



Marines with 2nd Distribution Support Battalion, Combat Logistics Regiment 2, 2nd Marine Logistics Group, conduct tactical vehicle onload at United Arab Emirates port after exercise Native Fury 24, May 28, 2024 (U.S. Marine Corps/Meshaq Hylton)

Giving Our “Paper Tiger” Real Teeth

Fixing the U.S. Military’s Plans for Contested Logistics Against China

By Zachary S. Hughes

Lieutenant Colonel Zachary S. Hughes, USAF, wrote this essay while a student at the National War College. It won the 2024 Secretary of Defense National Security Essay Competition.

There is growing concern that the U.S. military is unable to deter or win a conflict with China in the Western Pacific. China’s sophisticated arsenal of long-range missiles is a lethal threat to America’s traditional way of deploying and employing expeditionary

forces. With a rising sense of urgency, three U.S. military Services (Marines, Army, and Air Force) have embraced new concepts of operations that favor dispersed operations. On the surface, these ideas appear to restore survivability within the Pacific’s first island chain

by making American formations harder to find and target. Unfortunately, these concepts are astonishingly logistics-intensive. Worse still, America's military committed itself to these demanding concepts without full consideration of whether they were even logistically supportable. Now, evidence is emerging suggesting that each Service's *individual* concept is probably logistically unsustainable. Even worse, each Service concept implicitly transfers risk from the Service to the joint force but without a clear accounting of how all these risks aggregate together. This is even more disturbing because a survey of historical Great Power wars—and a specific study of China's likely military options—strongly suggests that logistics is likely to be the *primary* determinant of military success or failure. For dispersed operations to succeed in a contested logistics environment, the U.S. military must address the problem coherently as a joint force. This requires facilitating a culture and organizations that integrate logistics jointly at every level of warfare, while giving logistics pride of place in both force design and campaign planning.¹

To understand why logistics matters so much in the Western Pacific, why the U.S. military Service concepts are so flawed, and how to begin addressing these challenges, this article proceeds in three stages. First, it reviews existing literature to draw three observations on contested logistics: that in a war between Great Powers, *logistics matters most*; that innovative militaries often fail due to flawed or undeveloped logistical concepts; and that the U.S. military's new concepts are logistically dubious. Second, the article identifies three mistakes that the joint force is making, including belated or insufficient consideration of joint logistics, too many arbitrary "seams" in logistics organization, and a large gap between "combat" and "support" cultures. Finally, the article proposes three solutions: aligning combat and support cultures, strengthening the logistics command structure in the Pacific, and better integrating logistics in planning and design.

First Observation: Logistics Matters Most

Although a hypothetical U.S.-China conflict would be complex, in terms of *military* considerations, logistics is probably the dominant factor determining success or failure. Three pieces of evidence support this claim. First, for the "most dangerous" course of action—an armed attack by the People's Republic of China to subjugate Taiwan—China's likely courses of action result in a contest that can be framed as competitive logistics. Second, the nature of the threat from the People's Liberation Army (PLA) implies contested logistics, which has compounding inefficiencies that can drive militaries to self-defeating countermeasures. Third, historical Great Power conflicts normally protract, and in protracted war, materiel factors dominate.

Competitive Logistics: Cues From Likely Conflict Scenarios With China.

The likely forms of a U.S.-China conflict suggest that logistics should have pride of place in the joint force. First, consider the highly dangerous—yet increasingly possible—amphibious invasion of Taiwan.² This would be China's most difficult—yet decisive—option to resolve its Taiwan issue. Most U.S. military concepts focus on either defeating or disrupting the initial amphibious assault to deny China its campaign objectives. However, forcible entry operations can be better framed as competitive logistics contests hinging largely on whether an invader can build logistics in a lodgment faster than the defender can shift combat power to contain it. Few historical amphibious assaults failed because the initial landing was defeated, while several prominent failures (for example, Gallipoli in 1915–1916, Anzio in 1944) occurred because a defender redeployed faster than an invader was able to generate momentum.³ Such lessons are not lost on the PLA, which makes a particular point of studying amphibious logistics in World War II and the Falklands War.⁴ The PLA even developed a new Joint Logistics Support Force—modeled after U.S. Transportation Command (USTRANSCOM)—that enjoys enhanced capability to leverage

"dual-use" industrial capabilities enabled by years of civil-military integration.⁵

Yet an invasion is not China's only available option to subjugate Taiwan. Open-source literature increasingly acknowledges the viability of a blockade as a tool for coercion, as a prelude to invasion, or as a face-saving fallback after an invasion failed.⁶ Blockades are ultimately exercises in competitive logistics at national scale: Can the blockaded nation materially hold out longer than the blockading force? Given that a likely U.S. response to such a Chinese close blockade of Taiwan would include a U.S. "distant" blockade of China (for example, by disrupting maritime shipping through the South China Sea), such a campaign could unfold as a series of concentric rings, each representing a logistics contest on a different scale.⁷

Thus, if a U.S. war with China is most likely to occur over the flashpoint of Taiwan, and if the PLA's two most likely options for such a war (blockade and/or invasion) are both bloody contests in competitive logistics, then any U.S. military approach to deter or defeat China must place logistical considerations foremost.

The Compounding Inefficiencies of Contested Logistics. Though several definitions of *contested logistics* exist, it can be summarized as an environment where an adversary seeks to disrupt friendly logistics efforts in all domains, in all points of the supply chain, and at all times.⁸ Demonstrating this concept, China's antiaccess/area-denial (A2/AD) system was designed to disrupt the lengthy buildup of forces the United States used to win the first Gulf War.⁹ Using long-range fires paired with proliferated intelligence, surveillance, and reconnaissance, China can attack U.S. bases, ships, and aircraft throughout the Pacific.¹⁰ These systems are particularly optimized to hit targets in the first island chain.

This A2/AD system could impose operational inefficiencies at every possible step, and these inefficiencies do not add up linearly but are compounding.¹¹ Some inefficiencies occur due to direct action: for instance, the PLA's long-range missiles can destroy munitions or fuel depots



MH-60S Seahawk assigned to Helicopter Sea Combat Squadron 5 picks up nets from flight deck during vertical replenishment aboard USS *George Washington* while underway in Pacific Ocean, June 14, 2024 (U.S. Navy/Nicholas Russell)

at major hubs like Guam,¹² can wipe out entire ramps of parked aircraft with effective cluster weapons,¹³ and can even hit moving supply ships at sea.¹⁴ Each of these effects imposes obvious logistics costs, but the true cost is in the inefficient countermeasures the United States must adopt to operate within such an A2/AD “umbrella.”

The primary mitigation the U.S. military Services are adopting is dispersal: spreading units out to complicate PLA targeting. Unfortunately, this also dramatically reduces efficiency.¹⁵ Modern high-tech weapons require specialized maintenance equipment, and a small quantity of such equipment can service multiple units at a single location. Once those units disperse, however, they must accept increased risk of critical equipment failure or must acquire, transport, and sustain equipment sufficient for each dispersed site—all of which imposes additional logistics costs.¹⁶ For

example, consider modern fighter aircraft. Sophisticated avionics require occasional software updates to keep pace with emerging threats. These updates require ground equipment kits that are often purchased in small numbers. Simply buying more kits is possible, but wasteful. Most of the time they sit unused, which is why the Air Force prefers a small number of such kits at a central location servicing many units.

Additionally, the complex terrain of the first island chain poses challenges for moving among dispersed sites. For instance, the Philippines is an archipelagic nation with complex seas, inland waterways, poor roads, and dense forests. Transiting between dispersed sites would require many modes of transportation, each vulnerable to different types of adversary interdiction (particularly at sites of transfer between modes).¹⁷ Coordinating such an effort requires significant inter-Service communication—a detectable signal to cue PLA fires.

To support dispersed operations, multiple emerging concepts also envision minimizing highly targetable “iron mountains”—intermediate hubs with large stockpiles of materiel.¹⁸ This poses serious challenges due to the vast distances in the Pacific. Each intermediate base is a chance to repack or reprioritize equipment in a way that is more efficient and responsive to the end-user. Seemingly mundane, these bases can be decisive: studies of the 1982 Falklands War have suggested that the intermediate node at Ascension Island was vital for logistics reorganization and restowing.¹⁹ Without Ascension, the British task force could not have contested Argentina’s seizure of islands 8,000 miles away from the United Kingdom.²⁰

Another way to mitigate the threat to logistics is by switching from a “pull” model to a “push” model. *Pull logistics* are like the most efficient modern delivery companies, using predictive analytics

so that materiel is available just in time to meet a request from the final user.²¹ In contrast, *push logistics* relies on scheduled logistics packets that are forecasted based on expected consumption rates. Push logistics are inefficient since they fail to respond to actual needs, often wasting crucial transportation capacity with unneeded supplies.²² However, a push model is far more resilient to disruptions than the hyper-lean pull model.²³ Unfortunately, push logistics often ends in significant excess material, which is usually stowed at an intermediate node.²⁴ Given that most contested logistics seek to minimize the use of intermediate nodes, this merely exacerbates the downside of push logistics.

A final mitigation that poses significant inefficiencies is the drive to preposition stockpiles of materiel at likely dispersal sites. This would greatly reduce the demand placed on a long-range supply chain. The disadvantages are significant: In historical cases where dispersed units relied on caches, much or most cached materiel was abandoned as units were forced to conduct hasty “survivability moves” between sites.²⁵ Additionally, there is a significant opportunity cost to cached sites, requiring considerable investments in materiel that can no longer be used for training or to meet an unexpected contingency.²⁶ Materiel hidden at an austere location is materiel that requires several forms of maintenance: maintenance of the materiel itself, of physical security, and of a relationship with the host nation.²⁷ Finally, caching creates a signature that could be detected and targeted; at the very least, it signals an intended scheme of maneuver, which could be a disadvantage during conflict (although perhaps an advantage as a deterrent).²⁸

Considering the contested logistics situation in the Western Pacific holistically, the combination of high threat, reduced capacity, compounding inefficiencies, and massive distance adds up to the greatest logistical challenge since World War II. Given the erosion of America’s manufacturing and shipbuilding advantages in the past 70 years, a dispersed campaign against China within

the first island chain would be the greatest logistic challenge ever attempted.²⁹

Protracted Logistics: Lessons From Historical Great Power Conflict. The history of Great Power conflict shows how logistical factors have largely dominated military success or failure. There are two main reasons for this. First, logistics is often the most important component of broad military strategy because sound logistics—more than any other factor—creates the broadest possible number of strategic options for a nation.³⁰ Thus, logistics is unique in not only being a means of strategy but also occasionally a strategic end in itself.³¹ During competition prior to conflict, Great Powers may even use logistics as a form of military maneuver.³² As logistical theorist Henry Eccles observed, “Throughout the whole spectrum of conflict, we should recognize how logistics factors tend to dominate.”³³

The second reason logistics factors dominate is that Great Power conflict is usually protracted. Though quick Great Power victories have occurred—for example, the collapse of France in 1940—history has far more examples of protracted conflicts.³⁴ If logistics is, as Eccles states, “the bridge between the national economy and the tactical operations of the combat forces,” then logistics is particularly significant in protracted wars where national economic and industrial strength are so crucial to triumph.³⁵ Concerningly, both the United States and China appear to be designing their forces to fight and win a short war over Taiwan. New U.S. Service concepts appear oriented at quickly defeating an initial amphibious assault, while Chinese thought fixates on “scientifically” determinative short wars.³⁶ Despite these optimistic concepts, in a protracted war, China’s geographic proximity, interior lines of communication, and strong manufacturing base would provide a better logistical foundation.

