

# Precision Logistics: Sustainment for Multi-Domain Operations

by Major Bradley Cooper, U.S. Army

PUBLISHED BY THE INSTITUTE OF LAND WARFARE  
AT THE ASSOCIATION OF THE UNITED STATES ARMY



SEPTEMBER 2019

*Leaders win through logistics. Vision, sure. Strategy, yes. But when you go to war, you need to have both toilet paper and bullets at the right place at the right time. In other words, you must win through superior logistics.*

Tom Peters, March 2001<sup>1</sup>

## ■ Introduction

The reemergence of inter-state strategic competition presents a more complex challenge for the U.S. joint force and the U.S. Army than any experienced in the last 18 years of conflict. The strategic security environment described in the 2018 *National Defense Strategy of the United States* necessitates that DoD and the military services prepare for operations on a complex and multi-domain battlefield.<sup>2</sup> Russia and China, among others, are developing capabilities to counter the United States through multiple layers of stand-off in all domains—space, cyber, air, sea and land.<sup>3</sup> They are synthesizing emerging technologies with analyses of military doctrine and operations. The U.S. Army's response to this challenge is embedded in a concept called Multi-Domain Operations (MDO).

MDO calls for the rapid and continuous integration of all domains of warfare to ensure that the U.S. Army can deter threats and prevail against bad actors as Army units face engagements that are short of armed conflict. Should deterrence fail, armed conflict will be undertaken to penetrate and “dis-integrate” enemy defenses; to exploit the resulting weak points; and to consolidate gains to force a return to competition (re-compete) on terms favorable to the United States and its allies and partners.<sup>4</sup> Doing so first

## ISSUE

A focused, resilient and innovative sustainment enterprise is essential to supporting Army forces from fort to port to foxhole in Multi-Domain Operations (MDO).

## SPOTLIGHT SCOPE

- Describes the U.S. Army's transition toward a sustainment enterprise that is best postured to support MDO.
- Explains U.S. Army Materiel Command's focus areas, which guide development of required MDO sustainment capabilities.
- Explores emerging enabling capabilities to overcome sustainment gaps and deliver precision and survivable logistics.

## INSIGHTS

- Existing capability gaps could limit the Army's ability to provide reliable, agile and responsive sustainment in an MDO environment.
- Precision logistics are required to achieve overmatch in MDO.
- The evolving sustainment enterprise relies on a Total Army effort—the Regular Army, Army National Guard, Army Reserve and Department of the Army civilians and contractors.

<sup>1</sup> Tom Peters, “Rule #3: Leadership Is Confusing As Hell,” *Fast Company Magazine*, no. 44 (March 2001).

<sup>2</sup> DoD, *Summary of the 2018 National Defense Strategy of The United States of America: Sharpening the American Military's Competitive Edge*, 19 January 2018, 2–3.

<sup>3</sup> Department of the Army (DA), U.S. Army Training and Doctrine (TRADOC) Pamphlet 525-3-1, *The U.S. Army in Multi-Domain Operations 2028* (Washington, DC: U.S. Government Printing Office, December 2018), Forward.

<sup>4</sup> TRADOC Pamphlet 525-3-1, *The U.S. Army in Multi-Domain Operations 2028*, iii.

requires neutralizing adversaries' anti-access/area denial (A2/AD) capabilities as U.S. forces deploy and then employ combat power into hostile environments. Threat A2/AD capabilities impede not only the mobility but also the sustainment of U.S. forces.

Recent studies have concluded that there are gaps in the joint force's ability to provide reliable, agile, responsive and survivable sustainment, causing senior leaders to ask how the Army is going to sustain itself and the joint force from fort to port to foxhole. It is imperative that the Army has a robust sustainment enterprise that can provide support over great distances in austere environments, both inter- and intra-theater, to prevail in conflict.

## ■ Background

The 21st century global threat impacts not only overseas theaters but also the U.S. homeland. The joint force must operate in myriad battlefields throughout expanded geographic areas and over extended time horizons. In strategic, operational and tactical support areas, the Army seeks to retain maximum freedom of action, speed and agility and to counter enemy efforts to attack friendly forces, infrastructure and populations.<sup>8</sup>

The current dynamic—lethal and global battle space—has changed the way that sustainers provide support. The Army's sustainment system is transitioning to an expeditionary enterprise that is a tailored and responsive, centering around an end-to-end, distribution-based system that is capable of continuous, integrated and globally-synchronized operations.<sup>9</sup> The evolving sustainment capability—precision, survivable logistics—is critical to support rapid power projection, MDO and independent maneuver.

