. We must deliberately coordinate and communicate those sustainment security requirements on the battlefield.

We Must Educate and Train to Win

Though technology will help us deal with complexity, we cannot ignore the human dimension of MDO. The sustainment community's education and training approach must evolve to account for the scale, tempo, and rigor required to prevail in LSCO. Leaders in both the operational and institutional realms cannot allow units to run back to garrison dining facilities, supply support activities, or fuel and water points during field training exercises.

The environment in which we train must be realistic and present the challenges that units and leaders will face during LSCO. This realism is critical to having trained and proficient combat-ready units.

Leveraging live and virtual training tools, individually and collectively through the institutional, operational, and self-development domains, is key to enabling leaders and units to gain proficiencies in sustaining the complex battlefield. Leaders in the operational force and faculties in the institutions must stay relevant by understanding how sustainment will be conducted in MDO and what training tools and techniques are available to prepare Soldiers for these operations.

We need to create conditions to force both sustainment and maneuver leaders to think through the scale and scope of the distribution challenge. Whether at a combat training center, during a warfighter exercise, or at home station using the Synthetic Training Environment, we must replicate the full complexity of the operational environment with practical problem sets that allow our units and leaders the necessary repetitions to achieve proficiency.

This includes fully integrating with the warfighter's tactical networks, mission command information systems (fully functioning and degraded), and staff processes at echelon during training exercises.

Self-development is a critical component of effecting this change. Every

lower enlisted Soldier, noncommissioned officer, and officer should find ways to enhance their professional competence. They need to track lessons learned from combat training centers, maintain relationships with their peers in the operational and institutional force, and read and reflect on modern warfare and sustainment. Sustainment leaders must understand and discuss maneuver warfare and ensure maneuver leaders understand how best to leverage sustainment capabilities across the battlefield. They cannot simply expect their leadership to hand them opportunities. All Army professionals are responsible for their own development.

War today and in the future is a complex business. The operational environment that we are planning to fight in is vastly different than what we have experienced over the past 18 years, but our principal responsibility to the warfighter remains the same. The sustainment warfighting function will provide support and services to ensure freedom of action, extend operational reach, and prolong endurance so that our Army can prevail during LSCO.

This requires detailed planning across the sustainment warfighting function and complete integration and synchronization with the warfighter at echelon.

Our sustainment system must be comprehensive with no singular points of failure to ensure we achieve the required effects at the speed, volume, and lethality required for LSCO. Securing our sustainment infrastructure is critical to that end. While we should always simplify our processes and procedures, we cannot win against a peer competitor with simple plans. The operational environment requires complex solutions that provide the enemy with multiple dilemmas to solve.

The principle of simplicity must not lead us to believe sustainment operations are simple; they are not. Achieving effective sustainment support, where all sustainment require-

ments (logistics, medical, personnel, and financial) are met, requires inherently complex operations.

Maj. Gen. Rodney D. Fogg is the commander of the Combined Arms Support Command and the Sustainment Center of Excellence at Fort Lee, Virginia. He holds master's degrees in logistics management and strategic studies, and he is a graduate of the Quartermaster Officer Basic and Advanced Courses, the Command and General Staff College, and the Army War College.

Brig. Gen. Douglas M. McBride Jr. is the 55th Quartermaster General and commandant of the Quartermaster School at Fort Lee. He holds a bachelor's degree in business administration from Northeastern University, a master's degree in resource management from the University of Central Texas, a master's degree in national security and strategic studies from the Naval War College, and a master's degree in strategic studies from the Air University. He is also a graduate of the Ordnance Officer Basic and Advanced courses, the Naval Command and Staff College, and the Air War College.

Maj. Graham Davidson is the executive officer for the Quartermaster General at the Quartermaster School. He holds a master's degree in education from the University of Virginia and a master's degree in business with a concentration in supply chain management and logistics from the University of Kansas. He is a graduate of the Quartermaster Officer Basic and Advanced Courses and the Command and General Staff College.

Setting the Globe: An Interview

The commander of the U.S. Transportation Command shares his



Gen. Stephen Lyons, left, commander, United States Transportation Command, speaks with Mark Estorga, 564th Aircraft Maintenance Squadron director, about the KC-135's Programmed Depot Maintenance process, major structural repairs and the sustainability of the aging tanker. (U.S. Air Force photo/Kelly White)

Interview With Gen. Stephen Lyons

his thoughts on the organization's role in battlefield sustainment.

■ By Arpi Dilanian and Matthew Howard

Projecting and sustaining power is the cornerstone of the joint force's ability to fight and win our nation's wars. As commander of U.S. Transportation Command (USTRANSCOM)—and the first Army officer to hold the position—Gen. Stephen Lyons is leading the charge to enable the global reach of the Department of Defense (DOD). A logistician through and through, Lyons was previously the commanding general of the 8th Theater Sustainment Command, the commanding general of the Combined Arms Support Command and Sustainment Center of Excellence, and the director for logistics (J-4) on the Joint Staff. Here are his thoughts on USTRANSCOM's role in battlefield sustainment.

How have your experiences prepared you to approach the USTRANSCOM mission from a dif-

ferent perspective?

I am following in the footsteps of some giants who were outstanding USTRANSCOM commanders and joint officers; they just happened to be wearing the Air Force uniform. If you look at USTRANSCOM and its mission, you discover how big of a piece the Army really plays. In a fully mobilized joint deployment and distribution enterprise (JDDE), the design is largely built around our ability to move a decisive force, which is predominantly the Army.

Having been a recipient of this great USTRANSCOM effort – what I really consider to be a national treasure – throughout my previous commands, I have a true appreciation of the importance of the mission. My past experiences help in my current role to have the perspective and understand what USTRANSCOM support looks

like on the receiving end.

How has battlefield sustainment evolved throughout your career?

What is most important is what hasn't changed—by that I mean the purpose and nature of logistics to project and sustain combat power, provide strategic reach, and enable freedom of action. That purpose is enduring and important to underscore in terms of the logistics enterprise.

What has changed is the character of war, and how we fight as a combined arms team is changing rapidly. When you think about the National Defense Strategy, it describes our problem sets in terms of expanded battle space across all domains, timing, tempo, and transregional challenges. For logistics that means the main drivers—time, distance, consumption, damage, destruction, and those kinds of

things—are all increasing.

The last time the Army really operated at a high-intensity, combined arms offensive tempo was probably in Iraq in 2003. It was tough, but our enemy was far from a near-peer competitor. As we adapt to the changing character of war, and you think through how we deliver lethal effects, I think we'll have to anticipate and adapt logistics architecture to support the changing character of war.

How are we improving deployment readiness and our ability to set the globe?

USTRANSCOM is one of 10 combatant commands. In that context, my number one priority is warfighting readiness—being ready not only to provide an immediate force tonight but also to transition to a high-end war plan and provide a decisive force when needed. We spend considerable time assessing the sufficiency and readiness of the mobility force to meet our most demanding war plans. We've got an incredible team, in our Strategic Plans, Policy, and Logistics Directorate and the analytics team in the Joint Distribution Process Analysis Center, that does that.

The global security environment is changing quite rapidly. We must assume that we'll have to project military forces over long and contested lines of communication and into transregional, multi-domain conflict. The key to success is our ability to globally integrate mobility operations with warfighting functions and the geographic combatant commands. It's also the agility and ability to adapt and innovate and to allocate fairly scarce resources to get strategic effects for the Secretary of Defense. So we spend a fair amount of time not only operating day to day but also thinking about the high-end war plan—what that security environment will look like and what we need to do to ensure mission success.

Setting the globe is key. USTRANSCOM's strength and agili-

ty is really underpinned by a global deployment network of nodes and routes that provide pathways in the air, on land, and at sea to be able to project power. The network runs from the continental United States, at power projection platforms, all the way into various theaters of operations where we have critical relationships with our allies and like-minded partners.

Within that network, we operate airlift, sealift, air refueling, and patient movement. I think of this almost in the context of strategic maneuver; positioning forces and capabilities provides us advantages over our potential adversaries physically, psychologically, and temporally. The demand the Chief of Staff of the Army has put on the JDDE to support rotational forces is really helping us to improve readiness by forcing us to operate on a regular basis. We're also working with the services to improve some of the fleets that are aging.

How is USTRANSCOM modernizing to meet emerging threats in a multi-domain environment?

For decades the United States has enjoyed dominance in all five domains. Generally, we can deploy our forces when we want, assemble them where we want, and operate how we want. Looking toward the future, we acknowledge that our access will be contested and the continental United States is no longer a sanctuary.

If you were an adversary looking at and assessing our capabilities, I would argue you'd probably call out three credible strategic strengths. The first is global command and control. The second is our ability to project power on a global scale. And the third is our deep bench of allies and like-minded partners that have stood with us for 75 years in defense of freedom. USTRANSCOM relies on all three.

USTRANSCOM relies on all three strengths. But we should expect that an adversary will attempt to make our strengths our weaknesses.

We see this clearly in day-to-day competition below the level of armed conflict, so we're doing a lot of work to ensure we maintain our nation's comparative advantage, creating multiple options for our national leadership while creating multiple dilemmas for our adversaries.

We're working with the services on capability development. We're working with geographic combatant commands to integrate warfighting functions, such as intelligence, fires, and protection. And we're working internally to be much more resilient so we can react to the unknown, especially in the area of cyber and our networks that are critical and central to our success.

Can you discuss the development of the Transportation Management System (TMS)?

In terms of the computational processing capability, look at how industry uses data and how fast this technology is moving, and then contrast that with our DOD legacy architecture. There's a pretty big gap there. First off, I want to make sure folks understand that TMS is not a fix-all enterprise system; it's not designed to do everything for everybody. It's part of a broader enterprise approach that includes cloud computing, enterprise data management, and some other initiatives that are ongoing.

It's also worth noting that it's designed to be at the edge where troops do work and to be transactional in nature; it's not a command and control system.

The concept of TMS is this. Imagine all of the global nodes in the deployment network—power projection platforms, aerial ports of embarkation and debarkation, sea-ports of embarkation and debarkation, and distribution centers. Today those are all disparate, separate, and disconnected. Can we take a commercial off-the-shelf solution and link together all those nodes across the JDDE through a common system that can transcend ordering,

shipping, paying, and cargo tracking across the defense transportation system? That is TMS. As we look at the functional assessment for each of these nodes, the prototype we're running is really determining whether there is a commercial system that is close enough to avoid significant customization.

Think about the power of the information you're going to feed into the broader enterprise fusion and decision-making systems and if we can move in that direction.

Each of the information technology systems today grew up on their own; none are integrated. Today, for example, an aerial port has limited visibility of what's inbound to their cargo dock until it shows up. We can obviously do much better than that, and that's why we're exploring the TMS solution.

What are your thoughts on Army Futures Command?

I really applaud the Secretary and Chief of Staff of the Army for taking the initiative to streamline and expedite the acquisition process. Today we're just too slow. Our adversaries

are stealing our intellectual property and outpacing our technological advancement.

This effort to better link dynamic requirements with capability development in a compressed and focused way is a huge step for our Army, particularly for materiel development.

From a USTRANSCOM perspective, it's critical for us to be linked with Army Futures Command. Anything developed for the ground force has to be moved, so we want to make sure deployability is always considered.

From platoon to combatant command, you have commanded at every level. What advice do you have for service members across the joint force?

Do your best. Challenge yourself, and challenge your teammates. Learn something new and get better every day. And stay fit: physically, mentally, and spiritually.

The biggest thing, though, is to remember that success has less to do with rank, position, and money than most people think. I admire our young troops across the joint force who are willing to give of themselves

for a higher cause. For the most part, they do so with a happy heart.

At the end of the day, their legacy is not defined by what they accomplish individually; it's defined by how well they set the conditions for their teammates to succeed.

If you work in the private sector, it's pretty common for managers to sacrifice their people to make their numbers.

But, in this great military culture we have, it's a completely reverse paradigm where we expect our leaders to sacrifice themselves for their people. That is a very special place to be, so for as long as you serve, enjoy it and make the most of it.

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USTRANSCOM: Sustaining America's Competitive Edge

■ By Gen. Stephen R. Lyons

Today, the United States enjoys a strategic comparative advantage due to our ability to project and sustain combat power globally at a time and place of our choosing. This capability is unmatched by any other nation in the world. We continuously evaluate today's operating environment with a critical eye toward the future security environment to retain our comparative advantage.

Our competitors are watching us. Our ability to respond with military force has been a deterrent to conflict and an assurance to allies that we will defend our mutual values of freedom and liberty. We should expect that capable adversaries will attempt to degrade or deny our ability to project power and may do so without ever firing a shot.

The United States enjoyed freedom of movement for

decades; we could deploy our forces when we wanted, assemble them where we wanted, and operate how we wanted. Today, our competitors analyze our power projection capabilities and methods. Adversaries' activities in the cyber domain, infiltration of contract value chains, foreign investment in critical global choke points, attempts to erode geopolitical access, and development of increasingly potent anti-access/area-denial weapons are clear indicators of their intent to degrade or deny the ability of the United States to project the joint force.

The U.S. Transportation Command (USTRANSCOM) exists as a warfighting combatant command to project and sustain military power. Powered by dedicated men and women, we underwrite the lethality of the joint force, advance American interests, and pro-

vide our nation's leaders with strategic flexibility to select from multiple options and create multiple dilemmas for adversaries.

Support to the Joint Force

The joint force is continuously on the move conducting dynamic force deployments around the globe. For example, as a matter of routine operations this year, the Army will project 18 brigade combat teams and 22 additional brigade-sized formations in support of our National Military Strategy.

When crises arise, USTRANSCOM is prepared to pivot on short notice to rapidly respond to globally integrated priorities. In wartime, with the benefit of a fully mobilized deployment enterprise, USTRANSCOM can scale to a capacity large enough to move a city the size of Cincinnati, including all residents and their vehicles.

USTRANSCOM's global responsibilities transcend air, land, and sea. These responsibilities are executed through three component commands—the Military Surface Deployment and Distribution Command, Military Sealift Command, and Air Mobility Command—and one subordinate command, the Joint Enabling Capabilities Command (JECC).

Commercial industry also plays an important role in the Defense Transportation System. Industry partners under contract provide critical transportation capacity for both airlift and sealift, access to global trade networks, and trained merchant mariners to crew Navy vessels.

Power Projection Framework

USTRANSCOM's ability to project and sustain military forces around the world is based on the dynamic synchronization of three distinct and important elements: global deployment networks, transportation and mobility capacity, and global command and control (C2).

Global deployment networks. Power projection starts with continental United States (CONUS)-based installations and seaports and the highways and railways that connect them. Approximately 80 percent of the joint force is based in CONUS. To ensure our national infra-

structure is sufficient to support military mobilization, USTRANSCOM manages several programs on behalf of the Department of Defense (DOD), including the Strategic Seaport Program, the Strategic Rail Corridor Network, and the Strategic Highway Network. In addition, we work closely with the Department of Transportation and other government agencies to ensure CONUS infrastructure supports DOD power projection.

Overseas deployment networks consist of nodes and routes that provide multiple paths to span the globe and project forces for combatant commanders. Our allies and partners provide access to key regions, supporting a substantial basing and logistics system that expands our nation's global reach. In Europe, as our NATO allies grow more uneasy about Russian activity on their periphery, we are gaining access to new nodes across the continent. In Poland and the Baltic States, the Army is rotating forces through training areas that could become intermediate staging bases in a conflict with Russia.

Transportation and mobility capacity

Transportation and mobility capacity provides the capability to move troops, equipment, and critical sustainment within established global deployment networks. Mobility capacity consists of rail, motor transport, sealift, aerial refueling, intertheater airlift, and intratheater airlift. In a crisis, commercial transport capacity is accessible through emergency preparedness programs like the Civil Reserve Air Fleet (CRAF) and the Voluntary Intermodal Sealift Agreement (VISA). Under CRAF and VISA activation, 267 additional long-range international aircraft, 23 U.S.-flagged roll-on/roll-off vessels, and more than 70 container and multipurpose ships become available for tasking.

Airlift, such as the C-17 Globemaster, the C-5 Galaxy, and the C-130 Hercules, enable rapid power projection and sustainment of forces around the world. In addition to passengers, cargo, and other special missions, airlift enables global patient movement. Aeromedevac medical professionals provide time-sensitive, mission-critical, in-flight care to patients in transit, converting fixed-wing aircraft into intensive care units.

Tanker aircraft are the backbone of rapid global operations and the lifeblood of our joint force's ability to deploy and employ an immediate force. Aerial refueling platforms, such as the KC-135 Stratotanker, KC-10 Extender, and the new KC-46 Pegasus, provide the ability to transfer fuel to other aircraft while airborne. Aerial refueling enables rapid long distance transit that doesn't rely on enroute basing and enhances receiver aircraft sortie production in the combat zone. For example, a B-2 strike package with aerial refueling support can fly transoceanic distances to deliver weapons anywhere in the world without landing in a sovereign nation.

Sealift forces carry 90 percent of military cargo in war plans. One of the biggest ships moving our military

On an average day, 115 rail cars are moving DOD equipment, 33 ships are underway, 1,500 trucks are delivering cargo, an aircraft is taking off or landing every 2.8 minutes with 455 sorties in motion, 47 tankers are refueling aircraft, and 13 patients are airborne under expert medical care. Our wartime requirements would increase this activity fourfold to fivefold.

equipment and supplies is the large, medium-speed roll-on/roll-off (LMSR) vessel.