This emphasis on materiel attrition is unfashionable in the U.S. military, which prefers decisive action and maneuver. However, scholarship of the sea and air campaigns of World War II suggests that materiel attrition—rather than individual

battles—was the primary means by which the Allies won.³⁷ Given all these factors, one would expect that logistical considerations dominate the thinking of military reformers. Sadly, the next two observations suggest otherwise.

Second Observation: Innovation Often Fails Because of Logistical Oversights

The importance of logistics was dramatically highlighted by Russia’s botched invasion of Ukraine in 2022.³⁸ Despite overmatch in technology, numbers, and firepower, Russia’s offensive ground to a halt well short of its objectives, largely due to insufficient fuel.³⁹ Russia’s failure is attributable to some of the classic problems of an authoritarian system, such as unchallenged assumptions and poor leadership.⁴⁰ Though Russia’s example is a useful reminder, there are more instructive historical examples: cases where highly competent, well-led troops embarked on bold new operational concepts that ended in national catastrophe due to foreseeable logistics failures.

One example is Imperial Germany’s 1918 offensive on the Western Front. To enable offensive maneuver in the face of entrenched firepower, the German army innovated new concepts of leadership, organization, and combined arms integration. Popularized as “stormtroop tactics,” the German concepts focused on elite units relying on surprise to disrupt a robust enemy defense, seize the initiative, and generate momentum.⁴¹ Tactically, this was extraordinarily effective. Unfortunately for the Germans, they lacked sufficient transportation, stockpiles of munitions, and lines of communication to sustain their momentum. The entente defenders gained strength as they withdrew closer to their sources of supply, while the German supply system neared collapse.⁴² The German offensive culminated early after only 40 miles of advance.⁴³ The last gasps of German military, moral, and materiel strength were spent for negligible strategic gain, and ultimately the innovative tactics merely

served to accelerate the collapse of the German war effort.

A second example of catastrophic innovation is the French disaster at Dien Bien Phu. Seeking to force their Viet Minh opponents into a decisive battle, the French planned a bold airdrop astride the Viet Minh's strategic lines of communication.⁴⁴ Relying on aerial resupply, French paratroopers established a fortified camp at Dien Bien Phu.⁴⁵ However, the effort was doomed from the outset: the French had chosen a logistically intensive operational concept with no recourse for altering their plan once committed. In contrast, their chief opponent—General Vo Nguyen Giap—wielded one of the most sophisticated logistics organizations in history despite relying largely on human porters.⁴⁶ Thus, the French irreversibly committed themselves to a battle of mass, firepower, and attrition against an opponent who could use his superior, flexible logistics to bring far more mass and firepower to bear at the vital place.⁴⁷ The battle ended with the annihilation of the French garrison and France's withdrawal from Southeast Asia.

It would be comforting to dismiss these failures as mere incompetence, but these were some of the most professional militaries of their times. Furthermore, these campaigns were led by experienced, battle-tested generals. One could blame these catastrophes on a failure to innovate, but in fact these were truly bold operations that initially caught their adversaries off guard. Each concept was also grounded in historical precedent: stormtroop tactics derived from extensive small-scale experimentation,⁴⁸ while in World War II's Burma theater, the British used fortified airheads to force Japanese attackers into battles of annihilation.⁴⁹ Instead, the fundamental flaw was more mundane: insufficient attention to logistics in planning.

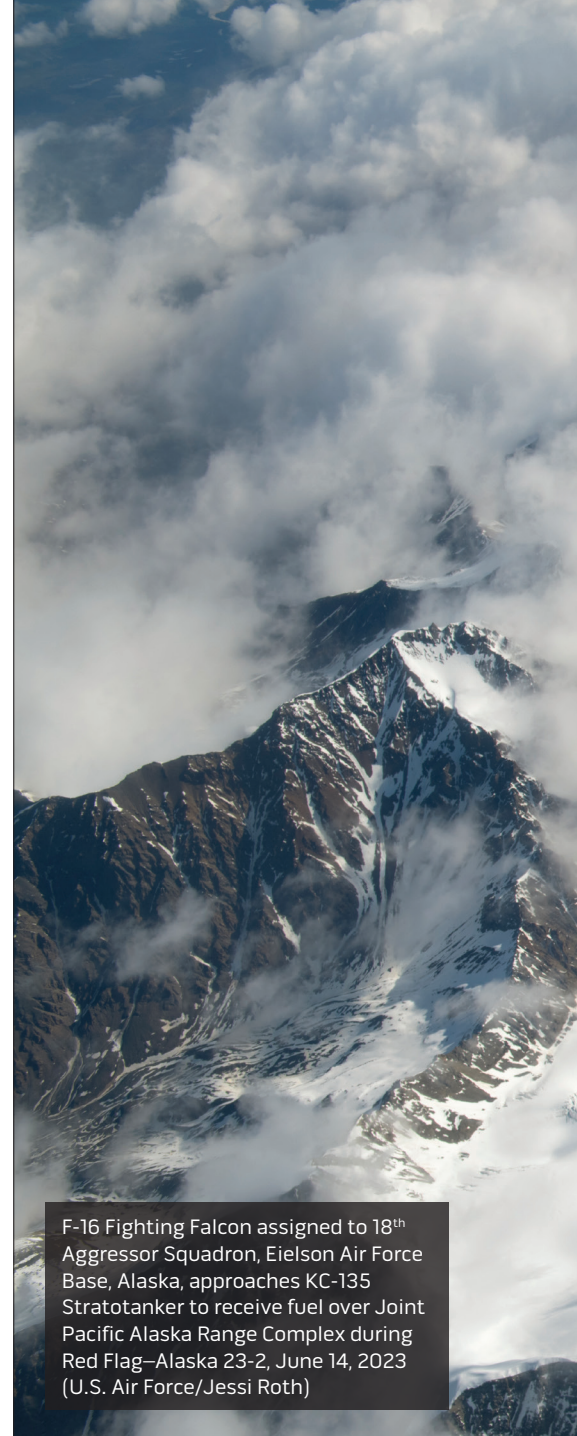
Taking a cue from these case studies, the U.S. military should ask itself the following: First, are the joint force's new operational concepts for the first island chain logistically sustainable at all, or are they self-defeating (as with the German 1918 concept)? Second, learning from

Dien Bien Phu, are the joint force's operational concepts effective in terms of competitive logistics against an adversary? Answers to these questions are troubling.

Third Observation: The U.S. Military's New Concepts Are Logistically Dubious

The Department of Defense has increased its focus on contested logistics at every level. At the strategic level, it has examined vulnerabilities in America's industrial base and intertheater sealift and airlift.⁵⁰ At the theater level, it has examined aerial refueling, intratheater sealift, and even emerging concepts for space-based supply.⁵¹ However, the most daunting challenge is closer to the fight: the Service concepts for dispersed operations in the first island chain. The Marines, Army, and Air Force all have notable similarities in their new operating concepts: all focus on land-based operations from dispersed sites, all aim to operate within the first island chain (that is, in the heart of China's A2/AD system), and all suffer from serious logistical challenges. In fact, the concepts are so difficult to sustain as to risk either outright self-defeat or imposing more cost than benefit on the wider joint effort.

The Marine Corps' Expeditionary Advanced Base Operations. Former Marine Commandant General David Berger laid out a bold vision for reform in *Force Design 2030*, resulting in the divestment of legacy systems including armor, artillery, and infantry.⁵² *Force Design 2030* aims to reorient the Corps toward supporting a campaign of naval maneuver, projecting power from the littorals by denying maneuver to an adversary while creating options for friendly naval maneuver.⁵³ Fundamental to this effort are two related concepts. First, expeditionary advanced base operations (EABO) establish littoral bases that provide fires, sensing, or logistical support to the maritime component.⁵⁴ Second, the stand-in force is envisioned as a low-signature littoral force that can survive, maneuver, and generate effects within an adversary's weapons engagement zone.⁵⁵



F-16 Fighting Falcon assigned to 18th Aggressor Squadron, Eielson Air Force Base, Alaska, approaches KC-135 Stratotanker to receive fuel over Joint Pacific Alaska Range Complex during Red Flag–Alaska 23-2, June 14, 2023 (U.S. Air Force/Jessi Roth)

To sustain a network of dispersed operations in a littoral environment against a lethal adversary, the Marines have updated their logistics doctrine.⁵⁶ The Corps clearly recognizes the need to be lighter and more mobile and able to operate coherently despite strict signature management.⁵⁷ These updates bring more questions than answers, however, and not all the answers may be favorable to EABO. Three major flaws in logistics still plague the Marines' new concepts. First, the concepts themselves were developed by officers from an operational



and maneuver background with undue consideration for logistics, a fact later acknowledged by General Berger.⁵⁸ Marine observers have quietly begun to acknowledge that the operational concepts may themselves be logistically infeasible.⁵⁹

Second, of all the Services, the Marines have chosen the most logistically challenging concept (that is, closest to the threat and farthest from friendly supply) despite owning the fewest organic logistic assets.⁶⁰ By design, the Marines are reliant on joint force logistics for sustained campaigns, lacking the intratheater logistics

of other Services.⁶¹ Though expert at expeditionary tactical logistics, the Marines have identified a shortfall in understanding operational logistics—in other words, inherently joint, theater-scale logistics.⁶²

The Marines have thus assessed that their new concepts require greater leveraging of joint logistics, yet this reveals a third problem: The solutions to EABO's logistics challenges could obviate the need for EABO altogether. If substantial tactical airlift is one solution, why not simply generate fires and effects from airpower instead of a littoral base?⁶³ If

low-signature, high-speed watercraft are needed to sustain stand-in forces, why not simply employ fires and effects from the watercraft?⁶⁴ Littoral fires and effects would doubtless challenge a Chinese adversary, yet if deploying them at meaningful scale requires joint logistics support that consequently constrains the joint force's other options, then EABO may be more trouble than it is worth. As it is, the sustainability of the concept is in question despite the Marines planning for a mere three Marine littoral regiments—begging a question of utility.⁶⁵ If unresolved, these

problems could echo the situation of the Japanese on Guadalcanal in 1942. The isolated Japanese lodgment was intended to improve Japan's operational air and naval reach, yet it proved so costly for the Imperial Japanese Navy to support that it ultimately did more harm than good.⁶⁶

The Army's Multidomain Task Forces. Whereas the Marine concept optimizes for the Pacific, the Army has pursued a more generalized concept: multidomain operations. In the context of a fight with China, the Army's new multidomain task forces (MDTFs) are a particularly important piece of this new concept. Designed as modular, inherently joint, brigade-sized formations leveraging space, cyber, information, and electronic warfare systems, MDTFs would benefit from the Army's organic air defenses, force protection, and long-range fires.⁶⁷

