MCDP 4

Logistics

U.S. Marine Corps

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FOREWORD

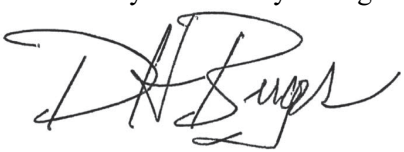
This doctrinal publication focuses on logistics. It describes the theory and philosophy of military logistics as practiced by the United States Marine Corps. It provides Marines a conceptual framework for understanding how logistics is an essential aspect of every military operation. The Marine Corps' view of logistics is based on our common understanding of the nature of war, our role in the joint force, and our warfighting philosophy as described in Marine Corps Doctrinal Publication (MCDP) 1, *Warfighting*.

This publication is a revision of the 1997 version of MCDP 4, *Logistics*. It places the time-tested, combat-proven principles outlined in the previous version in an updated warfighting context. As General A. M. Gray wrote, "like war itself, our approach to warfighting must evolve."[1]

This publication describes the role of logistics in a globally contested environment, within multiple domains, across the competition continuum. Marines must be able to operate when logistics is contested, which requires us to consider logistics opportunities and limitations in both force and operational planning. Professionals across all Marine Corps occupational fields must find innovative ways to move and sustain forces, experiment with alternative support methods, and train to conduct logistics in realistic conditions as cohesive units. Increasingly persistent and global threats reinforce the need to leverage strategic- and operational-level logistics to support Marines.

This publication is intended for all Marines. Logistics is a part of every military activity. Therefore, all Marines benefit by understanding the nature, theories, and design of the logistics enterprise. The more Marines understand how their needs are met by a complex network of systems and relationships, the better they will be at creating realistic plans, generating requirements, and using the network to build, position, and sustain the force. This understanding also helps develop support plans that shape and extend the endurance, reach, and survivability of Marine Corps forces.

This publication has a similar construct to MCDP 1, *Warfighting*. It is not intended to be a reference manual. It is designed to be read from cover to cover, and to be immediately applicable. This publication does not address specific techniques or procedures we should adopt. Rather, it provides broad guidance in the form of ideas, with historical lessons and realistic fictional illustrations intended to stimulate thinking and encourage additional learning. Reading, studying, and debating this publication with fellow Marines will enhance understanding about the essential role logistics holds in our ability to meet any warfighting challenge.



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LOGISTICS

Chapter 5. Logistics Planning and Execution
Leadership—Command and Control—Logistics Planning—Logistics Shaping Actions—Logistics Visibility and Adjustments—Risk—Conclusion

Notes

Scenario—***The Great Pacific War***

Major Rodriguez was jolted out of a sound sleep at 0400 by the crash of incoming long-range missiles at the local airport. The missiles had been launched by an adversary vessel in the Pacific. Her task-organized teams had been preparing for this attack for the past seven months in the far reaches of a Pacific archipelago, setting conditions for the introduction of Marine forces to support fleet and joint force reconnaissance and counter-reconnaissance operations. It appeared the conflict had begun and more Marines would soon be on their way to the area. Major Rodriquez and the team were ready.

One of the missiles created a massive crater in the local airfield. Efforts to harden the airfield minimized and contained damage, but did not prevent it. Fortunately, on-call engineers with airfield repair capabilities were safely positioned miles away from the airfield, covered with advanced camouflage netting that prevents visual and electromagnetic detection. The repair team raced to fix the crater; open runway repairs can be easily detected by satellite. However, the team had practiced these repairs, and the latest repair compounds have greatly reduced necessary exposure time, so they were soon back under cover.

Simultaneously, Major Rodriguez sent an autonomous unmanned aircraft system (UAS) to locate the enemy vessel in the area. The UAS, which was equipped with sensors that collect data, also carried supplies between the islands where Marines were dispersed. The UAS took off, and the data collected was

shared with the joint force command. The command incorporated the UAS data with an automatic, machine-learning-driven calculation to distinguish between hostile and friendly vessels.

A hostile vessel in the area was automatically targeted from the multiple launch rocket system (MLRS) located on an island close-by. Coincidently, the missile that struck the hostile vessel had been delivered to the MLRS unit by the same UAS that provided the targeting data.

Suddenly, the UAS lost signal. The UAS had been detected and neutralized by an enemy satellite, which had automatically tracked the drone and administered a high-powered, directed-energy weapon. Major Rodriguez wasn't worried—she had many more UASs in reserve.

Meanwhile, an allied fighter jet was running out of fuel and needed to make an emergency landing and, because of the shared allied logistics network, the joint force command was able to divert the jet to the recently repaired airfield. The joint force command could see that Major Rodriguez's unit was ready to provide fuel and ordnance to the friendly fighter. Bulk fuel was "hidden in plain sight" by anchoring its 2,000-gallon fuel pods on the littoral floor in an adjacent island bay. The same eight engineers who fixed the runway pumped the fuel and hung the ordnance. Master Sergeant Kelly later told the team this kind of thing would have taken at least 25 Marines back when he was a lance corporal—Lance Corporal Davis didn't believe him. The fighter jet was soon refueled, rearmed, and sent back out to destroy another target identified by South Korea's sensors.

Scenario

As Major Rodriguez's team returned to its expeditionary base camp, they were hit by an enemy cyber attack that disrupted the team's ability to communicate with higher headquarters. Major Rodriguez immediately launched five solar powered drones that provided uninterrupted connectivity to higher, adjacent, and subordinate units in the local operating area.

In the background, pre-planned logistics packages began making their way to units located on different islands via manned and autonomous air, sea, and sub-sea modes of conveyance. These packages were developed based on predictive algorithms, thus maximizing lift and distribution. State-of-the-art naval and joint integrated logistics command and control systems provided accurate real-time visibility on the location of logistics units, supply stockage and consumption levels, and supported unit requirements. The fusion of training, education, and technology provided Major Rodriquez and her team needed capabilities and capacity to operate in a high threat environment.

Chapter 1.
The Nature of Logistics

"As we select our forces and plan our operations…we must understand how logistics can impact on [sic] our concepts of operation…Commanders must base all their concepts of operations on what they know they can do logistically."[2]

—A. M. Gray, Jr

"Logistics is the bridge between our national economy and the operations of our combat forces."[3]

—H. E. Eccles

"I believe logistics, as a warfighting function, is the pacing function. Not one of, it's actually THE. We can have the best force, postured perfectly, with this magnificent JADC2 on top of it…If they're able to contest and really choke us off logistically, they'll take us to our knees. We can't let that happen."[4]

—D. H. Berger

Logistics is the engine of strategy. Strategy is the adoption, alignment, and the balancing of ends, ways, and means to achieve objectives in a contested and competitive environment. When conducted properly, formulating strategy refines objectives and

provides clarity to resource requirements. Logistics provides the materiel means to execute a nation's strategy.

Logistics is a complex undertaking that requires an in-depth appreciation of its inherent characteristics, elements, and relationship to warfighting. Marines with a firm grasp of what logistics fundamentally is and entails are prepared to support operations across the competition continuum.

WHAT IS LOGISTICS?

Logistics is the aspect of military operations that deals with the procurement, transportation, and maintenance of military materiel, facilities, and personnel. It provides for the physical needs of a force. During execution, logistics obtains and positions resources when and where needed. As an art and science, logistics encompasses a wide range of actions, activities, and interdependent relationships. Any activity that transports a military force from one place to another, provides the force with the physical means of waging war, and regenerates combat power for subsequent employment is within the realm of logistics. These actions enable a strategy, of which logistics is a critical and inseparable part.[5]

Logistics is the bridge that connects a nation's economy to its warfighting forces[6] and provides the means to convert national resources into combat power. Logistics transforms people, natural resources, and industrial capacity into units, weapons, equipment, and supplies. It is the art and science of sustaining military forces and projecting that power at the right time and

place for maximum operational effect. Military logistics sustains forces throughout the course of a campaign while providing the means to generate operational tempo and survive in a high-threat environment.

Logistics can be a decisive function of warfare. Winning or losing battles, gaining or losing allies, and even significant changes in popular opinion and sympathies can be attributed to the way a force is moved and supplied. For the first part of the American Revolutionary War, George Washington's Continental Army was hampered by a logistics system based on insufficient wagons moving on poorly maintained roads. This limited the Army's size, staying power, and operational mobility. Through their alliance with France, the Army delivered supplies and capability by sea that enabled the decisive victory at Yorktown. The Inchon landing in 1950 and immediate capture of Seoul by United Nations' forces deprived North Korea's army of its logistics infrastructure and decisively changed the outcome of the campaign.[7]

In summary, logistics is both an enabling and limiting factor in operations and sets the parameters for what is strategically achievable, operationally feasible, and tactically possible.

THE EVOLUTION OF LOGISTICS

Logistics has always been an important aspect of warfare; however, over time the evolution of warfare, technology, and commercial practices from the premodern era through the industrial and information ages has changed the way logistics is

conducted. Understanding evolutionary changes helps shape logistics concept development and provides insights on how to support Marine Corps forces.

The industrial revolution radically changed warfare and logistics. Industrialization enhanced the scale of warfare by increasing materiel production and enabling mass conscription. Technological advancements and mass production increased weapon lethality while transportation developments significantly enhanced military mobility. As a result of these innovations, military forces grew larger, delivered unprecedented firepower, and became increasingly capable of moving over vast distances at greater speeds.

The industrial revolution also transformed logistics from an important aspect to an essential prerequisite for war. A nation's ability to leverage industrial capacity to develop military capabilities was a crucial factor in determining whether to go to war or not. Logistics considerations, in part, shaped other decisions on where and when to initiate campaigns. Major operations could not be conducted until the necessary buildup of troops and supplies had been provided by the logistics system.

In today's military, the ability to gather, store, and process information has exponentially increased its ability to observe, orient, decide, and act. Advanced weapons, sensors, and information systems provide the ability to locate the enemy, concentrate forces and firepower, and engage targets more rapidly and at greater distances than ever before. Information systems are progressing at a rate that is accelerating real-time planning and execution, thereby increasing the demand for even more

responsive sustainment. In this data-rich environment, we need to ensure we do not become information rich and knowledge poor. Logistics information needs to be tailored to provide leaders actionable knowledge at the right time and place for maximum warfighting impact.

Technology will continue to change the character of war. Aircraft, vehicles, and weapon systems will become increasingly lethal, maneuverable, and survivable over time. Humans everywhere will continue to incorporate emerging technologies and ideas into ways to conduct war. Despite these advancements, Marines will still need to move large quantities of fuel, water, and ammunition throughout the battlespace. Unmanned platforms, additive manufacturing, three-dimensional printing, renewable energy, and predictive supply and maintenance have the potential to improve tactical distribution, modernize the supply chain, and increase equipment readiness. However, this technology will not eliminate the need to provide robust and tailored logistics to Marine Corps forces.

Throughout history, logistics has been composed of varied means that span generations of technology. In Afghanistan, mules and motor vehicles provided mobility to allied and enemy forces. "Hybrid logistics," which is timeless and blends old, new, and emerging technologies is best suited to support Marines. Hybrid logistics provides a rich menu of support options to meet the needs of Marines operating across the competition continuum.

Hybrid Logistics

Today and in the future, Marines will operate in five domains: sea, air, land, space, and cyberspace. Evolutionary and revolutionary advances in technology will increase our competitors' lethal capabilities in each domain. We know this based on the British experience in the Falklands in 1982, the Israeli experience against Hezbollah in 2006, and the Russian experience in Ukraine in 2022. Marines will have an advantage for shorter periods of time in each domain, so we cannot count on the sustained dominance in each domain that we had in the past.

Further, the cyberspace domain will be particularly challenging and must be accounted for in our planning. Our enemy's anti-access/area denial capabilities will make building "mountains of steel" ashore problematic. Our forces will require a high level of mobility, survivability, and lethality to defeat this threat. The World War II Japanese kamikaze foreshadowed the power of anti-access/area denial by using conventional aircraft in an unconventional and deadly way. We know our future foes will develop similar innovative and lethal ways to offset our strengths and exploit our vulnerabilities. Our potential adversaries' anti-access/area denial capabilities—particularly in the Pacific—will require us to have a force that is more distributed. When this force disaggregates and aggregates in the littorals, our operating concepts, doctrine, capabilities, and capacity need to allow us to rapidly move, maneuver, and reposition. That force will require modular logistics capabilities that still move "mountains of steel," but in a way tailored and supportive of distributed force design. This is the essence of hybrid logistics.[8]

OPERATIONAL CONTEXT

Marine logistics occurs in threat environments that are globally contested in multiple domains, requiring support across a rapidly and often unexpectedly changing competition continuum.

Threat Environment

Logistics capabilities are often critical requirements and a potential point of force vulnerability. They become the focal point for engagements and attacks because of their importance to military operations. During Operations Enduring Freedom and Iraqi Freedom, insurgents targeted coalition logistics systems. Airfields and logistics hubs were targeted with indirect fires and main supply routes were habitually subject to ambushes and improvised explosive devices. A logistics system that sustains forward forces needs to be designed for a lethal, distributed, and multi-domain threat environment.

Operations and plans can change rapidly because of enemy actions and capabilities. Many nations have the ability to quickly locate and strike targets with precision using a variety of lethal and nonlethal means. Adversaries' ability to sink vessels or strike forward installations with little to no warning puts the expeditionary force at risk.

Technological advances have enabled adversaries to reach, attack, and disrupt US military operations around the world, often with little or no notice. These advances can hinder the forces'

logistics efforts where units are forward-deployed or stationed at US-based installations.

Threats exist in all domains and the enemy will attack using every available weapon system and means to disrupt US operations. The enemy will use espionage, information functions, and space and cyberspace capabilities to rupture our cohesion and degrade our decision-making ability. These capabilities are so prevalent and important that space and cyberspace have been elevated to domains equal to land, maritime, and air. The space and cyberspace domains are particularly integral to global and regional logistics. Multi-domain operations provide opportunities for us to conduct logistics; however, they also provide the enemy opportunities to find, understand, and target logistics activities.

The cumulative effect of these threats makes our entire logistics network a target. Adversaries will attempt to strike information systems, manufacturing capabilities, facilities, units, and transportation platforms to disrupt our ability to compete and sustain forward-deployed forces. Marines and the joint force need to build a logistics system that can survive destructive and disruptive enemy action. This system will need to sustain forces over great distances, at multiple locations, and provide the means to protect facilities and regenerate combat formations. An example of the threat to our manufacturing systems is depicted in the “Bill’s Garage” vignette that follows.

Global Threats: Bill's Garage

Bill lives in Grangeville, Idaho and runs a small manufacturing business. He is considered an expert in certain materiel solutions. In fact, Bill's ball bearings are so good, he received an exclusive contract to provide parts for an advanced weapons platform. Bill knows his bearings.

What Bill doesn't know is that a foreign country has a team of twelve people who monitor Bill's garage 24 hours a day. They can use the number of bearings that Bill provides the weapons manufacturers as indications and warnings as to whether the United States might attack them. This data is collected using a combination of satellite imagery, cyber monitoring, and human intelligence. Bill's garage is a priority target if tensions escalate because aircraft landing gear will not work without his bearings. A precision cyber strike is already in place to disrupt Bill's manufacturing business.

Logistics Across the Competition Continuum

Logistics activities affect activity across the competition continuum (see Figure 1-1). Actions below the threshold of violence include deterrence and assurance; actions above this threshold are called conflict or war. Crisis is often unpredictable, which causes us to react with little-to-no warning. Crisis can also be temporary or lead to violent conflict. Day-to-day actions below the threshold of violence can escalate rapidly to crisis response and conflict. Logistics planning that anticipates these transitions enable forces to endure across this continuum.[9]

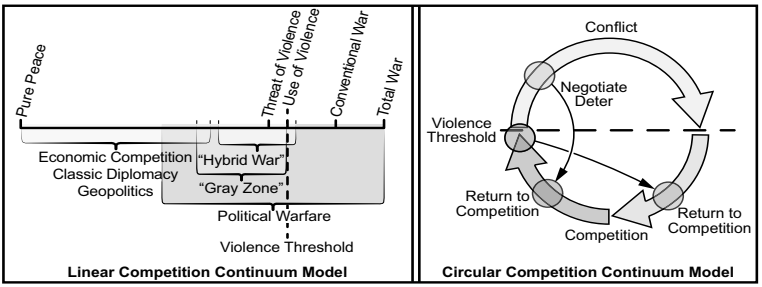

Figure 1-1. Competition Continuum Models.

Logistics is integral to deterrence through the support of forward-positioned forces. With a sustained presence, Marines in strategic locations can deter or disrupt enemy or adversary plans over time. Forward-deployed forces, ashore and afloat, can provide credible threats that deter an adversary. Adversaries are less likely to take certain actions if they know Marines are in position and have the capability to impose costs on them. Just monitoring potential enemy activity can complicate foreign decision-making and make adversaries less likely to pursue objectives not favorable to the United States.

Credibility is key to deterrence, and effective logistics is an important characteristic of any credible force. Logistics determines a force's operational reach in time and space and contributes to its survivability. Force mobility and maneuverability is driven by lift and distribution capabilities and capacity. Logistics provides forces the materiel means to persist in locations and reposition as conditions dictate.

Marines assure allies and partners through shared training, exercises, forward-deployed presence, and interoperable systems. Logistics provides many appealing benefits to other countries such as local and regional contracts and cost sharing in facilities and training. Forward-positioned stocks, in-theater logistics capabilities, and advanced bases each generate effects that assure allies and partners and deter adversaries. These actions also convey commitment and help convince foreign decision-makers that the presence of US forces is both beneficial and credible. The relationships developed through forward presence yield diplomatic, informational, military, and economic (DIME) dividends such as opportunities for assured access, basing, and overflight when crisis erupts.

When the threshold of violence is crossed, logistics provides the physical means for conflict. What a military force is physically able to do is based on the way it is moved and supplied. This means the operational art of war is intimately linked to its logistics capabilities. Logistics gives a force reach, freedom of action, and endurance, but offensives cannot be sustained indefinitely. A force generally loses strength as it attacks and can become weaker over time. Eventually, it reaches a culminating point where it can no longer sustain the attack and reverts to the defense. Plans that do not account for logistics capabilities and capacity will cause the force to culminate before achieving its objectives.[10]

Logistics Benefits across the Elements of National Power

Marine logistics can provide many benefits to foreign nations across each element of national power: diplomacy, information, military, and economics. United States diplomacy is often enabled by Marine logistics efforts, such as non-combatant evacuations or humanitarian assistance operations. These types of activities generate goodwill with other countries and support diplomatic objectives. Logistics can also facilitate deception operations by conducting actions to confuse adversaries. When other countries turn to the United States for military support, it may be to do the fighting or for assistance with command and control, intelligence, and logistics. Marine Corps logistics provides economic benefits many countries find valuable. Using local contracting to meet the needs of forward forces and developing infrastructure, such as roads and ports in strategic locations, provides commercial benefits to other nations. These efforts across the DIME facilitate support for US objectives, deter adversaries, and build trust with the host nation.

LOGISTICS CHARACTERISTICS

Having described logistics within a threat context, we can now examine the various characteristics of logistics.

