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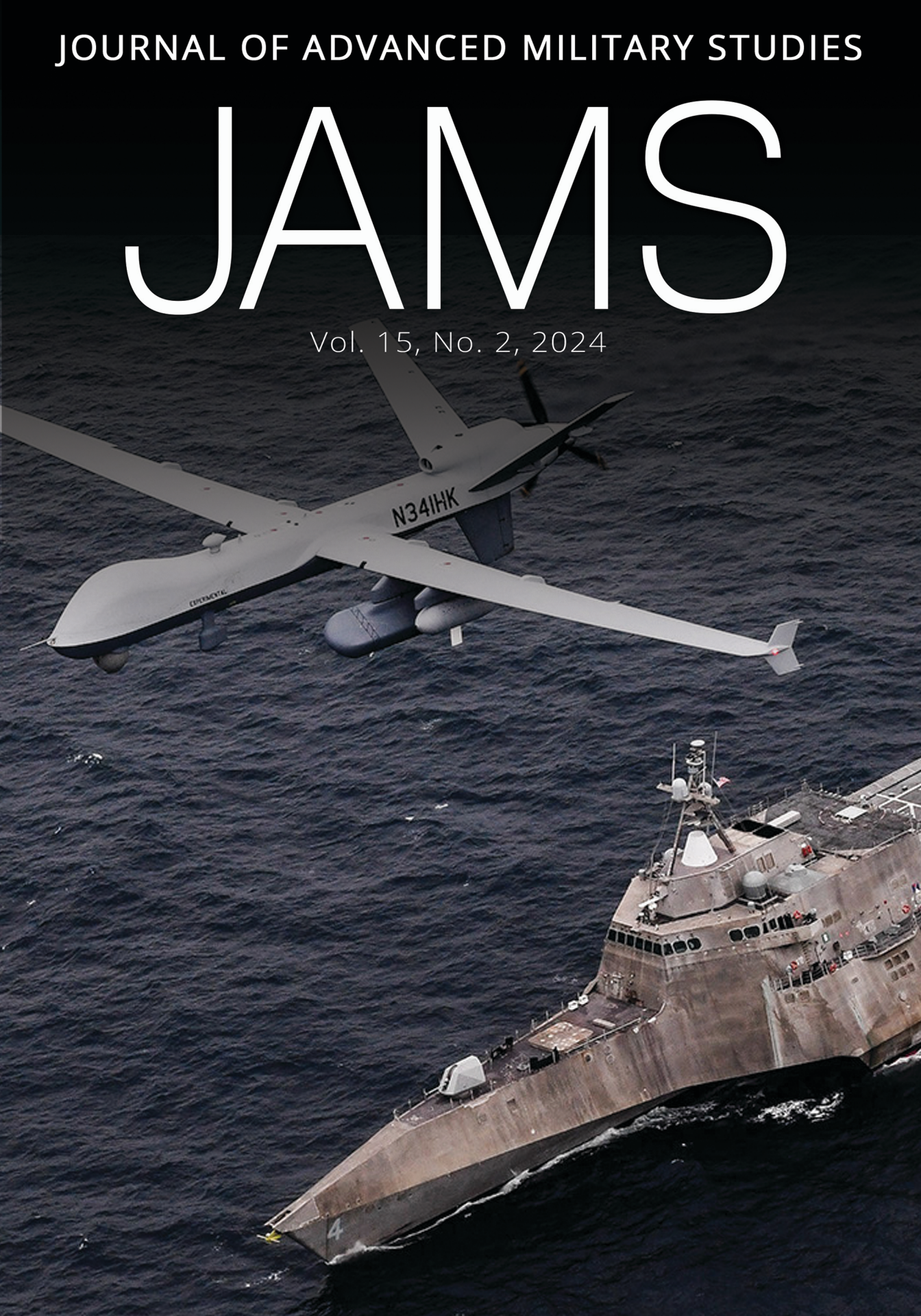

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Rescuing the Unreachable
Personnel Recovery and Resupply in a Contested A2/AD Environment

Captain William Fensterer, USN; Colonel Richard Marshall Jr., USMC; Commander Colleen Minihan, USN; and Lieutenant Colonel Jason Phillips, USA

Abstract: In a potential armed conflict between the United States and the People's Republic of China in the Indo-Pacific, sustainment of the Joint force is not assured. China's modernized antiaccess/area-denial (A2/AD) capabilities threaten sustainment lines of communication and challenge successful joint personnel recovery operations. This article examines the Joint operating environment through the lens of a historical case study, analysis of the current operating environment, and an assessment of the future operating environment—the next fight. The authors propose large quantity artificial intelligence (AI)-capable unmanned systems and a scalable force concept able to penetrate the A2/AD and recover and resupply the Joint force. Fielding new and existing technologies, continual doctrine refinement, and tailored wargaming is necessary to find and cover the gaps in our capabilities and be prepared to win the next fight.