Precision logistics, when properly executed, delivers forward support that provides a reliable, agile and responsive sustainment capability;<sup>10</sup> enhances materiel readiness; lowers inventory consistent with the need to reduce demand; and reduces costs. Communication, speed and agility are key to its effective and efficient execution. Survivable logistics is a vital enabler of U.S. military power, ensuring that it can withstand hostile actions and unfavorable environmental conditions. Without a resilient logistics capability, the effectiveness of Army and joint forces on a multidomain battlefield is severely limited.<sup>11</sup>



A CH-47 Chinook helicopter from the 25th Combat Aviation Brigade conducts sling-load operations at Schofield Barracks, HI (U.S. Army Photo by Sergeant Sarah Sangster).

## MDO SUSTAINMENT FRAMEWORK

**Strategic Support Area.** This includes: areas of cross-combatant command coordination; strategic sea and air lines of communication; and the homeland. The enemy may attack the strategic support area to disrupt and degrade deployments and reinforcements that are attempting to gain access to the operational support area and move to the tactical support area.<sup>5</sup>

**Operational Support Area.** This is where many key Army mission command, sustainment and fires/strike capabilities are located. The Army enables friendly operations in this area by dedicating significant logistics capacity to open windows of superiority. An enemy may target this area with substantial reconnaissance, information warfare and operational fires.<sup>6</sup>

**Tactical Support Area.** This directly enables operations in close, deep maneuver and deep fires areas. Many friendly sustainment, fires, maneuver support and mission command capabilities are in the tactical support area. Friendly units in the tactical support area must be prepared to endure threat fires and to defeat enemy ground force infiltration and penetration of the close area.<sup>7</sup>

<sup>5</sup> TRADOC Pamphlet 525-3-1, *The U.S. Army in Multi-Domain Operations 2028*, C-4.

<sup>6</sup> TRADOC Pamphlet 525-3-1, *The U.S. Army in Multi-Domain Operations 2028*, C-4.

<sup>7</sup> TRADOC Pamphlet 525-3-1, *The U.S. Army in Multi-Domain Operations 2028*, C-4.

<sup>8</sup> TRADOC Pamphlet 525-3-1, *The U.S. Army in Multi-Domain Operations 2028*, C-3.

<sup>9</sup> Major General Terry E. Juskowiak and Colonel John F. Wharton, "Joint and Expeditionary Logistics for a Campaign-Quality Army," *Army Logistician*, September 2004.

<sup>10</sup> TRADOC Pamphlet 525-3-1, *The U.S. Army in Multi-Domain Operations 2028*, xi.

<sup>11</sup> DoD, Defense Science Board, *Task Force on Survivable Logistics: Executive Summary* (Washington, DC: U.S. Government Printing Office, November 2018), i.

## ■ Current Initiatives

DoD has tasked the Army with the responsibility for providing logistics support to joint operations and campaigns, including joint over-the-shore and intra-theater transport of time-sensitive, mission-critical personnel and materiel.<sup>12</sup> This requires that the Army have a suite of robust yet agile sustainment capabilities operating throughout the entire three-dimensional battle space.

U.S. Army Materiel Command (AMC) has identified seven focus areas that are essential to the joint force's ability to compete, penetrate, dis-integrate, exploit and re-compete in this MDO environment.<sup>13</sup>

- **Installation Readiness.** Infrastructure is vital to power projection and enables the Army to deploy ground forces, prevent conflict, shape outcomes and conduct military operations.<sup>14</sup> Installations provide secure and sustainable facilities and infrastructure that support combatant commanders' priorities, enable Army missions and maintain Soldier and unit readiness.<sup>15</sup> To support large-scale combat operations (LSCO), installations must have the capability to marshal and mobilize forces rapidly. The Army has mandated that installations increase their resiliency by being flexible, effective and affordable and is working with industry partners, manufacturers, users and security practitioners to reduce vulnerabilities at every installation.
- **Soldier and Family Readiness.** This involves a collaborative network of agencies, programs, services and individuals that promotes the readiness and quality of life for every servicemember. As General Gus Perna, Commander of AMC, has stated, "The readiness of our Army depends on the readiness of our Soldiers and their families. Our Army families must have the confidence that we have put our arms around them and given them the ability to grow."<sup>16</sup>
- **Industrial Base Readiness.** This is comprised of the government and industry's skills, knowledge, facilities, materiel and repair processes in support of Army products.<sup>17</sup> The Army's arsenals, depots and ammunition plants must continue to meet the current surge and innovation requirements while industry leaders must help the Army to ensure quality, accountability and cost-effectiveness to modernize the force for 2028 and beyond.