Logistics as Both Art and Science

Logistics requires a balance between art and science. Logistics is an art, demonstrated through logistics planning that balances efficiency and effectiveness while providing the commander with the maximum amount of capability and flexibility possible. As a science, logistics involves calculating requirements; accounting

for and managing vast equipment inventories; and developing detailed force generation, regeneration, and movement plans. For example, fuel, water, and ammunition requirements can be calculated with varying degrees of predictive accuracy. However, Marines best serve unit needs by anticipating how enemy actions affect consumption rates. The loss or degradation of logistics capacity is also a planning consideration, mitigated by contingency plans that leverage the entire ecosystem of Service, naval, and joint logistics.

Logistics is defined by results rather than by activities. We can measure results by our forces' ability to achieve competitive advantage and overmatch against thinking opponents. In a contested environment, the art of logistics helps mitigate enemy actions and threats by providing multiple options to achieve our sustainment and support goals. The science aspect of logistics enables us to calculate friendly requirements within the context of enemy actions and threats. Logistics applications (art) and calculations (science) occur in a contested environment. Logistics ensures the right support is in the right place at the right time.

Logistics depends on in-depth knowledge of those being supported and a thorough understanding of the capabilities, capacity, limitations, and potential of our logistics design. We benefit by understanding the various logistics elements and the relationships among those elements. Factors that contribute to each planning requirement need to be analyzed and considered to understand their major assumptions and drivers.

The success of wars, campaigns, and battles often depends on successfully applying both the art and science of logistics. Conflict requires extensive resources that are often limited and must be prioritized. Demand can exceed supply, resulting in shortfalls that need to be anticipated and rectified. Logistics planning helps forecast demands and ensures the best use of limited resources to accomplish the mission. It requires knowledge and judgment to balance logistics efficiency and logistics effectiveness. Marines steeped in the principles and processes of logistics planning will be able to anticipate, adapt, and respond to dynamic conditions. This balance is essential to providing *efficient* and *effective* logistics.

Supporting Complex Forces

Logistics is complex. Military organizations are composed of multiple interdependent parts that constantly adapt, changing in size, composition, organization, and operations in response to the mission and threat. Change and disruption in one part of the system can have a wide and disproportionate impact on the rest of the system.[11] Understanding the connections that matter most, and making flexible, anticipatory plans helps mitigate this complexity. Marines anticipate the loss of critical logistics capabilities and capacity by putting in motion plans that can regenerate needed capabilities. Periods in which the logistics system operates in a predictable manner will alternate with periods of considerable turmoil. Effective logistics efforts account for this turmoil and create sustained, seamless, and responsive support to forward-deployed forces.

Teamwork is an essential element of logistics, as many different individuals and organizations work together to provide support.

Logistics exists in many echelons of command, connected by a network of logistics systems and processes. Regular collaboration between individuals and elements is critical to solve complex logistic challenges. Teamwork fosters creative, sustained, and systematic cooperation among large numbers of individuals and diverse organizations. While a commander is ultimately responsible for logistics, unity of effort, driven by teamwork, is the key. Each team member provides knowledge of processes, procedures, and resources to integrate into a solution. Cross-leveling knowledge of each organization's role in the logistics ecosystem fosters teamwork. This knowledge then leads to the most important element in teamwork, trust. Trust is the deeply held conviction that those requesting and providing support are capable, reliable, and dependable. Trust ensures complex logistics interdependencies are distilled into actionable logistics support.

A team that understands how the logistics system is organized, formally and informally, and maintains an aptitude and willingness to work with others, ensures forces will be supported in an effective and responsive way.

LOGISTICS AS A WARFIGHTING FUNCTION

Logistics is one of the seven Marine Corps warfighting functions. Warfighting functions group similar activities into discrete bins that aid in planning and execution. The logistics warfighting function should not be viewed independently but as part of an interdependent whole. Continuous integration of all warfighting functions (see Figure 1-2) provides focus and unity of effort essential to achieving warfighting success.

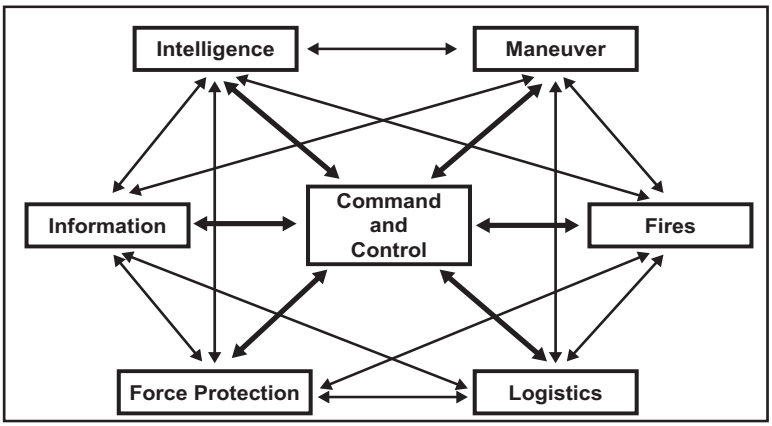

Figure 1-2. Warfighting Functions.

The unique relationships between logistics and the other warfighting functions are as follows:

- Command and control is composed of individuals, information, and the organizational means to generate effective actions in war. Logistics provides the means to sustain and maintain the people and materiel needed to execute command and control. In operations across the competition continuum, commanding people and controlling operations are essential to success. Command and control directs and prioritizes the logistics efforts that set and maintain conditions for this success.
- Intelligence is knowledge about the enemy and surrounding environment needed to support decision making, and logistics is a provider and consumer. Logistics units transiting the battlespace require the latest threat assessments and provide real-time reporting of enemy and friendly actions. Planning and executing logistics is heavily dependent on understanding battlespace intelligence.

- Fires and maneuver are combined to produce lethal or nonlethal effects on a target. These mutually supporting warfighting functions are logistically intensive (e.g., fuel, ammunition, and water). Fuel, ammunition, and engineering support are needed to provide the range, precision, and mobility necessary to rapidly mass fires and reposition to avoid enemy counterbattery fires. Bases and stations provide the needed infrastructure to efficiently generate fires and maneuver.
- Force protection is the means by which leaders prevent or mitigate hostile actions against their organization, resources, facilities, and critical information. Force protection addresses physical threats and threats to systems operating across the command and control and information continuums. Force protection of Marine Corps units at home station, overseas, or engaged in operations across the competition continuum requires logistics. Logistics provides the mobility, means of survivability, and regenerative capacity needed to deter or recover from enemy action.
- Information provides Marines the means to achieve cognitive overmatch over the enemy and adversaries. Information capabilities and activities are central to addressing information- age threats and opportunities. Every Marine and Marine Corps organization "consumes, communicates, and relies on information to accomplish the mission."[12] Information can increase the efficiency and effectiveness of logistics, while also being a critical vulnerability. Marines need secure, resilient, and seamless logistics information capabilities and capacity to maximize the interaction with all Marine Corps warfighting functions.

A commander who thoroughly understood the criticality of logistics in terms of its relationship to all warfighting functions

was Major General Oliver P. Smith during the Korean War. Major General Smith's actions at the Chosin Reservoir exemplified logistics-informed decision making, and skillful integration of each warfighting function, as illustrated in the following vignette.

Incorporating Logistics in Operations: Chosin Reservoir

Major General Oliver P. Smith was the commanding general of the 1st Marine Division during the Chosin Reservoir battle. This legendary battle is an example of successfully incorporating logistics in operations.

During this assault, 1st MARDIV's task was to "cut the road and railroad" between Yudam-ni and Mupyong-ni. Major General Smith's scheme of maneuver and pace was driven by the ability to keep main supply routes open and accumulate supplies at Hagaru-ri. Tanks and infantry were dedicated to protecting truck convoys. Most regimental tasks were to "open up," defend, or deny major supply routes.

When ordered to withdraw to Hamhung, Major General Smith's "movement was governed" by the ability to evacuate the wounded and preserve equipment. Supplies were available because Major General Smith had anticipated the importance of a key supply node. Prestaging supplies and creating an airstrip at Hagaru-ri proved essential for evacuating casualties and having enough rations and ammunition to fight throughout the advance to the sea.

First Marine Division defeated seven Chinese divisions during this breakout; supply, health services, transportation, casualty evacuation, and engineering were major factors in planning and decision making at every turn.[13]

LOGISTICS AND MANEUVER WARFARE

Maneuver warfare is our warfighting philosophy that "seeks to shatter the enemy's cohesion through a variety of rapid, focused, and unexpected actions that create a turbulent and rapidly deteriorating situation with which the enemy cannot cope."[14] This concept guides our logistics approach. We build flexibility and agility into our plans to allow Marine forces to exploit opportunities and strike enemy weaknesses. At the same time, we ensure logistics capabilities do not become a critical vulnerability that enemies can exploit. Marine logistics efforts focus on the commander's bid to achieve success. Aligning logistics resources to the main effort according to the commander's priorities makes the greatest contribution to mission accomplishment.

Logistics is essential to generating tempo and maintaining freedom of action by rapidly delivering supplies, repositioning forces, and repairing or replacing damaged equipment. Responsive logistics capabilities enhance tempo by anticipating requirements and adapting to new requirements, expanding rather than limiting the commander's operational possibilities. Marines apply the maneuver warfare philosophy to logistics actions across the competition continuum.

There are many ways to conduct military logistics, but Marines approach logistics based on maneuver warfare and apply this philosophy all the time, not just in war.[15]

CONCLUSION

Logistics provides, positions, and sustains the materiel needs of military action. It is both the engine of strategy and the bridge that provides the Nation's resources to military forces. The way logistics is conducted changes as warfare evolves. Today, and in the future, Marine Corps logistics efforts will be globally contested in each domain and across the competition continuum. By treating logistics as an art and a science, Marines will develop support plans that enable success across the competition continuum and throughout all domains. Logistics is a critical warfighting function that serves particularly as an enabler to extend the reach and resiliency of the force. Finally, the Marine Corps approach to logistics is based on the philosophy of maneuver warfare.

Now that we understand what logistics is and how it relates to warfighting, we can address the theories that go into creating a logistics system. This will set the stage to later describe how the Marine Corps prepares and executes logistics with a diverse network of partners.

Chapter 2.
The Theory of Logistics

"We see the world in terms of our theories."[16]

—Thomas Kuhn

"There are three essentials in fighting—how to guard, how to hit, and how to move."[17]

—J.F.C. Fuller

"The line between disorder and order lies in logistics . . ."[18]

—Attributed to Sun Tzu

Marine Corps logistics theory is composed of principles, processes, and functions and is put into action by the mechanisms of a logistics system. Principles guide logistics design and planning; processes detail logistics execution; functions ensure all logistic aspects are accounted for during planning and execution.

LOGISTICS PRINCIPLES

Seven principles serve as fundamental guidelines for effective logistics: responsiveness, economy, flexibility, attainability, sustainability, simplicity, and survivability. These principles should be integrated into plans and considered during the execution of logistics.[19]

Responsiveness

Responsiveness is providing the right support in the right place at the right time. Among the principles of logistics, responsiveness is the keystone. Responsiveness is achieved through early identification of requirements, and determining and developing actionable, flexible plans. Responsive logistics provides the materiel needs to realize the commander's intent and concept of operations and the needs of numerous units operating in varied environments across the competition continuum. One way to do this is by balancing the capabilities in use with reserves that can be reallocated as a hedge against uncertainty. Another way is to create a web of distribution options, rather than employ a single breakable logistics chain optimized for efficiency. Lastly, cross-training individuals in multiple skill sets extends a wide range of expertise to more locations. All of these actions create a flexible logistics system that can provide responsive support.

Responsiveness is also about timing. Since it takes longer and more effort to accrue supplies than to expend them, we improve responsiveness by preparing equipment and staging supplies before they are required. Developing places; emplacing platforms; forming partnerships; positioning goods, personnel, and services; and establishing organizations and relationships before they are needed set conditions for responsiveness. A plan to assign people and position of assets creates a distribution system poised to facilitate successful operations.

Factory to the Front Line

Many of us are familiar with pre-positioning equipment and staging supplies in forward locations for Marine use in crisis and conflict. However, these actions are not limited to the battlefield. Manufacturing, complex maintenance, and energy production can also be "pushed forward" to provide increased responsiveness. Technological advances in additive manufacturing and three-dimensional printing make it possible to produce and maintain equipment close to where troops are engaged in battle. Innovations in solar energy production may yield opportunities to produce electricity, particularly at forward bases and stations. Providing these capabilities in forward areas makes it easier to deliver needed items in a timely manner and reduce transportation and energy costs.

Economy

Efficient logistics focuses on using the fewest resources as possible while providing rigor. In a military context, economy refers to employing the minimum resources required (within an acceptable level of risk) to bring about or create a specific effect. The commander affects economy by prioritizing and allocating limited resources without imbalance or inordinate excess.

The art of logistics appropriately balances effectiveness and efficiency in support of the mission. Logistics effectiveness is outcome-based and relates to a unit accomplishing its mission, no matter the resource cost. If the logistics system meets high priority mission demands it is effective, though not necessarily efficient.

In our quest to achieve the optimal balance between efficiency and effectiveness, we accept a degree of inefficiency to ensure effectiveness or sacrifice some measure of effectiveness to achieve greater efficiency. This reality creates an inherent tension as we attempt to find the proper balance between effectiveness and efficiency. Task Force 58 in Afghanistan achieved this balance, as illustrated in the vignette.

Efficiency and Effectiveness

In 2001, Task Force 58 in Afghanistan achieved success due to efficient and effective logistics. Task Force 58 established a forward operating base 350 miles inland from the sea by skillfully utilizing the full range of joint and naval logistics. The Marines achieved their objectives by keeping the force light, but lethal. Detailed logistics planning was possible due to accurate and visionary requirements determination. The Task Force 58 logisticians worked hand-in-hand with all units and organizations conducting or supporting combat operations. The strategic impact, operational reach, and tactical range of Task Force 58 was in large part a product of cross-functional teamwork and planning. This team understood the critical role of logistics in a first of its kind operation in Afghanistan.[20]

Flexibility

Flexibility is the ability to adapt logistics structure and plans to evolving situations, missions, and concepts of operation. Logistics provides the means to avoid attacking an enemy's strength, while providing the agility to exploit opportunities and to strike at enemy weaknesses. Logistics expands, rather than limits, our operational potential. Designing flexibility into the

logistics system provides options for adapting to the fog and friction of war while facilitating creativity and initiative.

Flexible plans provide the means to anticipate and adjust to a dynamic operational environment. Flexibility also enables multiple ways to provide logistics support and minimizes potential friction from planning oversights, shortfalls, or unforeseen circumstances. By including specific branches and sequels to the basic logistics plan, Marines can anticipate requirements related to the course of future operations.

Attainability

Attainability is the point at which the commander judges that sufficient supplies and support capabilities exist to initiate operations at an acceptable level of risk. For example, the Allied invasion of Normandy was delayed by a month because then-General Dwight Eisenhower felt they did not have enough landing craft for the assault.[21] When logistics planning uncovers risks, they should be framed by identifying "how likely" they are to affect the overall mission and "how much" that affects the force. The commander makes risk decisions based on materiel capabilities, force readiness, and other logistics factors.

A critical aspect of attainability is resource visibility, which enables the commander to determine whether sufficient capabilities are available to commence or continue operations. Logistics visibility provides sustainment activity information relevant to the force, such as sourcing options, infrastructure condition, materiel readiness, casualties, and supply levels.

Logistics visibility can be divided into two categories: demand visibility and supply visibility. Demand visibility involves understanding friendly force materiel needs relative to the concept of operations. Supply visibility provides an understanding of the available resources to draw from including units, equipment, infrastructure, and supplies. Processed and analyzed logistics information creates a shared understanding of the demands of anticipated operations and expected ability to meet those demands.

Information not only needs to be gathered; it also must be processed and analyzed to provide meaning and value. A snapshot of current data is not as important as creating a shared understanding of the demands of anticipated operations and expected ability to meet those demands.

Sustainability

Sustainability is the ability to maintain the necessary levels of logistics support to achieve long-term military objectives. The commander's vision sets anticipated minimum and maximum materiel levels to support operations while managing risk. The logistics capabilities of a force range from total self-sufficiency to total dependency on others. Marine Corps forces often use a blend to provide operational and tactical flexibility.

A unit is self-sufficient when it has everything it needs to sustain itself over a given period of time. A force that provides all its own food and water, or builds its own airfields, is a self-sufficient force. A self-sufficient unit has the advantage of being

autonomous and flexible over a given period of time (e.g., naval expeditionary force operating from forward-deployed warships).

Dependency is an outsourcing approach in which a unit relies on external agencies or other countries for sustainment (e.g., food, water, airfields). A nation that must obtain its semi-conductors or parts from another country is dependent. This approach has an economic advantage in limiting force footprint and signature, but often requires access to friendly local suppliers.

Dependency and self-sufficiency represent two ends of a spectrum. Clear-cut instances of either completely organic or totally outsourced logistics rarely exist. A combination of methods is typically used based on the mission, operating area, and commander's guidance. Striking the balance between organic and outsourced sustainment is part of the art of logistics.

Simplicity

Simplicity minimizes logistics complexity by fostering efficiency and effectiveness in operational planning and execution. A unit attains simplicity by implementing clear, standardized, and interoperable processes and procedures and clearly defined command relationships. Units can further reduce complexity by limiting the number of required actions and relying on proven methods and standing operating procedures.

Logistics is complicated, but its design and execution does not need to be. Marine Corps forces operate in expeditionary environments and rapidly deploy forces over vast distances.

Sustaining these forces in the air, land, and sea requires various logistics resources and services. Logistics planners capture requirements and develop support plans based on usage data, personnel and equipment densities, and mission. While this process is complex and methods are sophisticated, we need to make logistics as actionable, simple, and straightforward as possible.

Simplicity reduces friction. Good planners recognize that in warfare the simple becomes difficult, and the difficult seemingly impossible. Concepts of support plans should be built around simple, compelling concepts, with focus on the underlying intent of what we are trying to achieve, not on producing detailed and explicit instructions covering every eventuality. We can further reduce complexity by limiting the number of required actions and relying on proven methods and standing operating procedures.

Survivability

Survivability is the capacity of an organization to prevail despite adverse impacts or potential threats. Logistics units and installations are high-value targets. Units can increase their survivability prospects through dispersion, deception, and minimizing their electromagnetic and physical signatures. Logistics planning that addresses how to make logistics resilient and regenerative facilitates survivability. A logistics system must be survivable to provide responsive and unrelenting support to forces over time. We use multiple methods to avoid, mitigate, and recover from a hit.

Avoidance and dispersion can prevent our logistics assets from being targeted. Avoidance is placing friendly logistics capabilities beyond the reach of enemy forces, but close enough to be brought forward when needed. Dispersion is placing logistics capabilities within enemy range, but at multiple points to complicate enemy targeting and avoid large logistics stockpiles. A dispersed logistics footprint has a better chance of avoiding or withstanding attacks.

Hardening our logistics capabilities using protective bunkers and armor can mitigate the effects of enemy action.