Keywords: personnel recovery, contested logistics, sustainment, antiaccess/area-denial, A2/AD, expeditionary advanced base operations, EABO, Indo-Pacific

The potential for a direct conflict between the United States and the People's Republic of China (PRC) is driving the U.S. military to reconsider how the Joint force will fight and win a war in the Indo-Pacific

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region. Technology advances in the last 80 years since World War II undeniably shifted the character of modern warfare. China's military capacity and modernized antiaccess/area-denial (A2/AD) capabilities threaten sustainment lines of communication and impose risk to isolated personnel recovery operations. Sustainment of the Joint force in a modern-day war is not assured. This article examines the joint operating environment through the lens of a historical case study, analysis of the current operating environment, and an assessment of the future operating environment—the next fight. To address this issue, the authors propose large quantity artificial intelligence (AI)-capable unmanned systems and a scalable force concept able to penetrate the A2/AD and recover and resupply the Joint force. Fielding new and existing technologies, continual doctrine refinement, and tailored wargaming is necessary to find and cover the gaps in our capabilities and be prepared to win the next fight.

A Historical Perspective: Guadalcanal

The Pacific theater in WWII provides a comparative study of potential conflict with China. Specifically, the Guadalcanal campaign offers insight into the plight of U.S. military losses associated with executing personnel recovery in contested waters and resupplying units that become cut off from friendly forces.

During the Guadalcanal campaign, the U.S. Navy faced the staggering challenge of recovering sailors adrift in seas with swift currents, dangerous wildlife, and prowling enemy vessels. The Marine Corps faced a similarly desperate task of sustaining a growing force on shore who were always one lost naval engagement from being cut off from resupply. The Navy reduced casualties and provided consistent resupply because of sufficient freedom of maneuver and uncontested forward basing, which will likely be contested in a future conflict. Naval forces operating in the Pacific were perpetually concerned with being spotted from the air, surface, or subsurface, but being spotted generally required a human to see an enemy vessel. Radar was still new and not fully trusted by many senior officers.[1] Even when spotted by radar, units had few options for an attack: move close enough to strike, deploy aircraft, or surface and fire torpedoes. This environment permitted high-value ships to act as screens for search and rescue vessels with a low risk to the force.

At the same time, the fleet made excellent use of its aerial lines of communication and aviation assets to ensure that sailors adrift were rescued and isolated forces were resupplied. In some cases, Consolidated PBY Catalina seaplanes could land on the ocean and provide emergency supplies like food, water, and life rafts to survivors as well as take on the severely wounded before departing. This avenue of rescue is unlikely to be available to modern forces due to the projected A2/AD zones and weapons engagement zones, which will restrict even the fastest platforms from providing relief. Current methods of aerial resupply

and medical evacuation (medevac) rely on the helicopter with its limited range and supply planes, such as the Lockheed C-130 Hercules, which will face the same A2/AD issues as surface vessels, further limiting commanders' options.

During the naval engagement, the Navy lost approximately 30 warships.[2] As many as 10,000 sailors were adrift; thousands were killed in action from active combat and water exposure, and thousands more were wounded, awaiting rescue.[3] Many were saved by the quick action of personnel rescue teams and ad hoc rescue sorties performed by ships and aircraft in the area. They were successful because of their ability to operate in a reasonably uncontested environment.[4]

Landing craft available to forces in the Guadalcanal campaign were instrumental to the survival of many sailors who would have otherwise been forced to wait for their ships to limp back to a safe harbor. The landing craft were multirole vessels providing daring rescue to sailors adrift in Iron Bottom Sound while simultaneously providing medevac to wounded sailors aboard stricken vessels and running supplies from supply ships and warships alike to maintain the ground forces ashore. These vessels were an innovative medevac method, but were reliant on a mother supply ship, maritime superiority, and near shore operations, limiting their usefulness in a modern campaign against the PRC and negating their value in the event of cutoff forces.