But like the Marines' stand-in forces, the MDTFs have several fundamental problems. First, the concept of their employment is unclear. Based on the ranges of their weapons systems, MDTFs would need to be positioned within the first island chain.⁶⁸ Thus, they will have the same sustainment challenges as the Marines.⁶⁹ Second, although envisioned as light and mobile, the weapons systems assigned to MDTFs are decidedly heavy: high-mobility artillery rocket systems and Patriot batteries are logistics-intensive, while new capabilities like the Typhon missile battery are massive, road-bound, and not optimized for austere operations.⁷⁰ Third, the Army's concept is so similar to the Marines' that it is unclear what unique capability it brings, and vice versa. Though this is not inherently damning, if neither concept is logistically sustainable, then it may be "too much of a good thing." Like the Marines, the Army only has three MDTFs templated, which may not provide much power for the logistical costs incurred.⁷¹

The Air Force's Agile Combat Employment. Not coincidentally, China's A2/AD systems pose the greatest threat to the Air Force's operating methods. Studying the overwhelming success of U.S. airpower in Operation *Desert Storm*, the PLA concluded that America's dependence on large, logistically efficient

bases was a targetable vulnerability.⁷² The PLA designed a bespoke system of long-range weapons to disrupt these bases, even creating an independent PLA Rocket Force.⁷³ Facing an imminent threat to its large bases, the Air Force adopted agile combat employment (ACE), a doctrine of distributing airpower among smaller dispersed sites.⁷⁴

Operating from austere airfields is historically well established. During World War II and the Korean War, Army Air Forces and the Air Force, respectively, deployed fighter units to dirt or steel mesh strips.⁷⁵ However, as jet aircraft advanced, they required increasingly robust airfields and support facilities. Over time, this incentivized large, efficient, well-stocked bases with large runways. Thus, the Air Force is in the position of reverting to a much more austere model with aircraft and support systems optimized for major installations. Though low-level innovation and force restructuring have helped adjust command relationships and culture to the challenge, four daunting logistics problems remain.⁷⁶

First, studies have suggested that dispersed air operations require a massive increase in support personnel—particularly in certain maintenance specialties.⁷⁷ The Air Force's efforts to certify "multi-capable Airmen" can only partly mitigate this need.⁷⁸

Second, while dispersing reduces the risks from long-range fires, it can dramatically increase the risk from ground attacks. Even a small ground force can cause catastrophic damage to parked aircraft.⁷⁹ For example, during the Falklands War, a single British Special Air Service team—on foot—destroyed more enemy aircraft in an hour than most fighter squadrons destroyed throughout the entire campaign.⁸⁰ They achieved this feat by surprising a small, austere airfield with poor perimeter security—a lesson not lost on the PLA, which studied the Falklands conflict in depth.⁸¹ To prevent such attacks, small airfields demand the same degree of perimeter security as large ones—thus, dispersal among multiple sites increases the security force size multiplicatively.⁸² Outsourcing this defense is no panacea; host-nation security might

not always be available, and relying on the Army assumes the availability of large numbers of untasked infantry. Even if available, these forces have their own hefty sustainment requirements.

A third problem is that—from the perspective of sortie generation—ACE may be inherently self-defeating. Historically, achieving air superiority requires a high sustained sortie generation rate.⁸³ Given the Air Force's relatively diminished fighter fleet, generating sufficient mass to contest the PLA requires unusually high sortie rates for each aircraft. Unfortunately, the inherent inefficiencies of dispersed, austere operations constrain the rates of sortie generation. Thus, dispersed operations merely trade "risk-to-force" for "risk-to-mission."⁸⁴ This was what the Polish air force discovered in 1939: Facing an overwhelming Luftwaffe assault, some Polish fighter units managed to stay in the fight throughout the entire 6-week campaign by dispersing to "secret" airfields well stocked with materiel.⁸⁵ However, due to the dramatic losses of materiel left behind each time they were forced to displace, the Polish aviators never generated enough sorties to pose a serious threat.

A final problem for ACE is its conceptual overreliance on organic airlift (at least as applied in the Pacific theater). Multiple conferences, exercises, and war games examining ACE have focused on how the Air Force can self-deploy and self-sustain using its own airlift.⁸⁶ This concept is flawed: in most modern conflicts, only 1 to 2 percent of the necessary materiel traveled by airlift—nearly 95 percent traveled by sealfight.⁸⁷ Additionally, this assumes the availability of such airlift, whereas in a major conflict, other stakeholders' demands for airlift would be staggering. This is symptomatic of insufficient consideration of ACE's implications for joint logistics.

Three Emergent Problems in Joint Force Logistics

1. An Insufficient Consideration of Joint Force-Wide Logistics. The Chinese pacing threat is the scenario driving U.S. military modernization,⁸⁸ yet paradoxically the entity responsible for such a



Staff Sergeant Evan Minca, 517th Airlift Squadron loadmaster, and Captain Andrew Miller-Bissell prepare to offload M777 howitzers from C-17 Globemaster III in Eastern Europe, May 2, 2022 (U.S. Air Force/Shawn White)

scenario (U.S. Indo-Pacific Command, or USINDOPACOM) has little direct say in acquisitions or modernization.⁸⁹ Instead, each military Service’s modernization reflects individual Service conceptions of such a conflict. This is not to suggest that the Services are disingenuous or do not coordinate with USINDOPACOM. Rather, bureaucratic pressures matter tremendously, and Service-driven acquisitions incline to Service-focused solutions. Services gravitate toward concepts that allow them to play a more decisive role, reinforcing the bias toward roles like operations or fires over supporting roles like transportation or sustainment.⁹⁰ This has enabled Services to commit themselves to extraordinarily logistics-intensive operational concepts with belated consideration for the supportability of those

concepts—or an implied assumption that other Services will assume more risk in support. It is probable that the joint force has enough logistical capability to support a single Service’s stand-in, dispersed operational concept—but not all simultaneously at the end of a contested, thousands-mile-long supply chain.⁹¹

2. Too Many “Seams.” Service concepts create extraneous “lateral seams” among Services due to belated or insufficient consideration of how their logistics fit together holistically.⁹² This exacerbates the lateral seams imposed by the complex terrain of the Western Pacific. A unit deployed in this terrain will be fighting under threat of PLA bombardment while thousands of miles from the U.S. industrial base. Should a unit run into logistics difficulties, its best option may be to

reach laterally to adjacent units (whatever their Service) instead of requesting resupply from a distant rear area base that is vulnerable to communications jamming or interdiction.⁹³ Indeed, embattled Ukrainian brigades do just that: by pulling critical parts from adjacent units rather than reaching backward to depots, they reduce Russia’s ability to intercept their lines of communication.⁹⁴

There are also doctrinal “longitudinal seams” that are no longer helpful.⁹⁵ It was previously useful to conceptualize transport as either intertheater, intratheater, or tactical. Each of these categories operated on different timescales and was vulnerable to different threats. Each category had an organization to facilitate it: USTRANSCOM directed intertheater movements, after which a lead logistics



Marines with 3rd Landing Support Battalion ground-guide Medium Tactical Vehicle Replacement at Pohang, South Korea, June 12, 2023, as part of Combined Distribution Exercise 23 (U.S. Marine Corps/Danny Gonzalez)

Service appointed by the combatant commander facilitated intratheater movement, and finally individual Services handled tactical distribution.⁹⁶ However, the need to minimize the number of highly targetable intermediate hubs means that the boundaries between these categories of transportation are blurring, and existing doctrine is ill-suited to address it. It is increasingly likely that intermediate handoffs in materiel may be replaced by continuous movement toward the end user,⁹⁷ by placing intermediate nodes farther from the threat,⁹⁸ or by replacing intermediate nodes with an “intermediate zone” wherein low-signature logistics handoff will occur.⁹⁹ Such solutions require increasing the amount of intratheater transport with a greater degree of communication between components, and probably the ability to conceptually flex between the traditional roles of tactical, intratheater, and inter-theater logistics. Normally a problem of this magnitude would have a clear lead Service appointed to champion and advocate for resources, but at present none has been identified.¹⁰⁰

3. A Large Cultural Gap Between Combat and Logistics Communities.

There is a significant cultural difference between military career fields traditionally considered as either “combat” or “support.” Multiple factors contribute to this difference: different bureaucratic incentives, different prospects for promotion, and different outlooks on risk acceptance. Also, the post–Cold War emphasis on a “revolution in military affairs” deliberately sought to deemphasize logistics,¹⁰¹ while multiple rounds of budget cuts often disproportionately cut logistics staff.¹⁰² Whatever the reason, officers from combat communities have a different outlook and often dominate conversations with their support peers.¹⁰³

This cultural gap is poorly suited to a conflict inside the first island chain. Not only will support personnel be vulnerable to PLA targeting, but also China prefers to target logistics assets.¹⁰⁴ Furthermore, in a dispersed, contested operation, many units traditionally considered “combat arms” (for example, Marine littoral regiments) may function less like units of maneuver and more akin to firing

positions for long-range missiles. In fact, it may be the logisticians doing most of the “maneuvering”: for example, maneuvering supplies from distant stockpiles to concealed end users, all while maintaining a coherent scheme of maneuver under fire. This implies that logisticians should be driving many concepts of operations, yet officers from combat arms backgrounds still tend to dominate planning. This imbalance partly explains how concepts like ACE are so popular with operations personnel and so unpopular with support personnel.¹⁰⁵ Succeeding in a conflict with China requires that logisticians gain an increasingly dominant voice in planning and design.

Three Recommendations to Enable Contested, Dispersed Logistics

Revitalize a Joint “Combat Logistics” Culture. To focus the logistics community on combat operations, give it a stronger voice and raise its “joint-mindedness.” The most important place to start is culture—especially how that community attracts and educates talent.

There are already multiple programs for advanced logistics education and multiple elite units that focus on expeditionary combat logistics.¹⁰⁶ However, at present, there is no institute that focuses on producing logistics leaders who are joint-minded, experts on dispersed operations, oriented on combat in the Western Pacific, and capable of leading the conversation in campaign planning. In other words, there is no joint institution dedicated to developing the skill sets young logistics leaders need for the United States to succeed in a dispersed, contested logistics environment in the first island chain.