Survivability can be further achieved through mass. While mass comes at a cost, it provides a way to achieve resiliency. Losing one unmanned fuel truck does not matter much to someone who has 1,000. Techniques such as swarming provide an overwhelming number of targets for the enemy. This is particularly effective when using cheap, inexpensive, and replaceable methods. Disposable platforms used in mass can create survivable systems.

Deception enables survivability. Hiding or obscuring our actions, locations, and intentions makes it harder for the enemy to find and target us. Deception techniques includes decoys, misinformation, camouflage, and signature management. This is relevant across multiple domains. The ability to change or mask a logistics platform's electromagnetic signature enhances its survivability. Marines should always assume our enemies and adversaries are observing us and take precautions regarding what they are revealing.

Defensive Actions

Defending logistics forces with lethal capabilities lessens the likelihood for enemies and adversaries to attack. For example, employing antiair defenses and counterbattery artillery on forward bases, or using crew-served weapons in supply convoys, can impose costs on our enemies. Lethality throughout the force presents few "soft-targets," and thereby deters attacks and preserves capabilities.

Creating the means to regenerate logistics capability and capacity after an attack is an important planning consideration. Resilient logistics is paramount and underpins each logistics principle. Despite our best efforts, we will be attacked and our operations will be disrupted. Building resilient logistics capabilities and systems can set conditions to maintain momentum and regenerate combat power faster than our enemies and adversaries. We build resilient forces by regenerating equipment and people, as well as preserving access to reserve logistics stockpiles. Resilient systems are realized by establishing and rehearsing contingency plans with alternative methods and successions of command. Codifying and rehearsing these plans significantly improves our ability to fight after an attack.

The Logistics Process

The logistics process consists of four essential actions required to support a force in any environment or level: sourcing, distribution, sustainment, and disposition (see Figure 2-1).

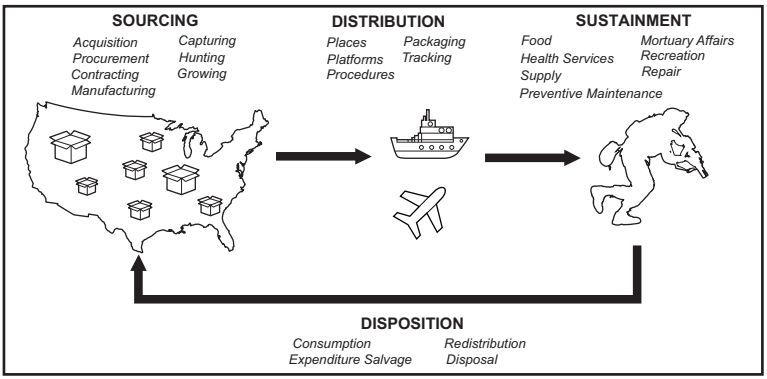

Figure 2-1. The Logistics Process.

Sourcing is about obtaining goods and services. It meets the physical needs of the force, such as weapons, equipment, facilities, ordnance, services, and commodities (e.g., food, clothing, fuel, repair parts). Sourcing includes procuring, contracting, manufacturing, or any activity that makes equipment or supplies available.

Distribution is about moving people and materiel from the point of origin to the point of need. Distribution involves the lift required to move things, the storage areas where items are staged, and the synchronization of activities to deliver resources to forces when and where they need them. Packaging and tracking items are essential aspects of distribution.

Sustainment is about providing logistics and personnel services required to maintain and prolong operations until successfully accomplishing the mission and redeploying the force. The

materiel and morale of military forces can diminish because of consumption, platform use, and enemy action. Resupply and repairs are needed to restore physical combat power while certain services focus on preserving morale. Sustainment encompasses a wide range of support activities that include supply, support, repair, replace, and replenishment actions.

Disposition is about consuming, returning, or disposing weapons, equipment, and supplies. The logistics process is complete when supplies and services are used or returned for redistribution, repair, salvage, or disposal.

LOGISTICS FUNCTIONS

The logistics functions provide a framework to understand the wide range of activities that encompass logistics at the strategic, operational, and tactical levels of warfare. If the logistics processes describe what needs to be done, the logistics functions help organize what needs to be done. As depicted in Figure 2-2, the logistics functions are supply, maintenance, transportation, general engineering, health service support, and services (e.g., exchange, food, billeting, mortuary affairs).[22]

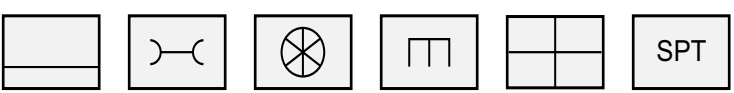

Figure 2-2. Logistics Functions.

Supply is the procurement, distribution, maintenance while in storage, and salvage of supplies, including the determination of kind and quantity of supplies. Supply planning focuses on forecasting requirements, establishing distribution nodes, and creating reorder and stock thresholds.

Maintenance involves maintaining equipment in, or restoring equipment to, serviceable condition to maximize operational availability for the force. Its activities include inspection and classification, servicing, testing and calibration, repair, modification, and rebuilding.

Transportation is moving people and materiel from one location to another. It includes any mode of transportation (e.g., ships, trucks, planes, trains) as well as enabling activities (e.g., landing support, port and terminal operations, material handling).

General Engineering is employing engineering capabilities and activities to create infrastructure and modify, maintain, or protect the physical environment. Construction includes creation and repair of infrastructure (e.g., buildings, roads) and terrain modification (e.g., drainage). Utilities includes power generation, refrigeration, and water production and storage.

Health Service Support seeks to minimize the effect of injuries and disease on unit effectiveness. It includes preventive medicine, medical stabilization, surgery support, medical and casualty evacuation, dental health, and mental health. The goal of health services is to preserve the force and return individuals back to full duty as rapidly as possible.

Services are several different activities that are required to sustain forces. These include religious ministries, financial management, billeting, messing, contracting, disbursing, postal, exchange, law enforcement, legal services, civil affairs, and mortuary affairs.

Each logistics function is factored into the overall logistics plan through a concept of support. Integrating logistics functions into a support concept provides a framework to ensure timely provision. For example, developing maintenance plans with supply and transportation considerations reflects a comprehensive and proactive approach to planning. Health services support requires supply, transportation, maintenance, and general engineering services. Logistics functions are often interdependent and mutually reinforcing. By applying the art and science of logistics, Marines can design a holistic concept of support that can be wargamed, rehearsed, and refined during execution.

The logistics functions are foundational elements of comprehensive and integrated planning; they provide clarity, focus, and organizational purpose at each level of warfare. However, the scale, scope, and character of these functions differs at each level of war. Figure 2-3 shows how activities vary at each level of war and are addressed further in the Chapter 3.

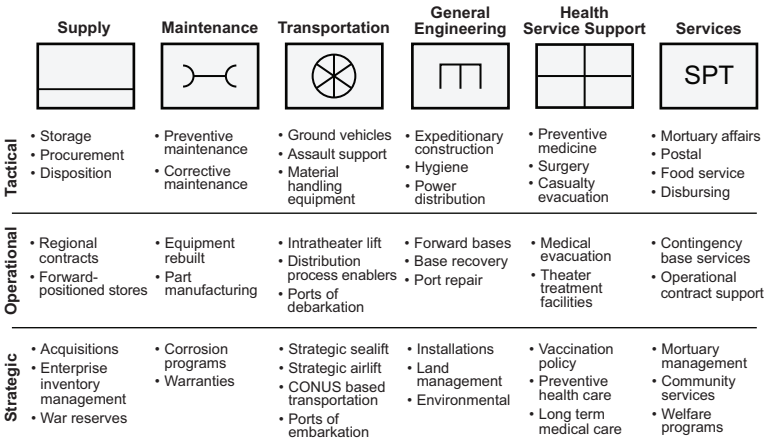

Figure 2-3. Logistics Functions at Each Level of Warfare.

THE LOGISTICS SYSTEM

A logistics system is required to produce, position, and sustain combat power and provides a framework upon which each logistics function can be accomplished. All logistics systems have three fundamental parts: an organizational construct, sourcing methods, and a distribution model.

Organizational Construct

An organizational construct describes the structure and relationships within and among units. The complex nature of logistics requires efforts from multiple units and organizations. Therefore, relationships among higher, adjacent, and subordinate

units, as well as within the units themselves, affect the entire system. A force's support system varies depending on whether it has a logistics unit dedicated to providing support or is responsible for its own sustainment.

Two important relationships are *command relationships* and *supporting relationships*. Command relationships define responsibility and authorities within a unit. Support relationships define the desired purpose, scope, and responsibilities among different units. Support relationships occur when units from outside the command authority are given responsibility to provide specified requirements. Support relationships allow a unit to focus its attention and resources on an assigned mission, knowing its logistics needs are being met by another supporting entity. There are many types of support relationships that vary according to different criteria. Effective planning ensures responsibilities for each functional area are accounted for and clearly communicated to everyone involved in the planning effort. This allows units to understand their roles in the larger mission, enables concurrent planning, and facilitates prioritization and resource decisions. In addition to formal command and support relationships, other relationships exist among agencies, nations, and individuals that should be accounted for in the support plan.

A force's structure significantly affects the way its logistics efforts are conducted. A unit can be organized based on a *function, task, geography*, or a combination of the three. A *functional* organization is composed of largely the same type of capabilities as seen in supply, medical, or engineering battalions. This organization fosters development of occupational proficiency and provides a pool of resources that can be task-organized to meet

various contingency, exercise, or garrison requirements. An engineer support battalion is a functional organization.

A *task-based organization,* also called multifunctional, merges numerous functional capabilities into a single unit tailored to anticipated requirements. A direct support combat logistics battalion is an example of a multifunctional unit task-organized to meet an infantry regiment's needs. A *geographic* organization does the same for a specified region or area, such as when an aviation ground support unit is assigned to support an airfield. Task-organized and geographic organizational constructs are most effective when a particular unit or area is expected to need significant and enduring support. These approaches provide responsive support and fosters implicit communication and cohesion among units over time.

Functional, geographic, and task-organized logistics units provides commanders a range of support options and serves as a hedge against uncertainty. This balance was demonstrated by Marines in Operation Desert Storm, as depicted in the vignette on the following page.

SOURCING METHODS

Sourcing methods relate to how a force obtains required materiel. The various sourcing methods include acquisition, procurement, contracting, foraging, capturing, or manufacturing. This requires many individuals working at different levels. Responsibilities and relationships for obtaining materiel resources often overlap significantly among different units and agencies.

Operations Desert Shield and Desert Storm Logistics

To support the 92,000 Marines participating in Operation Desert Storm, the Marine Corps deployed two full force service support groups made up of almost 14,000 Marines and Sailors. The 1st Force Service Support Group primarily carried out general support logistics functions for the entire Marine expeditionary force. It was organized largely along functional lines and ensured the receipt of materiel and services from the ports and airfields and their delivery to major tactical formations. The 2d Force Service Support Group provided direct support to combat forces. It was task-organized into combat service support detachments, each tailored to the needs of the supported operational unit. Designated units supported forces as they advanced into Kuwait. The result was a fully integrated logistics organization that provided holistic support to Marine forces in Saudi Arabia and Kuwait.

Marines often source equipment through large-scale acquisitions and procurement processes among institutions, agencies, and industry. However, by using initiative and innovation logisticians find many ways to supply the forces. For example, supplies and equipment can be captured from the enemy, manufactured or rebuilt on-site, grown, or purchased from local businesses.

Additionally, Marines can create treaties and contracts to source equipment and supplies at intermediate points throughout a global distribution network involving host-nation contracts, local commercial vendors, cross-service agreements, and global acquisition efforts. Pre-staging equipment and supplies provides another sustainment source. Forward installations or advanced

bases can also serve a role in producing necessary services such as billeting, messing, water, fuel, and power. The ability to produce equipment and supplies in forward locations can reduce transportation times and energy costs throughout the entire logistics system. An example of a forward-positioned item is the use of additive manufacturing and three-dimensional printing to make repair parts near the point of need.

Another important aspect of sourcing is the tactical units' role in identifying strategic acquisition and procurement needs. All units are empowered to identify resource and capability gaps to inform institutional sourcing efforts. Embedded sensors, predictive modeling, and close relationships between supported and supporting units enhances our ability to predict in resources or capability gaps early in the planning stages.

Sourcing: Archipelago

Major Rodriguez and her team brought much of what they needed on this planned rotation to the Pacific. Uniforms, personal items, equipment, and electronic tablets were all sourced through the acquisition system. But to keep the footprint light, she established local contracts to obtain much of the materiel, equipment, and food. The team employs sensors that are manufactured locally. A foreign military sales program was established with the host nation so the relatively inexpensive sensors are widely available. They even have a three-dimensional printing machine that is used to produce parts for generators, weapons, and motor vehicles. The team's largest demand is for aviation fuel, which is sourced regionally.

DISTRIBUTION

Distribution Model

A distribution model provides a template for how people, equipment, and supplies travel from the point of origin to the receiving point and facilitates materiel disposal and force redeployment. A distribution model should be tailored in size, structure, and procedures to support the mission, composition, and warfighting style of its military force. It depicts a supply chain or a supply web that establishes places, platforms, and procedures for moving supplies.

Supply Chains and Supply Webs

A supply chain is a network of people or organizations that transform raw materials into capabilities. These capabilities are positioned where they are needed and sustained until repositioned or expended. A supply chain provides responsive links between demand requirements and the means of meeting those requirements. A supply chain efficiently moves materiel, but it can be ineffective when disrupted. When a single chain link breaks, the system becomes degraded or inoperable. A supply chain is like a road. If any part is blocked, movement along the entire road stops until it can be cleared. A blockage or disruption can be operationally disastrous for expeditionary forces in austere environments.

Supply webs are networks of interrelated connections that provide flexibility through multiple sourcing and distribution options. These webs provide multiple options to source,

transport, and store supplies needed to meet demands, but are often more costly to maintain and require more oversight and coordination than supply chains. Supply webs foster effectiveness because they are hard to block, but their inherent redundancy can be resource intensive. They can be thought of as a road network with multiple highways, roads, and trails that provide opportunities to reach multiple producers and consumers. However, maintaining a supply web requires decision-making throughout the process. Supply webs provide resiliency to expeditionary forces.

Distribution Nodes

Distribution nodes are locations where people and materiel are stored, reconfigured, or await movement to the next point. In the most forward areas, these places include caches, combat outposts, assembly areas, advanced bases/stations, and sea bases. These nodes provide the Navy-Marine Corps team various support capabilities and opportunities.

As a forward-deployed, expeditionary force-in-readiness, the Marine Corps employs a combination of basing methods. We use permanent bases to carry out strategic logistics functions and support development of forward-deployed, operational- and tactical-level logistics capabilities. As a naval force, the Marine Corps has always made extensive use of seabasing. The Navy-Marine Corps team has pioneered innovation in conducting logistics functions afloat. Examples include hospital ships, the aviation logistics support ship, and the offshore petroleum distribution system.

Seabasing

"Consider a 'mobile offshore base' design consisting of three or more 600-by-600-foot sections that could maneuver with internal propulsion at speeds of up to 6 knots. The sections would readily join together to form a very large floating base with a normal full length (4,000–10,000 feet) runway on top, space for massive aircraft and machinery repair facilities, logistics storage, and troop berthing spaces, and room for other military units and gear. The mobile offshore base would be able to accommodate troops and a wide number of medium-sized transport and supply planes much too large to land on aircraft carriers. And instead of operating in a region for only three months at a time (like a carrier fleet), the mobile bases would operate in an area as long as we needed them there."[23]

– Owen and Offley

In determining where and when to establish forward locations, there is an intrinsic tension between the need for security and the desire to provide responsive support. Since we know our activities will be contested in a competitive global environment, hardening and resiliency are major considerations when establishing fixed forward locations. Security can be achieved by rapidly establishing and dis-establishing locations in the same way artillery batteries practice displacing shortly after firing to avoid enemy counter-fire. Marines must conduct a thorough nodal analysis of the potential risks and vulnerabilities at these locations to determine the best way to project power and sustain the force while limiting dependence on fixed infrastructure.

We rely on domestic entities and overseas allies and partners for basing rights and access to logistics support. Any location that

has to do with the production or positioning of the forces, equipment, supplies, or sustainment services is a node in our distribution system.

Platforms

Platforms are transportation assets that position people, equipment, and materiel throughout the battlespace, region, and globe (see Figures 2-4 and 2-5). Fulfilling transportation requirements at various echelons across the globe with limited assets requires detailed planning, visibility, and coordination among numerous individuals and organizations.

Tactical transportation assets are platforms that facilitate battlespace distribution and connect units to their supplies and services such as vehicles, aircraft, and surface vessels. At the operational-level, intratheater lift includes platforms used for movement within a particular geographic theater. This often includes military and commercial airlift, sealift, rail, truck, and

Figure 2-4. Current Platforms.

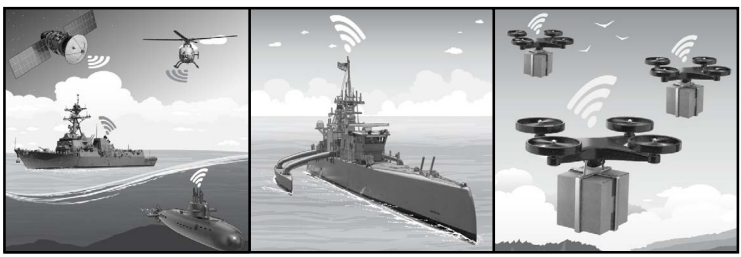

Figure 2-5. Evolving Platforms

pipeline capabilities. These assets may be part of standing or emergent host-nation support contracts and managed by a theater logistics organization or military contracting.

At the strategic-level, intertheater lift includes platforms that enable military movement throughout the United States and transportation to and between areas of responsibility or operations. These assets facilitate the deployment and distribution of forces, supplies, and logistics services for use in campaigns and enable global crisis responsiveness. Intertheater lift platforms include cargo and passenger aircraft and ships.

Platform innovations can provide tactical advantages throughout the battlespace. New transportation methods can reduce signature through subsurface delivery methods or novel approaches tosignature management. Platforms that reduce or eliminate human operators can enhance security while decreasing personnel requirements on the force. Finding ways to operate in space to sustain forces may provide global, regional, and tactical sustainment benefits. Future capabilities like this would generate tempo and provide breadth and depth to the logistics system.

Logistics Platforms

First Lieutenant Sampson is responsible for coordinating drone refueling efforts. After coordinating with the aviation combat element representatives for the drone to launch the next day, the plan is to remotely control the swarm. As the team continues to assemble the swarm, he begins drafting his concept of operations to brief Major Rodriguez that evening. The plan is simple. Drones will land on the fuel vessel located offshore from the pier, refuel an internal 150-gallon fuel tank, and return to a third location a few blocks away from the command post so the team can recover them. Some of the drones are also going to a decoy site as part of a deception effort. Although the team has not yet performed this type of mission during their first six weeks in the area, they trained for it many times before they deployed, and First Lieutenant Sampson is confident the team will flawlessly execute the mission. While this is a small fuel order, it is enough to power the unit's generators, small surface craft, and land-based vehicles for another four days when augmented by solar power.