The capacity of one LMSR is equivalent to approximately 400 C-17s; two LMSRs can deploy an entire armored brigade combat team. Pre-positioned ships are always forward deployed with unit equipment sets and critical supplies, which affords strategic flexibility and an accelerated response in a crisis. Ready Reserve Fleet vessels are berthed in reduced operating statuses at various locations on U.S. coasts and are available within five days to upload equipment at DOD strategic ports.

Global C2

Global C2 underpins the effectiveness of the joint deployment and distribution enterprise (JDDE) by facilitating the dynamic allocation of scarce mobility forces to achieve the Secretary of Defense's strategic priorities. The transregional and global nature of mobility requirements drives USTRANSCOM to balance competing demands and priorities. Globally integrated C2 also enables us to amass mobility resources from multiple geographic regions to achieve unity of effort for high priority missions.

At the most challenging level, responsive global C2 is essential to fulfill expectations of the 2018 National Defense Strategy.

The strategy describes five wartime missions that can shift the weight of effort quickly from one to another based on globally integrated operations, requiring us to respond at the speed of war.

We must be adept at rapidly exercising global C2 given the inherent speed and responsiveness of air mobility capabilities to dynamically changing global demands. Globally integrated C2 across all modes optimizes mobility enterprise outputs and ultimately ensures mission success.

Evolving for the Future

The enormous success of the joint force over the last 30 years does not guarantee success for the next 30 years. USTRANSCOM must continue to evolve to ensure the U.S. military retains power projection as a comparative advantage.

To help shape future operations, we are leading efforts to move to a cloud-based computing environment and build an enterprise data environment that harnesses improved data analytics and sets conditions for artificial intelligence in order to improve mission outcomes. We are focused on cyber mission assurance through basic blocking and tackling—improved operator discipline, cyber hygiene, and cyber defense.

We also are advancing initiatives such as key terrain investments, infrastructure improvements, and close coordination with other agencies to ensure resiliency. We are modernizing our aging sealift and aerial refueling fleets to maintain our strategic comparative advantage over our adversaries.

We are reevaluating our role as the leader of the JDDE by looking comprehensively at end-to-end logistics to improve warfighting outcomes for the joint force. At echelon, we are encouraging a culture of innovation throughout our workforce to ensure the JDDE remains both effective and efficient well into the future. Throughout all of our initiatives, our number one priority is and will remain warfighting readiness.

USTRANSCOM is globally committed today and remains ready to transition rapidly to a fully mobilized enterprise to meet crisis and wartime requirements.

On an average day, 115 rail cars are moving DOD equipment, 33 ships are underway, 1,500 trucks are delivering cargo, an aircraft is taking off or landing every 2.8 minutes with 455 sorties in motion, 47 tankers are refueling aircraft, and 13 patients are airborne under expert medical care. Our wartime requirements would increase this activity fourfold to fivefold.

In the words of former Secretary of Defense James Mattis, "The surest way to prevent war is to be prepared to win one."

At the direction of the President of the United States and reinforced by longstanding allies and partners, USTRANSCOM ensures DOD global deployment networks and assigned mobility forces are ready to support combatant commanders and our national strategic objectives. I am amazed at our nation's ability to project military power in order to compete, deter, and—if necessary—respond to win decisively.

Our service members and merchant mariners are working around the clock and around the world to ensure mission success. The sun never sets on USTRANSCOM. Together, We Deliver.

Gen. Stephen R. Lyons is the commander of the USTRANSCOM at Scott Air Force Base, Illinois. He holds a bachelor's degree in criminal justice from the Rochester Institute of Technology, a master's degree in national resource strategy from the Industrial College of the Armed Forces, and a master's degree in logistics management from the Naval Postgraduate School.



The Cheese Has Moved

An Interview With Lt. Gen. Paul Ostrowski

■ By Arpi Dilanian and Matthew Howard

Lt. Gen. Paul Ostrowski, principal military deputy to Dr. Bruce D. Jette, ASA(ALT), addresses members of the Army Acquisition Workforce Jan. 24, 2018, at Fort Belvoir, Virginia, about ways they can streamline acquisition. (Photo by Catherine DeRan, U.S. Army Acquisition Support Center)



With more than
25 years of experi-
ence in acquisition,
operational and
joint assignments,
Lt. Gen. Paul Os-
trowski has unique
insight in how the
Army does busi-
ness. In this arti-
cle, he shares his
thoughts about
the role sustain-
ment plays in
acquisition.

Few people know acquisition better than Lt. Gen. Paul A. Ostrowski. As the principal military deputy to the Assistant Secretary of the Army for Acquisition, Logistics and Technology (ASA[ALT]), Ostrowski is at the forefront of the Army's modernization renaissance. With prior acquisition assignments that include Program Executive Office Soldier and multiple stints within the Office of the ASA(ALT) and U.S. Special Operations Command, he knows what it takes to change the way the Army does business. We sat down with him to discuss the role sustainment plays in acquisition.

Can you discuss the fundamental relationship between Army acquisition and battlefield sustainment?

The key is to understand and be able to move forward in a multi-domain fight against a peer or near-peer competitor. We've been at war for the past 17-plus years in a counterinsurgency (COIN) environment. From a maintenance perspective, we had the best of all worlds—safe zones and forward operating bases where we could bring in field service representatives (FSRs) to maintain our vehicles and equipment. If we continue to rely on FSRs to be our maintainers in large-scale, multi-domain combat operations, it's going to be a "fail."

Going forward, we have to make sure systems we develop are easy to maintain by Soldiers. We have to spend more time looking into the logistics piece as we start the procurement process. As we buy capability for the Army, we've always looked at best value across the entire spectrum. The price is important, but what is the capability it's really bringing? We judge things based on technical aspects of the capability we're going to get.

Historically, what we've not brought in is sustainability. How intuitive is this system? Can Soldiers operate and maintain it without a ton of training? If we start bringing those

factors into the evaluations up front, at the end of the day we're going to get a much better piece of equipment that is sustainable by Soldiers.

You've often said we're too focused on following processes rather than being focused on the end product. What are we doing to enable a shift in culture?

It starts at the top. You have to go out to the folks doing the yeoman's day-in and day-out knife fighting down in the trenches and let them know they're empowered. Whether it's sustainment or acquisition, let them know they are now in a position where they can take risk, because you've got their back. And that's what we've done. We've delegated authorities so they no longer have to bring 90 percent of decisions up to the Pentagon to get a "yes or no" answer; they're empowered to make their own decisions. We've cut down the amount of documentation required so they can focus on what's important.

What is important? The measure of success isn't getting to a milestone in the acquisition process. It isn't, getting into the engineering, manufacturing, and development phase or going into low- or full-rate production. It's about getting capability to Soldiers. If you keep your eyes on that prize, everybody wins.

Change is hard. There is a great book about change, *Who Moved My Cheese?* If you haven't read it, the point is the cheese has moved and we have to embrace that and move with it because it's going to make the difference for Soldiers and their survival on the next battlefield. That's where our attention must be focused, not on whether we followed a strict process or checked a block. The question is, "Did we develop and put capability in the hands of Soldiers to make a difference on the battlefield?"

So it's up to leadership; we have to lead our way through this. It's making a difference; people do feel empowered. Some don't and are leaving

our forces, and that's okay because they've done great work all these years. But it's about being able to adapt.

Companies adapt all the time; the government must be able to do the same. I know our people can do it. You just have to ask, empower, and trust them.

How are processes being reformed to bring new technologies to the war-fighter faster?

Quite frankly, it started with the hill. Congress has done a great job helping us. They understand our Cold War-era acquisition processes could not be sustained moving forward for two reasons. First, the threat doesn't have to worry about those kinds of processes. They are not constrained by heavy oversight efforts that are lethargic, conservative, and lead to capabilities already almost obsolete by the time they're fielded. Second, technology has been evolving at such a rapid rate that Moore's Law is no longer applicable in many sectors. Things don't come and go within two years; it's less than that. For some electronics, it is two weeks or even two days.

In looking at their oversight of the Department of Defense (DOD), Congress realized the amount of regulation in place was preventing us from bringing on next generation capabilities at the pace needed to get ahead. So they legislated several things to give us an opportunity to do business differently. We are getting away from a lockstep, regulation-based federal acquisition process in favor of doing business the way industry does business with industry.

This has opened up a ton of opportunities. Options like "other transaction authorities" (OTAs) are allowing us to engage both traditional and nontraditional partners in a much more expeditious and conversational environment, while maintaining the legal sufficiency to move forward with contracts. Not only can you

experiment, make use of the prototypes, and take them through low-rate initial production, but you can also begin fielding and go to full-rate production. That's huge.

DOD typically does business with about 5,000 companies in the United States; there are over 23 million. Those other 22,995,000 have a lot of technology that may have a military application. Some were never designed to be dual-use, but that doesn't mean we're not able to use them. In the Army, there's lethality and fighting and winning our nation's wars, but what else do we do? Humanitarian assistance, disaster relief, you name it—there are tons of things beyond the lethality piece where we need those same kinds of capabilities.

Think about communications and surveillance. Are things like those new Ring doorbells not intelligence, surveillance, and reconnaissance (ISR) tools? Sure, they were designed to protect your home, but how many thousands of ways can we use them? Take my uniform. We have tons of outdoor enthusiasts in the world and a market that answers their demand for lightweight, breathable, all-weather clothing; isn't there a military application for that? The answer is yes.

It's a really interesting environment we find ourselves in. We have to reach out to these companies and small startups and help the incubators and accelerators. Finding these technologies can help solve our problems faster.

What impact has two years of favorable budgets had?

Prior to the last two years, we took the limited resources we had and focused them on gaining readiness. It has paid off in the past, and we can expect it to pay off in the future. By 2022, we're on track to have 66 percent of our brigade combat teams (BCTs) at the highest level of readiness. Even in the meager years, readiness was always the number one priority. We have

to be able to fight tonight.

More recently, we've had the opportunity to take advantage of additional money. Congress helped us out with funding beyond the limits set in the Budget Control Act (BCA). Because of that, we've been able to focus money toward beginning the science, technology, research, and development work necessary to bring on next-generation capability. We're beginning to get past being in a position where we have to maintain parity and just continue to upgrade current capabilities without ever really getting overmatched.

The additional spending is allowing us to bring about the cross-functional teams at Army Futures Command (AFC). Look at air and missile defense, for example. We've had the best air defense artillery in the world up to date—the U.S. Air Force. In terms of being able to defend our equities and forces in COIN environments, the Army never had to put money into missiles and space because we had air dominance; we're not going to have that against a peer or near-peer competitor. So we're focusing money into those particular areas to modernize and are making great progress.

The question is how long can we keep that up? We can't count on continued increases in the budget forever, so we've had to make hard decisions. This year, we've moved over \$30 billion around in the Program Objective Memorandum to get after modernization. Normally, when you move \$5 billion around, it's a lot; when you move \$30 billion, it makes a statement.

We are focusing this Army on those modernization priorities. Whether we go back to BCA levels or sustain the \$180 billion-plus budget we had last fiscal year, our modernization priorities are going to be fully funded. We've made that commitment.

How does sustainment tie into AFC?

There are three pillars within AFC: futures and concepts, combat capa-

bilities development, and combat systems. Futures and concepts looks at what tactics, techniques, and procedures (TTPs) we will need to fight and win on the future battlefield from that pure competition perspective. What are the TTPs for operations in a megacity or underground?

Futures and concepts also helps develop the unit of action. Right now, we're organized around BCTs. That's worked fairly well with respect to COIN environments and under AirLand Battle doctrine. But with Multi-Domain Operations—the concept we're evolving into doctrine—what kind of unit of action will we need to dominate in those kinds of environments? Are we going to need cyber or space warriors? What impacts will technologies like artificial intelligence, robotics, or quantum computing have?

The second pillar, combat capabil-

ities development, then takes those concepts and begins the experimentation to bring about materiel solutions. This allows us to visualize and produce physical models of equipment to take to Soldiers for feedback. If we're going to fail on something because it doesn't work, we want to fail early and cheaply. But because our funding and attention are focused on those modernization priorities, and because we're getting the Soldier involved early and upfront, if we win, then we get big wins.

Together, futures and concepts and combat capability development also address lifecycle sustainment management and the long-term viability of our systems. Along with our program managers (PMs) and contracting officers, they ensure we factor in sustainability—in terms of both reliability and maintainability—upfront and are designing and building easily

intuitive systems for our Soldiers.

The last pillar, combat systems, is the acquisition community. Here at the Office of the ASA(ALT), we are a separate entity from Army Futures Command. But we are nevertheless linked because we are the ones to take those experimentations and turn them into pieces of equipment that can be fielded. The combination of all three pillars working together is really what's important.

Can you elaborate on some of those game-changing technologies?

A big focus is gaining standoff from the threat. One of the things other nations understand is they never want to go into a close fight with the United States; our close fight capabilities are phenomenal. Nobody wants to go up against our BCTs in a one-on-one fight. So what have they



U.S. Army Space and Missile Defense Command/Army Forces Strategic Command engineers and leadership brief Dr. Bruce D. Jette, Assistant Secretary of the Army (Acquisition, Logistics and Technology) on the capabilities and progress of the command's Mobile Experimental High Energy Laser, or MEHEL, during a Feb. 13 visit to the command's headquarters at Redstone Arsenal, Alabama. MEHEL is a science and technology prototype for warfighter familiarization and training with high-energy lasers utilizing a Stryker armored vehicle as the platform for integrating the systems. (Photo by Ronald Bailey, U.S. Army Space and Missile Defense Command)

done? Rightfully and understandably so, they've bought standoff—the ability to attack us in depth and from a much greater distance than we can reciprocate. We're outgunned and outdistanced in certain areas right now. We have to turn that around.

Hypersonic defense will give us the ability to reach out and touch threats at much greater ranges than we can today. Robotics will allow us to keep Soldiers out of harm's way. Whether it's clearing a complex obstacle or providing ISR capabilities in the air and on the ground, robots and unmanned aerial systems (UASs) can keep Soldiers apart from the upfront threat.

Within the next four years, we'll also be bringing in high-energy lasers designed to intercept rockets, artillery, and mortars (RAM), UASs, and cruise missiles. Right now, if we want to take down a \$500 UAS, we shoot a \$100,000 missile at it. It's very effective, but is that really the best way to take care of that particular target, especially in a swarm environment?

We do it today because we have no other way of doing it. Iron Dome, for instance, is the Israeli system that takes down RAM. We have Patriot missiles and a variety of other options to go after certain sets of select targets. But high-energy lasers open up a whole new realm because they have an unlimited magazine. As long as the system is fueled, we have the ability to fire as many shots as we need to take down a swarm of UASs, or as many barrages of artillery or mortars as necessary.

These are just a few examples, but there are tons of others. Technology will be critical to our ability to fight and win in a peer or near-peer fight. Most importantly, though, it allows us the opportunity to deter—never going to war in the first place.

Are there any lessons learned the Army can capitalize on?

We all have our successes and failures; we must be able to look in and see what happened. Regardless of

service, I've seen a common theme throughout my career: to get to the end game of a capability in the field, you have to start off with a requirement that's executable.

What do I mean by that? If I'm asking for a hoverboard that can hold a Soldier and fly at 10,000 feet in today's fight, that's called unobtainable; it just does not exist. In the past the services, and frankly the Army, have often written their requirements in a vacuum. A requirement developer would say, "I want 99 percent confidence this thing can do what it's supposed to do 99 percent of the time." That's great, but it's going to cost a billion dollars and 10 years to test to the 99th percentile. What if we say 80-80 percent and then hold the contractor responsible for 99-99 percent?

The other thing is asking for certain technical readiness level (TRL) requirements. Somebody can say we're already at TRL 6, but there's the component, the system, and the integration piece. Just because you have an alternator at TRL 6, does it make a difference to the engine when you put it in? What's its TRL now? What about when you put the engine in a vehicle? We may be at a TRL 6 in one place, but that does not mean we're at that TRL level across the board from a system and integration perspective.

Go back over time and look at the failures of all the services. We were too easy to rush to requirements that were unobtainable. The technologies weren't achievable in the time frame we thought they would be. We misdiagnosed where we were from a TRL perspective, and we allowed requirements creep to continue and continued to gold-plate the capability. If you look across the board, that set of circumstances always gets us in trouble.

We have to break that, and that's what we've done with the cross-functional teams. Requirement developers aren't writing requirements in a vacuum anymore. The science and technology folks are in the room say-

ing, "Nope, that technology's just not there yet; don't ask for that because it's not going to happen."

You have a tester on the team saying, "Don't ask for 99-99 unless you want to pay for the testing, in time and money, to get that reliability and confidence."

The PM and contracting officer are there; industry is there. You've gone through the whole process with the right people in the room so that when we write a requirement, we know it's achievable.

And once we get that requirement locked in and the Chief of Staff of the Army has signed off on it, nobody gets to change it. Only the chief can make that decision. All of these factors will stop a lot of the fallacies we've been known for in the past.

To sustainers in the field, what advice do you have as the Army reaches an inflection point for modernization?

Stay engaged. Right now, we need feedback from across the entire force. We have to be sure we are doing the right things in terms of sustainment. The way we're going to find that out and know if we're doing a good job, bad job, or something in between is through feedback from those living it every day. It's easy to sit here and think the world is great from the Pentagon, but it is a much different story, most likely, out in the force. We need you to stay engaged and continue to give us that feedback so we can continue to develop this process and make it even better.