The need for such young leaders is obvious. Each Service's literature on dispersed operations states a need to organize multifunctional logistics teams at a lower level than previously attempted; that these organizations need to be closely integrated with combat units; and that these units will be led by junior officers invested with significant training, authority, and trust.¹⁰⁷ Such officers will need to understand how they both support and leverage the wider joint logistics enterprise and will need to be skilled at leveraging resources both locally (from their host nation) and laterally (from adjacent joint units). The U.S. military has a unique opportunity to cross-level these skills across its Services. It can do so by building a training program that is challenging, motivating, and professionally enhancing for its graduates while also drawing ambitious, talented young leaders. Such a program should be competitively selective and should allow students to immerse themselves in emerging logistics problems (and solutions) to drive the pace of combat in both planning and execution and—crucially—to do so while developing an understanding of the problems the entire joint force faces. To conceptualize such a program at scale, consider an analogy: the Air Force, Navy, and Marine weapons schools.¹⁰⁸ Each school sharpens some of the best young leaders in its Service by ruthlessly focusing them on tough, realistic, inherently joint problem sets. The result is a cadre of graduates with joint perspective and instant credibility. Additionally, the

schools regularly engage in exercises and exchanges with one another—a cross-flow so successful that F-35 pilots from every Service now operate off the same tactical standards, enabling real-time joint integration.¹⁰⁹

For an example of the power of an expeditionary, joint-minded, combat-oriented logistics cadre, no better example exists than the Royal Marines Commando Logistic Regiment during the Falklands War. The regiment was unique in that it recruited competitively from every branch of the British military.¹¹⁰ Once recruited, its members had to pass the infamously grueling commando training program. Its command structure was joint by design, rotating billets between army and marine officers.¹¹¹ Curiously, it was also a joint organization subordinated to a service organization, something unseen in U.S. practice. The result was an elite, inherently joint organization that punched well above its weight. Designed to support three commando battalions while enjoying air superiority and robust transportation infrastructure, the regiment instead found itself supporting a multiservice division, under constant air attack, with only 20 percent of its templated ground transport, without a usable port, and 8,000 miles away from home.¹¹² That they succeeded had little to do with any specialized training and almost everything to do with the esprit, culture, and joint-mindedness of the organization. The success of the entire British task force often hinged on quick decisions made by a junior officer or noncommissioned officer in the regiment. The fact that they not only consistently made the best choices but also had the confidence to do so under fire exemplifies the kind of culture the U.S. military needs for its logisticians.¹¹³

Empower a Stronger Joint Logistics Structure in the Pacific. Setting the conditions to deter or defeat China in the Pacific requires lengthy, expensive preparation, particularly in logistics. Although USTRANSCOM is the permanent functional joint logistics integrator, its focus is on strategic, intertheater logistics. USINDOPACOM has directive authority

for logistics but may lack sufficient “fingertip feel” in the first island chain.¹¹⁴ There are several indications that the present command structure is insufficient and that an organization is needed that is simultaneously stronger, more focused, and inherently joint.

First, the present structure maintains too many lateral and longitudinal seams, as discussed. Second, though several recent Pacific exercises emphasized joint logistics, these efforts must be accelerated and expanded to develop new methods of command, control, and operations.¹¹⁵ A more powerful advocate for such exercises could increase their scope and fidelity. Third, the lack of an overarching, persistent, theater-specific joint logistics “watchdog” allows the military Services to inadvertently make overly optimistic assumptions about their operational concepts and logistics preparations. In the absence of such a watchdog, Services tend to make their own logistics preparations in host nations, often with a poor understanding of the internal politics of those nations—and how scarce resources are actually allocated in those nations.¹¹⁶ Similarly, a joint watchdog can identify dangerous risks that might look reasonable from a single-Service perspective—for example, if too many Services rely on throughput of a major hub like Guam, making it an even more vulnerable target.

In addition to shoring up the problems with the current command structure, there are two additional benefits to a stronger joint logistics organization in the Pacific. The first lies in helping the United States triumph in competition. Recent scholarship has suggested that in Great Power competition, logistics is maneuver.¹¹⁷ In tactical combat, forces maneuver to positions of advantage; similarly, in strategic competition, logistics maneuvers to create opportunities that can deter or win conflict. In practice, this implies building infrastructure, developing caches, and maintaining host-nation relationships, all serving as a deterrent to aggression.¹¹⁸ A joint logistics structure—permanently standing and oriented on the

Pacific—could bolster this maneuver during strategic competition.

The second benefit of such a joint structure is its ability to hasten a better kind of logistics operation. Logistics personnel dispersed in complex terrain will need to reach laterally for resources, adapt to battlefield changes at the speed of missile warfare, and do all this despite intermittent communications with distant headquarters.¹¹⁹ This kind of operation is impossible to command through centralization and instead favors the development of the kind of “team of teams” popularized by General Stanley McChrystal.¹²⁰ McChrystal’s construct advocated the importance of consistent, broad, and flat communications. However, against China such detectable and targetable communications can be deadly. Instead, developing a consistent, broad *culture* may be a closer fit. But such a culture must be developed *before* a conflict begins—that is, by an existing joint organization focused on logistics in the Pacific.

Several solutions might serve to create this semipermanent, joint, and combat-oriented Pacific-focused logistics structure. The least disruptive would be to simply assign more personnel to USINDOPACOM staff—although this would continue the disadvantage of being too far removed from the first island chain. A better solution might be to take an existing logistics organization with strong Pacific ties and strengthen it into a joint headquarters. The best candidate for this is the Army’s 8th Theater Sustainment Command.¹²¹ With a strong understanding of theater military and commercial logistics—and the relationships that go with them—this would likely be the lead agency for coordinating wartime intratheater logistics anyway.¹²² Empowering it as a joint organization during competition would give it far more ability to set the tempo for logistics developments in the theater. Admittedly, empowering a new headquarters would require careful war-gaming to find where this organization’s authority overlapped with existing Service infrastructure (for example, Services are responsible for logistics on their own bases). Where this organization might be

most valuable is in providing a framework for the logistics web connecting various Service sites—and ensuring such a web is well coordinated, well integrated, and resilient prior to the beginning of hostilities.

In fact, an Army War College think tank suggested this as the primary role the Army should play in a fight with China.¹²³ In a refreshing departure from Service parochialism, these scholars argued that the Army (and the 8th Theater Sustainment Command) was uniquely positioned to construct and empower a logistics “grid” that could then be occupied by joint combat units.¹²⁴ Such a grid would consist of a distributed network of local joint headquarters, with few arbitrary seams and greater ability to shift resources laterally than any structure currently extant in doctrine. If realized and resourced, such a structure might be exactly the thing to rescue the logistically frail Service concepts. However, creating this grid will take significant preparation and therefore merits joint-level advocacy and attention prior to conflict.

Experiment With a New, Logistics-Led Framework for Planning. Logistics scholars agree that military planning should—in theory—involve operations and logistics personnel working in tandem.¹²⁵ In practice, this rarely occurs. More commonly, lead planners from an operational, maneuver, or fires background create an initial concept and then use rough rules of thumb to check logistical viability.¹²⁶ Periodically, logisticians are asked for a check on feasibility and are generally expected to “make it happen” if it is remotely possible. This creates a significant bias toward operational considerations over logistics ones, which was appropriate in an era of assured logistics. However, in a campaign of dispersed operations in the first island chain, logistics will be of paramount importance. Thus, at any level of planning or design (for example, designing a campaign to defeat a PLA invasion of Taiwan), commanders should experiment with planning guidance by directing logisticians to lead the planning of operations, and having operational personnel verify that it satisfies certain criteria.

For example, a logistician leading planning for a Taiwan scenario might use simple templates to estimate locations where firing units will need to be, when they will need to be there, and for how long—in other words, using rough rules of thumb for operations. That same lead planner can then consider detailed logistics-driven courses of action that achieve these objectives. A conflict to defeat a Chinese attack on Taiwan is well-suited to such an approach because U.S. success would not be decided by offensive maneuver but instead by its denial of Chinese objectives. This denial would be achieved primarily via long-range fires from templated firing sites—in other words, an operation well-suited to planning via rough templates, allowing planners to refine logistical details.¹²⁷

This may seem an arbitrary change, but every planning methodology seeks to optimize a certain objective function. This is poorly described in most military literature but is well documented in literature for computer science or operations research.¹²⁸ In effect, this planning approach seeks to optimize logistics feasibility, while “satisficing” operational needs—the inverse of most current approaches. One might expect that operations-driven and logistics-driven approaches would converge on the same solutions. In practice, though, such convergence rarely happens due to the “anchoring effect” of the initial design and the bias of its designer. Plans created by teams using a logistics-driven methodology could broaden a commander’s understanding of a problem, particularly when compared side by side with plans created using a more traditional methodology. Most important, this alternate approach can elevate logistics in the commander’s mind while reducing the cultural gap between combat and support personnel by stimulating healthy debate. This approach can work beyond campaign planning. For example, some authors have argued on the need to bring logistics advocacy into research and development much earlier than currently practiced.¹²⁹



Soldiers from 1st Battalion, 7th Air Defense Artillery Regiment, 108th Air Defense Artillery Brigade, conduct convoy operations to Patriot air defense artillery site in undisclosed location in U.S. Central Command area of operations, November 30, 2023 (U.S. Army/Christopher Neu)

Considering the Counterarguments

The Joint Warfighting Concept (JWC) and the Joint Concept for Contested Logistics (JCCL) address these problems. Since these documents are classified, a full discussion is impossible. However, publicly available information shows them as necessary but insufficient. The JWC has been described as a “north star” to guide Services’ force design;¹³⁰ the JCCL is a supporting effort to this.¹³¹ Force design affects procurements that are 5 to 15 years away—thus, these concepts will not solve near-term problems of culture, planning, and preparation in the Pacific. Furthermore, none of the Services lost

significant equities in the development of the JWC. Given ferocious competition for scarce resources, a sufficiently bold concept should have had winners and losers.

Local contracting (for example, “21st-century foraging”) will minimize supply-chain demands. While it will do little to help with certain classes of supply (such as munitions),¹³² improving operational contract support can reduce other demands on long-distance supply chains.¹³³ However, Service literature is guilty of cognitive dissonance, a symptom of the cultural gap between combat and logistics communities. While military authors espouse the importance of enabling tactical units to self-support via local

contracting,¹³⁴ they also cite Ukraine as an example of the need for strict signals discipline (for example, controlling cell phones).¹³⁵ In an era of proliferated smartphones, disciplined emissions control and large numbers of local civilian contractors are a poor combination.

Furthermore, multiple Services are reinvigorating host-nation relationships and local contracting skill sets, but they are doing so in a way that is occasionally ignorant of host-nation realities. Truly leveraging a host nation requires understanding its capacity for support—and deconflicting competing demands from the joint force. It also requires a range of skill sets beyond contracting, such as security force assistance battalions, civil



Sailors receive pallets from fleet replenishment oiler USNS *Guadalupe* during replenishment-at-sea aboard guided-missile destroyer USS *Decatur*, Philippine Sea, December 28, 2022 (U.S. Navy/David Negron)

affairs, foreign area officers, and special operations forces.¹³⁶ This level of detailed fingertip feel at theater scale requires better integration of logistics in planning and a stronger hand in theater coordination.