Procedures

A distribution model requires procedures to identify how support requirements are identified and how this support is delivered where it is needed. These procedures vary for each link in the chain or web based on threat, geography, friendly capabilities, and other factors.

Identifying Requirements (Push/Pull)

A distribution system must have a way to determine if resources and services will be provided based on predetermined schedules, (push) or upon request (pull) (see Figure 2-6).

The push method forecasts requirements and establishes a set sustainment schedule. It provides regular, predictable, and dependable support. If requirements change, it takes time to adjust the push method to meet emergent needs. The push method requires forethought, detailed planning, and detailed coordination with all entities involved in the storage, movement, and distribution of supplies.

The pull method responds to requirements identified by the requesting unit, which takes on the responsibility for submitting requirements. This approach is more efficient because it reduces

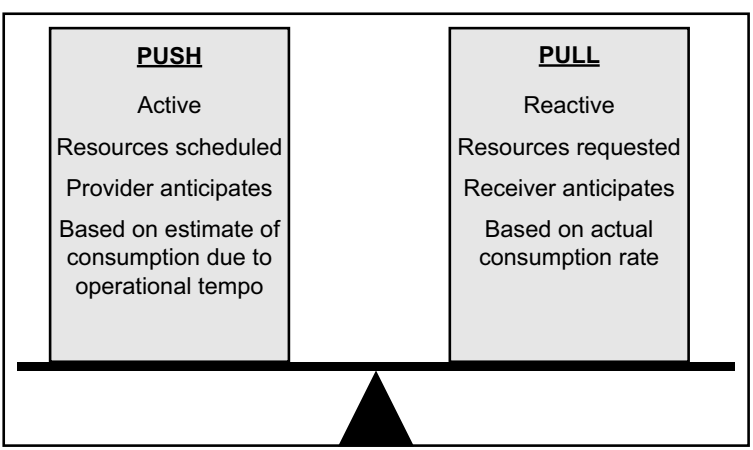

Figure 2-6. Push vs. Pull Methods.

waste by only providing supplies and services upon request. Well-developed processes and procedures, reliable communications, and off-the-shelf packages help facilitate the pull method.

Forces often employ a combination of both methods. Routine support favors the push method while unanticipated, rare, or specific requirements favor the pull method. Logistics was decisive in the Battle for Khe Sanh and the Siege of Kut; these battles reflect the use of push and pull methods, as demonstrated in the vignette on the following page.

Discipline throughout the system is critical. Over-inflating requirements or providing that "little extra just in case" places an extraordinary burden on the logistics system. When repeated across an entire force, such demands would create an ever-increasing and cumulative demand for unnecessary resources and place an unnecessary burden on logistics assets. Referred to as the "logistics snowball effect," overstating support requests can undercut the prioritization process and potentially divert needed support to a less-urgent requirement. Marines should incorporate disciplined requirement generation into training to develop procedures, trust, and good habits needed in crisis or conflict.

One way to validate requirements is to leverage emerging technology. Digitally mapping the supply web with modeling tools can improve visibility of consumption and conditions to enhance logistics planning and preparation. By augmenting logistics with artificial intelligence and machine learning, a logistics unit may increase its responsiveness, while potentially making the support system more efficient and effective.

Khe Sahn "Push" and Kut "Pull"

The 1968 Battle of Khe Sanh in Vietnam is an example of the push method. The Marines used a set sustainment schedule to move 14,000 tons of supplies over a 77-day period in a very high threat environment. This provided the Marines the logistic means to defeat two North Vietnamese Army divisions of nearly 25,000 personnel. The Siege of Kut in Iraq in 1916 is an example of over-reliance on pull logistics. The 6th Division composed of British and Indian soldiers ran out of food and supplies. Ground lines of communication were severed, which significantly impacted the ability to identify what was needed. The division surrendered to Ottoman forces due to starvation and combat action. Despite the novel attempt to resupply the division by air, the forces eventually ran out of equipment and supplies.

Distribution Methods

The Marine Corps uses three distribution methods to deliver materiel and services to the receiving units: *point, unit,* and *blended*. In point distribution, resources are staged at a designated location (point) and the receiving unit goes to that location to obtain its supplies or services. In point distribution, the using unit is responsible for transportation from the supply point. In unit distribution, the issuing unit delivers supplies and services directly to the receiving unit's location. Point distribution places a greater burden on the supported unit (pull), while unit distribution puts more burden on the issuing unit (push). These distribution methods are related to the push/pull methods.

Contested Distribution

In a contested environment, the logistics system will have to provide the materiel requirements that cannot be acquired locally or exceed organic capability. This can be done through a blend of point and unit distribution. In the opening stages of the Battle for Guadalcanal in 1942, logistics was contested and problematic for Marine Corps forces. Over time, logistics support improved via a combination of air, sea, and ground delivery. These logistics were delivered and distributed rapidly as compared to the Japanese, who suffered logistically. Building upon the Guadalcanal model, logistics support in a widely dispersed and high threat environment will need to be modular to facilitate lift and distribution. It will use a variety of locally obtained resources configured to support storing logistics in caches that hide in plain sight, yet can be accessed quickly. Decoys and deception efforts in the air, land, maritime, and cyberspace domains can be combined to protect the supply web. Creative approaches that limit exposure of vulnerable platforms to attack may also be used. Methods such as zone distribution can establish locations where supported and supporting units can meet halfway to conduct resupply. Platforms that are mobile, possess organic reach, and provide capability, but do not present lucrative targets are needed to sustain forces in these conditions. Expendable systems can also provide necessary materiel while mitigating the enemy threat.

Blended distribution is a mix of both methods in which the responsibility of delivery and transportation is shared between the issuing and receiving unit. In this method, the issuing unit delivers supplies to a certain point for the receiving unit to collect, such as aviation and naval refueling zones or airdrops. This is an example of logistics responsibilities overlapping and

being shared among organizations, and it requires communication and teamwork to execute.

While certain situations might call for using one method over the other, the distribution methods are most frequently used in combination. When establishing procedures Marines should consider unpredictable consumption rates, reliability of communications required for the pull method, and the impact of different distribution methods on friendly unit signature. Threats also impact these decisions when access is limited or significant resources are necessary to defend the delivery effort. The ultimate goal of these procedures is to balance the ability to respond to support requirements with the need to allow forces to focus on their objectives.

TESTING THE THEORY

Logistics theories require periodic analysis and review to determine whether they are still relevant. The character of war evolves over time and concepts are ideas awaiting validation. This is particularly true relative to logistics, where operational concepts are validated through logistics feasibility analysis. What worked in one situation may fail in another. Campaigns of learning create institutional understanding of fundamental issues across the functions of logistics and throughout the levels of warfare. Wargaming plans test logistics feasibility, allowing us to develop mitigations for anticipated logistics challenges. Wargaming, modeling, and simulating are methods for testing and refining our theories as new technologies and ideas emerge in the ongoing logistics evolution and operations across the competition continuum.

Wargaming to Inform Logistics Support

Major Rodriguez and her team incorporate wargaming into their daily battle rhythm using various applications and software programs. Each morning, her enlisted logistics team downloads automated reports from logistics information systems and adjusts estimated consumption rates based on creative wargaming methodologies. Her logistics operations chief, Master Sergeant Kelly, leverages his Naval Postgraduate School background to analyze wargame results across various applications to gauge the effectiveness of forward-positioned stocks and supply levels. After a few weeks and with the aid of artificial intelligence, the team has developed the skills to navigate applications quicker and improve wargame results. Their education and training combined with using emerging technology enable this logistics team to generate operational tempo by providing predictive, proactive, and responsive logistics.

CONCLUSION

Logistics theory shapes logistics planning and execution. Our logistics theory includes principles and concepts that frame how we think about logistics. The logistics system turns theory into actionable parts and provides the means to plan, source, and provide support. This system consists of command and control, processes and procedures, places, and platforms to conduct logistics operations. Logistics is executed by people from designated locations, in various organizational configurations. The next chapter discusses how the Marine Corps integrates within a broader enterprise to accomplish the logistics actions necessary at each level of war.

Chapter 3.
The Logistics Enterprise

"Logistics becomes, in fact, the very core of generalship…to get military forces into a theater of war in superior strength and husband that strength until they shall prevail."[24]

—S. L. A. Marshall

"The distinctions between the levels of war[fare] are rarely clear… usually there is some overlap… a single commander can have responsibilities at more than one level of war."[25]

—MCDP 1, *Warfighting*

"The purpose of the [joint logistics enterprise] is to protect and sustain military power across the globe at a time and place of our choosing and represents a [United States] comparative advantage that provides multiple options to our nation's leadership and multiple dilemmas to potential adversaries."[26]

—Joint Publication (JP) 4-0, *Joint Logistics*

Now that we understand the theory and system of Marine Corps logistics, we will look at how that system interacts with the joint logistics enterprise, which is "a multitiered matrix of key global logistics providers cooperatively structured through an assortment of collaborative agreements, contracts, policy,

legislation, or treaties utilized to provide the best possible support to the [joint force commander] or other supported organizations."[27] The joint logistics enterprise includes the entire logistics capability that enables a force to extend its reach and sustain itself in a forward operational environment. This capability is far greater than just the logistics organizations within a Marine air-ground task force. The joint logistics enterprise encompasses the capabilities of all the Services and their organic industrial bases, the combatant commands, and the defense industrial base.

LOGISTICS AND THE LEVELS OF WARFARE

What makes the Marine Corps unique is its expeditionary nature. Marines can prepare forces for deployment and employment by leveraging strategic and operational airlift and sealift, much of which resides in the joint logistics enterprise. The logistics activities conducted at the strategic level are different from those carried out at the tactical level. For this reason, it is important to consider levels of warfare as we discuss the joint logistics enterprise (see Figure 3-1).[28]

Effective military activities depend upon the successful conduct and integration of logistic activities at all three levels. Russia during World War I and China during the Korean War had little difficulty raising large land armies. Concentrating these armies in a theater of operations and keeping them supplied proved far more

difficult. As a result, the actual combat power brought to bear was only a fraction of each country's entire capacity.

Expeditionary operations depend on operational and strategic logistics. Marines should be proficient at higher-level logistics when facing persistent and global threats. Strategic logistics forms the foundation from which operational logistics enables

Figure 3-1. Levels of Warfare and Logistics Focus.

and sustains tactical logistics. The logistics process transforms resources into measurable and sustainable combat power. This chapter describes what logistically needs to be accomplished at each level of war and who does it, starting at the forward-most forces and working back across the bridge that connects them to the Nation's resources.

TACTICAL LOGISTICS

Tactical logistics is concerned with sustaining forces directly involved in deterrence/assurance, crisis response, or war. The goal of tactical logistics is to support a concept of operations while preventing the force from reaching a premature culminating point. Tactical logistics involves the actual execution of the logistics functions to sustain combat forces with resources immediately or imminently available. Figure 3-2 provides examples of tactical logistics activities by functional area.

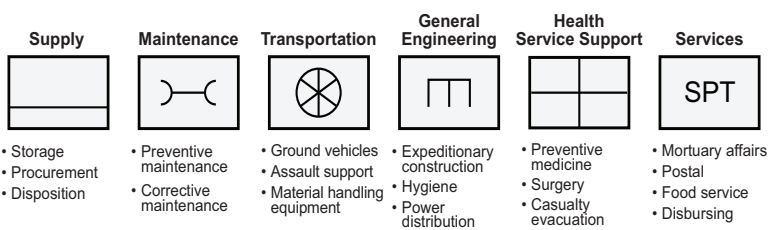

Figure 3-2. Tactical-Level Logistics Examples.

Tactical-level logistics is performed by units positioned and operating throughout the joint operations area. For Marines, tactical logistics is primarily conducted within the Marine air-

ground task force with a single commander under which a combined arms force can be tailored to the mission. While Marine Corps forces are constituted for specific missions, they are typically task-organized with ground, aviation, logistics, and command elements. Although most Marine air-ground task forces possess a dedicated logistics element, no single element has all the capabilities to operate independently, and each element has at least some basic self-support tasks.[29]

Logistics roles are spread throughout the Marine air-ground task force with responsibilities shared by individuals, designated staff members, functionally organized units, and military occupational specialists. As a task-organized force, identifying who is responsible to meet each logistics requirement at each level is important for any planning effort. Sometimes a unit is responsible for its own logistics, other times a support unit provides logistics to another unit, and often both units execute some of the logistics responsibilities.

Another important relationship at the tactical level of war is among adjacent units, particularly between the Marine Corps and Navy. The supporting-supported relationship is one way to understand how Marines support and receive support from their fleet counterparts. In this relationship, different responsibilities are covered by each Service and can change over time. For example, prior to an amphibious assault the Navy may be responsible for aviation refueling, but once established ashore the Marine Corps provides aviation fuel to support the Navy.

Placing Capabilities Throughout the Logistics System at Each Level of War

The Navy's fleet readiness centers provide a model for forward supply webs that blend logistics responsibilities across the levels of warfare. Fleet readiness centers conduct maintenance, repair, and overhaul of aircraft, engines, components, and support equipment. Sailors, Marines, and civilian artisans work at these centers to conduct strategic and operational logistics together with tactical units. For example, a fleet readiness center in Japan works with seven globally distributed detachments to provide depot level maintenance support directly to Navy and Marine Corps aviation units that operate in the Pacific. These capabilities include the ability to manufacture parts and repair engines. Fleet readiness centers and associated detachments form networks that provide some capability at multiple locations that are responsive to tactical units. Fleet readiness centers also support Navy/Marine Corps interoperability using interchangeable parts, systems, facilities, and personnel. Placing some capability at numerous locations makes a logistics system survivable and responsive. Additionally, the use of a diverse logistics system establishes supply and distribution capabilities and relationships during competition that provide greater flexibility and adaptability as the situation transitions to crisis or conflict. This is an example of combining Navy and Marine Corps resources across the levels of war in forward areas.

A Marine air-ground task force requires logistics support from organizations outside the Navy-Marine Corps team. Service and joint logistics enterprise sources routinely complement organic Marine air-ground task force logistics capabilities. For example, Marines receive airdrops from US Transportation

Command C-17s, fuel from the Defense Logistics Agency, surface lift from the Army Theater Support Command, and aviation ammunition from the Air Force. These operations are planned, coordinated, and executed by various commands throughout the logistics "system of systems." In other words, logistics responsibilities and capabilities are present with the Marine air-ground task force, but require external augmentation to meet the needs of the force.

We understand that Marine logistics is naval and joint in nature. Marine Corps forces often provide logistics support to other joint and multinational forces. Conversely, Marines frequently require support from a variety of outside sources. The Marine air-ground task force supports and receives support from others by coordinating with operational-level headquarters to access regional and global support.

OPERATIONAL LOGISTICS

Operational logistics links the strategic means of war to its tactical employment by positioning and sustaining forces throughout a specified geographic area.[30] The goal of operational logistics is to enable campaigns to accomplish national objectives. Logistics at this level focuses on "setting the theater" by forming a theater distribution system that includes bases, intratheater force movement, sourcing unit materiel requirements, coordinating support, and campaign-level planning and management of these efforts.

Establishing an operational-level distribution system involves synchronizing the places, platforms, and procedures to support

campaigns or theater requirements. Places involves establishing or planning the land and infrastructure requirements to project and sustain forces. For example, forward bases often simultaneously serve as home stations for forward forces, important waypoints in force closure, and supply nodes where materiel can be stored or reconfigured. Platforms that comprise the operational distribution system are the intratheater lift assets that move forces and supplies within a given theater. Intratheater lift also includes coordination mechanisms and enablers, such as material handling equipment and load masters at ports.

Operational logistics focus on campaign sourcing and theater distribution systems and many logistics activities are conducted at this level. Resources needed to support campaigns are obtained through joint logistics enterprise coordination or regional contract support. Joint logistics enterprise coordination provides supplies and equipment units cannot get themselves using a variety of methods including cross-servicing agreements and forward-positioning materiel. Regional contract support is another important aspect of operational sourcing, or forward provisioning, that leverages availability and interoperability of capabilities from foreign and commercial organizations.

Figure 3-3 provides examples of operational logistics activities by functional area.

Combatant commanders design campaigns and have many logistics organizations, processes, and tasks to consider when developing support concepts. Central to this support is the joint logistics enterprise. This network allows individuals and organizations to cooperate at each level of warfare to support deployed forces. The joint logistics enterprise includes each

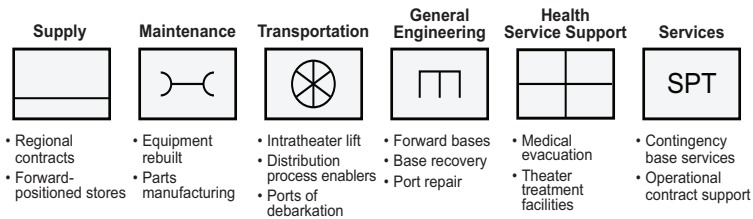

Figure 3-3. Operational-Level Logistics Examples.

military Service, the interagency, nongovernmental actors, and industries from the United States and its multinational partners. These agencies augment tactical units' logistics capabilities by providing support and services such as coordinating transportation or providing classes of supply. The vignette on the following page offers an example of senior leaders organizing and codifying logistics in a theater of war.

Combatant commanders integrate, coordinate, and synchronize limited resources, while various units and agencies actually execute logistics. While the joint logistics enterprise provides a vast array of global resources, each Service is typically responsible for providing logistics for their respective forces. The Marine Corps component commanders are responsible for setting conditions for successfully employing Marine Corps forces and conducting operational logistics. This includes preparing, moving, and positioning forces and resources in the sequence, timeliness, and readiness-level necessary to accomplish operational goals and objectives. In large operations, the Marine Corps component commander may establish a logistics support organization to perform operational logistics functions to support tactical-level logistics.

Joint Force Logistics

The Pacific campaign during World War II was a battle of logistics; the industrial potential was a massive advantage for the United States as Japan was "nearly totally reliant on its sea lines of communication for the importation of raw materials. The Japanese strategy was therefore one of securing interior lines of communications by a ring of fortified bases in the Central, South, and Southwest Pacific, as well as Southeast Asia. Consequently, the US strategy became one of stopping Japan's advance and then penetrating the interior lines of communication."

With little understanding of the functions of operational logistics as we comprehend them today and continuous concerns with separate sustainment systems, resulting in duplication of effort and waste, Admiral King and General Marshall issued a directive on March 8, 1943 entitled *Basic Logistical Plan for Command Areas Involving Joint Army and Navy Operations*. The plan directed that logistics organizations in areas of joint Army and Navy operations be brought under the Unified Command. It further provided that the theater commanders organize joint logistics staffs. The idea was to force centralized logistics planning at the Commander in Chief, Pacific Fleet Headquarters (CINCPAC) J4 section, which included branches that dealt with transportation, POLs, supply, planning, medical, construction and administration, and statistics. Ammunition and communication requirements were handled by the J3, Operations Directorate. Despite this policy and a staff being put in place, issues still arose due to the personalities of those theater Army and Navy commanders in regards to the idea of centralization of logistics.