Mine Resistant Ambush Protected vehicles are staged at Pier 8 to be processed and transported by the 517th Movement Control Team, 25th Transportation Battalion, Materiel Support Command Korea, and the 551st Inland Cargo Transfer Company, 498th Combat Sustainment Support Battalion, MSC-K Nov. 28, 2017 at Busan, Korea. (Photo by Sgt. 1st Class Vincent Abril)

Battlefield Sustainment on the Korean Peninsula

■ By Maj. Gen. Michel M. Russell Sr. and Col. William L. Ellis

Since 1953, the Korean Peninsula has been under a United Nations Command (UNC)-led armistice between the Republic of Korea (ROK) and the Democratic People's Republic of Korea (North Korea). In order to maintain this armistice, Eighth Army has remained forward-deployed on the peninsula.

Strategically, this arrangement has been anchored by our ROK-U.S. al-

liance, which serves as the keystone for all military and political activity on the peninsula. Our relationship with the ROK was born of blood and shared values that have inextricably linked our two countries for over 68 years. For 55 of those years, the 19th Expeditionary Sustainment Command (ESC) has provided operational-level sustainment to the Eighth Army and U.S. Forces Korea (USFK).

The delicate balance between armistice and contingency operations has been tested in the last 30 years. North Korea has conducted numerous provocations against the ROK. These range from the first Rodong missile flight in the 1990s to the Hwasong-15 missile flight in November 2017 to an aggressive, evolving nuclear program that now includes a theater ballistic missile with potential nuclear capabilities.

The 19th Expeditionary Sustainment Command prepares for battlefield sustainment by setting the peninsula, establishing the sustainment framework for a transition from armistice to contingency operations, and activating of this framework using multi-modal operations.

Even today, as our national authorities negotiate for peace on the international stage, the need for the ability to “Fight Tonight,” if required, still remains.

Readiness, being ready to fight tonight, is the way of life here. It is the reason we are stationed on the Korean Peninsula. Everything we do must focus on maintaining and improving readiness because, should deterrence fail, we must be ready to engage in combat operations with little or no warning.

If we were to transition to combat operations, how would we execute battlefield sustainment? We would accomplish this mission by setting the peninsula, establishing the sustainment framework for a transition from armistice to contingency operations, and activating of this framework using multi-modal operations. Additionally, we must creatively use innovative economy of force and equipment utilization in order to provide Eighth Army operational reach, freedom of action, and prolonged endurance.

Setting the Korean Peninsula

Our essential contribution to the Eighth Army mission to be ready to “Fight Tonight,” is for the sustainment community to be ready to sustain the fight tonight. Over the last two years, in response to the severity, threat and type of provocations from North Korea, readiness on the peninsula has been at an all-time high. As our maneuver forces train and prepare for any eventuality across the full spectrum of operations, so does the sustainment community.

Our Army senior leaders have ensured that our Army forces on the peninsula have all of the supplies required to support a wide variety of contingency operations. This push for readiness started a flow of materiel to set the theater at a rate unseen since Operation Desert Storm.

The “tyranny of distance” in getting the supplies from the strategic rear to the peninsula was just the first in a series of challenges. The Army has

consolidated its foot print at Camp Humphreys and closed most of its installations in Seoul, northward, and on the west coast.

As installations closed, there was an influx of supplies, including class II (clothing and individual equipment), IV (construction and barrier materials), VII (major end items), VIII (medical materiel), and IX (repair parts). Those supplies filled every bit of warehouse concrete and blacktop space in the Daegu-Busan enclave.

Coordination for class V (ammunition) was conducted through numerous All Things Pacific and Korea forums led by Eighth Army, U.S. Army Pacific, Army Materiel Command (AMC), and the Army Staff. Further coordination was required to determine where to store the multiple containers of class V, since all ammunition depots and ammunition supply points belong to and are managed by the ROK. Increased net explosive weight was added to the depots that were already near capacity. This was accomplished by accelerating the removal of 3,500 containers of obsolete munitions from War Reserve Stocks for Allies-Korea in order to create additional storage space.

The close synchronization and shared efforts of the ROK-U.S. alliance facilitated one of the largest and fastest movements of preferred and conventional munitions to one area of responsibility since Operations Iraqi Freedom and Enduring Freedom. This relationship is one reason why the ROK-U.S. alliance is so vital to the successful defense of the ROK.

Delivering these classes of supply on time and in the quantities required was just the first challenge that our Army leaders and strategic partners overcame.

Establish the Sustainment Framework

Since 2018, the Army has been able to set the theater to support large-scale combat operations on the Korean Peninsula. This means it can quickly get enough supplies to the



Daegu is the fourth largest city in the Republic of Korea. This view of the city from Apsan Mountain shows Camp Walker in the foreground and Camp Henry in the center top of the photo. (Photo by Kevin P. Bell)

peninsula but not necessarily position the supplies in tactical locations that make them easily accessible and defendable in order to support the tactical fight.

It has been our focus, over the past year, to design and implement a concept for the operational storage of supplies that directly contributes to smooth and efficient distribution of supplies in support of a transition to contingency operations. As we work through these challenges, we looked at the basic building blocks of battlefield sustainment in order to support a tactical fight and sustain the theater. These building blocks are synchronization, distribution, communication, mission command, and the following principles of logistics: integration, anticipation, and responsiveness.

In addition to being prepared to transition to combat operations, we had to consider our directed wartime tasks—executing noncombatant evacuation operations (NEO), reception, staging, onward movement and integration (RSOI) operations,

and Army support to other services (ASOS). This sometimes includes requirements based on agreements with the 16 United Nations Sending States.

Synchronization, integration, and coordinated execution, along with greater transparency, were critical as we planned for future operations. At the combined and joint levels, we led and participated in numerous Eighth Army tabletop exercises and joint and combined tactical discussions to include USFK-ROK and Department of the Army-led rehearsals.

In order for our strategic and operational enablers to support the tactical fight, they have to understand all of our requirements for each phase. To support this understanding the 19th ESC has expanded its ability to conduct near-term planning and prepares future plans 45 to 60 days out.

Because the 19th ESC does not have a G-5, it depends on the 8th Theater Sustainment Command's future operations cell to provide

operational to strategic reach-back planning and integration. The 19th ESC has created its own G-3/5 in order to plan for future phases and potential eventualities and leverage its sustainment framework to help Eighth Army shape the battlefield for follow-on operations. This provides the Eighth Army with the freedom of action to gain the initiative and maintain momentum in support of the scheme of maneuver.

Additionally, simultaneous planning and synchronization of war-fighting functions enable us to develop actionable plans in conjunction with the G-3, J-3, and C-3 and G-5, J-5, and C-5 from the joint and combined headquarters. We must plan across the joint and combined force because each requires unique considerations. While this seems obvious, it is often one of the biggest challenges sustainers face if they are not involved in the initial development of a plan.

Trying to develop a concept of support for a plan you do not fully



The 19th Expeditionary Sustainment Command conducts combined joint logistics over the shore operations by off-loading military vehicles from Army ships in Busan, Republic of Korea, on April 13, 2017. (U.S. Army Photo)

understand or for one that is not fully supportable from a sustainment perspective is not only frustrating but potentially adds extreme risk. 19th ESC planners were involved in the entire development process for the operation plan as it was vetted, through USFK, UNC, the Combined Forces Command, Indo-Pacific Command, and the Joint Chiefs of Staff, to ensure it was feasible, sustainable, and executable from both a maneuver and logistics perspective.

Lastly, the plan had to be further integrated at the joint level because of Eighth Army's ASOS mission. Once Eighth Army becomes Army Forces Korea, during contingency operations, it provides critical classes of supply and services to the joint force. This ASOS mission has several sustainment impacts for supporting other services with classes of supply and common user land transportation assets. This adds additional complexity to our battlefield sustainment framework.

Activating the Sustainment Framework

When it comes to setting the peninsula and optimally positioning supplies to enable quick and immediate access, the true devil in the detail belongs to activation of the concept of support. Even though 19th ESC is in direct support of the Eighth Army and is under the operational control of the 8th Theater Sustainment Command during combat operations, it is also part of the combined fight. Multiple competing demands for finite resources and services require an extensive multi-modal logistics support plan that reaches from the sea to the demilitarized zone and beyond.

The heart of logistics on the peninsula is distribution—the 19th ESC's primary method of extending Eighth Army's operational reach and endurance. This is especially challenging when looking at class I, IIIB (bulk petroleum, oils, and lubricants), IV, V, VII, and VIII. Sustainers must

understand the logistics network from our industrial base all the way to the tactical point of delivery and the sequencing and timing of moving personnel, equipment, and supplies across vast distances and possibly through anti-access/area-denial environments. Additionally, we depend on sea and air component commands to maintain freedom of access to the air and sea lines of communications leading to and from the peninsula. The successful execution of NEO and RSOI depends on access to our critical air and sea ports of debarkation.

Innovative Economy of Force and Equipment Use

Battlefield sustainment requires us to be innovative in our approach to maintenance and supply. In the event of a contingency, combat systems will be repaired by the heavy repair division of Materiel Support Command-Korea (MSC-K). This organization conducts sustainment and depot-level repair programs in order

to maintain Eighth Army readiness. However, during contingency operations, MSC-K's repair capability and capacity will shift, and the organization will become the combat power generation center to quickly repair battle-damaged equipment.

Through MSC-K's professional and very skilled workforce and our current transportation network, we can significantly affect the combat operational readiness rate of critical combat systems. This reduces the Eighth Army's initial reliance on class VII being shipped from the states and provides the industrial base the time needed to activate the resupply of critical class VII major assemblies and combat platforms.

In addition, AMC, through its life cycle management commands, has deployed two forward repair activities (FRAs) to the peninsula. These FRAs have directly increased our combat and communications systems' readiness.

The 19th ESC co-hosted sustainment summits with the Eighth Army to identify and resolve tactical to operational supply challenges for class IX repair parts. We also worked closely with AMC to make many class IX improvements, to include closely monitoring and improving all supply metrics to within Department of the Army goals and refining the use of Global Combat Support System-Army at all echelons.

As we look at operations on the Korean Peninsula, it remains essential that we maintain immediate access to the modernized Army Pre-positioned Stock (APS) 4, which is forward deployed to Camp Carroll in Daegu. We have operationalized war reserve secondary items in APS 4 by transferring them to MSC-K in order to greatly improve readiness. The Army Sustainment Command, through the 403rd Army Field Support Brigade, also has reconfigured the APS 4 fleet into ready-to-issue combat sets. This has directly improved our RSOI issue time, providing Eighth Army combat power faster and more efficiently.

Unique to the battlefield sustainment construct here is our dependence on ROK wartime host-nation support. During contingency operations, the joint force has access to over 22,000 members of the Korean Service Corps (KSC). These paramilitary ROK soldiers provide invaluable skilled labor that quickly extends our sustainment capacity throughout the peninsula and to rotational and deploying units by supplementing logistics requirements with a ready and in-place workforce.

Also, through agreements with the ROK Ministry of Defense, wartime host-nation support in the form of logistics equipment is identified and issued to the joint force during combat operations to enable logistics throughout the peninsula.

USFK approval of Logistics Civil Augmentation Program 5, administered by AMC, will provide essential sustainment functions that the current force structure does not retain, including NEO and RSOI requirements. This is the first time the Logistics Civil Augmentation Program has been made available in the ROK.

In this article, we have discussed how the Korean Peninsula is set, the sustainment framework that is in place during armistice, and how this framework is activated to support contingency operations. Additionally, we must now understand how one mission drives the operational to tactical sustainment structure. One of the major challenges to effective operational to tactical situational awareness of the multiple modes, nodes, and formations throughout the ROK is the lack of communications equipment authorized to the ESC and its down trace units. There is also an essential need for an embedded tactical signal element with the capability to support distributed logistics operations across the entire peninsula.

The underlying premise for most operations on the peninsula is that distributed logistics is executed by units that must have a high degree


of organic mobility. With the threat of theater ballistic missiles, special operations forces, and other asymmetric North Korean forces focused on sustainment inventories and infrastructure, logistic formations must be more agile, connected, and cyber-hardened, and they must retain situational awareness and mission command on the move.

The Korean Peninsula has some of the most challenging mountainous terrain that impacts communications. It also has numerous water obstacles, bridges, tunnels, and megacities. These challenges coupled with the potential flood of noncombatants fleeing from the north to the south under NEO directives create a distinctive fog of war that we plan for every day. Consequently, our logistics formations must be adequately equipped with up-armored vehicles to protect themselves while delivering supplies and services on time, every time.

As always, it is our professional warrior logisticians that execute graduate-level logistics in direct support of the entire spectrum of operations on the peninsula. We do this in spite of numerous challenges, atmospheric, and the tyranny of distance. Our mission to support the fight tonight is one we do not take lightly, as we build upon our 55 year legacy of being the Army's only permanently forward deployed ESC. Team 19 ... Pacific Victors ... Katchi Kapshida!

Maj. Gen. Michel M. Russell Sr. recently served as the commanding general of the 19th ESC. He will serve as the assistant deputy chief of staff, G-4. He previously was the USFK J-4, Combined Forces Command deputy C-4, and the United Nations Command deputy U-4. He also served as the Chief of Transportation at Fort Lee, Virginia.

Col. William "Bill" L. Ellis is the support operations officer for the 19th ESC. He holds a bachelor's degree from Portland State University and a master's degree from Webster University.



■ By Arpi Dilanian and Matthew Howard

From private to sergeant to three-star general, retired Lt. Gen. Larry Wyche is the epitome of an Army logistician. Across multiple assignments at Army Materiel Command (AMC) and during his time as the commanding general of the Combined Arms Support Command at Fort Lee, Virginia, Wyche developed a reputation for ensuring our warfighters had what they needed when they needed it.

Here are his perspectives on the challenges of battlefield sustainment and how the Army is preparing to succeed in the future.

How has the Army's evolution impacted sustainment throughout your career?

We're a very different Army today than when I joined back in the mid-1970s. For example, when I became

a Soldier, we had significantly more forces in Europe, forward stationed against the Cold War-threat of the Soviet Union.

As logisticians our role was to ensure we had the "big logistics tails" that ensured we could meet, delay, and push back Soviet and Warsaw Pact forces. That involved planning and moving huge amounts of equipment, materiel, and resources to support corps- and division-sized units

Maintaining the Warfighter Logistician Mentality: An Interview With Retired Lt. Gen. Larry Wyche

A former deputy commander of Army Materiel Command and commanding general of Combined Arms Support Command outlines what logisticians need to remember about sustaining the future fight.

in major combat.

Today, the Army is a brigade combat team (BCT)-centric force. We're a smaller presence in Europe and more continental United States (CONUS)-based. We are deploying BCTs and units rotationally around the globe in support of combatant command requirements.

For logisticians, it's not about massive flows of logistics, like it was in the 1970s and 1980s. Today it's about

precise, tailored, expeditionary logistics support that allows warfighting commanders to have what they need, while still being light enough, agile enough, and fast enough. It's about right-sizing the logistics element to minimize our footprint and be able to move forces quickly and fight continuously.

Let me put these changes into the perspective of shoot, move, and communicate. When I first entered the

military, I was a [military occupational specialty] 19D, cavalry scout. When you talk about shooting, it was the M16 rifle, the M60 machine gun, and the M72 light anti-tank weapon. Now, with the M249 squad automatic weapon and other advanced weaponry, it's absolutely amazing to me how much more lethal the Army has become at the company level over the past several years.

When it comes to the "move" part

For logisticians, it's not about massive flows of logistics, like it was in the 1970s and 1980s. Today it's about precise, tailored, expeditionary logistics support that allows warfighting commanders to have what they need, while still being light enough, agile enough, and fast enough. It's about right-sizing the logistics element to minimize our footprint and be able to move forces quickly and fight continuously.

of that equation, in the old days, we had the jeep, the old "deuce and a half" [2 1/2-ton] cargo truck, and the commercial utility cargo vehicle. Compare the M113 [armored personnel carrier] and the M114 [armored fighting vehicle] to the Bradley fighting vehicle. Now we're looking at a future of next-generation combat vehicles, some manned and some unmanned and robotic, that will give us overmatch against peer competitors.

Last but not least is communicate. We had the old AN/PRC-77 radios you put on your back, and the TA-312/PT field telephones where you'd run a landline after you moved in and occupied an area. That's how we did comms. When you look at the technology we use to talk and stay connected today and at how much more globally connected we are, it's like night and day. We've brought an entire Army network together and placed it in the hands of Soldiers at the tactical level.

Having said that, all that technology comes with some challenges, because you have to be able to repair and sustain those new types of equipment. You have to be able to integrate all of the systems together and provide precision logistics to sustain them over time. It's a double-edged sword. We're at the point now where we're exercising much of this new technology and equipment. Overall we're doing well, but ensuring our logistics is as sophisticated as our new weapon systems is a big challenge.

I would also argue we've made a major transformation from a leader development standpoint, from the time I came into the Army 42 years ago. When you look at our Soldiers now, especially over the last 17 years, our standards and leadership have improved significantly, and it's unbelievable what they can do.

What were some of the greatest challenges you faced during your tours at AMC?

I had the opportunity to serve at

AMC as the commander of Joint Munitions Command, the AMC G-3, and then finally as the deputy [commanding general of AMC]. I really enjoyed AMC, and I worked for four great commanders. During my time in and out of those positions, our biggest challenge was ensuring we didn't lose our warfighting edge as we transitioned out of Afghanistan and Iraq. Over 15 years, we had proven ourselves in combat, and we could not afford to come back to the CONUS and go flat. So to maintain that warfighter-logistician mentality, we forced our leaders within AMC to get out and to continue developing those relationships, letting the force know we were still there to support them. That's easier said than done.

