



Pvt. Sherry Chapman, Theater Movement Control-In-Transit Visibility, 21st Theater Sustainment Command, and Staff Sgt. Adam Moses, 386th Movement Control Team, 16th Sustainment Brigade, train on a Portable Deployment Kit during a Transportation Knowledge Management Workshop at Kleber Kaserne, Kaiserslautern, Germany, 25 April 2019. The Portable Deployment Kit allows movement control teams to track in-transit equipment in the European theater. (Photo by Staff Sgt. Adrian Patoka, U.S. Army)

Automated Systems

The Complexity of the Supply and Logistics System of the U.S. Army and the Need for Automation

Alan Cunningham

If anything has become apparent over the last couple of years with the COVID-19 pandemic, the subsequent supply chain crisis, and the Russian invasion of Ukraine, it is that supply chains matter.¹ These situations have seriously affected the entire globe, changing the way in which governments, militaries, and private industry assess weaknesses within their supply chain and cyber systems.

The most recent development of the Russo-Ukrainian War, the February 2022 invasion of mainland Ukraine by the Russian Federation, clearly demonstrates how important supply chains and logistics are to militaries. In the ongoing conflict, with casualties mounting and Ukraine launching successful counteroffensive upon counteroffensive, the Russian military has been facing serious logistic issues (including truck and railroad supply problems) while showing their political and military inability to commit war, resorting to conscripts to try to win a failing war.²

Given this moment for reflection, it is important to look at how supply chains and the entire logistical operation of our own U.S. Army can be updated to combat these new threats and better defend the Nation.

How is the Army (and the entire U.S. Armed Forces) prepared to deal with supply chain issues in times of direct action and during combat operations? The military is seriously underprepared and years behind in maintaining an advantage in emerging technology like artificial intelligence (AI), machine learning (ML), and blockchain technology.

The U.S. Army Logistics-Supply Chain

Historically, the U.S. Armed Forces have “always shown a mastery of logistics,” according to Colin S. Gray, a professor at the University of Reading in England and longtime military strategist.³

Writing in the Strategy Bridge, Michael Trimble and Jobie Turner reiterated this perspective, stating,

While military history in general abounds with logistical failures, the study of American military history reveals that superior U.S. logistics has repeatedly bailed out poor planning, sub-optimal operational decisions, and tactical errors ... Since the end of the Second World War, logistics has been the great asymmetric advantage of the U.S. military.⁴

However, in recent years, flaws within the system have become apparent. According to Bradley Martin, the director of the National Security Supply Chain Institute at the RAND Corporation, in the aftermath of the Cold War,

logistics planners moved away from a focus on effectiveness to a focus on efficiency, in the sense that little is left idle for significant periods and that commodities are delivered at minimum cost ... [meaning] such factors as planning for attrition or dispersion or consideration of resupply points became matters of cost, with a bias toward “just in time” delivery that is simply not executable in the world as it has evolved.⁵

Breaking Defense reported in November 2021 that a popular military and foreign policy think tank, the Ronald Reagan Institute, had identified “that the US military’s supply chains were ‘exceedingly fragile’ and that the US needs a ‘manufacturing renaissance’ amid intensifying relations with China.”⁶

In an essay for the Heritage Foundation, Lt. Gen. John E. Wissler, the former commander of the U.S. Marine Corps Forces Command, highlights the issues facing the service:

The success of military logistics during the past 16-plus years of overseas combat operations is partly to blame for anyone’s assumption that continued logistical success in the ever-changing national security environment is a given across the entirety of the military logistics enterprise ... Failure to understand the implications of not modernizing logistics in a time of great technological change potentially spells doom for the success of the modernized force.⁷

Partly out of necessity and age, the U.S. Army has one of the most complicated supply chains in the world, largely maintained by the Army Materiel Command and the Defense Logistics Agency, the two main interfaces the Army has with the national defense industrial base.

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Soldiers prepare for Allied Spirit X by retracking an M1A2 SEP V3 Abrams tank in Hohenfels, Germany, 3 April 2019. The exercise included about 5,600 participants from fifteen nations including the United States and Germany. (Photo courtesy of the U.S. Department of Defense)

How the Army's Logistics System Functions

The Army's logistics and supply chain system is incredibly, almost convolutedly, complex. Filled with moving human parts and thousands of contractors from within the national defense/security infrastructure, the Army's logistics system is now rather bloated.