"Thus, many historians believe there was never a unified logistics system, but close logistics integration did exist in many cases in the forward areas, and Admiral Nimitz' logistics staff was described by one senior officer as the most competent group he had ever worked with. It has been further described as the only 'truly functioning theater joint staff of the war,' and it would subsequently serve as the model for the joint staffs." (Vignette source: Gropman, The Big L).[31]

STRATEGIC LOGISTICS

At the strategic level, the joint logistics enterprise provides a source of Service, joint, interagency, industry, and foreign logistics capabilities and capacity. The Office of the Secretary of Defense, Joint Staff, Service headquarters, US Transportation Command, Defense Health Agency, and the Defense Logistics Agency each serve important roles in the joint logistics enterprise that provide access to logistics on a global scale. This includes cooperation with allies, such as those of the Northern Atlantic Treaty Organization, and partner nation militaries and commercial sectors.

Strategic logistics produce the means of war by leveraging and providing the Nation's materiel resources as the means to conduct campaigns. Logistics at this level focuses on infrastructure (to include bases and stations), acquisition, procurement, enterprise inventory management, and strategic lift.

Infrastructure, at the strategic level, supports Service recruitment, entry-level training, force generation, and unit training efforts. This involves obtaining and managing US military installations, facilities, and land. Infrastructure includes housing, community services, and welfare programs for Service members, veterans, and their families.

Acquisition and procurement involves obtaining the materiel to meet the force's needs. To do so often involves developing new capabilities and determining supply and equipment sources and national stockpile levels.

Enterprise inventory management includes the condition and allocation of equipment and supplies throughout the force. It involves materiel readiness, prepositioning materiel, and war reserves. Materiel readiness involves maintaining the working condition and providing prescribed quantities of equipment to the force. Prepositioning materiel includes staging equipment and supplies in forward and/or strategic locations. War reserves are supplies and equipment preserved for contingencies and unanticipated events.

Strategic lift is transportation in the continental United States and between theaters. It includes airlift, sealift, and the enablers that facilitate moving personnel and equipment.

Installations can be important elements of strategic transportation by housing infrastructure and facilities, such as runways and port handling areas, necessary to project forces overseas. Figure 3-4 lists strategic logistics activities by functional area.

Strategic logistics is conducted by numerous joint logistics enterprise actors, including the Service headquarters, interagency, allies, partners, the defense industrial base, and academia.

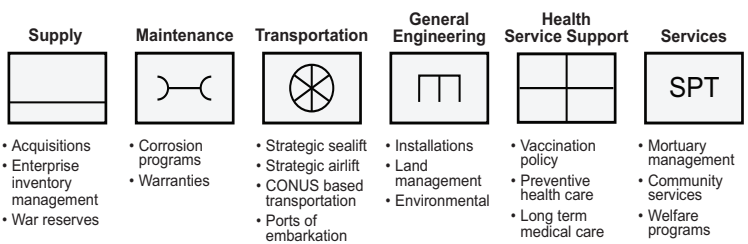

Figure 3-4. Strategic-Level Logistics Examples.

ROLES AND RESPONSIBILITIES

Marine Corps

One of the primary responsibilities of the Commandant of the Marine Corps is to organize, train, and equip forces so they are prepared for employment in campaigns. This includes recruiting, organizing, supplying, equipping, training, servicing, mobilizing, demobilizing, administering, and maintaining Marine Corps forces. Logistics is a direct or supporting aspect of each of these efforts.[32]

The Service's direct role in terms of strategic logistics includes acquiring and procuring materiel and systems used by Marines, administering the Marine Corps-owned land and infrastructure, and allotting materiel resources throughout the force. The Service also conducts institutional command and control of logistics efforts by maintaining awareness of resources, establishing standards and policies, prioritizing efforts, and positioning logistics resources.

Logistics is an important aspect of other strategic efforts conducted by the Service. Force design and development, posture, mobilization, training, and talent management are some of the key areas in which logistics is critically important. People who plan and execute Service responsibilities should ensure logistics aspects are appropriately integrated across each of these strategic efforts.[33]

Department of Defense/Interagency Roles

Certain organizations and agencies within US Government departments provide strategic logistics capabilities, services, or support. Leads for functional responsibilities, commonly used items, and classes of supply are often established to achieve efficiency across the military at a global scale. For example, the functional combatant commander at US Transportation Command is designated to coordinate strategic transportation and global fuel management. The Office of the Undersecretary of Defense for Acquisition and Sustainment is particularly important for industrial base and procurement authorities as well as other strategic sourcing decisions and policies. The Defense Logistics Agency is another important agency that supports the Marine Corps by providing general supply items, repair parts, disposal, and other critical logistics services and support. The military Services and combatant commanders work with these agencies, which serve as focal points for specified issues to meet current and anticipated logistics requirements.

Defense Industrial Base

The defense industrial base is a global industrial complex that facilitates research and development, as well as the design, production, delivery, and maintenance of military weapon systems and supplies. The defense industrial base includes government-owned and operated facilities, academic institutions, and private-sector companies that support national defense. The defense industrial base includes US entities and specified global partners that collectively support building and

Tactical Support from Strategic Agencies—Defense Logistics Agency

Major Rodriguez's primary responsibility is to provide sustainment options for an undetermined amount of time. She quickly formed relationships with local suppliers, met with the Defense Logistics Agency support team representative, reviewed acquisition and cross-servicing agreement options with the defense attaché office, and explored existing mutual logistics support agreements. Her supply officer, Second Lieutenant Jamison, sent two government commercial purchase card holders along with a field ordering officer and pay agent team into local towns to develop relationships with local shop owners. They identified sourcing opportunities and got a sense for potential supply and demand challenges in the area of operations. Major Rodriguez contacted her naval logistics counterparts to understand husbanding agent opportunities in the theater and reached out to the Army theater sustainment command to introduce herself and her team of logisticians. Her contracting officer never left her side. In fact, she connected with the nearest expeditionary contracting platoon and contingency contracting core representatives to widen the scope of available sustainment options. After just a few days, Major Rodriguez developed a sourcing logic for each class of supply specific to her force's demands and considerate of theater logistics capabilities. She compiled all sourcing logics, laid them over a map of the theater with respective time-space analyses by transportation method, and presented the supply web to her commander as the overarching concept of logistics support for the force.

sustaining military forces,[34] from the most complex weapon system to the most basic supplies. Part of the defense industrial base is the organic industrial base, which is the military-owned

capability to conduct depot maintenance and rebuild equipment. Each Service requires a core organic industrial base to retain a limited capability to build capacity that will be necessary during times of war.[35] The defense industrial base is a fundamental part of acquiring and procuring equipment and supplies needed for war.

Academia

Academia produces many technologies that are incorporated into the products and materiel produced by the defense industrial base. Academia also provides concepts and techniques of great value to military logistics. Inventory management techniques and improved demand-forecast methods offer a means to increase our capabilities and efficiency. However, in adopting these techniques, we should consider that methods that prove efficient commercially will not necessarily succeed under the demanding conditions of war. Partnering with academia allows us to leverage the human capital offered by a partnership between Marines and universities. These partnerships have great potential in areas of emerging technology and thought that impact lift, distribution, and supply.

Allies and Partners

Allies and partners are logistics force multipliers. There is great strength in the power of combined US and allied logistics. Allies and partners that support forward positioning of US equipment and supplies send a deterrence and readiness message to enemies and adversaries.

Allies and partner nations often make vital contributions to theater sustainment and distribution systems. Other countries provide US forces access, basing, and overflight necessary to facilitate global reach. Foreign bases are often major nodes that are essential to positioning and sustaining forces. Foreign nations can provide ground, sea, and air transportation assets to facilitate tactical and operational distribution. Allies and partners contribute to distribution systems by providing local security and defending lines of communication.

Obtaining local supplies and services from foreign military and commercial sources is a time-tested, combat-proven sustainment method. Different localities can provide a range of support options, thus reducing demand on the theater logistics system. Contracting food, water, fuel, and transportation is commonplace and benefits the host-nation economy. Additionally, allies and partners enhance maintenance and procurement efforts when they use compatible weapon systems and platforms. This interoperable force makes the supply web more effective, efficient, and responsive. However, foreign support may potentially produce unintended consequences such as creating scarcity and inflationary pressures in the host nation. Marines should closely monitor the effects that supporting US forces places on the local economy and population.

Trust is the catalyst for harnessing the power of US and foreign logistics cooperation. Trust is earned over time and relationships are designed to be mutually beneficial. Building and strengthening relations during competition lays the foundations for coalitions in conflict. Forward presence fosters trust by

signaling US commitment to allies and partners. Forward presence creates conditions for important bilateral training and expanded military-to-military cooperation throughout a region. Through exercises and training, US and allied forces work together to create interoperable forces greater than the sum of their parts. Investment in US military hardware and software with allied and partner assistance creates life-long relationships between militaries. As seen in the F-35 program, multiple nations can be part of the production, fielding, and lifecycle process. Equally important is growing the trust between the United States and one nation into trust between multiple nations. Positive relationships with one partner can be leveraged to increase regional and global relations with other countries.

CONCLUSION

The bridge that connects the Nation's warfighting forces to its economy is composed of various people, operating at different echelons around the world. The joint logistics enterprise forms this bridge through a complex matrix of individuals and organizations whose activities, responsibilities, and methods differ throughout the levels of warfare. For Marines, the Marine air-ground task force focuses on tactical logistics with adjacent units, the Service headquarters focus on strategic logistics with joint logistics enterprise partners, and the Marine Corps component commander works with the combatant commander to link it all together at the operational level. Now that we understand what needs to be done to conduct logistics and the stakeholders that perform these functions, we can describe how Marines prepare to conduct logistics.

Scenario—Welcome to the Theater

Captain Neal, the logistics officer for 2d Battalion, 7th Marine Regiment, arrived in the Manila Airport military terminal. Upon arriving, a red-patch-wearing landing support Marine gave him a headset and a set of virtual goggles. He put the goggles and headphones on.

"Welcome to the theater, Captain Neal," said a voice through the headphones. The voice was clearly computerized, although completely clear and actually a bit comforting. "We have run diagnostics to understand the available logistics in your area. When ready, tell me the types of products and services you are interested in."

Captain Neal replied after a few seconds. "Who else is operating in the area?"

"I see you are a Marine, are you looking for only Marine units in the area? I have identified other Army and Navy organizations, as well as a Defense Logistics Agency (DLA) office and two other organizations within the United States Government."

Captain Neal was impressed. "Connect me to the DLA representative, and show the other two organizations on the screen with a list of known logistics capabilities or contracts."

Michael Desa, a DLA agent, saw who was calling with additional information about the unit he was from, what organic logistics capabilities are in the unit, the operation the unit is deployed to

support, and how long this unit has been deployed thus far. He touched his screen, and said, "Captain Neal, welcome to the Philippines. I am your DLA rep, ready to work with you."

Captain Neal was now intrigued. He wondered what was meant by "your DLA rep." He replies with, "We just arrived into the theater and I want to immediately establish contact. I know our Marines back home have 24-hour reachback capability, but that is a long distance to get something we need right now. Can you send me a list of the recent support history for units in the area and then a second list of what units have requested prior to launching further into the jungle from here?"

Captain Neal was eager and excited. He did not even give Michael a chance to reply, and continued, "I'll tell you, it sure would be easier to not have to navigate through logistics options myself. I mean, the virtual logistics assistant is nice; it gives me visibility of nearly all the logistics agreements and options already here in theater, but I still need to sift through lists of information."

Michael follows with, "That's what I am here for. DLA reps are now the front desk for you guys. We can run the analysis for options and feed that right back to you. The decision for which option you want to use is still up to you. Although, we also offer some additional capabilities where we can even make the decision for you."

"How does that work?" with a bit of disbelief, but also some increasing intrigue. "There must be a catch."

Scenario

Michael understood the disbelief. "We have models built from historical logistics data for all the requests coming from military forces in your area of operations. These models pull in demand and usage data from small and large units, those coming in for exercises or operations, and even broken out by unit type, which includes organic and typical attached logistics capabilities. At the end of a deployment, we have compared the results of the model with the actual demand. They are remarkably similar."

"So, you're saying that you can handle all of our logistics needs?"

"Sort of. I can actually do a lot of the work behind the curtain for you. You have options. You can sift through the options available and coordinate logistics yourself, while our system watches from afar to collect the data. Or, you can push me a note whenever you need support, and I…well, really the DLA team…does the coordination for you."

"What's the catch?"

"We are talking about matters of scale. Your request for some food, water, fuel, and ammunition is pretty specific. Sending that from the continental US will be costly in money and time. We can bundle requirements for greater cost advantage in shipping. To this latter point, we stock the shelves of DLA facilities to meet your anticipated needs. Heck, it actually messes us up when Services request support from back at home station. We are already investing in posturing what you likely need close to where you need it."

Chapter 4.
Logistics Preparation

"The essence of flexibility is in the mind of the commander; the substance of flexibility is logistics."[36]

—H.E. Eccles

"Equipment is useful only if it increases combat effectiveness. Any piece of equipment requires support: operator training, maintenance, power sources or fuel, and transport. The anticipated requirements and the employment of the equipment must take these requirements into account."[37]

—MCDP 1 *Warfighting*

"This relation between tactical mobility and numbers of vehicles, between the size of staffs and effective control, will increase in importance in any future war. Unless they are constantly watched and ruthlessly cut down, vehicles and staffs will multiply until they bog down movement."[38]

—W. J. Slim

Marines must be well-trained, educated, and equipped to create forces that meet the demands of combat. Logistics is a key consideration in how the force is built. This chapter reviews the traits individual Marines should possess to effectively conduct

logistics, how training and education develop these traits, and the logistics considerations of equipping the force.[39] This chapter describes how logistics is an essential element in preparing for and executing deployments.

LOGISTICS AND THE INDIVIDUAL MARINE

People are essential to logistics. Organizational models and procedures are only effective if the people who use them are committed, competent, and well led. Successful units are composed of professional, proficient, and proactive Marines. They are problem solvers who work together to tackle the most daunting challenges.

Logistics is about attitude. Planning and executing logistics is a very complex, cognitively challenging, and physically demanding task. These demands are met by focusing on delivering what Marines need when they need it. Having a mission-focused and can-do mindset backed by proven performance builds trust and confidence.

Logistics is a cooperative team effort. Every Marine benefits by understanding logistics characteristics and principles. This knowledge baseline shapes logistics requirements across the force and creates an appreciation for the challenges and opportunities presented by logistics in warfare. Logistics requires allocating and distributing scarce resources, an undertaking that demands a team-oriented approach toward meeting warfighting requirements. A thorough understanding of logistics by all Marines facilitates teamwork and generates combat power.

Initiative

Taking the initiative generates operational tempo. Taking action without explicit direction is the essence of initiative. The more familiar one is with all aspects of an ongoing operation, the more one can effectively exercise initiative. By being fully conversant in the commander's intent and supported unit's requirements, we can provide the logistics wherewithal to generate and maintain momentum. Awareness of the purpose and scope of the operation, coupled with initiative, enables Marines to do what needs to be done as soon as it needs to be done. By focusing on the overall objective and needs of the supported unit, we can best exercise initiative. The British Expeditionary Force, 1918 vignette below provides an example of how initiative and commander's intent set conditions for logistics success.

Commander's Intent, Initiative, and Logistics
British Expeditionary Force, 1918

The value of the commander's intent can be seen in all sorts of operations, but is most obvious in situations where formal communications break down. One of the immediate effects of the German offensive that began in March 1918 was the psychological paralysis of the command structure of the British Expeditionary Force. While this breakdown precluded issuing coherent orders for a number of days, it did not hinder logistics units from effectively participating in the defense. Thanks to a shared understanding of the defensive battle developed during a series of discussions held the previous winter, British logisticians were able to make the best use of remaining resources to support the deployment of provisional combat units and operational reserves. These forces eventually brought the attack to a standstill.[40]

Proficiency

Logistics is technically demanding; even routine logistics functions require specialized equipment, systems, and training. Proficient Marines form the very heart of the logistics system. Expertise in the many individual actions required to perform each logistics function is essential to providing effective support. Whether operating equipment, repairing broken items, inputting data into a system, storing ordnance, or conducting any other logistics action, proficiency drives performance.

Supporting multiple forces of different composition and size in an austere environment is logistically demanding. This demand can be offset by multidisciplinary Marines. Marines who can repair and maintain an array of equipment and operate multiple types of vehicles can reduce a unit's personnel footprint. Training and education focused on developing Marines with balanced breadth and depth across multiple specialties maximizes force structure. Infusing critical thinking and problem-solving skills in these Marines provides additional skillsets to plan and execute logistics in a contested, dynamic area of operations.

Attention to Detail

Small things matter in logistics. Logistics is a multidiscipline endeavor that requires constant integration and coordination of people, services, and supplies across many organizations, often without clear unity of command. Mistakes in logistics calculations, errors in support timing, and flawed execution can disrupt operations. The complexity of logistics calls for planners who are critical thinkers who ask the right questions, clearly articulate the problems, and process relevant information to

develop workable solutions. Solutions might involve detailed coordination in executing or adjusting plans and procedures to better meet operational requirements. The most responsive systems include processes and procedures that provide a shared understanding of the overall mission. This, in turn, provides a level of detail that enables centralized command and decentralized logistics execution. Attention to detail ensures plans and operations are seamlessly linked and skillfully executed.

Teamwork

Logistics requires regular collaboration among individuals, supporting, and supported organizations. Collaboration is critical to building cohesion. This crosstalk expands a Marine's understanding of the capabilities and perspectives of each entity, and builds trust across the network. Trust between supported and supporting elements is essential for responsiveness, particularly in times of crisis or conflict. Building relationships prior to contact with the enemy reduces friction and increases trust. Understanding the cultural nuances and requirements among different units is foundational to a responsive logistics system. Knowing the formal and informal organization of the logistics system, combined with aptitude and motivation of those throughout the network, is critical to providing responsive support.

Adaptation and Innovation

Logistics adaptation and innovation are integral to overcoming the fog and friction of war. Marines adapt to new environments by modifying existing organizations and processes to that environment. Innovative Marines develop new ideas,

organizational methods, and tools to better address dynamic operational requirements. Adaptation and innovation are necessary to gain and maintain advantage over the enemy and adversaries. These efforts are often energized during crisis and conflict, when the need is emergent and the threat is imminent. Yet adaptation and innovation are needed at all times, and should not be characteristics applied only in crisis and conflict.

The way we look at a problem can sometimes be the problem. Bringing together diverse groups can help us approach problems in a multifaceted way. Groups composed of different ages, ranks, and backgrounds view challenges and opportunities through multiple, perceptive lenses. Marines provide invaluable human capital to adaptation and innovation efforts. By creating and using diverse teams, we create a "power of combinations" well prepared to tackle the most daunting warfare challenges.