The other significant challenge was the supply availability of repair parts to maintain the readiness of our systems. When you look at the type of wars we had been involved in, we were a rotational force deploying primarily to Iraq and Afghanistan. We didn't use as many of the heavy platforms and weaponry we normally would have in a more conventional fight, such as M1 Abrams tanks, Bradley fighting vehicles, and M88 [Hercules recovery vehicles].

As a result, the industrial base – both DoD and commercial – has adjusted accordingly. Once we transitioned to a CONUS-based Army supporting multi-domain operations, some of those repair parts were not available to maintain our fleets. It was no one's fault, as we were focused on the war we had to fight at the time, but we weren't quite ready for the war we potentially confront today.

So now we're getting the industrial base geared back up to support the type of Army we are transitioning to. Are we there yet? No. But when you look at the number of BCTs we have trained and ready to fight versus a couple years ago, we're much better than where we were.

How have advancements in end-to-end asset visibility improved our ability to sustain the warfighter?

We can see ourselves from the manufacturer all the way to where the part needs to be on the battlefield. That's irreplaceable. The challenge is understanding where the chokepoints and lack of system integration are in the pipeline that can limit the maneuverability and options available to our warfighters.

Identifying chokepoints becomes even more important—and difficult—when you consider the global supply chains for our modern, integrated weapons systems. There are more chokepoints in these chains, and it requires more analysis to identify where these points may emerge and how to mitigate their consequences. When you talk end-to-end logistics sustainment today, you're often talking about long distances and a large number of players in the supply chain. Now that we can see ourselves better, we have to look at our efficiency and effectiveness.

End-to-end visibility also allows us to better identify requirements and to have better forecasting. As a result, we're able to address some of the challenges we've had with our industry partners as they develop solutions to meet our requirements. At the end of the day, this strengthens our industrial base and facilitates readiness.

What impact will Army Futures Command (AFC) have across the enterprise?

AFC is a big win for our Army. You have one command with the right structure and leadership to synchronize and integrate requirements and acquisition—a single focus on developing future capabilities from beginning to end. AFC will reduce the time it takes to validate requirements and procure equipment.

Over the past 17 years, we were focused on making sure our Soldiers had what they needed at a particular moment on a particular kind of battlefield. As a result, we didn't put the resources we needed into mod-

ernization, so we lost some of our technological advantage. With so many unknowns in the world today, we cannot afford to take the time we have taken in the past to put something in our Soldiers' hands. I truly believe we won't have that problem going forward because of the establishment of AFC.

The other piece is our relationship with industry. When you think about the Army, and the Department of Defense as a whole, we have a huge impact on government resources. But in the scope of big research and development efforts, we're actually quite small in certain key areas. It is unbelievable what technology is out there in commercial industry. Reflect on Steve Jobs—he started in his garage! We have to do a better job of seeking out all the other developers like Steve Jobs, and the technologies we desire, within industry. It has to be a very deliberate, focused effort, and AFC will help with this. Having said that, resources must come with it to be able to execute. Army leadership is very aware of this, and I think we will see great things from AFC moving forward.

What is most important for success as we shift to a large-scale, multi-domain environment?

Leader development—the key to our future is the ability of our leaders and Soldiers to execute on the battlefield. We have to put in the investment to develop them; we're not teaching them what to think. We're teaching them how to think. They must be able to think on their feet and deal with a myriad of challenges.

We must also continue to rely on our noncommissioned officer (NCO) corps. Having been an NCO, I know firsthand what our NCO corps has done to make our Army the best in the world. Not every Army in the world has the kind of professional NCO corps that we do. In some ways, our NCO corps is our secret weapon. These Soldiers epitomize the model of what you want a Soldier to be:

bright, articulate, and results-oriented, while taking care of people. And I truly believe we have only begun to scratch the surface of the potential of our NCOs.

There are obviously other areas we have to address, such as organizational structure, unit types, and the entire DOTMLPF [doctrine, organization, training, materiel, leadership and education, personnel, and facilities] spectrum. But our Soldiers will adapt to the new multi-domain approach to operations and the accompanying new doctrine.

What is the greatest lesson you have learned that all Soldiers should have in their hip pocket?

Treat everyone with dignity and respect. Understand that everyone deserves good leadership, and we are all members of a team of teams, so don't let your ego get in the way of that. Cultivate the ability to keep your eye on both the big picture and the little details—especially as a logistician—and develop a commitment to serving others and your organization selflessly.

A great logistician has to anticipate what the commander will need and when and where they'll need it before the commander does. Logisticians need to keep one eye on the present and the other on what's next. No commanders want their options limited by a lack of logistics. And while no organization can afford to have everything everywhere all the time, in many cases, astute anticipation ensures that the most critical materiel is there when it's needed most. That is a key lesson for logisticians.

Also for all our sustainers, always remember that as warfighter logisticians, you have to be prepared to give the shirt off your back and boots off your feet to support the fight. I often would tell my logistics Soldiers that we will never say no as long as we have one gallon of gas or one bullet left to give. That kind of attitude and approach is the most important lesson I can share.



Feeding the Forge:

Sustaining Large-Scale Combat Operations

■ By Lt. Gen. Michael Lundy, Col. Richard Creed, and Lt. Col. Scott Pence

In sword making, a forge requires a steady supply of fuel to increase temperatures enough to bring solid metal to a malleable state. Bellows transport air to the fire, which consumes more fuel and makes the hearth burn hotter. It is a simple process, perfected centuries ago. Without a sustained supply of fuel and air, the most capable swordsmiths cannot forge metal into a worthy weapon. Similar to a forge, the lethality, tempo, and endurance of an army is limited by its ability to sustain itself. The next “first battle” will not be lost for lack of courage. It will not be lost for lack of valor either. In actuality, the next first battle could be lost before it even begins.


Without adequate sustainment capability and capacity to sustain our

maneuver formations, we are at risk of being unable to close with peer threats or face early culmination if we do. Multicorps large-scale combat operations require tens of thousands of vehicles and hundreds of thousands of Soldiers employed across hundreds of miles. Operations under these conditions require massive amounts of fuel and ammunition, maintenance and medical care in depth, and the ability to reconstitute combat power beyond what our Army can currently provide. Scale matters, and the ability to sustain forces at scale is something only a handful of armies can do. This is not a future theoretical problem; it is a problem our Army faces today.

This article is in the wrong publication. By that we mean that its intended audience is broader than the sus-

tainment community. Understanding sustainment, knowing how to plan for it, and making it central to operational art is the responsibility of all military professionals. Sustainment is critical to our business and, as such, is too important to be relegated to the care and concern of just one proponent of the Army. For decades there have been uninformed assertions about tooth-to-tail ratios, which do not account for the reality that the Army must sustain itself and the joint force anywhere in the world, across the range of military operations. In some ways, we have cut well past our “tail” to the point we cannot bring our “teeth” to bear on the most dangerous threats the operational environment is likely to present.

Twenty years of operations in the

A large tan military truck, likely a L-Series truck, is shown in a forest setting. The truck is equipped with a crane that is lifting a large green container. The truck has large, rugged tires and a heavy-duty frame. The background consists of tall pine trees.

Large containers carrying a wide range of necessities are off loaded during at the Rosepine Training Area Jan. 16, 2019. (Photo by Chuck Cannon)

Balkans, Iraq, and Afghanistan coincided with institutional efforts to reduce sustainment force structure in the pursuit of efficiency.

Supporting limited contingency operations exclusively for more than a decade disguised the risks that accumulated as the reductions occurred. The relatively permissive threat environments in those theaters do not resemble the threat environment of large-scale combat operations (LSCO) against peer threats.

Risks we could mitigate during limited contingency operations become untenable when the possibility of LSCO is no longer far-fetched. The bottom line is that significant reductions in sustainment force structure, mitigated by the availability of contractor support and coupled with

a focus on brigade and below operations, resulted in an Army-wide lack of capability, capacity, and experience for the requirements of LSCO.

Sustainment Considerations for LSCO

The current operational environment makes sustaining Army forces a challenging, complex problem. Our allied and partner-nation ports, which have remained reliable sources for reception, staging, onward movement, and integration, are within range of adversarial long-range fires, including chemical munitions. The most capable ports may be rendered incapable of off-loading shipments of supplies and equipment, forcing us to use different ports that result in significantly longer lines of communication.

Longer lines of communication generally require more vehicles and alternative methods of delivery. Some of the solutions could be contracted, depending upon the proximity to the forward line of troops and enemy activity, but contract support in LSCO is much less assured than it was in limited contingency operations.

Contracted sustainment plays an important role, but assuming we can contract our way to winning the next war brings high risk. A large portion of our sustainment capacity came from contracted logistics over the past 20 years through the Logistics Civil Augmentation Program.

Against a peer or near-peer enemy, contracted support vehicles are vulnerable targets. Likewise, few host-nation trucking firms will have

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excess capacity, at any price, available to adequately cover the scale of the sustainment requirements for large-scale combat—especially if their own national armies are fighting alongside us.

Assuming that we take operational security, camouflage, and deception activities seriously and train our forces to become experts in passive protection, our sustainers will need to keep most supply commodities mobile enough to avoid destruction. Bulk storage of commodities in centralized locations will incur significant risk, particularly at the division level and below.

Due to the reach of the adversary's indirect fires, tactical resupply missions will be done while in contact with the enemy. According to a July 2017 Popular Mechanics article by Kyle Mikokami, in 2015, a Russian-made unmanned aerial vehicle dropped a single thermite grenade on a Ukrainian ammunition supply point. The subsequent explosion destroyed nearly all of the Ukrainian multiple-rocket launcher ammunition.

While sustainment underpins all elements of operational art, it directly enables tempo, extends operational reach, and prevents early culmination. Investments in fuel and transportation capacity enable tempo during the most critical phases of operations when forces require rapid repositioning to occupy advantageous positions before the enemy does.

Extending operational reach requires a mastery of logistics science and skillful anticipation. Bold plans ungrounded in sustainment realities are generally remembered as historical debacles. During LSCO against a near-peer enemy who is looking to mass fires at long ranges, operating at reduced tempo or culminating early can quickly place the force at a critical disadvantage.

The best operational artists in history, from Alexander the Great to Gen. George S. Patton, fully understood the criticality of sustainment. The level of mobility, tempo, and

operational reach required to prevail against integrated fires during LSCO requires simultaneity of operations and is only achievable with adequate transportation, maintenance, logistics, and medical support to enable flexibility, speed, and freedom of action.

Interdependence of Sustainment and Maneuver

Combat power may win battles, but sustainment wins wars. Throughout history, when great armies lost, inadequate sustainment was a key factor. In retired Col. Gregory Fontenot's book, *The First Infantry Division and the U.S. Army Transformed: Road to Victory in Desert Storm, 1970–1991*, he notes that in the Persian Gulf War "persistence and determination could do nothing to solve the problem of scarce and hard-to-deliver repair parts." The problem reflected a systemic problem in Army logistics: parts arrived in Saudi Arabia and disappeared into a morass of storage sites."

This is not a new or novel problem. However, we can improve the organizations that manage parts flow and maintenance priorities to maximize the combat power of the force. Simply acquiring more resources is not enough to succeed. Resources must be employed by capable formations to generate the greatest return for money spent.

All Army leaders need to consider sustainment as fundamental to the combined arms approach to operational art and planning. Maneuver leaders cannot make informed decisions about operational and tactical risk without a deeply rooted appreciation for and professional understanding of sustainment. This should occur through sustainment education within each branch as well as a repetitive exposure during training events where there are penalties when culmination occurs because of poor sustainment planning and execution.

In a different era, when tracked vehicle commanders ran out of fuel during training, it was a professional-

ly embarrassing event that could lead to administrative action. As a result, there was a strong incentive for leaders other than logisticians to pay close attention to fuel consumption, maintenance, and resupply.

Maneuver leaders grew up understanding that sustainment was their responsibility. Just as mission command is not a signaler's problem, sustaining operations to maintain tempo is not just a logistician's problem. Artillerymen need to understand controlled supply rates and movement in order to provide accurate and responsive fires. If armor and mounted infantry Soldiers do not conduct post-operations maintenance and forecast fuel requirements, they don't get to the fight, and every attack aviator is just a pedestrian without their fuel and ammunition platoon.

Due to multiple factors, sustainment tasks (fuel, maintenance, supply, personnel regeneration, and medical planning) have become less culturally ingrained into the maneuver community. "Other people" took care of those things, particularly during limited contingency operations, and everything worked out okay. The fact is other people are unlikely to be around to take care of sustainment during large-scale combat operations.

Forging Future Sustainment

The revised Field Manual (FM) 4-0, Sustainment, outlines training considerations for the relentlessly lethal environment of LSCO. As the Army's capstone manual for the execution of sustainment, it is deliberately aligned with FM 3-0, Operations.

Its operational framework provides an expanded physical, virtual, cognitive, and temporal perspective to account for the multi-domain extended capabilities of friendly and enemy forces. FM 4-0 also includes critical considerations for planning and provides examples to illustrate the volume of materiel and sustainment capabilities required to maintain an expeditionary army.

As the Army modernizes to meet the challenges of LSCO, sustain-

ment formations will change. Expeditionary sustainment commands will be aligned with corps to enable operational-level logistics. Divisions will have sustainment brigades with tailored battalions to provide the enhanced capacity, mobility, and redundancy essential for increasing operational reach and raising culmination thresholds. These adjustments will enable the agility commanders require to seize fleeting opportunities to occupy and hold positions of advantage and consolidate gains.

Sustainment training and education must continue to increase its emphasis on LSCO-oriented curricula, historically relevant case studies, and comprehensive written and oral assessments to create deeper subject matter expertise. Sustainment leaders must develop a profound understanding of peer threat capabilities and be able to anticipate requirements in the LSCO environment.

Meanwhile, all of the centers of excellence must inculcate their leaders with a deeper understanding of sustainment planning across the range of military operations through each phase of professional military education. Logistics command and control is an interdependent and collaborative effort; it demands competent practitioners in all warfighting functions.

Reviewing the historical case studies in *The Long Haul*, from the Army University Press LSCO Book Set, enables leaders to understand and visualize the sustainment challenges of LSCO. The book contains 11 case studies of past sustainment operations with lessons applicable to LSCO.

Since most leader development occurs in units, commanders from every branch need to drive sustainment education and professional reading assignments. Professional development discussions on LSCO are simple ways to do so. Commander-driven leader training and development that is two levels down ensures subordinate leaders gain a broader perspective and are prepared for their next jobs. This training also identifies key self-devel-

opment areas for individual leaders.

Sustaining LSCO requires cultural adaptation and evolution of our sustainment systems and organizations for a demanding operational environment. While limited contingency operations will always be with us, all Army professionals have an obligation to prepare for the unique requirements of wars against peer enemies. We cannot afford to wait until a crisis exists to prepare ourselves for what the nation expects us to do. The next first battle may be the last, and it is everybody's business to be prepared. Reigniting the forge of the American sustainment advantage is one of the most significant steps we can take to prevail in the next first battle.

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U.S. Army Central: Providing operating in the CENTCOM



A convoy of vehicles drives through an Army Prepositioned Stock-5 remote staging lot during large-scale equipment issue from APS-5 to the 155th Armored Brigade Combat Team at Camp Arifjan, Kuwait, June 28. The 155th ABCT received an entire ABCT equipment set in support of Operation Spartan Shield, marking the largest ever equipment issue from APS-5. APS-5 is managed and maintained by the 401st Army Field Support Brigade. (U.S. Army photo by Justin Graff, 401st Army Field Support Brigade)

Combat Logistics to Units Area of Responsibility



■ By Command Sgt. Maj. Joseph C. Cornelison

U.S. Army Central (ARCENT) draws its lineage from the storied history of the Third U.S. Army, which was commanded by one of America's most famous generals, Gen. George S. Patton Jr. Aptly referred to as "Old Blood and Guts," Patton certainly understood the importance of combat logistics. During the Third Army's historic drive to relieve the beleaguered First Army at Bastogne during the Battle of the Bulge, Patton told one of his logistics officers, "My men can eat their belts, but my tanks have gotta have gas!"

To this day, ARCENT still places a premium on timely and efficient logistics and sustainment. And I believe that our subordinate commanders' logistics status reporting accuracy has improved since Patton's tour of duty with the outfit.

The ARCENT Mission

ARCENT is designated by the Secretary of the Army as the Army service component command of Central Command (CENTCOM). On behalf of the Secretary of the Army, ARCENT exercises

administrative control of more than 35,000 U.S. Army personnel in the Middle East and Central Asia by supplying, equipping, training, servicing, administrating, and maintaining forces. We also support joint partners in the CENTCOM area of responsibility (AOR) through Army support to other services, such as missile defense, logistics management, transportation, fuel distribution, communications, veterinary services, and explosive ordnance disposal.

ARCENT's additional sustainment and protection responsibilities include contracting, medical support and evacuation, military postal service support, and detainee operations. Additionally, ARCENT improves relationships and interoperability with partner nations through exercises and facilitates the transition of joint forces in and out of theater.