Dispersed operations will be a temporary measure only. In some theaters, it may be possible to disperse to survive an initial missile bombardment and then reconcentrate for efficiency. However, the PLA's capacity for bombardment might be practically unlimited. In a conflict over Taiwan, the Chinese are likely to hold the initiative: having a "time limit" on how long the U.S. military can disperse allows the PLA to keep that initiative by retaining a sufficient arsenal in reserve. Furthermore, given the PLA's interior lines and proximity to its industrial base,

these stockpiles might replenish quickly. Unless the United States intends its forces to act as sacrificial tripwires, then short-duration dispersal remains a valid tactic but a poor strategy.¹³⁷

New, autonomous, low-signature transport will solve contested logistics. Multiple authors have developed clever concepts of transportation, including submarine fuel bladders,¹³⁸ semi-submersible transports,¹³⁹ backpack-sized cargo drones,¹⁴⁰ self-propelled shipping containers,¹⁴¹ space-based or rocket-launched resupply,¹⁴² and wavetop skimming seaplanes.¹⁴³ Additionally, the Army and Navy are reinvigorating traditional sealift efforts.¹⁴⁴ However, it takes roughly a decade to field such platforms at scale, possibly too late to deter China.

Furthermore, the development of these systems is still too Service-centric. For instance, if the Marines fielded a fleet of semi-submersible transports, would the Air Force not demand their support to sustain remote island airfields? Thus, any breakthrough requires joint integration anyway.

Additive manufacturing and alternative energy sources will boost efficiency. Technologies to generate parts and power in the field could greatly improve logistics efficiency.¹⁴⁵ However, such systems are only of limited utility if the complex weapons systems they support are not engineered with their use in mind. For instance, most high-performance jet aircraft or missiles cannot accept parts that do not meet certain rigid

criteria—substandard parts can result in catastrophic failures in flight. Similarly, much of the joint force’s logistics challenge is oriented on munitions, which are another high-risk class of supply requiring strict tolerances. None of this is to say these technical efforts are ill-advised; many types of equipment probably can use 3D printed parts or run tolerably well on alternative fuels. However, the United States is preparing for a high-tech fight and will thus be constrained by its reliance on sensitive, high-performance weapons. Until a new generation of weapons is designed with additive manufacturing in mind, its impact may be real, albeit marginal.

Cheap, easy-to-sustain drones will replace hard-to-sustain weapons. While evidence from wars in Ukraine and Nagorno-Karabakh suggests great potential for relatively cheap drones, these technologies are unlikely to solve logistical challenges in the Pacific.¹⁴⁶ For one thing, many autonomous or unmanned systems require comparable—if not more—materiel to sustain than manned systems.¹⁴⁷ Furthermore, the cheap, short-range drones prevalent in Eurasian conflicts may be irrelevant to the vast distances of the Pacific, where drones may need to be larger, heavier, and more sophisticated.

Joint All-Domain Command and Control (JADC2) and artificial intelligence (AI) will dramatically boost efficiency. JADC2 is the U.S. military’s effort to leverage proliferated sensor networks and AI to enable better, faster decisions.¹⁴⁸ Logistics is a data-intensive art and therefore is integral to JADC2.¹⁴⁹ However, JADC2 has been difficult and slow to implement, given networks that were never designed to work together. Furthermore, AI’s promise has probably been overstated.¹⁵⁰ One can train an algorithm to aid a specific tactical decision, such as how to redirect a critical part when the plane carrying it breaks down.¹⁵¹ But there is no dataset to train an algorithm on a theater-wide logistics effort for a 21st-century Great Power conflict, when such a conflict has never occurred.¹⁵² Training an algorithm on simulations is also dangerous, as flawed

assumptions can dramatically skew results.¹⁵³ Thus, AI will incrementally improve logistics processes but is unlikely to usher in radical change.¹⁵⁴

Concluding, With Cautious Optimism

It is important not to overstate the above critique of these innovative technical efforts to enable contested logistics. Just as dispersed, contested logistics creates compounding inefficiencies, positive technical innovations create compounding efficiencies. Over time, these innovations might overcome the inefficiencies, resulting in a breakthrough: where a new type of operation suddenly becomes feasible. Such has happened many times in military history. However, no such breakthrough ever occurred without an honest accounting of the challenges faced.

Therefore, the U.S. military faces the greatest logistical challenge of its history, in a conflict where logistics is likely to be determinative, and while wielding new operating concepts that thought of logistics too little or too late. To overcome these challenges, America must invigorate the culture, organization, and mindset of its logistics communities. A strong combat logistics community—joint by design, oriented on the Pacific, and trained to overcome hardships—can set the stage for the many technical improvements currently in development. Failure to make these changes risks making the joint force a “paper tiger” possessed of bold concepts with little staying power. China’s ambitious leaders are unlikely to be intimidated by such a force. However, it is not too late to build a logistics enterprise that makes these concepts truly formidable—and to give this tiger some real teeth. JFQ

Notes

¹ There are multiple definitions of *logistics*. For this article, consider the following: “A discipline that encompasses the resources needed to keep the means of a military operation going to achieve its desired objectives. It includes planning, managing, treating, operating, and controlling these

resources.” Moshe Kress, *Operational Logistics: The Art and Science of Sustaining Military Operations*, 2nd ed. (New York: Springer Science and Media, 2016), 7.

² Mathieu Duchâtel, “An Assessment of China’s Options for Military Coercion of Taiwan,” in *Crossing the Strait: China’s Military Prepares for War with Taiwan*, ed. Joel Wuthnow et al. (Washington, DC: NDU Press, 2022), 87–112; Michael Casey, “Firepower Strike, Blockade, Landing: PLA Campaigns for a Cross-Strait Conflict,” in Wuthnow et al., 113–138.

³ “Gallipoli in Brief,” New Zealand History, December 4, 2019, <https://nzhistory.govt.nz/war/the-gallipoli-campaign/gallipoli-in-brief>; Clayton D. Laurie, *Anzio* (Washington, DC: U.S. Army Center for Military History, 1972).

⁴ Conor M. Kennedy, “Getting There: Chinese Military and Civilian Sealift in a Cross-Strait Invasion,” in Wuthnow et al., *Crossing the Strait*, 223–250; Christopher D. Yung, “Sinica Rules the Waves? The People’s Liberation Army Navy’s Power Projection and Anti-Access/Area Denial Lessons from the Falklands/Malvinas Conflict,” in *Chinese Lessons From Other Peoples’ Wars*, ed. Andrew Scobell, David Lai, and Roy Kamphausen (Carlisle Barracks, PA: Strategic Studies Institute, 2011), 75–114, <https://apps.dtic.mil/sti/pdfs/ADA553490.pdf>.

⁵ Minnie Chan, “Chinese Media Unveils Details of U.S.-Inspired Military Logistics System,” *South China Morning Post*, May 11, 2022; Joel Wuthnow, “A New Era for Chinese Military Logistics,” *Asian Security* 17, no. 3 (2021), 279–293; Kevin McCauley, *China’s Military Reforms and Modernization: Implications for the United States*, U.S.–China Economic and Security Review Commission, 115th Cong., 2nd sess., February 15, 2018, https://www.uscc.gov/sites/default/files/McCauley_Written%20Testimony.pdf.

⁶ Lonnie D. Henley, *Beyond the First Battle: Overcoming a Protracted Blockade of Taiwan*, China Maritime Report No. 26 (Newport, RI: China Maritime Studies Institute, March 2023), <https://digital-commons.usnwc.edu/cgi/viewcontent.cgi?article=1025&context=cmssi-maritime-reports/>; Casey, “Firepower Strike, Blockade, Landing”; Duchâtel, “An Assessment of China’s Options for Military Coercion of Taiwan.”

⁷ Henley, *Beyond the First Battle*.

⁸ Amos C. Fox, *Contested Logistics: A Primer* (Arlington, VA: Association of the United States Army, February 2, 2024), <https://www.ousa.org/publications/contested-logistics-primer>; Jon Michael King, “Contested Logistics Environment Defined,” *Army Sustainment*, Winter 2024, https://www.army.mil/article/272922/contested_logistics_environment_defined.

⁹ Roger Cliff et al., *Entering the Dragon’s Lair: Chinese Antiaccess Strategies and Their Implications for the United States* (Santa

Monica, CA: RAND, March 21, 2007), 45–48, <https://www.rand.org/pubs/monographs/MG524.html>.

¹⁰ Toshi Yoshihara and James R. Holmes, *Red Star Over the Pacific: China's Rise and the Challenge to U.S. Maritime Strategy*, 2nd ed. (Annapolis, MD: Naval Institute Press, 2018), 200–220.

¹¹ Maximilian Bremer and Kelly Grieco, “The Pentagon Needs Fresh Ideas for Evading Taiwan Logistics Pitfalls,” *Defense News*, December 4, 2023, <https://www.defensenews.com/opinion/2023/12/04/the-pentagon-needs-fresh-ideas-for-evading-taiwan-logistics-pitfalls/>; Miranda Priebe et al., *Distributed Operations in a Contested Environment: Implications for USAF Force Presentation* (Santa Monica, CA: RAND, July 17, 2019), https://www.rand.org/pubs/research_reports/RR2959.html.

¹² Yoshihara and Holmes, *Red Star Over the Pacific*, 205.

¹³ Alan J. Vick and Mark Ashby, *Winning the Battle of the Airfields: Seventy Years of RAND Analysis on Air Base Defense and Attack* (Santa Monica, CA: RAND, 2021), 68–79, https://www.rand.org/pubs/research_reports/RR4793-1.html.

¹⁴ Robert Haddick, *Fire on the Water: China, America, and the Future of the Pacific* (Annapolis, MD: Naval Institute Press, 2022), 130–140; *China Military Power: Modernizing a Force to Fight and Win* (Washington, DC: Defense Intelligence Agency, 2019), 90–95, https://www.dia.mil/Portals/110/Images/News/Military_Powers_Publications/China_Military_Power_FINAL_5MB_20190103.pdf; Christian Brose, *The Kill Chain: Defending America in the Future of High-Tech Warfare* (New York: Hachette Books, 2020), chap. 1.

¹⁵ Priebe et al., *Distributed Operations in a Contested Environment*, ix–xii.

¹⁶ Priebe et al.

¹⁷ John Sattely and Jason A. Paredes, “Sustainment of the Stand-In Force,” *War on the Rocks*, September 12, 2022, <https://warontherocks.com/2022/09/sustainment-of-the-stand-in-force/>.

¹⁸ Sattely and Paredes; Brandon L. Erwin, “Sustainment Within the Weapons Engagement Zone,” *Marine Corps Gazette* 108, no. 3 (March 2024), 91–95.

¹⁹ Kenneth L. Privatsky, *Logistics in the Falklands War: A Case Study in Expeditionary Warfare* (South Yorkshire, UK: Pen and Sword Books, 2014), 64.

²⁰ Peter Hore, “‘Logistics Miracle,’” *Naval History Magazine* 36, no. 2 (April 2022), <https://www.usni.org/magazines/naval-history-magazine/2022/april/logistics-miracle>.

²¹ Marine Corps Doctrinal Publication (MCDP) 4, *Logistics* (Washington, DC: Headquarters U.S. Marine Corps, 2023), chap. 2.

²² Kress, *Operational Logistics*, 68–70; MCDP 4, *Logistics*, chap. 2.

²³ For a discussion of incentives and metrics in civilian versus military supply chains, see Brett A. Friedman, *On Operations: Operational Art and Military Disciplines* (Annapolis, MD: Naval Institute Press, 2021), 100–107.