An innovative culture is created when leaders enable individual ingenuity and team creativity to flourish. Innovations should be tested against potential threats using an action-reaction-counteraction approach. Unleashing individual and group ingenuity in force and operational planning, along with realistic training and experimentation, is essential to creating a logistics system that is flexible and responsive across the competition continuum. Individual productive output is best cultivated when the overarching organization rewards creative, innovative thinking. Mulberries at Normandy are an example of innovative thinking to solve a problem.

Mulberries in Normandy

Planners of Operation Overlord, the Allied amphibious assault into Normandy, knew the force would face a throughput challenge after seizing the beach. They assumed the local port of Cherbourg would be sabotaged and knew the beach assembly areas would not be able to build up combat power that was sitting in the massive armada offshore. So, they made their own artificial ports called mulberries. Mulberries were piers established at sea that connected to the beach via a six-mile-long steel roadway. Mulberries alleviated the need to seize additional ports and offloaded 7,000 tons of equipment and supplies per day in support of the invasion.[41]

Human-Machine Teaming

Logistics is about how people interface with machines. Individuals are key to executing effective logistics, but machine teaming takes this execution to new, higher levels. In the 20th century, the introduction of the internal combustion engine, interchangeable parts, and mass production shaped our way of war. Mass producing vehicles, aircraft, ships, and munitions were critical factors that drove the operational approaches and, ultimately, the results of war. In each case, humans teamed with machines to increase the lethality, range, and speed of Marine Corps units.

Emerging technology such as unmanned platforms, artificial intelligence, machine learning, additive manufacturing, and wireless and other advanced connectivity have the potential to increase the speed and tempo of war. Human-machine teams can provide new and promising capabilities across every aspect of warfare. This technology has the potential to make legacy

systems more capable and efficient, while creating future systems that provide asymmetric advantage over our foes.

Talent Management

Effective talent management focuses on the most important dimension in warfare: the human dimension. Maneuver warfare places a premium on individual judgment and action. By treating Marines like the gifted individuals they are, we foster creativity, initiative, and ingenuity. We should recognize that all Marines of a given grade and occupational specialty are not alike, and should be assigned to billets based on specific ability and temperament. Talent management should align the skill sets of Marines with their desired and proven proficiencies. It recognizes individual preferences for assignment and career progression—without penalty or bias. Placing Marines in roles where they want to serve and can excel improves unit performance, retention, and personal satisfaction. Talent management is particularly important in logistics because many support occupations are hard to develop and challenging to retain.

Many logistics specializations require a heavy investment of time and resources to develop proficiency. Marines in aviation maintenance and communication systems are examples. It takes a very deliberate and exacting effort to find people capable of performing these technical jobs. Retaining Marines of this caliber and incentivizing them to stay in the Marine Corps, vice pursuing more lucrative opportunities in the private sector, is challenging. The way we overcome this challenge is by creating a work environment and career paths that meet the needs of the individual Marine and the Marine Corps.

Logistics Talent Management

During the weekly walkabouts with the sergeant major, Lieutenant Colonel Davidson talks with Marines from all walks of life across more than 40 occupational specialties in the unit. Individual interests are recorded for every Marine, from the privates first class in the supply warehouse to the sergeant major. Corporal Hays from the Communications Platoon, Lance Corporal Mayberry from the Engineer Platoon, and Staff Sergeant Sorenson from the Headquarters Company all have a passion for aviation. Corporal Hays owns multiple drones; Lance Corporal Mayberry is deeply passionate about mechanical engineering and enjoys building model airplane engines; and Staff Sergeant Sorenson gives rides to friends on his single-piston aircraft on weekends. Lieutenant Colonel Davidson assigns these Marines the task to come up with a way to use their aviation interests to improve distribution during the unit's upcoming deployment.

The three Marines designed and built a new small unmanned system tailored to the needs of the unit. This platform provides the payload capacity that matches the demand of the highest priority repair parts for their supported infantry battalion. The team works with the operations officer and the distribution management officer to find opportunities to incorporate this capability throughout the deployment. On several occasions the small, quiet drone was used to resupply forward elements operating on small dispersed islands and aboard small craft on inland waterways. On one notable occasion, the camera-equipped drone identified an enemy element drawing weapons from a cache, which was immediately fed into the unit intelligence cell to inform a strike to eliminate the enemy.

After the deployment, the sergeant major speaks with each Marine's respective monitors about their interest to laterally move into aviation occupational specialties, and Lieutenant Colonel Davidson ensures all Marines update their talent marketplace record with their expressed interest in moving specialties.

Another challenge is that logistics specialists are often few in number, which can affect the unit mission. For example, a Marine aircraft wing lacking sufficient certified aviation quality control specialists must limit the number of detachments it can deploy. A lack of electricians and generator specialists can degrade or disrupt mission-critical command and control systems. Too few heavy equipment operators can hamper or stop port operations. Retaining competent and qualified Marines is a logistics readiness issue.

Carefully balancing the needs of the Marine Corps with the desires of the individual Marine can create mission-oriented, proficient, and motivated Marines. The more we can put Marines in the roles they are suited to and like, the better. Aligning natural talents and traits improves performance, with an expected benefit of rapid growth of skill and maturity. Placing Marines in roles they are interested in helps retain high quality people. This requires mentorship, coaching, and caring for Marines throughout their careers. It rewards proven performance, creates opportunities for nontraditional pathways, and fosters teamwork commitment to the profession of arms.

LOGISTICS TRAINING AND EDUCATION

Training is necessary to develop individual skills and bring people together into cohesive teams that can fight and win across the competition continuum. Logistics should realistically be woven into training at every opportunity. Education allows us to understand how logistics influences battles and campaigns. The more we learn, the better we can innovate and account for logistics considerations in our operations.

Training

Training is instruction and applied exercises for attaining and retaining the skills, knowledge, and attitudes required to accomplish military tasks. Training is an experiential development process that builds and strengthens individual and unit skill sets. Effective logistics depends on continuous, challenging, integrated, progressive training at the individual and organizational levels. Training begins at the entry-level and increases in complexity, breadth, and depth. Logistics training creates the cognitive means to plan and execute logistics.

Integrated, realistic training between logistics units and supported units builds trust and develops an appreciation for each other's capabilities, limitations, concept of operations, and requirements. Training provides opportunities to develop and refine support concepts, processes, and procedures. Logistics procedures used in forward operational environments require regular rehearsal. Exercises that use resources or methods not available in an expeditionary setting create unrealistic expectations for supported units.

Logistics units train to master the internal relationships and techniques specific to their mission. Logistics units often deploy as task-organized logistics elements with capability and capacity tailored to the anticipated needs of the supported force. Training together as task-organized formations develops cohesion and trust.

Training focused on mission accomplishment in realistic conditions yields performance dividends. It is critical that training

stresses and tests Marines to function effectively in a combat environment. The more we interject friction, uncertainty, and hardship into the training, the more Marines will be ready for war.

Maneuver warfare requires Marines at every rank to be leaders, problem solvers, team builders, and decision makers. Creating training venues that force Marines to perform one to two levels higher than they have experienced in the past, facilitates professional development and growth. Leaders need to concurrently challenge and teach, supervise but not micro-manage, and reward initiative, even if it leads to failure. Failure is part of the training and learning process.

Education

Education serves a significant role in developing Marines at all ranks. Professional military education is a systemic institutional effort to develop and teach Marines the art and science of war. This learning is enhanced by individual efforts to expand knowledge through self-study and formal education. As leaders progress, they become well versed in the techniques and procedures of their occupational specialties. They learn about the interrelationships among different occupational fields in the Marine Corps. Marines who develop a sound understanding of logistics know how the system works, and how to best request and receive support. They also understand how and why logistics sets limits on operations and how to expand these limits. A logistics education nested within the study of the larger art of war provides important insights and knowledge.

Understanding the role of logistics in campaign design helps planners develop actionable operations and plans. The capabilities, culture, and needs of each element of the Marine air-ground task force and joint force provide context for determining requirements. With knowledge about the joint logistics enterprise Marines can better develop plans to meet support requirements. By studying military history, theory, organization, and technology Marines build understanding of how logistics enables and limits warfighting. The adage that says, "if you want a new idea, read an old book" applies to logistics. Logistics case studies dating back to the time of Alexander provide timeless best practices and lessons learned. Additionally, integrating an in-depth appreciation of science, technology, and business management techniques into military education enhances proficiency in the conduct of war.

Possessing a firm grasp of logistics techniques and procedures enables effective support planning and execution. Lifelong pursuit of cross discipline learning enables development of warfighting skill sets. This includes appreciation of the humanities, psychology, and history, augmented by science and technology studies. These topics help Marines increase their knowledge of the art and science of warfare. Education and training help Marines navigate the complexity and the lethality of the modern battlefield. Diverse expertise is needed to sustain and support the force in the most arduous combat conditions. Lastly, Marines will benefit by knowing how strategic and operational logistics can best support tactical level logistics.

LOGISTICS CONSIDERATIONS FOR EQUIPMENT

Marine Corps forces are specifically organized and equipped for expeditionary operations to accomplish a variety of missions, often in austere environments.[42] To be expeditionary, Marine equipment needs to be scalable, resilient, reliable, and easy-to-maintain. Marine equipment needs to be logistically sustainable. The operational benefits of equipment should be carefully compared to the logistics costs. Marines carry or operate equipment in the execution of their duties. Heavy, complex, and logistically intensive vehicles and weapons systems increase support requirements. The "soldier's load" is an important planning factor in a force's range and mobility. Advancements in lethality and mobility platforms should be worth the corresponding increase in maintenance and supply requirements. For example, developing aircraft with robust intelligence, surveillance, and reconnaissance capability without developing the associated capabilities to safely capture and store the information limits equipment usefulness and hides its true cost.[43]

Marine units vary in size, scope, and composition. However, with modular and multifunctional equipment, Marines can tailor or aggregate force packages to meet the supported units' varied requirements. Having the ability to aggregate or disaggregate capabilities and systems provides Marines flexibility for various situations. Maintaining numerous logistics options with on-call reserves enables units to adapt and scale to an ever-changing combat situation.

When does a Middle Weight Force become a Heavy Weight?

Marines carry more than 100 pounds of individual combat equipment to the fight. The infantry battalion has increased from 2,250 to more than 8,400 principal end items. The Joint Light Tactical Vehicle weighs 18,000 more pounds than the vehicle it replaced and gets less than six miles per gallon. The MV-22 flies twice as fast, twice as far, and carries twice as much as its predecessor, but consumes seven times the fuel. The AAV replacement is faster, but gets fewer miles per gallon. The reach and range of a Marine unit is the sum of its logistics parts. The Marine Corps will need lift and distribution platforms and procedures to move and support forces heavy, medium, and light.

For example, modular fuel systems aggregated or dispersed throughout the operational environment, to include surface and subsurface, provide logistics capacity and flexibility to the force.

Expeditionary forces often operate in austere environments that do not provide reliable access to supplies and infrastructure. Marines need reliable and durable equipment that can withstand the punishing effects of a harsh environment. Equipment should be easy to operate and maintain, requiring minimal specialized operator and maintainer training. The force should not be dependent on delicate equipment that cannot withstand the rigors of unforgiving weather and terrain.

Marines thrive in austere environments by maintaining as light a footprint as possible. Units that obtain their own supplies, meet energy needs, and produce their own equipment are more self-sufficient than others. In history, the Mongols exemplified self-

sufficiency. The Golden Horde was a light, self-sustaining force that generated speed, tempo, and lethality through very lean, but responsive logistics.

Mobility and Reduced Signature by Light, Self-sustaining Forces

The Golden Horde achieved advantages in mobility and signature management by placing much of the logistics responsibility on the individual. Each member of the Horde hunted or lived off the livestock that accompanied them rather than relying on a following supply train. This livestock-based diet allowed the army to travel for about ten days without stopping or making fires, which would give away their position.[44]

The joint logistics enterprise provides many means of strategic lift to facilitate the closure rate and global reach of Marine Corps forces.[45] Accordingly, compatibility between Marine Corps equipment and the joint logistics enterprise transportation assets that move them is crucial for regional and global responsiveness. Naval integration is particularly important. For example, trucks that do not fit within naval vessels, or require maintenance crews on both ends of a movement for disassembly and re-assembly, reduce tempo and increase the logistics requirements of the force. Marine Corps force planning should incorporate the spatial, maintenance, information technology, and energy considerations into all equipment and systems. The easier it is to transport Marine Corps forces, the more expeditionary and responsive the force.

The Navy has a special role in making Marines expeditionary. The Marine Corps gains its strategic mobility in large part from

its naval character; the sea remains the only viable way to deploy large military forces to distant theaters and to rapidly shift forces between theaters. The Navy provides much of the tactical lift for Marines to use the sea as maneuver space and support operations ashore. Sourcing Marine Corps equipment should include special attention to the naval concepts, equipment, processes, procedures, and systems required to transport and sustain the force. Marine Corps equipment needs to continue to be purpose built for operations conducted with the Navy. Equipment should be compatible with naval assets: easy to load, offload, and reconfigure at sea.

As an expeditionary force, the Marine Corps should strive to create self-reliant forces. Organic lift enables movement throughout the battlespace. Various platforms provide tactical mobility options for Marines operating from the sea or during operations ashore. Part of creating organic mobility within a force is evaluating each capability according to how difficult it will be to move. Heavy or bulky equipment may have limited transportation options and require more transportation assets to move. To remain an expeditionary force in readiness, we require a balance between mass and mobility.

Equipping Logistics Units

Logistics unit equipment requirements vary, depending on the forces they are designed to support. If the Marine air-ground task force is big and heavy, the logistics support will be big and heavy. Conversely, if the Marine air-ground task force is light and low-signature, the logistics support can be light and low-signature. Units designed for combat require redundant, survivable, and

expendable methods and sources. Logistics units must have adaptable and scalable equipment options to support Marine Corps forces that often vary in their composition, size, and missions. Marine Corps units with organic or direct support transportation assets also exhibit a degree of mobility and movement flexibility greater than those without.

Information systems are integral to modern logistics because they provide the connection between information and decision-making. The ability to operate and interact with technology provides the force a level of technical maturity that can become an advantage against adversaries. Information systems facilitate processes and capabilities that form the nerve center for meeting supported unit requirements, tracking logistics capacity, and directing logistics activities on a global scale. Keeping pace with technological advancements that improve logistics command and control, will enable us to gain advantage over our adversaries and improve our lift, distribution, and support efforts.

Information systems that facilitate global logistics must be protected from disruption. These systems are valuable targets to adversaries seeking to degrade or disrupt our strategic ability to deploy and employ forces. When developing these systems, Marines must consider their ability to transfer protected or compartmented information to unsecure networks, such as those used by other nations or commercial vendors.

The technology that enables logistics requires integration with partners throughout the Marine air-ground task force and joint logistics enterprise. Command and control systems should be

capable of interfacing with logistics information systems to facilitate decision making and responsiveness. Interoperability and visibility of logistics information across the entire enterprise provides Marines with numerous and diverse opportunities to move and sustain forces. Ideally, these systems will be few, simple to learn, and easy for end-users to operate. These systems should also be capable of predictive analysis, using artificial intelligence and modeling to anticipate requirements.

LOGISTICS PREPARATION FOR DEPLOYING FORCES

Logistics has a role in preparing and rapidly deploying forces on a global scale. Well-trained and properly equipped Marines who are ready to deploy are a force multiplier for the joint force. Logistics sets conditions for the rapid deployment and agile employment of Marine Corps forces.

Logistics carries an important role in preparing forces for deployment through the force generation process. Force generation is "the systematic, Service-wide approach to selecting, resourcing, and preparing units for deployment." This process identifies units to meet combatant commander requirements and establishes staffing and equipping goals for these unique missions and situations.[46]

Generating the Force

Generating the force involves identifying and sourcing needed personnel and equipment to deploying units. Logistics supports the development of personnel and equipment capabilities and provides them to the necessary units.

Each logistics function is necessary to support the transition from civilian to trained Marine, before they reach their first unit. Installations provide quarters and places for entry-level training from recruit training through occupational specialty schools. Transportation, health care, food service, and many other logistics activities enable the process of making Marines and providing them occupational specialties.

Logistics also facilitates the delivery of equipment and supplies to units. Acquisition and procurement programs require a domestic distribution system to fill units with needed materiel. Bases provide facilities to store, repair, modify, maintain, and otherwise prepare equipment and supplies. Contracts and transportation assets deliver this materiel to Marine Corps units.

Readying the Force

Once units are generated with people and equipment, they become combat ready by conducting training and mission rehearsals that build proficiency and cohesion. Logistic support is important to any training effort, whether conducted at home station, overseas, or a Service-level venue. Providing places, equipment, and services to training includes building and managing barracks, creating and maintaining ranges, and conducting supply, maintenance, transportation, and sustainment activities.

Logistics in support of training should keep pace with the needs of the force as it evolves. For example, installations provide the infrastructure and services to support the training needs of a multi-domain combined arms force. Additionally, facility maintenance, unit transportation, and sustainment activities all provide opportunities to experiment with new logistic techniques

and capabilities that may provide additional benefits throughout the battlespace.

Deploying the Force

Deployments are coordinated and supported by joint logistics enterprise organizations that seek to maximize lift and minimize response times. Deployment speed is governed by access, lift, and throughput factors, but units that are logistically prepared to deploy generate force deployment tempo. Allies and partners can perform a vital role in generating deployment speed and tempo by facilitating access and providing lift and throughput enablers to maximize force flow.

In permissive environments, units can deploy using an efficient force closure model. In this method multiple platforms, often commercial, are used to flow people and equipment through multiple locations, often breaking up units to reassemble them

Force Closure vs. Power Projection

An example of force closure is Operations Desert Shield and Desert Storm. The US objective was Kuwait. The force had seven months to move, assemble, and reposition forces using a combination of military and commercial transportation assets through uncontested airports and seaports in the region.

An example of power projection is the island-hopping campaign in World War II. The US objective was Japan. The force had to fight across the Pacific against air, surface, and subsurface threats all along the way. Just getting within range of the objective included naval battles and amphibious operations to seize the Philippines and the Marshall, Mariana, and Ryukyu Islands.

where they are required. In contested environments, units may adopt a power projection approach, in which they plan to fight when they arrive where they are required. Combat formations throughout the movement enable the force to defend itself and immediately execute on arrival.

In many situations, commercial, maritime, and airlift will be an appropriate deployment method, such as while conducting security cooperation. However, the character of war is globally contested and our forces can be attacked, denied, or disrupted throughout the planet. It is unlikely that a purely permissive force closure approach can be used in this environment. Marine Corps forces must be capable of deploying forces over distance despite enemy disruption.

A resilient distribution system combines the logistics principles of sustainment and survivability to enable force projection in a contested environment. The installations that serve as nodes in this system must prepare to be attacked across multiple domains. Plans to harden, disperse, avoid, and regenerate forward bases must be resourced and rehearsed.

Deception is also an important aspect when deploying forces in a contested environment. These actions span the physical, virtual, and human action spectrum and include disinformation, decoys, and signature management activities. Deception actions are designed to influence the enemy's perception and decision-making processes. By creating confusion and doubt as to the movement, placement, and subsequent operations of friendly forces, we create cognitive advantage against our foes.

