NATIONAL SECURITY WATCH

Future Logistics Themes:
Discovering Innovative Solutions to Army Logistics Processes for Moving and Sustaining Combat Power

Introduction

Shaping a long-term vision for Army logistics requires that one identify and prepare to leverage critical research advancements that will profoundly affect Army logistics in future joint operational environments. Knowledge of anticipated developments in scientific, engineering and technology disciplines will generate innovative solutions to logistical challenges. Today, scientists and engineers are expanding the limits of understanding of what is possible. The world is on the verge of reaching what some futurists call an "inflection point" in history, such that the speed of advance and the convergence of several scientific and engineering disciplines will fundamentally change every aspect of human endeavor. The synergistic effect of artificial intelligence, autonomous computing, biotechnology, nanoscale technology, information systems, cognitive research and other areas accelerates the pace of innovative breakthroughs. Insights gained and products developed from advances in the application of knowledge, energy and materials science will provide significant benefits to Army and joint logistics in the decades to come. Logisticians must be ready to apply the results of this research. If unprepared, U.S. military forces and logistics processes risk years of underperformance.

Through a disciplined and rigorous program of discovery and innovation, likely advances in relevant technologies can be predicted and their benefits to operational effects and logistics processes projected. These predicted technological advancements can then be incorporated into Army logistics sooner rather than later. The U.S. Army Logistics Transformation Agency has identified and appraised five themes for future logistics innovation: Prediction & Cooperation, Telepresence, Energy-on-Demand, Designer Materials and Quantum Computation & Communication. These themes describe imaginable and plausible future advancements in technology, organization and/or business processes that may significantly improve logistics effectiveness. Each theme is a set of future conditions brought about through imaginable (deep) future advancements in technology or business processes that provide the means by which logistics functions will be significantly improved and requirements radically reduced. By proactively probing into the future, they bring an advanced look at potential improvements to Army logistics, for which the logistics community can start preparing now.

Technological advancements alone do not equal transformation. Only when the advancements are applied to processes and systems does the Army truly transform. The themes presented here, along with the application of their anticipated technological advancements, will offer some of the greatest potential for future Army logistics. Together, they translate into improved capabilities for deployment and sustainment and offer the widest range of prospective solutions to the challenges facing logisticians in the future.

Prediction & Cooperation

This theme identifies future conditions that facilitate the projection of future solutions to logistic problems with high degrees of accuracy, thereby contributing to predetermining outcomes of proposed courses of action. It will have the capacity to provide global connectivity and control for logisticians and will provide them with the ability to know what is happening within all logistics business processes and enable them to act upon that knowledge. It will provide capabilities that permit future commanders and logisticians to dominate in a complex, chaotic and time-constrained environment.

Logisticians will remain fully synchronized with the commander's intent in support of high-operational tempo distributed operations. Logisticians will have actionable knowledge to enable full command and control over the supply chain and its supporting distribution system. Accurate prediction of unit needs will allow logisticians to properly mobilize and use resources within a short time period to achieve desired battlefield effects with minimum supply system latency issues. Capabilities that allow prediction and preemption of logistics demand across the entire tactical-to-strategic continuum will change the way the United States fights future adversaries. Predicting logistics demand in a real-time, current-operations context shortens the decision and planning horizon (thereby contributing to a commander's freedom of action) and preempts logistics failures. It's about eliminating guesswork in determining what U.S. forces need at any given moment.

Telepresence

This theme employs instant remote presence with the ability to see, hear, touch, taste and smell. It provides a virtual environment for humans to control devices, robots, etc., in a hostile and/or remote real environment with the experience of being fully present at the live real-world location remote from one's own physical location. Telepresence employs a human/machine system wherein human operators use head-mounted displays and body-operated remote actuators and sensors to control distant machinery. Soldiers using telepresence capabilities will be able to behave and receive stimuli as though they were at the remote site. As progression continues into an increasingly robotic/unmanned battlespace, there will be fewer Soldiers placed in harm's way.

Energy-on-Demand

This theme describes a condition that provides instant usable energy and power systems at the point-of-effect, when needed. It presupposes maximum energy conversion efficiencies, ubiquitous energy storage, maximum energy densities and onsite processing and utilization. Energy-on-Demand will enable dramatic reductions in operation and sustainment costs and will minimize the need to transport some types of fuel and power sources. The ultimate goal is to allow each platform to generate and store its own energy resources to provide instant, usable energy on the battlefield without today's fuel distribution costs and dangers.

Designer Materials

This theme encompasses the design of materials at both the molecular and macro levels, as well as the supporting processes used to give items their unique qualities and attributes. The emergence of molecular nanoscale technology manufacturing permits the ability to design materials with unique properties and attributes such as greater strength, reliability and conductivity. Advancements in materials technology are critical to the development of advanced systems and enabling devices. A primary goal of this theme is the development and optimization of materials' properties to improve performance characteristics such as wear, friction, corrosion, radiation, oxidation, durability and fatigue.

Quantum Computation & Communication

This theme promises exponential advances in computing power and will facilitate breakthroughs for the other themes. The use of quantum physics to develop secure communications, computers and processes will offer significantly greater capabilities than is possible with today's digital computers. Quantum computers will enable significant growth in the capability to develop new materials (Designer Materials) and medicine/vaccines, as well as support improved decisionmaking (Prediction & Cooperation). Developments in quantum communications and cryptology will enable the Army logistics community to capitalize on developments in many other areas. Quantum communication is particularly appealing for solving real-life conditions commonly found in telecom applications, and it directly supports Telepresence through zero-latency communications and virtually limitless, totally secure bandwidth.

Summary

This is one of the most promising periods of intellectual activity in human history. Revolutionary developments will offer the potential to fundamentally change underlying assumptions about the planning and execution of wars. New theories of warfare will continue to emerge. Stealth, speed, mobility, reliability and lethality will take on new meaning. A virtual tidal wave of change will profoundly affect organizations and individuals in multiple dimensions. Breakthroughs related to the themes addressed here will put U.S. forces on a path to achieve unprecedented logistics capabilities, and will help prepare for complex and adaptive adversaries who will permeate the international landscape of the future. Logistics will continue to set the operational limits of campaigns and will determine what combat units can achieve, where and when they can operate and for what length of time.

Challenges will be significant across many areas—cultures, organizations, institutions, doctrine and many others. Logisticians must overcome these challenges and build upon the important steps already taken to address and resolve deficiencies in strategic, operational and tactical capabilities. Joint forces must be able to close, maneuver, reposition, sustain and reconstitute with the requisite rapidity, precision and control that joint force commanders require. The goal must be to accelerate the discovery of integrated process and technology solutions to effectively support sustained land combat in a dramatically more complex and increasingly uncertain battlespace.