Back in 2008, during the height of the Iraq War, the men of Bravo Company, 2nd Battalion, 6th Infantry Regiment observed this. Staff Sgt. Craig Morales, the company's shop foreman, was quoted as saying, "The biggest challenge for us is making repairs without actually replacing parts—actually fixing things instead of just changing the part."⁸ The unit, not having seen any combat by the time this article was published, identified "usually a five-day wait to get even the most critical parts," resulting in their having to simply repair the part itself instead of replacing it, as should be done.⁹

Complicating this has been that relationship between the private defense sector and the military itself, with logistics writer Mike Brewster writing in *Forbes* that "although clearly the armed forces believe they are becoming more efficient by outsourcing many logistical chores, there is also concern over the extent to which these vital military tasks are now being performed by civilians."¹⁰ A very similar issue has been plaguing Russian forces in Ukraine during their 2022 invasion of the Eastern European nation.¹¹

While other nation-states (like Iran and China) also have poorly developed and implemented support and supply lines, this clearly does not make the United States a better adversary.¹² If one's enemies have poor logistical capabilities, that does not mean that the other side's capabilities are state of the art or superior. They can be in dire need of support or rework as well. And as has been seen by think tank reports, the essays of former military logistics officers, and academic articles by career Army logisticians,



Mine-resistant, ambush protected vehicles undergo thorough maintenance as part of the Logistics Task Force-Bagram Airfield "racetrack" at Bagram Airfield, Afghanistan, 12 March 2019. (Photo courtesy of the U.S. Army)

the Army supply chain is not the most secured or effective.¹³

The Flaws of Army Logistics

With Army logistics, the complexity is clear. One can see how complex the system is and how, if one area fails, the entire rest of the system goes down as well and can result in significant time delays. Anything from the procurement of artillery pieces to essential food and water for combat troops could be held up for days or weeks due to a poorly developed or ill-thought-out logistics system.

In the report from the Reagan Institute, the Task Force on National Security and U.S. Manufacturing Competitiveness, chaired by former private industry executives and including government officials and military officers, provided four strategic recommendations:

[E]mployers' roles [should be expanded] in workforce training by repurposing existing federal education grants to allow high school graduates to earn credentialed skills [and] U.S.

manufacturers should commit to fund 500,000 new graduates of trade school and apprenticeship programs over the next decade ... The federal government must develop the capability to work with private sector employers, as well as state and local governments, to provide liquidity and low-cost capital to critical domestic manufacturers and infrastructure ... Update the DPA [Defense Production Act] to enable holistic solutions for critical manufacturing facilities, such as targeted visa approvals for STEM talent, direct project financing, automatic fast-tracking of permits, and investments in workforce training ... The United States should establish a new forum to promote enhanced coordination on topics like growth, data governance, technology standards, and supply chain security.¹⁴

The primary issues the Reagan Institute report deals with concern the private defense sector's responsibility

in the acquisition of arms and materiel and the modernizing of legal aspects by Congress, looking at the system overall instead of directly at the U.S. Armed Forces, but they also highlight many issues that directly affect the current standing of the U.S. Army's supply lines. These recommendations, if followed, would drastically assist the Army's ability to function, clearing up much of the complexity and redundancy of the logistics system.

James Kennedy and Kris Hughes, both instructors at the U.S. Army Command and General Staff College and career military officers with years of experience in sustainment and maintenance, discussed in the May-June 2017 issue of *Military Review* ways in which the military can further innovate the logistics system. They advocate for the creation of a joint logistics staff officer track in which these officers would not be overburdened by certain knowledge gaps other individuals familiar with joint military missions have who are able to "more efficiently and quickly contribute to the mission [while bringing] new perspectives and insights from previous joint assignments, and they will also have an understanding of how the other services work and how to best integrate Army capabilities into joint operations."¹⁵

This would be coupled with the creation of a home-stead unit "where the majority of personnel can be retained in a unit to maintain unique skill sets [as well as] a decrease in PCS costs and the development of a core cadre with increased experience in unit-specific techniques, tactics, procedures, and operations" and the amending of policy that would

authorize Army Materiel Command to provide a limited amount of [Army Working Capital Fund] to the appropriate Army service component command to ensure Army Contracting Command contracting officers can respond swiftly to immediate life-support and setting-the-theater requirements, especially in humanitarian and disaster response operations.¹⁶

These solutions are far more directly relatable to the Army but also would assist in various areas, including the providing of a better family life for officers and enlisted working sustainment, better assist in the development of logistics officers for a more well-rounded approach, and better improve the complexity of the acquisitions process.

In a system reliant upon humans and physical security, however, a more automated approach is necessary and needed for the increasingly digitized world society has found itself in.

The Digital Age

The supply chain needs to be updated and made capable for the next large-scale conflict; that much is clear. In this new digital age, when we have the advent and benefit of technology, it is right to take advantage of these systems and use them to improve the current logistics. As such, including AI and ML technologies into the upkeep and monitoring system for military vehicles will be one of the most surefire ways to improve the Army's current logistics systems.

In this sense, it is helpful to envision the Army's logistics system as analogous to the human body. Vehicles have sensors throughout them and, similar to how humans sense time and space, these vehicles monitor each moving piece within the system, determining their operational quality or if they need assistance. This system of sensors feeds back to interlaced computers that would have AI-embedded technologies; this AI technology would read the entire system and be able to predict, based on wear and tear and with telemetry data forecasting how each driver practices maneuvers, or when parts are going to fail. It could calculate when an item breaks down and then promptly order the specific part automatically, moving it where it will need to be.