²⁴ Kress refers to this as “no free disposal.” Kress, *Operational Logistics*, 68–70.

²⁵ Michael Alfred Peszke, “Poland’s Military Aviation, September 1939: It Never Had a Chance,” in *Why Air Forces Fail: The Anatomy of Defeat*, ed. Robin Higham and Stephen J. Harris (Lexington: University Press of Kentucky, 2006).

²⁶ Ashley Roque, “Army to Use Operation Pathways to Test Assumptions About ‘Contested Logistics,’ Prepositioned Stocks,” *Breaking Defense*, March 31, 2023, <https://breakingdefense.sites.breakingmedia.com/2023/03/army-to-use-pacific-pathways-to-test-assumptions-about-contested-logistics-prepositioned-stocks/>.

²⁷ Haddick, *Fire on the Water*, 130–132.

²⁸ Haddick.

²⁹ Salvatore R. Mercogliano, “Logistics Wins (and Loses) Wars,” *USNI Proceedings* 150, no. 2 (February 2024), <https://www.usni.org/magazines/proceedings/2024/february/logistics-wins-and-loses-wars>.

³⁰ Thomas M. Kane, *Military Logistics and Strategic Performance* (London: Routledge, 2001), 1–12.

³¹ Kane.

³² Aaron A. Angell, “Logistics as Maneuver: Strategic Messaging Across the Competition Spectrum,” *Marine Corps Gazette*, March 2022.

³³ Henry Eccles, “Logistics and Strategy,” *Naval War College Review* 11, no. 1 (January 1958), 17–39.

³⁴ Iskander Rehman, *Planning for Protraction: A Historically Informed Approach to Great-Power War and Sino-U.S. Competition* (New York: Routledge, 2023).

³⁵ Eccles, “Logistics and Strategy.”

³⁶ Rehman, *Planning for Protraction*; Andrew Scobell, “China’s Calculus on the Use of Force: Futures, Costs, Benefits, Risks, and Goals,” in Wuthnow et al., *Crossing the Strait*, 65–81.

³⁷ Phillips Payson O’Brien, *How the War Was Won: Air-Sea Power and Allied Victory in World War II* (New York: Cambridge University Press, 2015).

³⁸ “Why Logistics Are Too Important to Be Left to the Generals,” *The Economist*, July 3, 2023; Marta Kepe, *Logistics and Sustainment in the Russian Armed Forces* (Santa Monica, CA: RAND, November 15, 2023), https://www.rand.org/pubs/research_reports/RR42523-1.html.

³⁹ T.X. Hammes, *Game-Changers: Implications of the Russo-Ukraine War for the Future of Ground Warfare* (Washington, DC: Atlantic Council, April 2023), <https://www.atlanticcouncil.org/wp-content/uploads/2023/04/Game-Changers-or-Little->

[Change-Lessons-for-Land-War-in-Ukraine-.pdf](#); Katie Crombe and John Nagl, “A Call to Action: Lessons From Ukraine for the Future Force,” *Parameters* 53, no. 3 (Autumn 2023), <https://doi.org/10.55540/0031-1723.3240>.

⁴⁰ Kepe, *Logistics and Sustainment in the Russian Armed Forces*.

⁴¹ Bruce I. Gudmundsson, *Stormtroop Tactics: Innovation in the German Army, 1914–1918* (Westport, CT: Praeger, 1989).

⁴² Julian Thompson, *The Lifeblood of War: Logistics in Armed Conflict* (Lincoln: University of Nebraska Press, 1991), 44–47; Jeremy Black, *Logistics: The Key to Victory* (Annapolis, MD: Naval Institute Press, 2021), 126–127.

⁴³ Thompson, *The Lifeblood of War*, 44–47.

⁴⁴ Thompson, 164–185; Phillip B. Davidson, *Vietnam at War: The History, 1946–1975* (New York: Oxford University Press, 1991), 161–191.

⁴⁵ Thompson, *The Lifeblood of War*, 164–185; Davidson, *Vietnam at War*, 161–191.

⁴⁶ Thompson, *The Lifeblood of War*, 144–145, 171–173.

⁴⁷ Thompson, 184–185.

⁴⁸ Gudmundsson, *Stormtroop Tactics*.

⁴⁹ Kane, *Military Logistics and Strategic Performance*, 28–32; Field-Marshal Viscount William Slim, *Defeat Into Victory: Battling Japan in Burma and India, 1942–1945* (New York: Cooper Square Press, 2000), 296–346; Thompson, *The Lifeblood of War*, 88–99; Shane Williams et al., “Echoes of the Past: The Burma Campaign and Future Operational Design in the Indo-Pacific Region,” *Joint Force Quarterly* 109 (2nd Quarter 2023).

⁵⁰ *National Defense Industrial Strategy* (Washington, DC: Department of Defense, 2024).

⁵¹ William T. Eliason, “An Interview With Jacqueline D. Van Ovost,” *Joint Force Quarterly* 107 (4th Quarter 2022); Bruce Busler, “Strategic Mobility in the Context of U.S. National Defense Strategies,” *Joint Force Quarterly* 107 (4th Quarter 2022).

⁵² *Force Design 2030* (Washington, DC: Headquarters U.S. Marine Corps, 2020).

⁵³ Brian Kerg, “A Summary of Changes in the New EABO Manual,” *USNI Proceedings* 149, no. 7 (July 2023), <https://www.usni.org/magazines/proceedings/2023/july/summary-changes-new-eabo-manual>; David Berger, “Marines Will Help Fight Submarines,” *USNI Proceedings* 146, no. 11 (November 2020), <https://www.usni.org/magazines/proceedings/2020/november/marines-will-help-fight-submarines>; Dustin League and Dan Justice, “Sink ‘Em All: Envisioning Marine Corps Maritime Interdiction,” *Center for International Maritime Security*, June 8, 2020, <https://cimsec.org/sink-em-all-envisioning-marine-corps-maritime-interdiction/>; Timothy Warren, “FARPs Keep Aviation in the Fight,” *USNI Proceedings* 150, no. 1 (January 2024), <https://www.usni.org/magazines/proceedings/2024/january/farps-keep->

aviation-fight.

⁵⁴ *Tentative Manual for Expeditionary Advanced Base Operations*, 2nd ed. (Washington, DC: Headquarters U.S. Marine Corps, 2021), <https://www.marines.mil/Portals/1/Docs/230509-Tentative-Manual-For-Expeditionary-Advanced-Base-Operations-2nd-Edition.pdf>.

⁵⁵ *A Concept for Stand-In Forces* (Washington, DC: Headquarters U.S. Marine Corps, December 2021).

⁵⁶ “MCDP 4, Logistics 2.0,” *Marine Corps Gazette* 107, no. 2 (February 15, 2023), <https://www.mca-marines.org/gazette/mcdp-4-logistics-2-0/>.

⁵⁷ MCDP 4, *Logistics, Sustaining the Force in the 21st Century: A Functional Concept for Future Installations and Logistics Development* (Washington, DC: Headquarters U.S. Marine Corps, 2019).

⁵⁸ Erwin, “Sustainment Within the Weapons Engagement Zone.”

⁵⁹ Erwin; Sattely and Paredes, “Sustainment of the Stand-In Force”; Brian Donlon, “Logistics 2030: Foraging Is Not Going to Cut It,” *USNI Proceedings* 149, no. 11 (November 2023), <https://www.usni.org/magazines/proceedings/2023/november/logistics-2030-foraging-not-going-cut-it>; Walker D. Mills and Erik Limpacher, “Sustainment Will Be Contested,” *USNI Proceedings* 146, no. 11 (November 2020), <https://www.usni.org/magazines/proceedings/2020/november/sustainment-will-be-contested>.

⁶⁰ Sattely and Paredes, “Sustainment of the Stand-In Force”; MCDP 4, *Logistics*, chaps. 4–5.

⁶¹ MCDP 4, *Logistics*, chaps. 4–5.

⁶² Aaron Angell and Mark Schouten, “Leveraging Logistics Above the MAGTF,” *Marine Corps Gazette* 108, no. 3 (March 2024), 12–15; Jake Sharry, “The Marine Corps’ Failure to Connect,” *USNI Proceedings* 146, no. 10 (October 2020), <https://www.usni.org/magazines/proceedings/2020/october/marine-corps-failure-connect>.

⁶³ Walker D. Mills, Dylan Phillips-Levine, and Joshua Taylor, “Modern Sea Monsters,” *USNI Proceedings* 146, no. 9 (September 2020), <https://www.usni.org/magazines/proceedings/2020/september/modern-sea-monsters>.

⁶⁴ Paul R. Watson, “The Stand-In Force Needs Sea Legs,” *USNI Proceedings* 149, no. 5 (May 2023), <https://www.usni.org/magazines/proceedings/2023/may/stand-force-needs-sea-legs>.

⁶⁵ Andrew Feickert, *The U.S. Marine Corps Marine Littoral Regiment (MLR)*, IF 12200 (Washington, DC: Congressional Research Service [CRS], Updated August 17, 2023), <https://crsreports.congress.gov/product/pdf/IF/IF12200/5>.

⁶⁶ Mills and Limpacher, “Sustainment Will Be Contested.”

⁶⁷ Andrew Feickert, *The Army’s Multi-*

Domain Task Force (MDTF), IF 11797 (Washington, DC: CRS, Updated April 19, 2024); Charles McEnany, *Multi-Domain Task Forces: A Glimpse at the Army of 2035* (Arlington, VA: Association of the United States Army, March 2, 2022), <https://www.ansa.org/publications/multi-domain-task-forces-glimpse-army-2035>.

⁶⁸ “Precision Strike Missile (PrSM),” Lockheed Martin, 2024, <https://www.lockheedmartin.com/en-us/products/precision-strike-missile.html>; Andrew Feickert, *The U.S. Army’s Long-Range Hypersonic Weapon (LRHW): Dark Eagle*, IF 11991 (Washington, DC: CRS, Updated July 2, 2024), <https://crsreports.congress.gov/product/pdf/IF/IF11991>.

⁶⁹ Collin Fox et al., “Expeditionary Advanced Base Operations for the Army,” *War Room*, January 13, 2022, <https://warroom.armywarcollege.edu/articles/exp-ops/>.

⁷⁰ Aaron-Matthew Lariosa, “Army Activates Latest Land-Based SM-6, Tomahawk Battery Based on Navy Tech,” *USNI News*, January 18, 2024, <https://news.usni.org/2024/01/18/army-activates-latest-land-based-sm-6-tomahawk-battery-based-on-navy-tech>.

⁷¹ Feickert, *The Army’s Multi-Domain Task Force (MDTF)*.

⁷² Dean Cheng, “Chinese Lessons From the Gulf Wars,” in Scobell, Lai, and Kamphausen, *Chinese Lessons from Other Peoples’ Wars*, 153–200; Vick and Ashby, *Winning the Battle of the Airfields*, 68–79; Cliff et al., *Entering the Dragon’s Lair*, 45–48.

⁷³ *China Military Power*.