A look from inside the quarter-mile long 'Big Gun Shop' that was originally built to produce 16-inch seacoast and battleship guns in 1889 at Watervliet Arsenal. New machines in the 'Big Gun Shop' will increase cannon production capacity at the arsenal (Photo by Matthew Day, Watervliet Arsenal).

---

### AMC FOCUS AREAS

- Installation Readiness
  - Soldier and Family Readiness
  - Industrial Base Readiness
  - Munitions Readiness
  - Strategic Power Projection
  - Supply Availability and Equipment Readiness
  - Army Logistics Information Readiness
- 

<sup>12</sup> DoD Directive 5100.01, *Functions of the Department of Defense and Its Major Components*, 21 December 2010, 30.

<sup>13</sup> General Gus Perna, "Sustainment Requires Keeping to the Right," *Army Magazine*, 20 February 2019.

<sup>14</sup> Office of the Assistant Chief of Staff for Installation Readiness, "Installation Readiness," *Stand-To! Army News Service*, 8 June 2016.

<sup>15</sup> "Installation Readiness," *Stand-To! Army News Service*.

<sup>16</sup> General Gus Perna, Association of the United States Army 2019 Global Force Symposium, 27 March 2019.

<sup>17</sup> Colonel Tom D. Miller, USAF, "The Defense Sustainment Industrial Base: A Primer," *Foreign Policy: 21st Century Defense Initiative Policy Paper* (June 2010): 7–8.

- **Munitions Readiness.** This focus area requires a ready and reliable stockpile, assured through optimizing the receipt, storage and issue of munitions. It provides the joint force with ready, reliable, lethal munitions at the speed of war. As the Army reduces excess or outdated munitions through demilitarization, the munitions industrial base must keep pace with the Army's accelerated weapon modernization plan.<sup>18</sup>
- **Strategic Power Projection Readiness.** This is a function of the Army's ability to rapidly project expeditionary and follow-on forces from fort to port, port to port and then port to foxhole while integrating equipment and supplies on the battlefield. The Army must build its capabilities and instill a mindset to be ready to rapidly alert, marshal, deploy and, upon arrival at a theater, be ready to fight.<sup>19</sup> The AMC commander has repeatedly emphasized that, "We must use everything in our means—roads, railheads, airfields and ports—to rapidly link our people to equipment."<sup>20</sup>
- **Supply Availability and Equipment Readiness.** This is the foundation of materiel readiness; it ensures that Soldiers and units have the right equipment, parts and materiel to achieve their mission at any time and any place.<sup>21</sup> AMC is focused on establishing the appropriate breadth and depth of repair parts available to minimize equipment shortages and to ensure that battle-damaged equipment is rapidly repaired.
- **Army Logistics Information Readiness.** The Army has several systems to manage its materiel, maintenance, supply, acquisition and financial activities.<sup>22</sup> Reforming logistics information readiness is critical to ensuring the right information at the right time and leveraging the Army's enterprise resource planning systems. As General Perna has said, "We have a massive amount of data at our fingertips. Our ability to see ourselves is the first step in assessing ourselves. We need to be able to bring the data to bear quickly."<sup>23</sup>



*Soldiers of 1173d Deployment Distribution and Support Battalion supervise operations at the Port of Shuaiba, Kuwait, 15 June 2019. The unit tracked and verified the downloading of 250 pieces of equipment off the U.S. Vessel Liberty Passion (U.S. Army photo by Staff Sergeant Veronica McNabb).*

## ■ Sustainment Gaps and Emerging Technologies

As these sustainment initiatives are evolving, the Army has conducted analyses using an LSCO scenario to determine any gaps and shortfalls within the total force. A 2018 study identified 17 major gaps in the force. Three of these were sustainment-related: shortage of Class III (fuel) at the line

<sup>18</sup> Nicole Kirschmann, "Gen. Perna commends JMC's continued efforts to support munitions readiness," *Army News Service*, 30 November 2018.

<sup>19</sup> Major General Kurt Ryan, "Power projection readiness: A historical perspective," *Army News Service*, 1 May 2017.

<sup>20</sup> General Gus Perna, Association of the United States Army 2019 Global Force Symposium.

<sup>21</sup> Sean Kelly, "Ensuring Readiness for the Strategic Support Area: Supply Availability and Equipment Readiness," *Army News Service*, 15 April 2019.

<sup>22</sup> National Research Council, *Force Multiplying Technologies for Logistics Support to Military Operations* (Washington, DC: The National Academies Press), 109–111.