As the command sergeant major of ARCENT, my peers frequently ask me what it is like to be the senior enlisted leader of an Army service component command. I tell them that we are responsible for tens of thousands of multicomponent Soldiers whose units rotate out frequently on different timelines. These factors present some unique yet rewarding leadership challenges.

My background as an infantryman with divisional Army units provided me with a working, but less than expert, knowledge of the Army logistics and sustainment enterprise. However, I quickly ascertained that one of the most important things we do in ARCENT is to set the theater for potential combat operations, primarily a logistics and sustainment function.

How do we accomplish this? By transporting, feeding, fueling, and arming the Soldiers within the CENTCOM AOR and repairing and assisting with the maintenance of their equipment. The 1st Theater Sustainment Command (TSC) is the vital element that makes this most important mission happen.

The 1st TSC

ARCENT's 1st TSC is a two-star command based at Fort Knox, Kentucky, with a forward command and control element at Camp Arifjan, Kuwait. The 1st TSC comprises more than 10,000 Soldiers, civilians, and contractors who ensure the Soldiers, Sailors, Airmen, and Marines within the CENTCOM AOR have the supplies and transportation to accomplish their missions.

A major subordinate element of the 1st TSC is the 184th Expeditionary Sustainment Command (ESC) with the Mississippi National Guard. The 184th ESC is the forward face of the 1st TSC in theater and oversees day to day sustainment efforts for the 1st TSC across the CENTCOM AOR. Under the 184th ESC's span of control are countless active Army, National Guard, and Army Reserve sustainment units that move, by land, sea, or air, what is needed throughout 20 countries in the CENTCOM AOR.

Setting the Theater

The best way to demonstrate the sustainment reach and strength of ARCENT is to use a hypothetical scenario. Sgt. Smith is a military occupational specialty 19K, M1 armor crewman, from the Army National Guard. His state's 100th Armored Brigade Combat Team (ABCT) has been assigned the Operation Spartan Shield mission, supporting ARCENT and CENTCOM.

After mobilizing at a stateside mobilization site, Sgt. Smith and the 100th ABCT ship their equipment and embark on a nine-month deployment to the Middle East. Sgt. Smith arrives at the theater gateway at Camp Arifjan. The camp is a cantonment area that houses more than 13,000 Soldiers and civilians who support missions throughout the CENTCOM AOR.

The Camp Arifjan theater gateway has been operational since Operation Desert Storm and is currently operated by elements of the 300th Special Troops Battalion. The gate-

way processes over 100,000 Soldiers, Sailors, Airman, Marines and civilians a year as they transit to and from the CENTCOM AOR. Sgt. Smith will spend approximately two to three days at the gateway, where he will receive a theater welcome brief, finance brief, Sexual Harassment/Assault Response and Prevention (SHARP) brief, and a camp orientation. Soldiers in units with onward movements will receive additional information regarding flights to their final destinations.

After in-processing at the gateway, Sgt. Smith and his battle buddies will move to Camp Buehring, Kuwait, which will be their on-again, off-again home for the rest of their rotation. Camp Buehring is another ARCENT-run facility that houses over 18,000 Soldiers and civilians who support ARCENT missions across the CENTCOM AOR.

While at Camp Buehring, Sgt. Smith will draw an M1 tank from the ARCENT-maintained Army Preposition Stocks (APS) 5 equipment set that is stored and maintained by ARCENT's 401st Army Field Support Brigade. The APS-5 fleet encompasses several brigades' worth of vehicular equipment, including thousands of armored vehicles, artillery equipment, and engineer and sustainment rolling stock.

Sgt. Smith's M1 has been stored in a climate-controlled environment and maintained to standard for the last seven years. The M1 has all basic issue items and necessary crew equipment that makes Sgt. Smith's tank crew combat ready the minute they leave the APS-5 issue yard.

Meanwhile, Sgt. Smith's home station baggage and equipment that did not fly into theater with him is moving into theater through the Trans Arabian Network (TAN). The TAN is a huge network of sea, air, and land nodes that spans the entirety of the Arabian Peninsula.

The 184th ESC oversees and manages ARCENT equipment that moves through and across the TAN. For example, the ABCT's container-

ized equipment sails from a U.S. port, across the Atlantic Ocean, around the Horn of Africa, and then into one of the many available ports across the region, all under the watchful eyes of the 595th Transportation Brigade, Military Surface Deployment Distribution Command. From there, it is trucked inland and finally delivered to Sgt. Smith at his unit area in Camp Buehring.

This scenario is just one of the many ways that ARCENT can use the TAN to deliver equipment and supplies to Soldiers. Keeping the TAN “warm” by using as many nodes and segments as possible, to move as much equipment as we can, gives the CENTCOM commander the strategic and operational flexibility for access, basing, and overflight by our forces throughout the AOR.

Sustaining the Fight

During Sgt. Smith’s tour of duty, readiness and the maintenance thereof is always a prime consideration for ARCENT leadership. We realize Sgt. Smith and his ABCT will potentially have future missions elsewhere.

Sgt. Smith and his tank crew will have multiple opportunities to conduct tank gunneries at the Udairi Range Complex located near Camp Buehring, with ammunition provided by ARCENT sustainment Soldiers from the 300th Sustainment Brigade. These gunneries ensure their crew qualifications are current. It not only keeps them ready for their theater reserve mission within the CENTCOM AOR but also ensures they return to their home station with little to no degradation of individual, team, and crew readiness.

As Sgt. Smith’s ABCT is serving as the CENTCOM theater reserve, he may have the opportunity to conduct missions as part of evolving requirements for the other named operations within the CENTCOM AOR—Operation Inherent Resolve or Operation Freedom Sentinel. Supporting these operations through theater-coordinated agreements is yet another way ARCENT Soldiers

support the combatant commander.

Sgt. Smith and a portion of his unit transition to an austere location within Syria for a short time to provide site security in support of Operation Inherent Resolve. Sgt. Smith and his unit are resupplied by air courtesy of the CENTCOM Deployment and Distribution Operation Center. This unit has ensured the delivery of over 53,000 tons by land and 5,800 tons by air of multiple classes of supply during the current campaign—all in the name of keeping Soldiers and their equipment fit to fight and combat effective.

Additionally, preventative medicine services and inspections in these austere locations are provided by the 8th Medical Brigade. This unit’s Soldiers ensure Sgt. Smith is living in sanitary conditions and that environmental hazards, such as foodborne illnesses or disease vectors, do not deplete our forces.

Although Sgt. Smith and his tank crew are fictional, the monumental efforts by ARCENT sustainers described above happen 24 hours a day, seven days a week. ARCENT supports the warfighter from the Sinai desert to the Euphrates River Valley and from the streets of Mosul, Iraq, to the mountains of Afghanistan. If you eat it, shoot it, drive it, or fly it, effectively an ARCENT sustainer has accomplished his or her mission.

We at ARCENT realize logistics and sustainment are the key enablers that continue to allow our Soldiers to fight and win, wherever and whenever they may be called.

Third Always First. Patton’s Own!

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ARCENT supports the warfighter from the Sinai desert to the Euphrates River Valley and from the streets of Mosul, Iraq, to the mountains of Afghanistan. If you eat it, shoot it, drive it, or fly it, effectively an ARCENT sustainer has accomplished his or her mission.

Rediscovering the Lost Art

A rotation at the Joint Multinational Readiness Center revealed that sustainers need to find creative and adaptive techniques to regain proficiency in base defense.

■ By Command Sgt. Maj. James A. LaFratta

Over several years of sustained conflict in Afghanistan and Iraq, forward logistics units in the Army lost a sizeable amount of institutional knowledge regarding base defense. This became painfully obvious during a recent decisive action training exercise rotation, Saber Junction 2018, at the Joint Multinational Readiness Center.

The event highlighted how the wisdom previously held at the junior noncommissioned officer (NCO) and company-grade officer levels no longer exists. Tactical expertise and field craft, once plentiful and taken for granted, atrophied after nearly

two decades of fighting the Global War on Terrorism, making base defense truly a lost art.

I will begin by stating the obvious: there is never enough time to train on everything. As logisticians, we identify the most important tasks necessary to survive and win in a multi-domain environment while providing uninterrupted support. We must therefore anticipate, determine, and prioritize where to place training focus and where to assume risk.

Unfortunately, old habits die hard, and history demonstrates that armies train to fight the last war. As the adage states, “train as you fight,”

we must avoid the complacency of training on the same tasks of the last conflict. Tomorrow’s operational environment will likely not resemble anything previously seen. It will blend counterinsurgency with near-peer threats. Success on the battlefield demands mastery of the neglected traditional basics while leveraging the latest technology.

Facing Reality

A glance at the average formation reveals that most Soldiers enlisted after 9/11. This means that only a few remember the post-Cold War era training rotations at the combined

Art of Base Defense

ative

Soldiers from the 173d Brigade Support Battalion (Airborne) participate in the base defense live-fire exercise Lipizzaner IV in Slovenia on March 13, 2018. (U.S. Army photo by Davide Dalla Massara)

maneuver training centers. There, units faced a conventional threat using Soviet-style tactics and equipment. These exercises validated the readiness of an organization to deploy to combat.

For support units, the exercises provided an opportunity to train on base defense. Units such as forward support battalions, the predecessors of the brigade support battalions, traditionally established a brigade support area (BSA). This required a degree of proficiency in skills such as the construction of individual or crew-served fighting positions and maximizing cover and concealment.

The repetition generated by these routine training events created a high level of competency and confidence throughout the organization. In the 1990s, most Soldiers knew exactly how many pieces of camouflage were required to conceal their assigned vehicles and the dimensions of a .50-caliber machine gun position.

As with any conflict, the attacks of 9/11 shifted the training focus. The large logistics support areas in Iraq and Afghanistan with contractor-managed security severely degraded these perishable tactical skills. Consequently, much of the Army's field craft expertise vanished.

Experiences during Saber Junction 2018 stressed how proficiency in establishing base defense has atrophied throughout the Army. However, identifying the problem is simple. To quote the military theorist Carl von Clausewitz, "Everything in war is very simple, but the simplest thing is difficult."

Merely discussing the issue in the abstract provides only heightened awareness to an obvious problem. This article does not offer a magic solution. Rather, it acknowledges the challenge logisticians face while providing methods to better prepare for future training events. Sustainers

will need to find creative and adaptive techniques to regain such proficiency because it is difficult, but not impossible, to relearn the lost art of base defense.

Relearning the Lost Art

The Joint Multinational Readiness Center rotation served to identify several areas for improvement. The first was the need to take a holistic approach to understand base defense. Army Techniques Publication 3-37.34, *Survivability Operations*, says that base defense demands significant effort and resources. It also requires consideration of several external factors. For example, logisticians must contend with defending against conventional and unconventional enemies, responding to chemical, biological, radiological, and nuclear attacks, and reducing their electromagnetic signature.

Using the factors of mission, enemy, terrain and weather, troops, time available, and civil considerations, it becomes readily apparent that each environment poses different challenges. For example, during the process of site selection, sustainment leaders must contend with determining how to establish perimeter security while maximizing the terrain for cover and concealment.

As most organic equipment is large and conspicuous, concealment using natural vegetation and camouflage requires skill obtained over time. Since the average BSA is extremely visible from enemy aerial observation, it is critical to master this skill.

The size of the BSA makes it a tempting target. Most sites require dedicated and specific space for the unit maintenance collection point, the role II medical facility, the supply support activity, and the fuel and ammunition transfer points. The site may also include all or parts of the brigade combat team's (BCT's) forward support companies, portions of the BCT staff, and any additional support elements, making for an even larger footprint.

This high-profit, low-threat way of interrupting logistics is often a low priority for protection assets. Consequently, it is imperative to maintain proficiency in passive defensive measures such as the emplacement of concertina wire and position of crew-served weapons.

Identifying a location for the BSA is only the beginning. After selecting a tentative site, leaders must identify the right personnel to send on the quartering party. The team should include senior representatives from each entity who understand their requirements to conduct daily operations. They must also know the size of their organizations, precisely the types and numbers of their equipment.

Once complete, the quartering party ideally conducts rehearsals to synchronize efforts and create a shared understanding so all members comprehend their tasks. This coordination will prove invaluable to mitigating confusion and frustration when equipment serials arrive at the BSA.

Moving Forward

Rotations at combat training centers deliberately stress unit systems to their breaking point and beyond. Fortunately, observer, controller, trainers help mentor rotational units by blending current doctrinal guidance with personal experience. They openly acknowledge that no one-size-fits-all answer exists to conducting a perfect rotation. They offer "a way" through daily feedback and a comprehensive assessment at the end of the exercise.

This information is invaluable as it forms a solid platform for improving a unit's performance. Learning organizations wisely embrace this feedback to help edit tactical standard operating procedures and identify focus areas for subsequent training.

One of the lessons learned in the recent rotation included the need to focus on the basics and create a tactical mindset embedded in every task. Senior leaders in every organization

directly prompt this line of effort and inculcate its importance to subordinate leaders.

Since survivability is one of the eight principles of sustainment, unit training plans should include protecting personnel, weapons, and supplies. In this instance, the term "art" is indeed appropriate since no specific template will produce an impregnable perimeter. This means that training priorities will vary by organization. It is safe to assume that most will combine tactics, techniques, and procedures learned in the 1990s with those from Iraq and Afghanistan.

A comprehensive view of base defense includes identifying the most likely threats to the BSA. This process includes measures to safeguard against penetrating and standoff attacks, to defend against chemical, biological, radiological, and nuclear threats, and to reduce the electromagnetic signature. For a brigade support battalion, this will include significant resources dedicated to the establishment of protection for the role II, the tactical operations center, and other critical nodes within the BSA.

Since engineer assets are frequently in high demand, a support unit cannot depend on these assets to help construct fighting positions and protective berms.

Therefore, gaining proficiency in these protection tasks must also form a significant part of pre-exercise training plans.

Focusing on skill level 1 tasks helps form a solid foundation for a comprehensive training plan. However, this alone will not suffice to prepare the unit for a major exercise or combat.

Another lesson emphasized the need to make a long-term investment regarding formalized training. Command teams must identify individuals to serve as subject matter experts through formal training.

Allowing junior NCOs to attend the Heavy Weapons and Master Gunner Courses are great ways to ensure new Soldiers understand the



Soldiers from the 173d Brigade Support Battalion (Airborne) participate in the base defense live-fire exercise Lipizzaner IV in Slovenia on March 13, 2018. (U.S. Army photo by Paolo Bovo)

capabilities of these systems under the mentorship of unit leaders. Empowering NCOs through education creates depth and breadth within the formation.

Finally a third, yet no less important, lesson learned was the need to safeguard training events at the company level.

During Saber Junction 2018, I realized the importance of fighting to preserve time, our most finite resource. The immediate support demands of the exercise left no time for training on the basics.

Dedicating training on individual and collective tasks and drills in the weeks before a major exercise is an absolute must. It is essential in building muscle memory and routine. It demands constant diligence as competing external requirements frequently overshadow and often consume training plans.

The uncertainty of tomorrow demands that senior leaders return to the drawing board and carefully choose between which tasks to train on and where to assume risk. As logisticians, we acknowledge that the mission never stops. We understand the need to strike a balance between technical and tactical proficiency that complements rather than compromises.

Success in training events begins long before the first vehicle departs the motor pool. Commanders must ensure that the weeks leading up to a major exercise focus on sharpening the tactical skills blunted by daily operations and competing requirements.

Sustainers face the challenge of providing timely and precise service and support in a variety of environments. This challenge requires a dedicated and conscious effort involving

communication and cooperation among staffs and command teams and between supporting and supported units to reduce what Clausewitz called the “friction of war.” Finally, we must never forget the harsh reality that once the BSA falls, the BCT fails.

Command Sgt. Maj. James A. LaFratta is currently the command sergeant major of the 2nd Infantry Division Sustainment Brigade. He wrote this article during his tenure as the 173rd Brigade Support Battalion (Airborne). He holds a bachelor's degree in military history from American Public University and a master's degree in military history for Norwich University. He is a graduate of the Sergeants Major Academy and is a demonstrated senior logistician.

Multi-Domain Intelligence



First Lts. Robert Russell and Matthew Statuti with the 55th Sustainment Brigade, 310th Sustainment Command (Expeditionary), 377th Theater Sustainment Command, review main supply routes during the Command Post Exercise-Functional (CPX-F), March 27, 2019, at Fort Bragg, North Carolina. The 55th, hailed as “America’s Sustainment Brigade” and based at Fort Belvoir, Virginia, is the largest sustainment brigade across the active Army, U.S. Army Reserve, and Army National Guard, has more than 3,000 men and women in 25 units spread across the East coast from Delaware to Virginia. (U.S. Army Reserve photo by Timothy L. Hale/U.S. Army Reserve Command)



Support for Sustainment

■ By Capt. Matthew Miller

According to a January–February 2010 Army Sustainment article by Lt. Col. Heber S. Meeks and Maj. Barton T. Brundige, sustainment units’ intelligence sections have been “focused on protecting the convoys that carried supplies and equipment to the warfighter daily,” during the last 18 years of counterterrorism and counterinsurgency campaigns. Intelligence personnel have identified potential threats and analyzed the enemy’s effort to attack friendly supply lines since antiquity, but today the threats to sustainment are changing.

According to Training and Doctrine Command Pamphlet 525-3-1,

The U.S. Army in Multi-Domain Operations 2028, as near-peer “adversaries have ... expanded the battlefield geographically ... multi-domain capabilities are less bound by geographic and time constraints.”