In this system, the emphasis would be on the optimization of fleet readiness and the ability to generate vehicles that work and function properly while streamlining the entire system from part breakdown to part replacement. To do this, though, we must place trust and turn over in large part to AI. While the replacement of the human aspect of the logistics process is impossible, we can replace much of the individuals who perform the analysis, call and release items, and input that pertinent information into the computer. The computer, through ML techniques and programming, will learn the process from itself and load all those core functions and knowledges of transit times into factoring out orders, rearranging accordingly.

The Challenges of Digital Updates

In digitally updating the logistics system, there will be three main difficulties in implementing more

automated or digital aspects into the Army's logistics system and supply chains. First will be the securing of digital communications; second, the legal authorization to purchase; and third are the cultural and mentality shifts that leaders will need to make.

Looking first at the securing of digital communications, however, this will be an important aspect for the logistics process of any company, entity, or industry, not purely the U.S. Army. With any process, especially in logistics, proper communication between parties and individuals is key to making the system function properly.

Having a technical system leaves it open to attack or penetration from nefarious entities or individuals looking to do harm, not only foreign nation-states' militaries and intelligence services but also U.S. soldiers looking to harm their fellow comrades in arms for one reason or another.

During a speaking engagement during the early days of the Russian invasion of Ukraine, Secretary of the Army Christine Wormuth discussed how the Russians' activities using cell phones "speaks to the fact that we're going to have to look at how can we reduce our signatures—the signatures of our formations on the battlefield—as much as possible because the battlefield of the future will be highly transparent."¹⁷

With securing digital communications, a more robust and innovative solution will be necessary if the Army and the Department of Defense (DOD) decides to technologize large parts of the logistics system. Given its importance in all matters military, this system must be among the most protected technological system in all the national defense framework.

The second aspect is improving the legal authorization to purchase and acquire the necessary parts and materials for sustainment. In protecting and enlarging this legal aspect, this comes down to the DPA. In an opinion piece for *The Hill*, Bob Nugent, a veteran U.S. Navy intelligence officer with experience in sustainment, writes that "the DPA is designed specifically for short-notice mobilization," meaning in the event that a national military emergency was needed, the U.S. military would not be best suited to develop the "inventories needed to respond to initial surge demand."¹⁸ This is quite similar to what the Reagan Institute report has iterated.

The main solution to this comes largely in the form of both policy and practicality; from a policy standpoint, ensuring the DPA is up to date and able to

function as described by many informed individuals is a primary goal and solution to solving the logistical issues within the U.S. Army's supply chain. Doing so will primarily be a congressional issue, though the DOD can be able to apply ample pressure on this front.

Bill Greenwalt, Jerry McGinn, and Christopher Zember, all former DOD personnel, urged that "all parties to avoid any changes that impede the effective use of the DPA" while recommending "an open dialogue between Congress and the Pentagon to understand and address current restrictions impeding the effective application of the DPA, and to ensure any future changes do not undermine the Defense Department's ability to effectively and rapidly address legitimate defense requirements."¹⁹ By having this level of collaboration between the DOD and policymakers, the DPA can be better reworked into adapting to the technological age that future conflicts will bring and help support improving the Army's supply logistics system.

The final aspect, having senior and junior leaders come on board to make some aspects of this supply and logistics system automated, is the most difficult challenge here in making the Army logistics process smoother.

From a technical standpoint, this will be challenging due to a fundamental misunderstanding about various technical terms that would be implemented: artificial intelligence, blockchain, big data, and machine learning. These are not common terms in military parlance and will be a challenge to understand. Having individuals make policy for a system, technique, or process they are not fluent in or do not have a complete understanding of will often result in an incomplete or ineffective policy. This mandates the need for leaders who either take a vested interest in policies that will benefit the soldiers of tomorrow or leaders who will listen to experts and junior soldiers who have taken the time to research and study these problems.

Having automated systems or AI take the lead on items will be a culture shock for many soldiers, officers, and senior noncommissioned officers alike. Many of these individuals' perceptions will largely be influenced by science fiction media they have consumed that has often been far-fetched and contributed to a negative understanding and view of heavily technical fields that are becoming more commonplace.²⁰ Because of this, senior officials, military and civilian alike, will be less inclined to implement AI or machine learning into

their logistics systems as they have a preconceived, misunderstood notion of the systems. Changing how officials and officers think and consider new and emerging technologies will be the hardest trial, one that will be nearly impossible without having persons willing to listen to new opinions and are open to change.

Conclusion

Throughout history, military operations have succeeded or failed because of sustainment in the long term. Not discounting the American fighting soldier, over the course of time and protracted conflict (the current conflict in Ukraine is a shining example), if combatant and geographic commands are unable to

get essential or necessary items to the battlefield, then the military operation will stall, and soldiers will end up becoming either more susceptible to enemy attack or take severe and heavy casualties.

This showcases the importance of automation and more technical needs to become standard within the Army logistical process. As the world becomes more technological, it is important that the military be forward-thinking and recognize that the 2030 operating concept will not be the most effective in the wars of 2070, 2080, or 2090.

Bringing technological advancements and aspects into the world of sustainment will allow the most vulnerable parts of the Army's sustainment apparatus to be protected and defended in the conflicts ahead. ■

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