⁷⁴ Air Force Doctrine Note 1-21, *Agile Combat Employment* (Maxwell Air Force Base, AL: Curtis E. LeMay Center for Doctrine Development and Education, August 23, 2022).

⁷⁵ Justin R. Davis, *The Air Force’s True Expeditionary Roots: Historical Context and Lessons for the Agile Combat Employment (ACE) Concept* (Fort Leavenworth, KS: School of Advanced Military Studies, 2021); Douglas A. Birkey, *Air War Over Korea: Lessons for Today’s Airmen*, Mitchell Institute Policy Paper 34 (Washington, DC: Mitchell Institute for Aerospace Studies, August 12, 2022), <https://www.airandspaceforces.com/article/air-war-over-korea-lessons-for-todays-airmen/>.

⁷⁶ Shawn Cochran et al., *The Forces We Need: Building Multi-Capable Airmen to Enable Agile Combat Employment* (Santa Monica, CA: RAND, December 20, 2023), https://www.rand.org/pubs/research_reports/RR1746-1.html.

⁷⁷ John Stillion and David T. Orletsky, *Airbase Vulnerability to Conventional Cruise-Missile and Ballistic-Missile Attacks: Technology, Scenarios, and U.S. Air Force Responses* (Santa Monica, CA: RAND, January 1, 1999), https://www.rand.org/pubs/monograph_reports/MRI028.html.

⁷⁸ Cochran et al., *The Forces We Need*;

James A. Leftwich et al., *Advancing Combat Support to Sustain Agile Combat Employment Concepts: Integrating Global, Theater, and Unit Capabilities to Improve Support to a High-End Fight* (Santa Monica, CA: RAND, May 23, 2023), https://www.rand.org/pubs/research_reports/RR1001-1.html.

⁷⁹ Alan J. Vick, *Snakes in the Eagle’s Nest: A History of Ground Attacks on Air Bases* (Santa Monica, CA: RAND, January 1, 1995), https://www.rand.org/pubs/monograph_reports/MR553.html; David A. Shlapak and Alan J. Vick, “Check Six Begins on the Ground”: *Responding to the Evolving Ground Threat to U.S. Air Force Bases* (Santa Monica, CA: RAND, January 1, 1995), https://www.rand.org/pubs/monograph_reports/MR606.html.

⁸⁰ Cedric Delves, *Across an Angry Sea: The SAS in the Falklands War* (London: Hurst and Company, 2018), 131–174.

⁸¹ Yung, “Sinica Rules the Waves?”

⁸² Stillion and Orletsky, *Airbase*

Vulnerability to Conventional Cruise-Missile and Ballistic-Missile Attacks, 39–42.

⁸³ O’Brien, *How the War Was Won*.

⁸⁴ Patrick Mills et al., *Building Agile Combat Support Competencies to Enable Evolving Adaptive Basing Concepts* (Santa Monica, CA: RAND, April 16, 2020), 7–8, https://www.rand.org/pubs/research_reports/RR4200.html.

⁸⁵ Peszke, “Poland’s Military Aviation, September 1939”; Bartłomiej Belcarz and Robert Peczkowski, *White Eagles: The Aircraft, Men, and Operations of the Polish Air Force 1918–1939* (Otrringham, UK: Hikoki Publications, Ltd., 2001), 182–200.

⁸⁶ Lucas Choate, “Failure Is Not an Option: Changing the Paradigm on Air Force,” *The Mitchell Forum*, no. 34, September 2020, https://mitchellaerospacepower.org/wp-content/uploads/2021/01/a2dd91_5a383894ec7b4982b3f23de3021245ed.pdf; Robert Kingery, “Maxwell AFB—Gunter Annex Airmen Take on the Challenge of Kingfish ACE,” Maxwell Air Force Base, August 12, 2022.

⁸⁷ Joseph Sinclair, *Arteries of War: Military Transportation From Alexander the Great to the Falklands—and Beyond* (Shrewsbury, UK: Airlife Publishing, 1992), 36.

⁸⁸ Haddick, *Fire on the Water*, 1–10; 2022 *National Defense Strategy of the United States of America* (Washington, DC: Department of Defense, 2022).

⁸⁹ Bradley Martin and Christopher G. Pernin, “So Many Questions, So Little Time for Pacific Logistics,” *The RAND Blog*, June 23, 2023, <https://www.rand.org/pubs/commentary/2023/06/so-many-questions-so-little-time-for-pacific-logistics.html>.

⁹⁰ Martin and Pernin.

⁹¹ Sattely and Paredes, “Sustainment of the Stand-In Force.”

⁹² For a definition of *lateral seams*, see Kress, *Operational Logistics*, 68–69.

⁹³ Patrick Griffin, “The Marine Corps

Needs a Local Supply-Web Logistics System,” USNI *Proceedings* 149, no. 10 (October 2023), <https://www.usni.org/magazines/proceedings/2023/october/marine-corps-needs-local-supply-web-logistics-system>; Gabe E. Mata, “A Marine Corps Supply Chain in the Indo-Pacific,” *Marine Corps Gazette* 108, no. 3 (March 2024), 28–31; Jeffrey M. Hubbard and W. Tyler Horton, “The Formation of Littoral Logistics Concepts,” *Marine Corps Gazette* 108, no. 3 (March 2024), 73–78.

⁹⁴ “Why Logistics Are Too Important to Be Left to the Generals.”

⁹⁵ For a definition of *longitudinal seams*, see Kress, *Operational Logistics*, 68–69.

⁹⁶ Kress, 1–25; John E. Wissler, “Logistics: The Lifeblood of Military Power,” *Heritage Foundation*, October 4, 2018, <https://www.heritage.org/military-strength-topical-essays/2019-essays/logistics-the-lifeblood-military-power>.

⁹⁷ Wissler, “Logistics.”

⁹⁸ Mills et al., *Building Agile Combat Support Competencies to Enable Evolving Adaptive Basing Concepts*.

⁹⁹ MCDP 4, *Logistics*, chaps. 2, 4.

¹⁰⁰ Martin and Pernin, “So Many Questions, So Little Time for Pacific Logistics.”

¹⁰¹ Kane, *Military Logistics and Strategic Performance*, conclusion.

¹⁰² Public Remarks by Chief of Staff of the Air Force General David Goldfein, Nellis Air Force Base, Nevada, September 17, 2017.

¹⁰³ For some discussion on this point, see Priebe et al., *Distributed Operations in a Contested Environment*, ix–xi; James A. Leftwich, Bradley DeBlois, and David T. Orletsky, *Supporting Combat Power Projection Away From Fixed Infrastructure* (Santa Monica, CA: RAND, January 26, 2022), ix–xi, https://www.rand.org/pubs/research_reports/RR596-1.html; Choate, “Failure Is Not an Option,” 7–8.

¹⁰⁴ Peter Suci, “The Really Boring Way China Would Try to Win a War Against America,” *The National Interest*, June 9, 2020, <https://nationalinterest.org/blog/buzz/really-boring-way-china-would-try-win-war-against-america-162036>.

¹⁰⁵ Choate, “Failure Is Not an Option.”

¹⁰⁶ Multiple examples can be found on their public domain Websites. Some examples include the Air Force Contingency Response Wing, Air Force Advanced Logistics Readiness Officer Course, Advanced Maintenance and Munitions Officer School, Army Sustainment University, among others.

¹⁰⁷ For some examples, see Jeffrey D. Horning, “Compressing the Spring: How III Armored Corps Sustains Large-Scale Combat Operations,” *Army Sustainment*, Winter 2024, 12–16; Sean T. Conderman and William J. Culp IV, “Littoral Sustainment Teams,” *Marine Corps Gazette* 108, no. 3 (March 2024), 46–53; Nicholas R. Boivin, “Logistics in the Littorals: Designing the Future Tactical-Level LCE,”

Marine Corps Gazette, March 2022; Priebe et al., *Distributed Operations in a Contested Environment*, ix–xi.

¹⁰⁸ The use of the term *weapons school* is an oversimplification, but the broad point remains. The Marines have the Weapons and Tactics Instructor Course, the Air Force has the Air Force Weapons School (formerly Fighter Weapons School), and the Navy has the Fighter Weapons School, among others.

¹⁰⁹ Author’s experience.

¹¹⁰ Privatsky, *Logistics in the Falklands War*.

¹¹¹ Privatsky.

¹¹² Privatsky; Michael J. Gunther, “Getting Ashore: Joint Logistics at the Battle of San Carlos,” in *The Long Haul: Historical Case Studies of Sustainment in Large-Scale Combat Operations*, ed. Keith R. Beurskens (Fort Leavenworth, KS: Army University Press, 2018), 120, <https://www.armyupress.army.mil/Portals/7/combats-studies-institute/csi-books/the-long-haul-isco-volume-4.pdf>; Thompson, *The Lifeblood of War*; Julian Thompson, *3 Commando Brigade in the Falklands: No Picnic* (South Yorkshire, UK: Pen and Sword Military, 2009); Michael Clapp and Ewen Southby-Tailyour, *Amphibious Assault Falklands: The Battle of San Carlos Water* (South Yorkshire, UK: Pen and Sword Military, 2007).

¹¹³ Gunther, “Getting Ashore: Joint Logistics at the Battle of San Carlos,” 123–124.

¹¹⁴ For a definition of *directive logistics authority*, see Joint Publication 4-0, *Joint Logistics* (Washington, DC: The Joint Staff, July 20, 2023).

¹¹⁵ Roque, “Army to Use Operation Pathways.”

¹¹⁶ Author interview with U.S. Joint Staff experts on Japan, 2024.

¹¹⁷ Angell, “Logistics as Maneuver.”

¹¹⁸ Marcus Gillett, “The Role of Logistics in Deterrence—MCA,” *Marine Corps Gazette* 108, no. 3 (March 2024), 16–19.

¹¹⁹ Griffin, “The Marine Corps Needs a Local Supply-Web Logistics System.”

¹²⁰ Stanley McChrystal et al., *Team of Teams: New Rules of Engagement for a Complex World* (New York: Portfolio, 2015).

¹²¹ David Wilson, “Army Sustainment Capabilities: Instrumental to the Joint Force in the Indo-Pacific Region,” *Joint Force Quarterly* 108 (1st Quarter 2023).

¹²² Gabriel W. Pryor, “Logistics in the Indo-Pacific: Setting the Theater for a Conflict Over Taiwan,” *Army Sustainment*, Winter 2024, 12–16; Wilson, “Army Sustainment Capabilities.”

¹²³ Nathan Freier, John Schaus, and William Braun, “The U.S. Is Out of Position in the Indo-Pacific Region,” *Defense One*, July 19, 2020, <https://www.defenseone.com/ideas/2020/07/us-out-position-indo-pacific-region/166964/>.

¹²⁴ Nathan P. Freier, John Schaus, and William G. Braun III, *An Army Transformed:*

USINDOPACOM Hypercompetition and U.S. Army Theater Design (Carlisle, PA: U.S. Army War College Press, July 17, 2020), 62–64, <https://press.armywarcollege.edu/cgi/viewcontent.cgi?article=1905&context=monographs>.