Theater Sustainment Command (TSC) G-2 (intelligence) sections need to build a capability to identify multi-domain threats to logistics, which may or may not emanate from the combat theater. One historical axiom of battle is the desire of commanders to destroy or cut off the enemy’s supply lines. Today, technology offers the enemy the ability to target supply lines from an adjacent state or the other side of the globe.

Russian and Chinese counter-space strategies, offensive electronic warfare (EW), and offensive cyber capabilities can jam, spoof, exploit, or destroy space-based reconnaissance and communications platforms preventing U.S. mission command. These offensive capabilities, based in the electromagnetic spectrum, have the potential to frustrate or confound theater-wide sustainment operations.

Consider the consequences of delivering the wrong munitions to a U.S. task force at the culmination of a conventional battle or a special operations forces’ Joint Precision Airdrop System full of supplies to

the enemy. Was the mistake human error, or was an enemy cyber unit inside a logistics computer network? The TSC G-2 section needs to have an understanding of, and the ability to identify, multi-domain threats in order to advise the TSC commander.

The Center for Army Lessons Learned Handbook 18-28, Operating in a Denied, Degraded, and Disrupted Space Operational Environment: Lessons and Best Practices, recommends that Army units prepare for, recognize, react, and report any attacks against space-enabled assets. In this type of environment, the G-2 section's responsibility is to recognize and report indicators and warnings of electromagnetic effects, recognize them for what they are, and not mistake them for computer glitches or human errors. If the attacks can be recognized as a disrupted phase, the potential for mitigation or counter-attack increases, which reduces the likelihood of avoiding a denied environment, where theater-wide sustainment will be done by hand with pencil and paper.

Intelligence Support to Sustainment Functions

In recent years, there have been several articles examining intelligence support to sustainment at the tactical level, but few mention intelligence support at the theater level. Multi-domain attacks on sustainment functions can be employed during all levels of conflict from peacetime humanitarian operations to major combat operations. They are potentially most dangerous in near-peer conventional conflict.

Sustainment functions, such as base development, theater opening and reception, staging, onward movement, and integration, are key throughout the spectrum of conflict, and all are subject to an electromagnetic or cyberattack. Military intelligence personnel assigned to TSC G-2 sections need to understand and recognize the effects of non-traditional threats during planning and throughout an expeditionary cam-

paign. The Department of Defense (DOD) Dictionary of Military and Associated Terms, defines a campaign as, "A series of related operations aimed at achieving strategic and operational objectives within a given time and space."

The five sustainment functions play a significant role in supporting the deployment, scale, and duration of any campaign in peacetime or war. In recent deployments, the expeditionary sustainment commands' (ESCs) intelligence sections and their subordinate brigade intelligence sections have handled security manager functions and the challenges of tactical intelligence support to logistics to include attacks against the staging of supplies, logistics bases, and convoy route security.

At the TSC G-2 level, there is a need for a dedicated effort to increase awareness of indicators and warnings of the effects of cyber, EW, and counter-space operations against this expeditionary supply chain. As Lt. Col. Devon Blake and Chief Warrant Officer 4 Deloye Meacham note in their March–April 2013 Army Sustainment article, "Intelligence Support to Sustainment Operations: Lessons Learned from the Iraq Drawdown," intelligence elements supporting sustainment do not "conduct lethal targeting, nor do they own any organic intelligence, surveillance, and reconnaissance assets."

Additionally, they are not responsible for securing computer networks from cyberattack, negating the impact of enemy counter-space systems, or countering adversary EW.

The responsibility of intelligence analysts is to identify enemy capabilities, search for these often disparate indicators and warnings of enemy actions, advise the commander, and share the information with those who need to know. No intelligence section operates in a vacuum. Sustainment intelligence sections should coordinate efforts with other associated units, including the Defense Logistics Agency, Military Surface Deployment and Distribution

Command, and Army Sustainment Command.

Indicators and warnings of the enemy's use of cyber, EW, or counter-space activities, such as jamming or spoofing GPS, may not be theater-wide. Subsequently, they may target sustainment functions in dispersed locations. What looks like a broken Blue Force Tracking system in one convoy at the unit level might actually be part of a pattern of an attack against the varied elements of the theater-level supply chain.

This emphasis on the importance of theater-level intelligence support to the TSC commander reflects the importance of the combat logistics chain.

In "Mission Command of Sustainment Operations," published in the January–March 2019 issue of Army Sustainment, Maj. Gen. Steven A. Shapiro and Maj. Oliver Davis write, "In a theater area of operations, mission command of sustainment operations is the senior sustainment commander's authority to direct all sustainment based on the sustainment priorities established by the combatant commander."

Therefore, the TSC G-2 section needs to prioritize the analysis of enemy kinetic and non-kinetic capabilities to avoid the trap of overanalyzing enemy capabilities and actions in lower level tactical reports. The TSC G-2 should ensure that tactical analysis is a priority at the ESC level in order to free up TSC intelligence analysts for the multi-domain fight.

If possible, a dedicated "multi-domain intelligence cell" should be established to focus on theater-wide cyber, EW, and counter-space threats to help prevent the enemy from using the electromagnetic spectrum to cut our physical supply lines.

Cyber/EW Threats to Sustainment

In 2017, the commander of U.S. Transportation Command, Air Force Gen. Darren McDew, noted in his PRISM 7 article, "Power Projection in the Digital Age: The Only Winning Move is to Play," that "the ad-

versary only needs to deny our ability to move the force by attacking our virtual lines of communication or injecting doubt into the system, causing us to question our operations or the integrity of our deployment data.”

If the enemy changes, corrupts, or simply deletes logistics data on the battlefield, it would greatly amplify the confusion experienced in an expeditionary environment. In the DOD, the parlance that logistics runs from “factory to foxhole” suggests that sustainment intelligence needs to train and exercise for cyber, EW, and counter-space threats.

Russian cyber and EW capabilities are some of the most effective in the world, and Russia has demonstrated a willingness to use them across the spectrum of war. We must assume that a near-peer enemy with similar capabilities would target U.S. sustainment operations by paring physical and electromagnetic attacks with cyberattacks.

In recent years, Russia has demonstrated a capacity to employ these capabilities in Georgia, Ukraine, and Syria. In Crimea and Ukraine, Russia jammed and spoofed navigation satellites that incapacitated GPS for radios, phones, and even some drones. It is likely Russia sees Ukraine, Crimea, and Syria as testing grounds for its cyber, EW, and counter-space capabilities.

China has highly developed cyber capabilities that it has used to hack foreign government networks in order to steal sensitive information. A hack or penetration of a sustainment network by an enemy could result in numerous nefarious outcomes. The ability to integrate the wide variety of units that support the logistics enterprise would be highly degraded with an enemy in the network.

According to Amanda Macias’s CNBC article from July 5, 2018, China is also expanding and testing its EW and counter-space capabilities in places like the South China Sea. Both Russia and China have developed and tested cyber, EW, and counter-space capabilities, and those

capabilities currently reside in both countries’ arsenals.

Other Logistics Chain Vulnerabilities

Cyber, EW, and counter-space threats to sustainment functions are not beholden only to near-peer actors. The robust means to jam communications and integration functions, and to conduct cyberattacks, already exist in smaller states and some terrorist groups, such as the Islamic State group, due to the relatively low cost of these capabilities. Small states and non-state actors might not be sophisticated enough to compromise a U.S. sustainment computer network, but the U.S. military does not go to war alone.

What about our coalition partners or commercial logistics providers that make up the factory-to-foxhole network?

According to the U.S. Transportation Command, roughly 50 percent of wartime transport capability comes from commercial industry. In theater, commercial logistics firms have played an essential role in the last 18 years of armed conflict. These non DOD entities pose a vulnerability. Potential coalition and commercial industry partner vulnerabilities could send theater sustainment functions into chaos without ever breaking U.S. networks.

If a commercial truck convoy’s GPS spoofed routing it into an ambush, the result could be disastrous and offer the enemy a propaganda victory. As noted earlier, the protection of these systems, DOD or otherwise, is not the role of the TSC G-2 section, but it is the responsibility of the G-2 to be cognizant of indicators and warn of these capabilities in its area of responsibility.

In “Visualizing Distribution as an Effect, Rather than a Service,” an online Army Sustainment article published in December 2018, Maj. Daniel J. N. Belzer writes that, during major combat operations, consistent consumption data is essential and could place tactical units at risk. Offensive cyber, EW, and

counter-space operations against the sustainment enterprise could create a shockwave across the theater of operations. TSC G-2 sections need to emphasize analysis and collection against these multi-domain threats, from both inside and outside of the theater, to sustainment forces.

Leaders should emphasize the pre-deployment training of analysts in cyber, EW, and space-based threats through formal training, such as the Army Space Cadre Course and Electronic Warfare Integration courses. Training in cyber indicators and warning is available to intelligence analysts and should be pursued aggressively in coordination with the unit’s G-6 section.

Additionally, the intelligence section should embrace the Army’s recommendation to exercise operating in a denied, degraded, and disrupted environment by including indicators and warning of cyber, EW, and counter-space effects in staff and field exercises.

The TSC G-2 section needs a multi-domain intelligence cell with trained intelligence analysts to understand and identify cyber, EW, and counter-space threats. This asset will ensure the sustainment commander can effectively maintain mission command over sustainment functions.

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Support area CP links key lines of support

■ By Lt. Col. Gerard M. Acosta, Lt. Col. Mike Hagerty, and Maj. Sean Hollars

As Army divisions prepare to conduct operations in complex, changing, and uncertain environments, effective mission command throughout the battlefield is critical. Because the doctrinal framework to execute mission command in the consolidation and support areas is nascent, the 3rd Infantry Division (ID) developed and tested a construct designed to fulfill this need.

Over the course of three command post exercises (CPXs) and an externally evaluated division warfighter exercise (WFX), the structure, manning, processes, and integration with other mission command nodes evolved and eventually fulfilled the commanding general's mission command requirements. The 3rd ID's concept is outlined in this article in order to assist other organizations in developing and implementing a support area command post (SACP).

Preparation for Conventional Conflict

When the 3rd ID's headquarters redeployed from Afghanistan in 2018, the division commander directed his leaders to transition their mindset from a counterinsurgency-centric operational approach to that of a conventional operational environment. The commander's challenge to the staff was to develop an operational framework focused on how the division would fight against a near-peer threat.

During initial mission analysis, it was unclear how the division would manage the consolidation and support area. The initial problem set was to develop the SACP framework, while meeting the commander's intent to generate

combat power, sustain the fight, and consolidate the gains made in the deep and close fight.

The division commander established the SACP's foundation by establishing its parameters. He stated that the SACP had to retain its strategic and tactical mobility; it could not be so large or cumbersome that it would become unable to move and survive. And, as a divisional mission command node, the SACP needed to integrate all of the warfighting functions (WfF) and produce a rapid support area mission decision cycle in order to sustain momentum.

Before WFX 19-02, the corps and division headquarters used the SACP as an extension of the sustainment or protection mission command node functions in the corps and division support area. During WFX 19-02, 3rd ID expanded the SACP's mission command responsibilities to assume the command and control of combat operations in the consolidation area. This provided flexibility to lead the division to seize the initiative and dominate during large-scale combat operations.

Doctrinal Framework

The Army has not created a manning and organization standard for the SACP, but it has doctrinally defined the consolidation and support areas in which the SACP operates. Army Doctrine Reference Publication 3-0, Operations, defines the support area as, "The portion of the commander's area of operations that is designated to facilitate the position, employment, and protection of base sustainment assets required to sustain, enable, and control operations."

The publication defines the consolidation area as the "portion of the commander's area of operations [AO] that is designated to facilitate the security and stability tasks necessary for freedom of action in the close area and to support the continuous consolidation of gains."

Field manual (FM) 3-0, Operations, reinforces the idea that corps and division commanders have the authority to establish consolidation areas to enable exploitation in the close fight. According to FM 3-0, a combined arms unit must control the consolidation area, conduct security and stability tasks, and be capable of employing and clearing fires.

According to the Center for Army Lessons Learned Handbook, Mission Command in the Division and Corps Support Area, due to a lack of resourcing, manning, and organization by the Army, divisions have used organic personnel and equipment to create a SACP capable of managing the consolidation and support areas, as doctrinally defined. Since the Army has no official standard for resourcing or operating a SACP, divisions must define the role of the SACP and the capabilities required to synchronize operations.

The 3rd ID SACP Framework

The approach below outlines how the 3rd ID resourced and employed the SACP during WFX 19-02. Deviating from the traditional administrative and logistics operations center, a SACP can best serve to integrate divisional sustainment mission planning, operation order production, and mission assessments.

The 3rd ID's goal was for the



Col. Chris Briand, left, commander of the 55th Sustainment Brigade, 310th Sustainment Command (Expeditionary), 377th Theater Sustainment Command, reviews data with Command Sgt. Major Frank Olmstead, brigade command sergeant major, during the Command Post Exercise-Functional (CPX-F), March 27, 2019, at Fort Bragg, North Carolina. The 55th, hailed as "America's Sustainment Brigade" and based at Fort Belvoir, Virginia, is the largest sustainment brigade across the active Army, U.S. Army Reserve, and Army National Guard, has more than 3,000 men and women in 25 units spread across the East coast from Delaware to Virginia. (U.S. Army Reserve photo by Timothy L. Hale/U.S. Army Reserve Command)

SACP to provide commanders with a consolidation area common operational picture to leverage and, at certain times, influence consolidation area movements to meet an operational objective. Key statistical measures included the following:

- The ability to use lift capabilities to transport personnel and goods to operational areas, reduce wait time, and maintain ground freedom of movement. This was identified during the air tasking cycle.

- The ability to improve asset visibility of critical information, including ammunition expenditures, recommended controlled supply rates, and projected ammunition allocation. This was identified during the fires targeting cycle.

- The ability to track ground movements, critical classes of supply reconstitution, materiel management, asset visibility, and emergency resupply operations. This was gained through support operations synchronization.

- The ability to align security assets with transportation movements, protect key sustainment infrastructure, and maintain route control and assessments. This was determined through the maneuver enhancement brigade (MEB) operations planning cycle.

Within the sustainment WfF, the SACP afforded 3rd ID the ability to integrate key logistics lines of efforts to include human resources, legal, medical, and financial management operations. Human resources provided the ability to track the movement of key military occupational specialty replacements within the AO. It also helped to link crews with combat systems before onward movement into the AO and sped decision-making for personnel processing.

Legal provided the ability to gain legal opinions regarding key operations and mission sets associated with displaced civilians, civil affairs (CA), and the use of host-nation support and non-governmental entities.

Integrating medical operations expedited the transport of casualties,

enhanced planning for contaminated area operations, and prioritized medical operations integration in the operation plan. Financial management ensured the inclusion of cross-service agreements and contracted host-nation support.

SACP Operational Design

The 3rd ID SACP was not originally co-located with either the sustainment brigade or the MEB headquarters. Because the MEB headquarters was only a response cell for WFX 19-02, utilizing its staff and mission command platforms was not an option. Instead the SACP staff came directly out of the division headquarters.

The SACP officer-in-charge was the deputy chief of staff and the SACP G-3 was a G-3/5 planner. The deputy commanding general for sustainment (DCG-S) supervised and coordinated all SACP actions and ensured SACP priorities were nested with those of the division commander.

The SACP's tactical operations center was divided into two sections: operations and sustainment. Operations consisted of the G-2, G-3, fires, division artillery, engineers, protection, special operations forces (SOF), and the liaison officers. Sustainment included the division transportation office (DTO) and the G-4, G-1, and G-6 sections. An additional tent connected to the main command post (CP) contained the civil-military operations center and psychological operations personnel. Liaison officers for the MEB and the consolidation area brigade combat team (BCT) were also located in the SACP.

Operational Integration

During WFX 19-02, the consolidation area force was designed to balance the combat power required for wet gap crossings and constricted terrain with one avenue of approach. The 3rd ID decided that the Stryker BCT (SBCT) was the best-suited BCT for the consolidation area fight; it was mostly focused on area security and eliminating the threat in an ever expanding consolidation area. The SBCT had both mo-

bility and an abundance of infantry to secure high ground and isolate urban population centers.

The 3rd ID task organized two rifle battalions from the SBCT to secure the division artillery and add mobility to the attached infantry BCT. This allowed the SBCT to control the consolidation area using a rifle battalion and a reconnaissance squadron. This task organization afforded the SBCT the reconnaissance, infantry, and limited anti-tank assets to control the terrain. The SBCT also retained control over its organic fires battalion and brigade engineer battalion, which enabled the brigade headquarters to use the battalions' unmanned aircraft systems, RQ-11 Shadows, to conduct intelligence, surveillance, and reconnaissance and their field artillery battalion to employ and clear fires within the consolidation area.

The division established a dedicated force of AH-64s Chinook helicopter from the combat aviation brigade to react to and destroy an armored threat within the consolidation area.

The 3rd ID tasked the MEB with securing the support area because its organization was terrain-focused. The MEB had the resources to secure the support area base clusters and conduct supply route security.

SACP battle tracking and operational involvement centered on the SACP's participation in division battle rhythm events. The main briefs that the SACP focused on were the 3rd ID WfF Working Group and the 3rd ID WfF Synchronization and Decision Board. These key meetings in the division main CP ensured the commanding general had the most up-to-date information to make decisions.