LOGISTICS PREPARATIONS OVER TIME

Preparing the force for expeditionary operations requires a long-term view. The logistics needs of the force are not limited to meeting the time-sensitive, short-term demands of the next mission. Many support requirements take years, if not decades, to develop. For example, installations require funding and construction timelines that take many years to produce. Acquisition programs require years of research, study, and investment to produce capabilities. Sustaining forces over the long term requires foresight, diligence, patience, and the active involvement of numerous stakeholders.

A long view is required to support a resilient Marine Corps community over time. Marines need to know their basic needs, and the needs of their families, will be taken care of, particularly during periods of separation. Logistics includes quality-of-life considerations, such as housing, community services, welfare, and recreation programs designed to meet family needs and form resilient communities. Preparation over time enables Marines to focus on the mission, trusting that their loved ones are being cared for during deployment cycles.

CONCLUSION

The Marine Corps' proven performance in combat is due to the capabilities and quality of our Marines. Marines are the heart and soul of our expeditionary force. Marines are manned, trained, and equipped to fight and win. The equipment and supplies of the force need to account for the logistics demands required to

sustain them in austere environments anywhere in the world. Our training and education rewards initiative, instills discipline, and builds cohesive teams. This preparation for conflict instills in Marines a bias for action in the absence of orders. It provides Marines the cognitive, physical, and technical training to out-think, out-perform, and out-match our adversaries. We are prepared to rapidly deploy, and we are ready to fight. Marines seek to find new ways to increase our lethality and survivability, ways that often include teaming up with machines. Formal training and schooling need to be matched by a self-driven quest for lifelong learning to effectively incorporate logistics into our operations. People's interests and skills should inform their occupational assignment. Investing time and resources into our Marines will yield combat readiness dividends in the present and over time.

Chapter 5.
Logistics Planning and Execution

[A dynamic view of command and control] "sees command as the exercise of authority…Control takes the form of feedback—the continuous flow of information about the unfolding situation returning to the commander—which allows the commander to adjust and modify command action as needed."[47]

—MCDP 6, *Command and Control*

"The establishment of advance bases in the Pacific during the early months of the war was primarily an effort to make up in a brief period for the failures of preparation stretching back over many years."[48]

—Duncan Ballantine

"The way to meet…logistical demands is to flow your resources to the focus of effort—the highest priority need at the time. This requires flexibility, in the form of intelligent, well-trained Marines…"[49]

—J. A. Brabham

Logistics planning is most effective when it is tailored to the specific conditions in which a force will operate. Leaders use command and control to integrate all logistics and warfighting

functions to operate in these unique environments. Aligning support with requirements requires planning, shaping actions, maintaining visibility, making adjustments, and risk management. Most of all, effective and successful logistics requires invested leadership.

LEADERSHIP

Commanders lead the logistics effort, just as they lead all other aspects of their organizations: by providing a clear statement of intent to focus the logistic effort. Commanders ensure logistic issues are considered throughout planning and determine whether operations are logistically feasible. The commander sets the tone for logistic discipline by demanding accountability, adherence to processes and procedures, and prioritization. All echelons of command set standards, supervise activities, change or clarify guidance, and engage with the logistics system to ensure the unit receives the necessary support from outside agencies.

Commanders and leaders at every level serve an important role in guiding the vast array of specialists required to provide logistics support. Units have Marines with different skill sets, such as electricians, radio mechanics, bulk fuel, and food service specialists, with whom leaders will forge teams with diverse specialties. This “power of combinations” sets conditions for mission success.

Leaders who teach, mentor, train, and understand their subordinates forge winning teams. These leaders infuse

competence, confidence, and focused energy into their people. Leaders throughout the system supervise what needs to be done, and get it done. Leaders create a culture of ingenuity in which Marines find a way to provide forces support no matter how demanding the conditions. Understanding Marines skill sets, leadership abilities, and personality is critical to building teams that conduct logistics effectively. Russia's logistics challenges in the 2022 invasion of Ukraine as depicted in the following vignette provides an example of the importance of logistics leadership.

Russian Invasion of Ukraine 2022: Leaders and Logistics

Russia experienced many logistic challenges in their invasion of Ukraine, but underlying all of them was a lack of leadership. Russia uses a top-down, directive command philosophy that discourages mid-level leaders, individual decision-making, and initiative. Russia has far fewer noncommissioned officers than Western militaries; this makes them less capable of communicating plans and supervising execution. Russia also maintains a culture that disregards individual welfare, even encouraging bullying of troops. This results in a disregard for sustainment issues, such as health services and mortuary affairs, and directly impacts unit morale. This approach to leadership, combined with few logistics specialists throughout the military, are major reasons why Russia experienced logistic challenges in early 2022. The inadequacy of Russia's military logistics system has consequently been a major factor in its inability to achieve its war aims.[50]

COMMAND AND CONTROL

Command and control provides leaders with the authority and the means to plan, organize, and direct operations of assigned and attached forces. Command and control gives purpose to action, while harmonizing the activities of organizations and personnel to achieve success across the competition continuum. Command and control is executed through a combination of human, technological, and procedural interactions.[51]

The relationship between command and control and logistics is the same in any unit, whether an infantry regiment, flying squadron, or logistics battalion. Command and control establishes what needs to be done, how it will be done, and who will do it, while logistics sets the limits on what a unit can and cannot do. Logistics is the engine of operations and command and control is the gas pedal and steering wheel. The engine defines how fast, how far, and how long a vehicle can go. The steering wheel determines where you will go and the gas pedal regulates the speed. Command and control relates to logistics by providing the basis for action. Logistics relates to command and control by informing what is achievable.

Logistics informs decision-making. Commanders need to know how, when, and where logistics issues provide options or affect achieving operational objectives. Logistics factors that shape any concept of operations include how quickly forces can be positioned or repositioned, how long they can be sustained, and how many resources are required to sustain them.

Command and control is integral to logistics. Commander's guidance, intent, and operational requirements inform how logistics is conducted. By establishing responsibilities within and among units, the commander organizes the logistics effort. Three other aspects of command and control that relate to logistics are priorities, processes and procedures, and information technology systems.

Priorities drive resource allocation. Priorities establish the order of need for a commodity or service, based upon the mission or tasks assigned.[52] The unit carrying out the most critical task often receives support priority. Priorities are most critical when allocating combat-essential or life-sustaining resources such as ammunition or medical support. Prioritizing scarce resources should balance support for current operations with preparations for future needs.

Processes and procedures are the rules that govern the running of a logistics system. These rules establish stocking levels among various units, set reorder thresholds, help Marines determine the means of resupply, and provide the means for early and continuous identification of requirements. The most responsive systems share information with a level of detail and transparency that enables decentralized problem solving and decision-making.

Information technology systems aid in making, and then communicating, decisions concerning allocation, distribution, and the movement of assets. These systems automate routine functions to improve the flow and functionality of the system. Harnessing technology improves information management,

expands the capabilities of the force, and assists decision-making. Alternative methods that enable sustainment without connectivity should also be developed and rehearsed. Systems are always vulnerable to cyberattacks, despite protection efforts. Marines need to factor the capabilities, limitations, and vulnerabilities of the Marine Corps logistics family of command and control systems into the logistics system design.

Logistics Information Systems

Major Rodriguez's chief updated the munitions report before leaving the cache, but by then the CC-433 sensor network had already registered the unit's missile reorder point with Lieutenant Colonel Dexter's workstation in Quantico at the ammunition program manager's office. Such a notification was routine for Lieutenant Colonel Dexter, who has interacted daily with Major Rodriguez since her arrival on the archipelago. He immediately called the theater mobility officer, Chief Warrant Officer Suzuki, who already recognized the notification on the Classified Ammunition Location Inventory System-Integrated dashboard. Together, they verified ammunition storage levels around the theater, reviewed sensor network reports from previous exercises, balanced the munitions report for redundancy, and submitted a request to the Army theater sustainment command to distribute the ammunition to the archipelago. What is most impressive with this automated inventory management system is that it recognizes priority global and theater demands and creates approval-ready sourcing and distribution solutions. In this case, replacement missiles arrived just before the firing batteries requested the next resupply mission.

LOGISTICS PLANNING

Planning is fundamental to effectively synchronize logistics to sustain forces across the competition continuum. Planning projects our actions forward in time and space to prepare for an uncertain future. Planning anticipates future requirements, sequences resources, and integrates each warfighting function to accomplish missions or achieve objectives. Logistics planning enables operations by matching the movement and sustainment activities to force requirements. This includes evaluating option feasibility and resource adequacy. Planning establishes the framework of logistics support, such as procedures and relationships, as well as provides the basis for adaptation in execution. Logistics planning involves understanding the environment and creating options.

Understanding the Logistics Environment

Understanding the operating environment is an imperative for developing a concept of logistics support. Viewing the operating environment through a movement and sustainment lens, informs commanders how, when, and where logistics impacts operations. This assessment factors in mission, enemy, terrain, weather, troops, and time, support available, as well as local civil considerations. Each of these elements influence each logistics function. Understanding the interconnectedness of local power grids and utility networks, the character of the economy, and impact of terrain are examples of logistics aspects of the operating environment. A comprehensive assessment of an area's challenges and opportunities includes threats, physical networks,

and available resources. As outlined below, a logistics intelligence preparation of the battlespace provides important context to the planning effort.

Threats

Threats to the logistics system are threats to the entire force. We should identify weaknesses in the enemy's logistics system while protecting our own. Activities targeted toward logistics units, intermodal transportation nodes, and communications networks can have immediate and long-term effects on expeditionary forces. Disrupting or degrading logistics capability can severely affect the endurance and reach of a combat force.

Threats to logistics capabilities may come in many forms across all domains. In physical form, a mobile or stationary logistics node can be targeted by conventional or special forces, insider threats, and non-state actors. Conventional forces using aviation assets, long-range fires, or space-based capabilities can target mobile or stationary logistics nodes over vast distances. Additionally, cyberspace attacks can deny or degrade communications among military forces and with supporting commercial partners. In great power competition, non-military tools such as economic or diplomatic coercion, can deny access to critical infrastructure such as ports, airfields, or host-nation supplies. Marines must have a comprehensive understanding of these threats to mitigate them through complementary, layered defensive measures and reconfigurable plans.

Logistics activities can increase threats to the entire force. The enemy can learn much about the size, location, composition, and vulnerabilities of the force through the force's logistics footprint. For example, contracts for waste disposal and services can reveal unit size and end dates can indicate the intent to displace. Marines may not be able to eliminate this information, but they can manage the force signature through awareness and preparation.

Physical Network

Understanding the operating environment requires identifying the physical network that facilitates lift, distribution, and sustainment. The physical network includes theater transportation nodes, such as seaports and airports, as well as the means of throughput to the last tactical mile, such as roads, railroads, and unimproved trails. Naval bases and stations at home and abroad are key logistics nodes in the physical network. These places are instrumental to the force's quality of life, training, and power projection capabilities. Physical network analysis includes both existing and potential infrastructure and areas of use. Examples include commercial airfields, beaches, ports, and other terrain suitable for logistics operations.

Sourcing and storage options are also part of the physical network. Many of the materiel and energy needs of a force can be obtained locally or at different points in a global distribution system. Allies and partners can provide sustainment options based on their capacity, capabilities, and willingness to contribute. Power, water, and distribution capabilities as well as forward storage sites provide opportunities to lighten the

transportation burden on our forces. Physical network analysis identifies opportunities to sustain the force and is essential to developing support options.

Much of the physical network is available to friendly and enemy forces. Understanding the physical network may revealopportunities to achieve advantages by disrupting their

Physical Network Analysis: Drug Cartels

United States Southern Command (USSOUTHCOM) is involved in daily reconnaissance/counter-reconnaissance activities to impact drug cartels. This command continuously conducts physical network analysis to understand the operating environment through the lens of the cartels. Since cartels know someone is always watching and trying to stop them from moving supplies, they employ various distribution methods. Drug cartels employ a hidden and flexible distribution system that combines places, platforms, and procedures to move their products. Cartels are hard to find because they use many transportation methods including semi-submersibles, surface craft, aircraft, drones, land transportation, and humans. They also use a changing combination of methods, or procedures, to deliver and cache drugs enabled by a variety of communications that are often degraded, intercepted, or disrupted.

The command invests many resources to understand this network. They look for how the materials necessary to make drugs are procured, how they are transported, where they are produced, and how they are packaged. Since cartels are always adapting and innovating, the network analysis is continuous, and USSOUTHCOM works continually to understand and adapt in coordination with other US agencies.

transportation and sustainment efforts. Intelligence efforts should incorporate a physical network analysis to support attacking the enemy and preserving the force.

Resources

Understanding available resources informs what is possible and provides the basis for developing support options. Resources include units, equipment, infrastructure, and supplies. This understanding begins with identifying what is available within the force, includes results of physical network analysis, and builds on the capabilities and capacity provided by the joint logistics enterprise.

The US military operates on a global scale, often transiting long distances to deter and defeat the enemy and adversaries. Understanding global logistics resources across all Services and into the defense industrial base provides the full array of support options and understanding of operational limitations. With an awareness of global, regional, and local conditions, planners can use resources from throughout the enterprise. Global resource visibility helps achieve a balance of effectiveness and efficiency in a resource-limited operational environment. It also provides multiple sourcing, lift, and distribution options.

Developing Options

Planning provides logistically feasible options to achieve objectives. Planners develop these options after they receive mission guidance and an adequate level of understanding of the

environment. Planners use information about the situation and environment to predict future logistics requirements. These estimates shape the feasibility and suitability of operational plans.

Marines benefit from the scientific nature of logistics because it is quantifiable and tangible. Information technology helps Marines with data collection, asset tracking, and requirement processing. This information helps planners anticipate the needs of the force to include resource quantity, as well as the impact of time-distance factors, on providing timely support. Support requirements extend over time, beyond the immediate engagement, and with an eye toward supporting the larger battle and the entire campaign.

Sustainment methods are developed as support requirements are determined. Marines with logistics experience and informed by logistics theory can better help develop actionable courses of action. We strive to maximize the number of ways requirements can be met to provide decision makers multiple paths to success. A comprehensive support plan addresses each logistics function and describes how they relate to each warfighting function. Support concepts should address the logistics methods, relationships, and systems that will be used to provide support.

Plans are not complete unless they incorporate the means to mitigate threats. Physical and cyberspace threats to bases and stations are real, therefore commanders and staffs at every level need to create a resilient and survivable physical network. This can be accomplished through leveraging emerging technology

that increases physical security, fortifies energy resilience, and prevents cyberspace intrusion.

The logistics principles provide a valuable guide to gauge the feasibility of a logistics support concept. The principles of flexibility and simplicity are particularly significant when developing support options. Support concepts need to be flexible, because no plan survives contact with the enemy. Plans should be simple enough to minimize friction and be easy to understand.

LOGISTICS SHAPING ACTIONS

A comprehensive logistics plan includes shaping actions that occur before the threshold of violence is crossed. Marines conduct various actions to deter adversaries, while setting sustainment conditions for the fight. These shaping actions telegraph resolve, enable movement, exploit enemy weaknesses, and create effects that influence friendly and enemy decision-making.[53]

Shaping actions occur at each level of warfare. Strategic shaping tends to focus on influencing key actor decision-making at a national level to achieve information superiority. Tactical shaping sets conditions for battlefield success through activities such as fires, targeting, and engineering. However, logistics is often most relevant to shaping actions at the operational level of warfare. Operational-level shaping is often called "setting the theater." This includes establishing a theater distribution network, supporting force posture efforts, and includes "forward provisioning" equipment and supplies. Setting the theater

provides ready access to logistics for Marine Corps units operating across the range of military operations.

A major logistics requirement in any campaign is getting forces from where they are to where they are required. Setting the theater includes maintaining or preparing a distribution system that can position forces and supplies for ongoing operations and contingency plans. Marine component commanders work with joint logistics enterprise partners to maintain existing distribution networks and develop plans to expand them to meet expected requirements in crisis or conflict. This includes identifying facility shortfalls, intratheater lift gaps, expected bottlenecks, sourcing and contract opportunities, node vulnerabilities, and any other factors that affect the flow of forces throughout the theater. By investing in the platforms and places required to execute contingency plans before a conflict occurs provides Marines an initial operational advantage.

Forward-positioning equipment and supplies prior to conflict increases responsiveness and survivability. Pre-positioned materiel bridges the gap between the time a force's initial supplies run out and the arrival of additional resources. Forward stocks provide responsive support to anticipated demands while reducing transportation costs to, and within, the theater. However, over-reliance on forward-positioned resources may put a force at risk. The enemy and adversaries may target these resources, or the host nation may undergo a political shift at odds with US interests. These risks are mitigated through coordinated force protection and diplomatic actions with the host nation.

Automating Pre-positioned Store Visibility

Major Rodriguez checked the common operating systems on her interconnected tablet. The detachment had responsibility for pre-positioned caches that enable crisis response operations, while upgrading them with technology to improve visibility for the force. Weapons system storage and sensor replacement was hard work, but it provided accurate information to decision makers locally, regionally, and throughout the joint logistics enterprise. For example, an artificial intelligence program used the information they were collecting to pre-generate her team's resupply requests so she did not have to build them from scratch or fill in a lot of information. All she had to do was validate the request and it was instantaneously visible on a system monitored throughout the joint logistics enterprise. Major Rodriguez began comparing and contrasting data from the previous night's operations with the cache common operational picture on her tablet and sure enough, the logistics automated information systems accurately linked real-time supply levels to the cache common operational picture. She exhaled a sigh of relief, like she did every morning when she and her team saw their hard work reflected in real-time across multiple information and decision-making systems.

Force posture sets the stage for projecting military power. Force posture is a result of strategic coordination between the Department of Defense and the interagency regarding where and when Marine Corps forces and capabilities are dispersed throughout the world. Force posture relates to setting the theater because the locations of Marine Corps forces and infrastructure overseas provide important nodes in theater distribution systems. These nodes become the means of moving forces to the point of

need when crisis or conflict occurs. Force posture includes the initial locations that forces need to be transported from. As an expeditionary force, force posture considerations should always account for the ability to transport Marines with their equipment and supplies as forces are positioned across the globe.

Force posture is enhanced by host-nation commercial and military capabilities. Territorial negotiations for forward bases, host-nation contract support, and overflight rights are some of the many issues Marines need to work out prior to conflict to effectively conduct logistics in conflict. This requires operational inputs from throughout the joint logistics enterprise as well as combatant commander and senior level Department of Defense and Department of State engagement. Maintaining or securing access to key geopolitical and military locations around the world allows Marine Corps forces to rapidly respond to crisis and conflict, while also acting as a deterrent to adversaries.

Marines will not always have access to the benefits of favorable force posture and setting the theater actions. There will be occasions when Marines have to create a lodgment or seize key terrain in austere and remote locations around the world. This will place an emphasis on making the naval expeditionary force as self-sufficient as possible, until strategic (i.e., joint logistics enterprise) and operational (i.e., naval) logistics can be brought to bear in support of planned and ongoing operations.