¹²⁵ Eccles, “Logistics and Strategy”; Henry E. Eccles, “Logistics in the National Defense,” *Naval War College Review* 12, no. 9 (1959); Choate, “Failure Is Not an Option,” 7–8; Henry E. Eccles, *Operational Naval Logistics* (Honolulu: University Press of the Pacific, 1950), 35–41.

¹²⁶ Kress, *Operational Logistics*, 61–84.

¹²⁷ Elbridge A. Colby, *The Strategy of Denial: American Defense in an Age of Great Power Conflict* (New Haven: Yale University Press, 2021).

¹²⁸ Vincent A.W.J. Marchau et al., eds., *Decision Making Under Deep Uncertainty* (Cham: Springer Nature, 2019), <https://link.springer.com/book/10.1007/978-3-030-05252-2>.

¹²⁹ Leftwich, DeBlois, and Orletsky, *Supporting Combat Power Projection Away From Fixed Infrastructure*.

¹³⁰ Thomas Walsh and Alexandra Huber, “A Symphony of Capabilities: How the Joint Warfighting Concept Guides Service Force Design,” *Joint Force Quarterly* 111 (4th Quarter 2023).

¹³¹ Frank Wolfe, “Joint Warfighting Concept Assumes ‘Contested Logistics,’” *Defense Daily*, October 6, 2020, <https://www.defensedaily.com/joint-warfighting-concept-assumes-contested-logistics/pentagon/>.

¹³² Author interview with U.S. Marine Corps logistician, April 2024.

¹³³ Wilson, “Army Sustainment Capabilities.”

¹³⁴ For example, see Nathan J. Gervaise, “Self-Sustainment in an EAB,” *Marine Corps Gazette* 108, no. 3 (March 2024), 54–55.

¹³⁵ Hammes, *Game-Changers*; Sean Ford, “Making Tactical-Level Logistics More Survivable: Employing an Infiltration Mindset,” *Marine Corps Gazette*, March 2021.

¹³⁶ Wilson, “Army Sustainment Capabilities”; Charles Flynn and Tim Devine, “To Uppgun Seapower in the Indo-Pacific, You Need an Army,” USNI *Proceedings* 150, no. 2 (February 2024), <https://www.usni.org/magazines/proceedings/2024/february/upgun-seapower-indo-pacific-you-need-army>.

¹³⁷ Haddick, *Fire on the Water*, 206–207.

¹³⁸ Lyla Englehorn, “Logistics in Contested Environments—Warfare Innovation Continuum (WIC) Workshop September 2019 After Action Report,” Consortium for Robotics and Unmanned Systems Education and Research, Naval Postgraduate School, November 14, 2019.

¹³⁹ Patrick Griffin, “Contested Logistics: Adapting Cartel Submarines to Support Taiwan,” USNI *Proceedings* 150, no. 1 (January 2024), <https://www.usni.org/>

magazines/proceedings/2024/january/contested-logistics-adapting-cartel-submarines-support-taiwan; Walker D. Mills, “Contested Logistics: Look to the Illicit Drug Trade,” *USNI Proceedings* 147, no. 8 (August 2021), <https://www.usni.org/magazines/proceedings/2021/august/contested-logistics-look-illicit-drug-trade>; Brent Stricker, “EABO Degraded Logistics in the WEZ: Self Propelled Semi-Submersible Solutions,” *Center for International Maritime Security*, October 11, 2022, <https://cimsec.org/eabo-degraded-logistics-in-the-wez-self-propelled-semi-submersible-solutions/>; Alec Blivas, “6 Platforms for Marine Expeditionary Advanced Base Operations Logistics,” *The Diplomat*, November 11, 2020, <https://thediplomat.com/2020/11/6-platforms-for-marine-expeditionary-advanced-base-operations-logistics/>.

¹⁴⁰ Ross Ochs, “Big Fight, Small Logistics Apparatus,” *Marine Corps Gazette* 108, no. 3 (March 2024), 62–65.

¹⁴¹ Englehorn, “Logistics in Contested Environments.”

¹⁴² Brian E. Hamel, “Supporting Warfare in the Indo-Pacific Through Space-Based Sustainment,” *Army Sustainment*, Winter 2024, https://www.army.mil/article/272928/supporting_warfare_in_the_indo_pacific_through_space_based_sustainment; Von P.H. Fernandes et al., “The World in 90 Minutes or Less: Rocket Logistics and Future Military Operations,” *Campaigning*, October 13, 2022.

¹⁴³ Garrett Reim, “Regent to Demo Seaglider for U.S. Marines’ Warfighting Lab in 2025,” *Aviation Week* (October 18, 2023), <https://aviationweek.com/aerospace/emerging-technologies/regent-demo-seaglider-us-marines-warfighting-lab-2025>; Mills, Phillips-Levine, and Taylor, “Modern Sea Monsters.”

¹⁴⁴ Chris Bernotavicius et al., “You Go to War With the Watercraft You Have,” *War on the Rocks*, July 26, 2022, <https://warontherocks.com/2022/07/you-go-to-war-with-the-watercraft-you-have/>; Rae Higgins, “New Vessel Class Enters Army Watercraft Fleet With Prototype Launch,” U.S. Army, October 12, 2022, https://www.army.mil/article/260993/new_vessel_class_enters_army_watercraft_fleet_with_prototype_launch; Jennifer Hlad, “Army Takes on a Naval Tinge as It Adapts to the Pacific,” *Defense One*, October 16, 2023, <https://www.defenseone.com/threats/2023/10/army-takes-naval-tinge-it-adapts-pacific/391251/>; Nick Wadhams, “U.S. Navy Secretary Looks to Asia to Revive Shipbuilding at Home,” *Bloomberg*, February 26, 2024; Pete Pagano, “Use the Gator Navy for Combat Logistics,” *USNI Proceedings* 148, no. 7 (July 2022), <https://www.usni.org/magazines/proceedings/2022/july/use-gator-navy-combat-logistics>; Joe Greco, “Unpacking Merchant Shipping,” *USNI Proceedings* 150, no. 2 (February 2024), <https://www.usni.org/magazines/proceedings/2024/february/unpacking-merchant-shipping>.

org/magazines/proceedings/2024/february/unpacking-merchant-shipping.

¹⁴⁵ For detailed examples of advanced manufacturing and fuels, see Andrew P. Armstrong, “3-D Printing: From Cutesy to Credible,” *USNI Proceedings* 150, no. 2 (February 2024), <https://www.usni.org/magazines/proceedings/2024/february/3-d-printing-cutesy-credible>; Patrick Tucker, “The Air Force Is Quietly Revolutionizing Parts Replacement,” *Defense One*, April 2, 2024, <https://www.defenseone.com/technology/2024/04/air-force-help-startup-quietly-revolutionizing-parts-replacement/395430/>; Walker D. Mills and Erik Limpacher, “Need Fuel? Marines Should Make Moonshine Hydrogen,” *USNI Proceedings* 147, no. 11 (November 2021), <https://www.usni.org/magazines/proceedings/2021/november/need-fuel-marines-should-make-moonshine-hydrogen>; Chase Smeeks, “Harvest Hydrogen for Distributed Logistics,” *USNI Proceedings* 149, no. 1 (January 2023), <https://www.usni.org/magazines/proceedings/2023/january/harvest-hydrogen-distributed-logistics>.

¹⁴⁶ Hammes, *Game-Changers*; John Antal, *7 Seconds to Die: A Military Analysis of the Second Nagorno-Karabakh War and the Future of Warfighting* (Philadelphia: Casemate Publishing, 2022).

¹⁴⁷ Leftwich, DeBlois, and Orletsky, *Supporting Combat Power Projection Away From Fixed Infrastructure*, ix–xi; Jack Watling, “Automation Does Not Lead to Leaner Land Forces,” *War on the Rocks*, February 7, 2024, <https://warontherocks.com/2024/02/automation-does-not-lead-to-leaner-land-forces/>.

¹⁴⁸ John R. Hoehn, *Joint All-Domain Command and Control: Background and Issues for Congress*, R46725 (Washington, DC: CRS, March 18, 2021), <https://crsreports.congress.gov/product/pdf/R/R46725/2>.

¹⁴⁹ Art Sellers, “Four Ways DOD Can Leverage AI for Contested Logistics,” *Defense Scoop*, June 20, 2023, <https://defensescoop.com/2023/06/20/four-ways-dod-can-leverage-ai-for-contested-logistics/>.

¹⁵⁰ For thoughtful articles that discuss artificial intelligence’s promise in contested logistics (at the risk of overstating their cases), see Bart De Muynck, “The True Role of AI in Logistics,” *Forbes*, August 17, 2023, <https://www.forbes.com/sites/forbestechcouncil/2023/08/17/the-true-role-of-ai-in-logistics/>; Rome Ruiz, “Redefining Contested Logistics: How AI Can Optimize the Navy’s Refueling Operations,” SparkCognition Government Systems, March 17, 2023, <https://sparkgov.ai/blog/redefining-contested-logistics-how-ai-can-optimize-the-navys-refueling-operations/>; Robert D. Wolfe and Matthew T. Barnes, “Artificial Intelligence in the Marine Corps Logistics Enterprise: Part 1,” *Marine Corps*

Gazette, November 15, 2023, <https://www.mca-marines.org/gazette/ai-in-the-marine-corps-logistics-enterprise-part-1/>; Everrett Bud Lacroix, “Future of Army Logistics: Exploiting AI, Overcoming Challenges, and Charting the Course Ahead,” *Army Sustainment*, August 1, 2023, https://www.army.mil/article/267692/future_of_army_logistics_exploiting_ai_overcoming_challenges_and_charting_the_course_ahead; “Transforming Army Logistics: The AI Revolution,” *Aerospace and Defense Review*, October 4, 2023, <https://www.aerospacedefensereview.com/news/transforming-army-logistics-the-ai-revolution-nwid-1385.html>; Harrison Schramm and Regan Copple, “Prepare for AI-Enabled Future Logistics,” *USNI Proceedings* 147, no. 11 (November 2021), <https://www.usni.org/magazines/proceedings/2021/november/prepare-ai-enabled-future-logistics>.

¹⁵¹ Audrey Decker, “Can AI Reduce Air Force Logistics Planning From Days to Minutes?” *Defense One*, February 1, 2024, <https://www.defenseone.com/threats/2024/02/can-ai-reduce-air-force-logistics-planning-days-minutes/393850/>.

¹⁵² William T. Smith, “Contested Logistics: AI, Optimization, and Rational Thought (A Mathematician’s Lament),” *Army Sustainment*, February 1, 2024, https://www.army.mil/article/272917/contested_logistics_ai_optimization_and_rational_thought_a_mathematicians_lament.

¹⁵³ For a discussion of training algorithms, see Smith, “Contested Logistics.” For a discussion of training an algorithm on simulations (as with DeepMind Technology’s AlphaGo), see Kai-Fu Lee, *AI Superpowers: China, Silicon Valley, and the New World Order* (Boston: Houghton Mifflin Harcourt, 2018).

¹⁵⁴ Smith, “Contested Logistics.”