Because the meetings were completely analog, the SACP would connect through Skype to see the analog map in the G-3/5 tent and communicate through a secret voice over internet protocol conference call. The SACP attended the synchronization and decision board to reconcile changes to the plan over the next 24 to 96 hours and ensure anticipated changes were synchronized with the sustain-

ment brigade's concept of sustainment.

Internally, the SACP's key tasks were to disseminate information and establish priorities of work. This was done through 7-minute drills and shift-change briefs. Both briefs have similar briefing formats, but the 7-minute drills were used to quickly update the DCG-S and ensure the SACP's priorities were aligned with the DCG-S's and commanding general's priorities. The shift-change briefs were typically 30 to 50 minutes. These were used to update the DCG-S and ensure each shift received a full brief on the events of the previous 12 hours.

Unlike divisions in previous WFXs, the 3rd ID SACP had tasking authority over the BCTs in the consolidation and support areas. The SACP did not create its own fragmentary orders, but instead it compiled information from the various sustainment sections and submitted it to the division's main CP for daily division operation order publication.

SACP Lessons Learned

A constant struggle throughout the WFX was maintaining commensurate situational awareness between all of the division's CPs. Essential to the sustainment fight is the development of a logistics common operational picture, which can ensure understanding across the division for sustainment operations. The expertise for sustainment operations remained in the SACP, but the sustainment representatives in the division main CP had to rely on the SACP to ensure that the commanding general had up-to-date information.

Other necessities for situational awareness were the SACP's participation in the nightly WFF synchronization and decision board and a daily touchpoint between the SACP G-3 and the division G-3. This ensured the SACP staff understood the latest changes to the scheme of maneuver and that the G-3 understood identified points of friction where additional division assets may need to be prioritized to support sustainment operations.

The 3rd ID staff identified early that controlling movement within the

consolidation area would be a constant challenge and that there were several available airlift assets that could be leveraged to fulfill unexpected sustainment shortfalls (typically ammunition). The DTO coordinated all movement requests within the consolidation area and ensured all lift assets conducted resupply even when it was not needed. In future WFXs, the DTO movement control team should incorporate the transportation movement release process into the daily movement control boards to ensure all convoys have the proper protection assets and mitigate route congestion within the consolidation area.

Another major lesson learned by the 3rd ID SACP staff dealt with securing and protecting sustainment nodes within the consolidation area. The first shortfall identified in early CPXs was the lack of extensive terrain analysis for sustainment node locations. Once the SACP was co-located with the sustainment brigade, the SACP staff was able to leverage the sustainment brigade S-2 section and conduct better terrain analysis for each proposed sustainment node location and the placement of protection assets.

The division engineer cells from the division's main command post, SACP, and tactical command post developed a survivability matrix for all static positions in the division battlespace. Within the consolidation area, horizontal engineers were constantly moving to build survivability positions and fighting positions to protect key mission command and sustainment nodes.

The biggest takeaway of the WFX was that the capabilities of the SACP increased exponentially once it was co-located with the sustainment brigade. The brigade S-2 shop and sustainment brigade support operations section enhanced the situational awareness of the SACP and enabled rapid dissemination of sustainment operations information to the division main CP.

If the MEB would have been a training audience, the ideal scenario would have been to co-locate the SACP with

both the MEB and sustainment brigade headquarters where it could serve as a conduit between the two. This arrangement would enable the SACP to better control Fires and Air elements throughout the support area and consolidation area because the MEB would have the requisite systems on its modified table of organization and equipment.

We still believe the correct answer for clearance of fires in the consolidation area is the land-owning unit (the SBCT). The requisite capability in the SACP or MEB would be an alternate if no BCT was in the consolidation area. Displacement procedures would change for the SACP and the other brigade headquarters in the support area, but the level of shared understanding would be exponentially better than it was when all three headquarters were displaced geographically.

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A Logistics Package convoy, from the 149th Brigade Support Battalion, prepares to travel 250 miles from Artemus to Greenville, Kentucky to deliver water, fuel, and Meals Ready to Eat to other Kentucky National Guard units conducting annual training June 5, 2016. (U.S. Army National Guard Photo by Maj. Carla Raisler, KYARNG)

In Search of Synchronized Tactical Logistics

A photograph showing a line of military trucks, including a large white truck with a crane-like structure, parked in a grassy field. In the background, several soldiers in camouflage uniforms are visible, some standing near a wire fence. The scene is misty or foggy.

By implementing effective field trains and combat trains command posts, brigade combat teams can win the decisive action fight.

■ By Lt. Col. Mike Hammond

The flow of sustainment and critical classes of supply to the most forward locations on a distributed battlefield requires an integrated system to support the linkage of sustainment to the operational scheme of maneuver. Army Field Manual 3-96, Brigade Combat Team, states that the brigade support battalion (BSB) commander is the brigade combat team's (BCTs) senior logistician, responsible for planning, synchronization, and execution across the BCT area of operations. The field manual also charges the BSB commander to retain the authority to mass, surge, and reallocate

logistics capabilities to support the BCT commander's intent and concept of the operations.

This basic task to synchronize logistics and sustainment efforts is difficult to accomplish and requires detailed planning. Synchronized tactical logistics is imperative to underwrite the BSB commander's ability to apply sustainment to assigned tactical tasks for up to six or more maneuver battalions executing simultaneous combat operations in a decisive action environment. Implementing and executing effective field trains command post (FTCP) and combat trains command post (CTCP) oper-

ations, focused on capabilities that support combat operations forward of the brigade support area (BSA), will allow the BSB commander to effectively mass, surge, and reallocate logistics capabilities on a distributed battlefield.

NTC Observations

BCTs training at the National Training Center (NTC), at Fort Irwin, California, struggle to build and emplace sustainable FTCPs and CTCPs that can facilitate tactical logistics distribution. Maneuver commanders further complicate this effort by retaining most of their

forward support company (FSC) capabilities in the CTCP and splitting CTCP nodes to create a unit maintenance collection point (UMCP) and two separate locations for role I medical care. What remains is a reduced CTCP that is unable to support the tactical distribution of sustainment forward of company trains.

Likewise, the FTCP usually contains a liaison capability without the mission command systems and leaders needed to understand the scheme of maneuver. There is typically very little understanding of requirements and consumption by class of supply.

Army doctrine is somewhat unclear about the recommended composition and resourcing of CTCPs and FTCPs. This article recommends a solution that centers on the capabilities of each sustainment node. Using the described method, the right leader with a clearly defined task and purpose will be able to support tactical sustainment distribution to the right location, at the right time, with the right quantity, and in a synchronized fashion.

Achieving capabilities at each node becomes extremely important when considering combat operations against a near-peer enemy with cyber capabilities. The right leader at the right sustainment node, and empowered to make decisions, can overcome battlefield friction and achieve these capabilities when mission command systems are denied by enemy cyber activity.

Battlefield Geometry

It is imperative for logistics planners and commanders to understand the battlefield geometry for implementing FTCP and CTCP operations that support synchronized tactical logistics. Before Army transformation and modular BCTs, commanders overcame these challenges by selecting their headquarters and headquarter company (HHC) commander, normally on their second company command. They were resourced by the best platoon leaders in the battalion, serving as the sup-

port platoon leader and maintenance officer.

The HHC commander and support platoon leader were habitually located the FTCP in the BSA, while the battalion S-4 and battalion maintenance officer were located in the CTCP. Moving sustainment and logistics forward of the BSA and to the CTCP remained difficult but was significantly simplified under the construct.

The Army added another layer of complexity by creating the FSC. Logistics planners and commanders must now contend with an additional logistics company headquarters and capabilities that complicate the tactical distribution of critical commodities. The BSB provides sustainment support to the BCT through its FSC. It resources the FSC to set the logistics conditions necessary to extend operational reach, prolong the endurance of maneuver forces, and ensure freedom of action in the BCT area of operations.

Synchronization of logistics, described in Army Training Publication 4-90, Brigade Support Battalion as “the arrangement of actions in time, space, and purpose,” requires continuous planning and accurate visibility of consumption rates by maneuver units. Building and executing FTCP and CTCP operations that support synchronization and the integration of tactical sustainment are critical.

The FTCP

The primary task of the FTCP is to coordinate with the BSB because the CTCP is frequently displaced during combat operations. The FTCP is the primary link between the maneuver battalion commander and the BSB.

Units training at the NTC achieve greater synchronization of logistics when the FTCP co-locates with the BSB inside of the BSA. This builds and maintains visibility of maneuver battalion planning, operations, and sustainment consumption rates.

The FTCP should coordinate the following capabilities: the building of distribution logistics packages

(LOGPACs) and mission configured loads, personnel replacement and human resource operations, liaison officer support to the BSB support operations (SPO) section, class IX (repair parts) distribution, planning for decontamination operations, and the receiving and processing of information from the CTCP.

Having the right leaders present at this critical node ensures the capabilities required for successful FTCP operations. Commanders assume significant risk when the right leader is not present at each node to ensure that the distribution of sustainment continues. Placing an FSC commander and a distribution platoon leader at the FTCP will ensure that BSB SPO planners understand the tactical requirements and apply the right sustainment to set conditions for the maneuver commander to accomplish his assigned task.

The FSC commander must be present in the FTCP while planning and preparations are happening for upcoming missions. The battalion maintenance control officer, with oversight from the senior maintenance warrant officer, supports the FSC commander's efforts to build class IX LOGPACs with other commodities through effective coordination with their counterparts in the BSB.

Timely Distribution

Another major issue for BCT sustainment in decisive action is the timeliness of logistics convoys. Army Training Publication 4-90 states that the distribution company conducts replenishment operations in two ways: through supply point distribution, in which the FSC comes to the supply support activity to receive supplies, and unit distribution (or LOGPACs), where the distribution company delivers supplies to the FSCs.

The issue of limited distribution throughout the BCT is exacerbated during decisive action at the NTC because the distribution platoon of the BSB's Alpha Distribution Com-

pany (ADC) now carries the BCT's common authorized stockage list. The speed of the decisive action rotation and the complexity of the environment is causing BCTs to revert back to Army of Excellence modes of distribution by locating all FSC distribution platoons in the FTCP, which is co-located with the BSA. While this expands the BSA in size, it simplifies the concept of support and reduces the maneuver task force's CTCP, which is under constant attack during decisive action.

Resourcing the FTCP with the proper mission command systems enables FTCP personnel to communicate with the CTCP and strengthens the linkage between maneuver commanders and the BSB. The BSB can provide upper tactical internet for the secure transfer of information. The very small-aperture terminals (VSATs) from the combined arms battalions and the reconnaissance squadron should be located at their units respective FTCPs in the BSA to facilitate their maintenance operations. Locating these VSATs at the FTCPs will mitigate interruptions of maintenance operations, repair parts, and the distribution of supplies.

The FTCP should track the battle and consumption rates. BSB planners and FTCP representatives can properly plan and execute sustainment operations forward of the BSA if mission command systems provided by the maneuver battalion and the BSB are present.

Assessment of the BCT's sustainment posture is a critical part of planning, and failure to conduct this assessment will affect the execution of tactical logistics. Assessments allow the BSB commander to determine if the concept of support requires adjustments.

The CTCP

Arguably the CTCP is the most important sustainment node forward of the BSA. If the right leaders are present and the capabilities of the CTCP are enforced, then the BCT and BSB commanders can continu-

ously monitor the battlefield to apply sustainment against tactical tasks.

The most important task of the CTCP is to execute the distribution of sustainment in support of its battalion. Sustainment planners must acknowledge that sustainment moves forward on the battlefield. The BSB's ADC is the lynchpin in distributing logistics to CTCP nodes and is often underutilized. This forces the FSC's distribution platoon, if it is not located in the FTCP, to return to the BSA for sustainment replenishment. This can negatively affect the tempo of an operation. The FSC distribution platoon is better utilized to conduct LOGPAC operations to logistics release points forward of the company trains.

The CTCP should include the following capabilities: assets to conduct maintenance operations, the distribution of critical supplies, role I medical operations, and class V (ammunition) resupply with mission configured loads that are preconfigured. The CTCP should remain mobile and austere to facilitate frequent displacement and contain critical assets, such as a portion of the FSC distribution platoon, to conduct emergency LOGPAC operations to company trains areas.

The FSC commander is the maneuver battalion commander's senior logistician and, in conjunction with battalion S-4, develops sustainment requirements at the FTCP. He can operate from the CTCP during combat operations, but generally, he should remain at the FTCP and coordinate sustainment activities with the BSB commander and BCT SPO.

The HHC commander and executive officer can provide the tactical expertise in the area of protection, and the battalion maintenance warrant officer manages UMCP operations. The HHC commander, as the senior company commander in the battalion, co-locates with the battalion S-1 and S-4 at the administrative/logistics operations center and provides support to the battalion specialty platoons, such as the battalion medical,

mortar, and scout platoons. Likewise, medical providers treat casualties and the medical platoon leader conducts casualty evacuation to the role II facility, which is located in the BSA.

Mission command systems support the ability of leaders in the CTCP to conduct necessary assessments of the sustainment posture of each maneuver battalion. The tactical task and conditions on the battlefield drive changes to the concept of sustainment. Commanders must resource this important sustainment node with mission command systems that support the CTCP's situational awareness during combat operations to enable the anticipation of sustainment requirements as the scheme of maneuver changes or the BCT achieves catastrophic success against enemy forces.

Effective FTCP and CTCP sustainment nodes must contain the capabilities described to assist in the tactical distribution of sustainment to maneuver units. The right leader at the right location, empowered to make decisions and cognizant of the scheme of maneuver, is needed to achieve these capabilities.

The FTCP and CTCP nodes should function as command posts and use mission command systems that support the assessment required to apply the correct level of sustainment to maneuver battalion's tactical tasks.

Functioning FTCPs and CTCPs underwrite the tempo of combat operations and can only increase the commander's operational reach when the right leaders are present to ensure the synchronization of sustainment operations is achieved through the capabilities of each node.

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How Data Analytics Will Improve Logistics Planning



Pvt. Sherry Chapman, logistician, Theater Movement Control-In-Transit Visibility, 21st Theater Sustainment Command, and Staff Sgt. Adam Moses, logistician, 386th Movement Control Team, train on a Portable Deployment Kit during the weeklong Transportation Knowledge Management Workshop, Kaiserslautern, Germany, April 25, 2019. The Portable Deployment Kit is a tool that Movement Control Teams use to track equipment in the European theater. (U.S. Army photo)

■ By Maj. Blake Schwartz, Brandon M. McConnell, and Greg H. Parlier

While the United States boasts the most powerful army in the world, one of its most critical military assets is the Army's logistics infrastructure. Gen. Gustave Perna, commander of Army Materiel Command, writes in his 2018 Army Sustainment article, "Projecting Our Force: Our Strategic Advantage," that one of our key strategic advantages is the ability to project power across the globe and overcome logistics challenges to sustain deployed forces.

As the Army shifts away from the force generation model of the last decade and a half of deployments, it must rely more heavily on the logistics base in the continental United States to sustain deployed forces. Globally positioned

assets, such as Army pre-positioned stocks, will augment stateside sustainment capabilities, but the Central Command model of extremely robust sustainment centers in theater will no longer work.

The next conflict will likely require an expeditionary force gaining entry, with additional forces following. Sustainment of the force is likely to be a significant challenge. As the 2017 National Security Strategy notes, "The ability of the military to surge in response to an emergency depends on our Nation's ability to produce needed parts and systems, healthy and secure supply chains, and a skilled U.S. workforce."

We have not faced the need to rapidly execute expe-

ditionary logistics to sustain major forces since Operation Iraqi Freedom in 2003. Fortunately, the data and analytics aids are now becoming available for logistics planners to much more effectively predict the requirements of an expeditionary force and sustain it efficiently.

According to “Mastering the Deployment Basics: An Interview With Retired Lt. Gen. Patricia McQuiston,” published in the March–April 2018 issue of *Army Sustainment*, significant benefits can be derived from the ubiquitous data available through Global Combat Support System–Army and other systems by fully capitalizing on rapidly developing information technologies and data analysis techniques.

These techniques can be especially helpful in informing the requirements and expected performance of the sustainment network.

With better sustainment demand forecasts, the Army can avoid costly “iron mountains” of supplies in theater. Additionally, supply chain bottlenecks can be anticipated and avoided so that units receive supplies much faster.

In short, the total asset visibility and historical data provided by GCSS–Army should enable much more effective logistics. However, relevant data must be used to generate accurate forecasts for future operations and to inform models of our sustainment networks.

The tools to perform these functions are just emerging, and will soon revolutionize military sustainment planning. Several Army agencies use sustainment models that perform some of these functions. However, the models are not well-suited for operational units because of setup and run-time limitations and specialized software requirements.

Two of these models are the Logistics Battle Command (LBC) model and the Planning Logistics Analysis Network System (PLANS). LBC is a simulation used by the Training and Doctrine Command Analysis Center–Lee to conduct comparative assessments of the impacts of force designs, weapon systems, vehicles, and concepts of support on military logistics.

PLANS is a web-based tool developed by the Army Corps of Engineers’ Engineer Research and Development Center that can project multi-modal logistics performance at a high fidelity. Further, PLANS boasts a user-friendly web-based interface and excels in over-the-shore logistics and route planning. Although LBC and PLANS are both excellent tools, they were not designed to incorporate GCSS–Army data.

Operational Demand Forecasting Tools

While LBC and PLANS are very useful as applied, neither is optimal for operational units, which need tools to quickly generate demand forecasts. Logistics planners at the tactical and operational levels rely predominantly on two tools to help them generate a forecast of sustainment demand for a mission: the Operational Logistics (OPLOG) Planner and the Logistics Estimation Workbook (LEW).