LOGISTICS VISIBILITY AND ADJUSTMENTS

Logistics visibility enables responsive and timely support. Visibility provides insight on our reach and endurance. It increases situational awareness over time by forecasting the second and third order effects of our actions. Logistics visibility includes monitoring sourcing options, infrastructure condition, throughput velocity, materiel readiness, casualties, and supply levels.

Information needs to be gathered, processed, and analyzed to provide meaning and value. Analysis identifies potential logistic impacts on operations now and into the future. Accurate, timely, and secure data helps Marines determine operational demands over time and assess their ability to meet those requirements. This information and analysis must be shared and accessible to everyone who needs it.

Logistics visibility and analysis shapes decisions to adjust tasks, priorities, and the distribution of resources. Marines must be able to adapt the logistics system to changing circumstances, respond to new requirements, and rapidly implement alternative courses of action. Feedback from units lets decision-makers know if changes are required. For example, the visibility gained when a patrol submits an ammunition, casualty, and equipment report after enemy contact shapes the decisions to continue the patrol, alter the mission, or reassign the task to another unit. Logistics visibility provides commanders information for making adjustments in the face of friction, chance, and thinking opponents.

Reallocating Resources in Conflict

"At no time and in no place was the situation, either to commanders or troops, as clear even as I can make it now. Into Scones' headquarters, from every point of the compass, day and night, streamed signals, messages, and reports announcing success, setbacks, appealing for reinforcements, demanding more ammunition, asking urgently for wounded to be evacuated, and begging for air support. His was the task of meeting or withstanding these appeals, of deciding which at the moment was the place to which his by no means over-generous reserves should be allowed. It was impossible for him to satisfy all of his commanders. It needed a tough, cool, and well-balanced commander to meet, week after week, this strain."[54]

—Field Marshall Viscount Slim

Technology is a force multiplier in terms of maintaining logistics visibility and facilitating adjustments in execution. Technology can provide the means to calculate and predict consumption rates, process support requests, track resources, model usage data, and estimate future requirements. Logistics information systems that are tied into the overarching command and control network increase situational awareness and facilitate resource reallocation. Technology has the potential to automate routine functions to improve the flow and value of information within the logistics system.

In a contested environment, understanding unit requirements and fulfilling those via the joint logistics enterprise helps overcome enemy and adversary threats and provides multiple paths to success. However, the enemy and adversaries will attempt to

compromise our logistics information networks. Creating global logistics awareness, while operating with vulnerable connectivity is challenging. Information systems need to be hardened against potential attacks and alternatives are needed when primary means are disabled or unavailable. Managing the signature in each domain helps protect forces and information systems from detection, attack, and disruption. This logistics signature can be manipulated to confuse or deceive our enemies regarding our intentions.

Joint Logistics Enterprise Visibility

Major Rodriguez replicated the supply web using digital twin software. This was part of a series of logistics war games to model logistics and to expand logistics nodes into a cache web. The team gathered terabytes of data, populated the data into the latest modeling systems, and ran numerous simulations to test the distribution network and validate anticipated consumption rates. Joint logistics agencies cross-walked the results with logistics planners from all Services back at the Pentagon. This was done to identify gaps in the distribution network during the transition from competition to conflict. Major Rodriguez shared the simulation results and Service-level feedback with her Navy, special operations forces, and host-nation counterparts, and adjusted numerous stock levels throughout the cache network.

RISK

We deliberately end this publication with a discussion of risk. Commanders make risk-based decisions, and every operational decision must include an understanding of logistics risk. Risk is the probability and consequence of an event potentially causing harm to something valued. To deal with risk we need to understand how likely and how much something will affect our operations. In the Marine Corps, the commander is responsible for managing risk and chooses to either avoid, accept, mitigate, or transfer risk. After this decision is made, the commander communicates the risk decisions and actions to the force.[55]

Historically, many battles, campaigns, and wars have ended based on the reach of the force and the timely availability of sustainment and reinforcements. These are logistics factors. The reach of a force is directly related to the quantity of munitions and fuel, maintenance of critical equipment, and availability and speed of transportation capabilities. Without these capabilities, a force cannot succeed.

Commanders who develop a keen sense for logistics make better risk-informed decisions. Their knowledge of logistics helps generate options to mitigate risk. These include preserving and setting limits on logistics consumption or pulsing operations in such a way that maximizes use of limited resources.

Marines should also recognize that risks exist throughout the entire military enterprise. Budgetary pressures exist among funding activities during competition and war. Procurement

trade-offs and funding challenges can limit logistics capability. The joint logistics enterprise, academic, commercial, and government agencies are also frequently the target of espionage, disruption, and subversion. These risks often exist outside the Marines' ability to influence, but still may negatively impact Marine Corps activities. Marines must consider risk across the entire capability development and logistics enterprise.

Remaining mindful of the logistics principles is one way to address risk. Simplicity reduces friction, flexibility helps overcome uncertainty, and survivability addresses the violent nature of war. Attainability is fundamentally a risk decision based

Risks, Logistics, and Rabaul

The Combined Chiefs of Staff decided capturing the Japanese fortress at Rabaul was the next objective following success at Guadalcanal. However, simultaneous operations in Europe and elsewhere in the Pacific made available resources scarce, particularly in shipping. The Combined Chiefs of Staff managed this risk by postponing the Rabaul assault and establishing more limited objectives. The result was Operation Cartwheel, a two-pronged assault with General MacArthur leading a western advance in New Guinea and Bismarck Islands, while Admiral Halsey led the eastern assault through the Solomon Islands. Operation Cartwheel required the rapid construction of numerous airfields that eventually led to Allied air and maritime supremacy. This dominance enabled the decision to bypass Rabaul altogether, as the risk was determined to be acceptable. The Allies were able to advance along the north coast of New Guinea to the Philippines without expending manpower and resources occupying Rabaul.

on materiel resources available. Adhering to logistics principles limits risks in our operations.

Planning provides opportunities to identify and address logistics risks. Wargames, modeling, rehearsals, and simulations are proven ways to uncover risks and identify options for addressing those risks. Providing estimates of supportability and incorporating logistics considerations in course of action evaluation criteria help keep plans realistic. Conducting periodic, deliberate assessments can reveal risks by identifying changes in the situation or environment and determining whether we are performing aswe anticipated. The Southwest Pacific campaign of World War II is an example of how logistics shaped and mitigated risk.[56]

CONCLUSION

Marine Corps Doctrinal Publication 4, *Logistics*, is the beginning, not the end of logistics discussion, debate, and development. What makes Marines unique is their ability to creatively apply, improve, or even modify doctrine in response to Marine initiative or to meet future challenges. The concepts and ideas presented in this publication are meant to guide our thinking and expand our understanding of logistics in warfighting. Moving Marine Corps logistics into the 21st century will require both conventional and contrarian thinking. Successfully supporting Marines in future conflicts requires in-depth knowledge tempered by experience, experimentation, and innovation.

Failure shapes our efforts as much as success, and both success and failure need to be viewed through a doctrine informed lens.

When properly applied, doctrine fosters creativity and guides imagination. In that vein, this publication is designed to immerse us into the art and science of logistics, while highlighting the warfighting challenges presented by the future threat environment. It is crafted to highlight the key role the joint logistics enterprise, allies, and partners have in logistics. Creating and fostering friendships and relationships with these entities is essential for our future success.

The primary purpose of the Marine Corps is to fight and win our Nation's battles. Logistics is essential to warfighting, and warfighting is our reason for being. The more we think, the more we hone our logistics skills for future war. Logistics at its core is the heartbeat of the Corps; it provides the physical means to close with and destroy the enemy. Logistics is like oxygen, transparent to the user unless in short supply. Logistics is a force multiplier, increasing unit readiness and morale through the provision of services across the spectrum of support. From air-delivered ammunition in combat to the delivery of hot food on a below zero-Arctic night, logistics enhances combat effectiveness and unit readiness.

Marine Corps Doctrinal Publication 4 is designed to facilitate crosstalk and debate among Marines and those in the joint force. All ideas and thoughts to help turn logistics doctrine and theory into actionable plans and needed capabilities are welcome. Read, think, and write about logistics. Be a thought leader in the advancement of logistics in the 21st century Marine Corps. Uphold the "can do" and relentless spirit of those who have served in wars past. In World War II, Medal of Honor recipient Alexander Bonnyman, Jr. was an engineer in the Pioneer

Battalion in the Battle of Guadalcanal. Based on his superior performance, he received a battlefield commission and then served as the executive officer of the 2d Battalion Shore Party for the Tarawa landing. His actions on Tarawa personify mission over self and sacrifice of the highest order. What transpired on Tarawa illustrates the tremendous impact that one Marine can have on a battle. We welcome the impact you will have on Marine Corps logistics and warfighting.

First Lieutenant Bonnyman's Medal of Honor citation follows.

The President of the United States takes pride in presenting the
MEDAL OF HONOR posthumously to
FIRST LIEUTENANT ALEXANDER BONNYMAN, JR.
UNITED STATES MARINE CORPS RESERVE

for service as set forth in the following
CITATION:

For conspicuous gallantry and intrepidity at the risk of his life above and beyond the call of duty as executive officer of the 2d Battalion Shore Party, 8th Marines, 2d Marine Division, during the assault against enemy Japanese-held Tarawa in the Gilbert Islands, 20[-22 November 1943. Acting on his own initiative when assault troops were pinned down at the far end of Betio Pier by the overwhelming fire of Japanese shore batteries, 1st Lt. Bonnyman repeatedly defied the blasting fury of the enemy bombardment to organize and lead the besieged men over the long, open pier to the beach and then, voluntarily obtaining flamethrowers and demolitions, organized his pioneer shore party into assault demolitionists and directed the blowing of several hostile installations before the close of D-day. Determined to effect an opening in the enemy's strongly organized defense line the following day, he voluntarily crawled approximately 40 yards forward of our lines and placed demolitions in the entrance of a large Japanese emplacement as the initial move in his planned attack against the heavily garrisoned, bombproof installation, which was stubbornly resisting despite the destruction early in the action of a large number of Japanese who had been inflicting heavy casualties on our forces and holding up our advance. Withdrawing only to replenish his ammunition, he led his men in a renewed assault, fearlessly exposing himself to the merciless slash of hostile fire as he stormed the formidable bastion, directed the placement of demolition charges in both entrances, and seized the top of the bombproof position, flushing more than 100 of the enemy who were instantly cut down and effecting the annihilation of approximately 150 troops inside the emplacement. Assailed by additional Japanese after he had gained his objective, he made a heroic stand on the edge of the structure, defending his strategic position with indomitable determination in the face of the desperate charge and killing three of the enemy before he fell, mortally wounded. By his dauntless fighting spirit, unrelenting aggressiveness and forceful leadership throughout three days of unremitting, violent battle, 1st Lt. Bonnyman had inspired his men to heroic effort, enabling them to beat off the counterattack and break the back of hostile resistance in that sector for an immediate gain of 400 yards with no further casualties to our forces in this zone. He gallantly gave his life for his country.

Harry S. Truman

Notes

1. MCDP 1, *Warfighting* (Washington, D.C.: Headquarters, US Marine Corps, 1997).

2. LtGen Alfred M. Gray, Jr., "Training the Fleet Marine Force," *Marine Corps Gazette* (July 1987) p. 15. Gen A. M. Gray, Jr., was 29th Commandant of the Marine Corps.

3. Rear Admiral Henry E. Eccles, *Logistics in the National Defense* (Newport, RI: Naval War College Press, 1997), p. 56.

4. General Berger in an interview with Dr. Seth G. Jones for the Center for Strategic and International Studies, 1 Sept 2021. Gen D. H. Berger is the 38th Commandant of the Marine Corps. (https://www.csis.org/events/maritime-security-dialogue-update-marine-corps-commandant-gen-david-h-berger).

5. There is a relationship between sustainment and logistics. In simplistic terms, logistics capabilities are employed to sustain the force. Sustainment is the broader category and is defined as "the provision of logistics and personnel services necessary to maintain and prolong operations until mission accomplishment and redeployment of the force" (JP 3-0, *Joint Operations*). Sustainment includes logistics as well as financial management, religious support, music services, and others. This publication focuses exclusively on logistics, which is "Planning and executing the movement and support of forces" (DOD Dictionary).

6. Eccles, p. 56.

7. A description of the relationship between the Inchon landing and the North Korean logistics system can be found in Kenneth Macksey, *For Want of a Nail: The Impact on War of Logistics and Communications* (London: Brassey's, 1990) pp. 160-164. For a more extensive treatment, see Charles Schrader, *Communist Logistics in the Korean War* (Westport, CT: Praeger Publishers, A Division of Greenwood Press, 1995).

8. Deputy Commandant of Installations and Logistics Brochure, Marine Corps Hybrid Logistics: A Blend Of Old And New (2016).

9. This is a simplified model of competition used to explain the role of logistics in preventing and prosecuting armed conflict. A more in-depth discussion of competition is found in MCDP 1-4, *Competing* (Washington, D.C.: Headquarters, US Marine Corps, 2000), the source of this image.

10. For more on culminating points see MCDP 1, pp. 3-9 or Carl von Clausewitz, *On War*, trans. and ed. Michael Howard and Peter Paret (Princeton, NJ: Princeton University Press, 1984) p. 528.

11. Robert Jervis, *System Effects: Complexity in Political and Social Life* (Princeton, NJ: Princeton University Press, 1984).

12. MCDP 8, *Information* (Washington, D.C.: Headquarters, US Marine Corps, 2022) pp. 1-7.

13. Major General Oliver P. Smith, in a letter to then-Commandant, General Clifton Cates regarding the battle at the Chosin Reservoir. To read more on Major General Smith, see “Commandership at the Chosin Reservoir” 19 Feb 2019.pdf (usmcu.edu).

14. MCDP 1, pp. 4-4.

15. Ibid, Chap. 4.

16. Thomas S. Kuhn, The Structures of Scientific Revolutions (Chicago, IL: The University of Chicago Press, 1996).

17. Paraphrased by Robert Leonhard in *Fighting by Minutes: Time and the Art of War* (Santa Barbara, CA: Praeder, 1994) p. 13. (NOTE: Original Fuller quote was "We thus obtain three physical elements of war—namely, protection, offensive action, and movement.")

18. Taken from the Thirty-Six Stratagems of War, a list often attributed to Sun Tzu, author of *The Art of War*.

19. For more information on the logistics principles read JP 4-0, *Joint Logistics* (Washington, D.C.: Joint Staff, 2019)

20. Colonel Nathan S. Lowrey, *U.S. Marines in Afghanistan*, 2001-2002 from the Sea: U.S. Marines in the Global War on Terrorism, USMC History Division (https://permanent.fdlp.gov/gpo20162/FROM%20THE%20SEA.pdf).

21. JP 3-02, *Amphibious Operations* (Washington, D.C.: Joint Staff, 2021) pp. IV-34.

22. Joint Doctrine includes operational contract support as an additional logistics function. In terms of "helping organize what needs to be done" logistically for Marines, contracting is a method to acquire either supplies or services. Contracting as a function focuses on legal and fiscal activities more appropriate for the more expansive topic of sustainment that has a greater emphasis for Joint Force operations. See JP 4-0 for more on operational contract support.

23. Owen, W.A. & Offley, A. B., *Lifting the Fog of War (*New York, NY: Straus and Giroux, 2000).

24. Col S. L. A. Marshall, *The Soldier's Load and the Mobility of a Nation* (Quantico, VA: The Marine Corps Association, 1980) pp. 3-4.

25. MCDP 1, pp. 2-10.

26. JP 4-0, pp. I-4.

27. Ibid.

28. For more on the levels of war, read MCDP 1, Chapter 2.

29. MCDP 1-0, *Marine Corps Operations*, 2001 version.

30. MCDP 1-2, *Campaigning* (Washington, D.C.: Headquarters, US Marine Corps, 1997) p. 88.

31. Alan Gropman, *The Big "L"* (Washington, D.C., National Defense University Press, 1997) pp. 295, 319-322.

32. MCDP 1-0 *Marine Corps Operations*, 2001 version.

33. For more detailed descriptions of Service-level logistics and the agencies that conduct it see MCDP 1-0.

34. Congress Research Service, Defense Primer: US Defense Industrial Base, congress.gov. Link: Defense Primer: U.S. Defense Industrial Base (congress.gov).

35. The Navy organic industrial base supports USMC aviation, not the Marine Corps organic industrial base.

36. Eccles, p. 25.

37. MCDP-1, pp. 3-15

38. Field Marshall Viscount Slim, *Defeat into Victory* (Cooper Square Press) p. 540.

39. For more on force planning read MCDP 1, Chapter 3.

40. Ian Brown, *The Logistics of the British Expeditionary Force, 1914-1918*, (Santa Barbara, CA: Praeger, 1998) Chapter 7. For a description of the paralysis of the operational command system, see Tim Travers, *The Killing Ground: The British Army, the Western Front, and the Emergence of Modern Warfare, 1900-1918* (London: Allen & Unwin, 1987).

41. Mulberry | artificial harbours, World War II | Britannica; accessed 26 July 2022.

42. For more on how expeditionary characteristics impact how the force is built see MCDP 3, *Expeditionary Operations* (Washington, D.C.: Headquarters, US Marine Corps, 1998).

43. Deputy Commandant of Installations and Logistics Brochure, "Marine Corps Hybrid Logistics: A Blend Of Old And New" (2016).

44. Jack Weatherford, *Genghis Khan and the Making of the Modern World* (Three Rivers Press, 2004) pp. 86-87.

45. Closure rate and global reach are critical expeditionary considerations. Closure rate refers to how quickly a military force can get to an objective area and reach refers to the geographical limits to which a force can deploy.

46. For more on force generation read Marine Corps Order 3502.6A, *The Marine Corps Force Generation Process*.

47. MCDP 6, *Command and Control* (Washington, D.C.: Headquarters, US Marine Corps, 1996) pp. 1-7.

48. Ballantine, Duncan S. *U.S. Naval Logistics in the Second World War* (Princeton, NJ: Princeton University Press 1947).

49. BGen James A. Brabham, "Training, Education Were the Keys," *Proceedings* (November 1991) pp. 51-54. MajGen Brabham was Commanding General, 1st Service Support Group, during Operations Desert Shield and Desert Storm.

50. Ronald Ti, "Russian Military Logistics Russia's War in Ukraine" Series No.3, International Centre for Defence and Security accessed 23 July 2022. Link: ICDS_Brief_Russias_War_in_Ukraine_No3_Ronald _Ti_June_2022.pdf

51. MCDP 6.

52. LtCol H. T. Hayden and LtCol G. I. Wilson, "The Tail that Wags the Dog," *Proceedings* (October 1990) p. 52.

53. MCWP 5-10, *The Marine Corps Planning Process.*

54. Slim, pp. 324, 325.

55. For more on risk read CJCSM 3105.01A *The Joint Risk Assessment Methodology*. Link: The Joint Staff (jcs.mil).

56. For more on Operation Cartwheel, read "Northern Solomons," by Stephen J. Lofgren, *The US Army Campaigns of World War II* or *Cartwheel: the Reduction of Rabaul* by John Miller, Jr. (Office of the Chief of Military History, Department of the Army, 1959) pp. 225-226.

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