<sup>23</sup> General Gus Perna, Association of the United States Army 2019 Global Force Symposium.

of departure; lack of tactical sustainment mobility; and the absence of division level materiel management.<sup>24</sup> Other analyses determined that logistical units in support areas are likely to be high-priority targets for attack.

To remedy these sustainment disparities, the Army is making doctrinal, organizational, training and leader development changes to increase storage capacity, to build or shift transport assets from one unit or another and to create top-level materiel manager positions. This should enhance the capability of the sustainment enterprise to deliver precision logistics from the strategic support area to the other support areas.

New sustainment-enabling capabilities are needed to ensure that Army formations can execute MDO in the future; as they mature, they should include advances in current and emerging technologies, such as robotics and artificial intelligence (AI). Capabilities that have the potential to be game-changers include: science and technology advancements, such as robotic and autonomous systems (RAS); additive manufacturing; alternative water sources; alternative fuel sources and/or advanced power generation; and cloud computing.

- RAS can improve the effectiveness of resupplying units at point of need; it can also increase force protection by reducing the number of personnel delivering logistic packages (LOGPAC). Delivering LOGPAC via RAS-enabled vehicles necessitates changes to tactics, techniques and procedures and requires technical considerations for all RAS vehicles.<sup>26</sup> Use of autonomous vehicles or vessels for ground and maritime logistics convoys offers several advantages, including speed, greater carrying capacity and saving of lives.
- AI and RAS enable precision logistics. RAS must be maintainable, user-friendly and have the ability to generate, store and distribute supplies across all formations. Sustaining RAS-enabled formations requires a concept-based, technically-integrated system-of-system solutions approach. An AI-enabled system provides commanders with the ability to resupply platforms and Soldiers at the point of need and without request, based on intent-driven priorities.
- Additive manufacturing is a critical enabler for improving and repairing Army systems. Benefits include savings on time, cost and complexity and increased trust in meeting the demanding requirements of many Army maintenance applications.<sup>27</sup> The additive manufacturing community employs a digital library of 3-D printed parts, the “Repository



A Soldier with the U.S. Army Medical Materiel Center-Korea inventories medical supplies in a warehouse. The Army's newest 1-star command will project and sustain medical materiel capabilities and data for the Army and joint force. Army Medical Logistics Command, a major subordinate command of Army Materiel Command, reached initial operational capability 1 June 2019 and is expected to be fully operational 1 October 2019 (Photo by Kimberly Hanson, AMC).

---

*The Army's success in achieving its two purposes—preparing for war and executing war—requires a thorough understanding of the challenges of Multi-Domain Operations and the opportunities of emerging technologies.*

General Gus Perna, March 2019<sup>25</sup>

---

<sup>24</sup> DoD, *Fielded Force to MDO 2020: LSGCO Gaps and Solutions Options*, 29 January 2018.

<sup>25</sup> General Gus Perna, Association of the United States Army 2019 Global Force Symposium.

<sup>26</sup> “Operationalizing Robotic and Autonomous Systems in Support of Multi-Domain Operations,” white paper, Army Capabilities Integration Center–Future Warfare Division, 2018, 31–32, <https://publicintelligence.net/us-army-robotic-autonomous-multi-domain-ops/>.

<sup>27</sup> Amanda M. Schrand, “Additive Manufacturing in the DoD,” *Defense Systems Information Analysis Center*, Fall 2018.

for Additive Parts for Tactical and Operational Readiness” (RAPTOR). As Soldiers and maintainers produce parts, they upload the blueprints of each part into the system, increasing the store of general knowledge available to anyone working on repairs and so improving the enabling capabilities of additive manufacturing as a whole.<sup>28</sup> Another significant improvement was seen in May 2019, when AMC established the new Rock Island Arsenal-Joint Manufacturing and Technology Center (RIA-JMTC) in Illinois. RIA-JMTC will serve as a central location for additive manufacturing technologies, for the development of best practices and for the promotion of the execution of the campaign plan throughout the Army materiel enterprise.<sup>29</sup>