During the planning process, logistics planners could use real-time analytics to evaluate and compare sustainment courses of action, create decision points, and generate recommendations for commanders.

From a broader national security perspective, effective sustainment will remain crucial to meeting future challenges. More intelligent planning and analytics tools will enable the Army to further extend logistics innovation and effectiveness.

OPLOG Planner

OPLOG Planner is the most widely used logistics planning tool in the operational force. The tool is maintained by the Combined Arms Support Command's Planning Data Branch (PDB), which is responsible for developing logistics planning factors in accordance with Army regulations. OPLOG Planner generates a forecast by estimating the weight and pallets required over time for each class of supply. The PDB uses logistics data from across the Army and joint communities to assess planning factors (how much a force will require of what classes of supply under specified conditions) and disseminates these factors to the Army and the joint community for planning use.

OPLOG Planner is PDB's primary means of publishing logistics planning factors. It is a user-friendly standalone program that produces estimates for the logistics needed to meet mission goals based on user inputs that describe the mission. Planners use OPLOG Planner to calculate transportation and other logistics assets required for the scheme of maneuver and to forecast demand over time.

OPLOG Planner is continuously updated through coordination between PDB and data owners including the Center for Army Lessons Learned, the Army G-1, and Training and Doctrine Command. Consumption for items is estimated using data from current and past operations, and a new version is released annually.

The LEW

The LEW is a Microsoft Excel spreadsheet-based tool that allows logistics planners to quickly estimate a forecast for supply, transportation, and maintenance requirements. The LEW uses doctrinal combat profiles and supply consumption rates and information in planning manuals, Army reference publications, and field manuals to derive planning factors and consumption rates for classes of supply. It is intended to be used during the planning process.

The LEW planning factors mirror those used by PDB and the Theater Sustainment Battle Book. Additionally, the LEW is updated by users in the Army logistics community to incorporate best practices and to keep it current.

The LEW is now part of the programs of instruction for the Combined Logistics Officers Advanced Course, the Logistics Captains Career Course, the Support Operations Course, and other Army logistics courses.

Current Gaps

OPLOG Planner and the LEW are effective tools for quickly determining a demand forecast. The continual updating of the tools and their underlying data provides units with the most relevant and up-to-date forecast factors available to generate the best sustainment demand forecast possible.

Ideally, the demand estimate should be a mission-based forecast (MBF) that incorporates mission type, task organization, climate, geography, and other statistically relevant

factors. A Logistics Management Institute study has documented the benefits of MBFs for Army aviation units. In *Transforming U.S. Army Supply Chains: Strategies for Management Innovation*, Greg Parlier notes that although the Department of Defense continues to research the potential of MBFs, the Army currently lacks the analytical capabilities to systematically generate them.

As the MBF and other improved demand forecasting methods emerge, the LEW and OPLOG Planner are designed to accommodate these updates quickly; however, gaps endure. For example, data is almost completely lacking on how varying climates affect supplies (other than water). To what degree will a combat vehicle's maintenance requirements differ in a jungle versus a desert? A planner's intuition says they will, but the data for such a forecast is lacking. Consequently, OPLOG Planner and the LEW cannot yet account for these factors.

Ammunition forecasting is another gap. OPLOG Planner calculates basic loads for systems but not ammunition consumption or requirements over time. The LEW provides even less forecasting capability for ammunition, providing only a means for units to track their ammunition consumption and levels in stock. Ammunition consumption forecasts are particularly complicated, because they depend on many factors including ammunition availability, interdependencies between weapon systems, and even the personnel involved. For this reason, ammunition forecasts will have a large variance, but future tools that provide a consolidated sustainment forecast should nevertheless include class V (ammunition).

More fundamental than the current demand forecast deficiencies is the lack of a tool to provide sufficient wargaming capability for sustainment planning. Neither the LEW nor OPLOG Planner provide logisticians with the ability to analyze the logistics network for a given course of action (COA). While the tools can be used to forecast sustainment requirements, they cannot be used to assess the supply chain to meet those requirements. They cannot predict bottlenecks or capacity shortfalls for a logistics network or assess risk.

Operational commanders and their staffs assess the scheme of maneuver for an operational COA for risks, suspect assumptions, agility, flexibility, mass, protection, and any criterion that the commander desires. But the sustainment plan often does not benefit from the same rigor of analysis.

Where is the supply chain most vulnerable? How would losing a logistics node due to weather or enemy action affect the plan? If the demand does not match the forecast (it never does because perfect forecasting is impossible), how long will it take to receive the needed items? And how do maneuver COAs compare in the logistics realm; is one more risky or harder to sustain? Logistics planners do not currently have tools to help them answer these questions in a rigorous way, especially in the time-constrained environment of expeditionary planning.

While OPLOG Planner and the LEW allow logistics planners to forecast the sustainment required for a mission, they do not enable operational or tactical planners to evaluate logistics COAs for feasibility, risk, robustness, or efficiency or to methodically compare alternate COAs. With the recent advent of total asset visibility through the GCSS-Army system, there is an opportunity to enable planners to conduct end-to-end analysis of a logistics COA for a mission and leverage GCSS-Army data to determine how best to sustain the scheme of maneuver. This would dramatically improve the ability of sustainment planners to prepare for and support operations. One new approach to provide this capability is the Military Logistics Network Planning System (MLNPS).

The MLNPS

The MLNPS was developed at North Carolina State University (NCSU) by a research team including active and former military officers. It is currently being further enhanced by the authors of this article and other researchers.

The MLNPS can generate a forecast for sustainment requirements based on mission information provided by a user. The forecast includes the needed quantity of supplies by location and time. The MLNPS creators have consulted with PDB in order to mirror OPLOG Planner estimating techniques where appropriate and improve on them where possible.

With the MLNPS, however, the demand forecast is only the first step. Using the forecast, a logistics planner can use the MLNPS to analyze from end to end the sustainment network intended for a COA. The tool can identify bottlenecks in the sustainment flow, expected delays, and logistics capacity or resources needed to improve the sustainment network's performance.

For example, the MLNPS might indicate that after arriving in theater, supplies are predicted to face mounting delays at the theater distribution point before going to tactical units. The MLNPS could be used to determine whether increasing warehouse capacity (by adding workers or space) or adding transportation assets for the distribution effort would mitigate or solve the problem. A planner could determine when added capacity was required and plan accordingly.

In addition, the MLNPS enables risk analysis, where the planner can identify what the effects of potential disruptions to the system are likely to be. For example, a planner could accurately estimate the delays downstream from a logistics node that closes or has reduced capacity. This allows the logistics planner to create decision points for the commander and recommend appropriate alternatives to prevent sustainment disruption. All of this is accomplished in near-real time (within minutes or hours, depending on the size of the model), keeping the tool relevant for operational mission planning.

Another critical advantage of MLNPS is that it is designed to incorporate data from GCSS-Army. While this

capability is currently being developed, the intent is for MLNPS to draw upon GCSS-Army's asset visibility to identify the best sourcing for supplies to further streamline expeditionary logistics.

After discussions with the Combined Arms Support Command, the research team is encouraged about the prospect of future integration of MLNPS as a GCSS-Army application. This would provide MLNPS capability to the force, make it accessible through GCSS-Army, and integrate a modeling capability with real-time sourcing data for supplies.

GCSS-Army provides opportunities to develop tremendously improved decision-support tools for logistics planners and decision-makers. During the planning process, logistics planners could use real-time analytics to evaluate and compare sustainment courses of action, create decision points, and generate recommendations for commanders. While units are currently using GCSS-Army to improve their requisition processes and supply operations, MLNPS provides the opportunity to dramatically improve sustainment planning as well.

From a broader national security perspective, effective sustainment will remain crucial to meeting future challenges. More intelligent planning and analytics tools will enable the Army to further extend logistics innovation and effectiveness.

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BOOK REVIEW

SUPPORTING THE DOUGHBOYS: US Army Logistics and Personnel During World War I

Leo P. Hirrel



**Combat Studies Institute Press
US Army Combined Arms Center
Fort Leavenworth, Kansas**

Dr. Leo P. Hirrel's book about World War I logistics provides lessons applicable to today's large-scale combat operations.

■ By William S. Kelley

As we commemorate the 100th anniversary of the end of World War I, Dr. Leo P. Hirrel's book about the logistics of that war is worthy of the attentions of Army and joint sustainers. Field Manual 3-0, Operations, has refocused the Army's attention toward large-scale combat operations, and the Army is challenged to prepare for operations against a near-peer competitor where all of the domains are contested. While the challenges we face today are great, we should consider the state of the Army 100 years ago.

World War I brought the Army into the 20th century with a modern administrative system and processes for manning, equipping, and training. We can gain perspective and understanding to address the issues in today's sustainment environment by studying the numerous sustainment challenges faced by the Army in World War I.

Reading *Supporting the Doughboys: US Army Logistics and Personnel during World War I*, benefits joint sustainers by addressing the size, organization, and logistics capabilities of the 1917 force. Moreover, the book demonstrates how the Army and nation met the challenges of mobilizing for a large-scale conflict.

Before World War I

After the Civil War, the Army went fifty years without fighting a major war. As a result, it had none of the equipment, doctrine, organization, or experience needed to support what would become a two-million Soldier Army deployed to France.

The pre-World War I Army was a small, constabulary force of approxi-

mately 100,000 active duty Soldiers. Regiments were the largest units in the force.

Logistics functions were not streamlined. Each supply bureau—Quartermaster, Ordnance, Engineer, Signal, Adjutant General, and Surgeon General—exercised extensive autonomy over their operations and their logistics. Congressional politics allowed these bureaus to resist efforts by the Army General Staff to streamline operations. The supply bureaus competed with each other for scarce resources, without any thought to the other bureaus or the Army at large.

For example, Hirrel notes that at the beginning of the war, the Adjutant General's Branch purchased all available typewriters on the market, and the Army's Rock Island Depot purchased all the available leather, without any consideration for the needs of the rest of the service.

Training and Equipping Issues

Hirrel explains the immense challenges faced in reorganizing the economy to support the war. Due to a policy of strict neutrality, President Woodrow Wilson did little to prepare the economy before the United States declared war.

The industrial base took 12 months to retool. Only by end of the war was it able to supply the needs of the Army. As a result, many Soldiers in stateside training bases were not properly equipped and had no chance even to fire a rifle before deploying to France.

The United States relied extensively on France and Great Britain to arm and equip its Soldiers. In his book, Truman, David McCullough writes that field artillery units, like those commanded by Harry S. Truman, were equipped with the French

75-millimeter howitzer upon arrival in France. Due to a lack of equipment in the United States and a desire for realistic combat training, Gen. John J. Pershing, the commander of the American Expeditionary Forces (AEF), instituted a 60-day training period for all arriving U.S. units. Training and equipping issues delayed U.S. participation as an independent force until the summer of 1918.

One of the earliest issues faced was clothing the Army. The war in Europe created a serious wool shortage for the U.S. textile industry in 1917 because imports were not available from suppliers in Australia and New Zealand. The brief military campaign in Mexico had exhausted the Army's inventory of uniforms, and rapid mobilization for World War I exacerbated the situation. As a result, there was widespread suffering the first winter. Soldiers lacked blankets, tents, and warm clothing at U.S. training bases and in France. Through a combination of legislation, government allocation of war materiel, purchases in theater, and salvaging of used uniforms, the issue was resolved by the summer of 1918.

Another issue that arose from the 1917 campaign in Mexico was related to the widespread acceptance of trucks to extend operational reach. No centralized process or strategy existed for purchasing and maintaining trucks. Each supply bureau simply went to the market and purchased what it required.

By the end of the war, the Army operated over 294 models of trucks, including many European models manufactured with metric measurements. This led to widespread shortages of repair parts and created challenges in keeping trucks operational.



The Army introduced a standardized 3-ton Liberty truck, but only 8,000 were purchased—far too few to meet operational needs. Altogether the Army only had about 50 percent of the trucks it needed. The challenge was keeping these trucks operational. This resulted in severe shortages of short-haul transportation assets. Hirrel writes that this issue was never fully resolved, but it set the stage for centralized planning and purchases of trucks for World War II.

Theater Distribution

Hirrel's astute observations include detailed descriptions and careful research, especially in the chapters focused on the challenges and adaptations made by the Army in the theater. Using today's parlance, Hirrel describes the Army's establishment of what was its theater distribution network. The author reiterates that the Army, as a small force inexperienced with large-scale operations. The only guidance available to sus-

tainment planners was the service regulations of the time. Planners applied these regulations to establish a theater area of operations.

The area adjacent to the U.S. portion of the lines was called the zone of the armies, and everything behind this area was called the line of communication (LOC). Hirrel writes that the area inside the LOC was further divided to provide sustainment capabilities by echelon. The advanced section, closest to the zone of armies, contained smaller depots, repair facilities, and most importantly, regulating stations. Regulating stations served as central receiving and shipping points, breaking down trains shipped from depots and slotting rail cars by destination, typically to the division railheads.

The intermediate section of the LOC contained the key facilities required to sustain the Army, including depots, warehouses, ice plants, bakeries, replacement depots, salvage and repairs facilities, forestry services, and

other activities. These facilities were quite large. For example, Gievres Depot had 165 miles of track, 208 warehouses containing 2 million square feet of storage, and employed 20,000 workers by the end of the war.

The base section of the LOC contained a major port, smaller ports, and supporting services, such as rail, warehouses, and personnel processing centers. The British Army, which had operated in France since 1914, used the most capable French ports on the English Channel adjacent to their lines. The U.S. sector, located in Lorraine, relied on the smaller Atlantic coast ports of Brest, St. Lazare, and Bassens. These ports supplied the needs of the French people and were generally less capable than those along the English Channel.

The ports needed extensive adaptations. Wharfs, rail lines, cranes, and warehousing were added. The American ports also needed a large labor force. Much of this force was provided by African-American stevedores

units. By war's end, the United States operated nine base sections with 26 ports.

Planners assumed the Army would contract for its transportation needs once in France. However, years of war had left French rail lines in poor shape. Rail lines connecting Atlantic ports to Lorraine ran 600 miles on secondary lines. Sections of rail were removed to be used at the front, and rail cars and locomotives were in short supply and in need of repair. As if that was not enough of a challenge, the employees running the French railroads were at the front.

The U.S. Army was tasked with an enormous challenge to build and manage hundreds of miles of rail lines with no experience or operational capability to do so. For this reason, the AEF Transportation Service was born. Its units were created with Soldiers who had railroad expertise from their civilian occupations.

Command and Support Relationships

Hirrel details the challenges in theater of resolving command and support relationships between the War Department, the AEF, the supply bureaus, and theater sustainment organizations, known collectively as the LOC. There was confusion about the roles of the LOC components. In addition, the AEF railroad community insisted on extensive autonomy within the LOC, and this precipitated a series of clashes with the AEF.

Pershing resolved the situation by strengthening the sustainment command's authorities by shifting responsibilities from the AEF Headquarters to the newly created Services of Support (SOS) command. Hirrel writes that under the command of Maj. Gen. James Harbord, the SOS was able to further improve the efficiency of theater sustainment through his enhanced authority and close relationship with Pershing.

Hirrel points out that important precedents developed in World War I concerning sustainment and unity of command. Pershing established

the principle that theater sustainers work for the theater commander. In 1918, word reached the War Department of issues with frustrated cargo at the ports due to mismanagement. The War Department drafted a plan in which Pershing would be relieved of responsibility for theater sustainment so he could focus on directing combat operations.

The Quartermaster General would come to France to take charge of the SOS and coordinate with Pershing but report directly to the War Department.

Pershing acted quickly and decisively to voice his objections to the plan and stressed unequivocally that the theater commander must have control of all his assets. Pershing won the argument, and to this day, theater commanders control sustainment in their theaters.

Logistics Innovation

Hirrel highlights innovations from World War I that are now common place in doctrine and operations. The AEF established theater stockage levels, expressed in days of supply (DOS), to safeguard against interruptions in the flow of supplies from the United States. The base section at the ports would hold 45 DOS, the intermediate section would hold 30 DOS, and the advanced section would hold 15 DOS.

Automatic re-supply, "push" logistics, was first used by the AEF to speed supplies to front-line units without a need for requisition. Much like today, commodities such as subsistence, fuel, and other supplies, were consumed at predictable rates and so were pushed forward based on unit populations and regular logistics reports.

The AEF developed classes of supply to aid in the management of the vast quantities of materiel needed. These classes were based on supply method, automatic or requisition-based. Routine daily supplies, such as fuel, food, and animal forage, were shipped automatically. These were classified as class I. Supplies

needed regularly, but not daily, such as clothing, were class II. Durable items, such as mobile kitchens, were considered class III. Lastly, munitions were considered class IV and were shipped based on operational need.

Hirrel's book is well-documented, accessible, and enjoyable to read. He takes the reader from the small constabulary focused Army of 1917 to one that grew to over two million Soldiers over 18 months and participated in the final campaign that brought the war to a close. He highlights the immense challenges the Army and nation faced to mobilize and equip for war.

The lessons learned and innovations of theater sustainers from 100 years ago are particularly durable. For example, clear command and support relationships, forward-based logistics, and responsive support all have their place in large-scale combat operations. On the 100th anniversary of the end of World War I, today's sustainers can gain a better appreciation of the challenges faced by our forerunners and apply these lessons to the challenges of today's operating environment.

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