- Alternative water sources can decrease the sustainment footprint and increase the mobility of support units. Understandably, demand for water is high; satisfying that demand is challenging, as water is bulky and heavy to transport. In the Pacific theater, the Army is testing placing blivets (portable, collapsible liquid bags) directly in the ocean, filtering the water that flows into them and storing it at the point of need, leading to a reduction in time of production and distribution of potable water.
- Alternative sources of fuel and advanced power generation can reduce stress on fuel storage farms and transportation assets. Lowering this dependence on fuel leads in turn to a reduction of transportation requirements, decreasing the number of Soldiers placed in harm’s way. Innovative measures to increase efficiency include adapting fuel cells into next generation combat vehicles. These fuel cells operate like batteries, which convert the chemical energy of a fuel (such as hydrogen, natural gas, methanol or gasoline) and an oxidant (such as oxygen) into electricity. Continuous operation is feasible if a fuel and an oxidizer are supplied to the cell.<sup>30</sup> Another technique that provides fuel at the point of need works by applying additives to commercial fuel from host nations, improving its performance and changing it into fuel that military forces can use.
- Cloud computing capabilities can access, retrieve, manipulate, merge, analyze and visualize data at machine speeds, providing substantial advantages for sustainment commanders and benefiting decisionmakers, warfighters, sustainers and staff.<sup>31</sup> The pace of data growth is accelerating; however, the Army’s ability to develop the appropriate AI models to access, search and extract relevant data to inform decisionmakers has not evolved at the same pace.



*The 3D-printed On-Demand Small Unmanned Aircraft System is a new concept whereby Soldiers add requirements to mission planning software, and the system selects the optimal configuration for an aerial vehicle. It can be printed and delivered within 24 hours. This kind of quick custom design and build is one of the great promises of additive manufacturing (U.S. Army photo).*

<sup>28</sup> Devon L. Suits, “3D printing technology enhancing logistics for Army,” *Army News Service*, 21 February 2019.

<sup>29</sup> Industry Week Staff, “Additive Manufacturing Center of Excellence Opens at Army Center,” *Industry Week*, 21 May 2019.

<sup>30</sup> Dr. Keith Aliberti and Thomas L. Bruen, “Energy on Demand,” *Army Logistician*, January 2007.

<sup>31</sup> DoD, *DoD Cloud Strategy* (Washington, DC: U.S. Government Printing Office, December 2018), 3.

In sum, the combination of current doctrinal, organizational, training and leader development changes, together with emerging and technology-driven, sustainment-enabling capabilities, can close sustainment-related gaps in the force, allowing the sustainment enterprise to deliver survivable, precision logistics from fort to port to foxhole.

## ■ Conclusion

As part of the joint force, the Army's role is to fight and win the nation's wars through prompt and sustained land combat against near-peer threats.<sup>32</sup> Competitors will contest resupply lines and seek to destroy support areas throughout the battle space with long-range precision fires. A focused and resilient sustainment enterprise consisting of the Total Army (the Regular Army, Army National Guard, Army Reserve and Department of the Army civilians and contractors) is essential to counter these vulnerabilities. Procuring and securing resources, developing alternate distribution methods and executing precision and survivable logistics is how the Army is going to support MDO.

The sustainment challenges of MDO require changes in doctrine, organization, materiel and training. Simultaneously, current sustainment techniques, such as Army pre-positioned stocks, operational contract support, industrial partnerships and host nation support continue to be integrated into support activities. Due to the demands of MDO, commanders should enhance sustainment training and strive to be interoperable across units, between echelons and with joint and allied partners. Sustainers need to train with degraded communication abilities, in defensive and offensive cyber and in electronic warfare. Leaders also need to ensure that the right talent is in the right position during the planning and execution phases.

The Army needs to continue leveraging innovative capabilities created by technological advances in robotics and AI—capabilities that enable the sustainment enterprise and the joint force. This can overcome identified sustainment gaps and enable precision and survivable logistics to support rapid power projection, MDO and independent maneuver. Only then will the Army be able to provide a sustainment capability that is responsive to its own needs and those of joint, allied and partner forces.



*Major Bradley Cooper is currently serving on the Army Talent Management Task Force. He was previously assigned as the Army Fellow with AUSA's Institute of Land Warfare, and he has over 17 years of experience as an Army Logistician. He holds an MA in Business from the University of Phoenix.*



A filled water bag and Tactical Water Purification System sit a few feet away from Bear Lake. Bear Lake is the site of "Poseidon Lake," 301st Quartermaster Company's water purification camp at Northern Strike 19, Camp Grayling, Michigan, 25 July 2019 (U.S. Army National Guard photo by Sergeant Donna Bellot).

---

*You can't do that [fight a war] without having very rigorous logistics planning and execution. It's common sense; it's just not going to happen.*

---

General Mark Milley, April 2019<sup>33</sup>

Reproduction and distribution of this report, in whole or in part, with appropriate acknowledgment of the source, are encouraged.

<sup>32</sup> DA, Army Doctrine Publication 1, *The Army* (Washington, DC: U.S. Government Printing Office, September 2012), 1-8.

<sup>33</sup> Arpi Dilanian and Matthew Howard, "The number one priority: An interview with Gen. Mark Milley," *Army News Service*, 1 April 2019.