Aerial lines of communications critical to sustainment were also largely unrestricted during the Guadalcanal campaign. Navy and Marine Corps air efforts to assist in the defense and resupply of Guadalcanal is well known. During the campaign, when supply routes became constrained, fast-moving destroyers moved the bulk of supplies to the island.[5] These ships were armored enough to survive limited combat and quick enough to escape to open water where they could evade enemy forces more effectively.[6] At times, even these vessels could not get close enough for landing craft to reach them, and the Marines were forced to rely on transport planes to provide enough basic survival supplies.[7] In addition to resupply, these planes were also used to transport casualties back to their home bases.[8]

Neither all-domain superiority nor secure lines of communication are assured in a modern war. A contemporary campaign in the Pacific will be against an adversary with formidable A2/AD capabilities and an exponentially expanded weapons engagement zone. Freedom of action will be severely restricted and will limit the United States' ability to effect personnel recovery and sustainment as it did during the Guadalcanal campaign.

The Indo-Pacific Operating Environment

Since the battle of Guadalcanal, the Indo-Pacific geography has remained the same. The region comprises more than 100 million square miles of predominantly maritime operational space.[9] However, advanced technology and the

People's Liberation Army (PLA) modernization have changed the character of future conflict. Key terrain and assets can now be threatened at greater ranges through space, cyber, precision weaponry, and informational cuing.

Emerging PRC military capabilities pose a significant challenge to operations, especially in the South and East China Seas. The People's Liberation Army Rocket Forces (PLARF) possesses ballistic missiles capable of striking U.S. bases as far away as Guam and antiship missiles capable of targeting an aircraft carrier at sea.[10] The PLA Navy (PLAN) currently has 355 ships, including surface combatants, submarines, amphibious ships, and auxiliary vessels; by 2025, this fleet is expected to grow to 420 ships.[11] The naval force is augmented by a large fleet of civilian-owned and operated vessels that serve a commercial and military dual purpose. Many Chinese fishing and other civilian-owned small vessels augment PLAN operations as the PLA Maritime Militia (PLAMM).[12] The PLAMM has the potential to surge a significant number of vessels to support Chinese aims, with some estimates numbering the distant water fishing fleet at more than 4,600 vessels strong.[13] A portion of the PLAMM is also capable of conducting mining and air defense missions. The PLA Air Force (PLAAF) possesses significant capability to employ fourth- and fifth-generation fighters, medium-range bombers, modern missiles, and precision munitions.[14] The PLAAF also operates an increasingly capable integrated air defense system and airborne- and space-based sensors.[15] Each of these PLA military services depends on cuing from one of three newly created PLA arms: The PLA Aerospace Force, Cyberspace Force, and the Information Support Force, which actively seeks to target and exploit vulnerabilities in U.S. space, cyber, and information activities. In a conventional fight, the Joint force cannot concentrate combat power without accepting mission-critical risks imposed by these integrated PLA systems.

U.S. victory in the Pacific during WWII was achieved by amassing overwhelming quantities of platforms compared to the Imperial Japanese Navy's fleet. In 1944, the U.S. Navy had 6,084 ships, compared to 381 combined combatants and auxiliaries in the current inventory.[16] The Air Transport Command (ATC) operated Curtiss C-46 Commando, Douglas C-47 Skytrain, C-56, and C-84 aircraft, controlled a force of more than 3,700 total aircraft by 1945, and delivered more than 650,000 tons of cargo from 1942 to 1945 in support of the Burma theater alone.[17] The Battle of Okinawa was supported by the most significant amphibious assault force in history, consisting of more than 1,600 vessels and supported by a robust fleet of cargo aircraft.[18] The sheer quantity of assets available for both personnel recovery and logistics during WWII will be challenging to match in a modern campaign, even with ally and partner support.

The Next Fight: Personnel Recovery

Current combat search and rescue techniques are insufficient to cover the scale of expected casualties resulting from a kinetic war with the PRC. Some wargames suggest the United States may lose 2 aircraft carriers, 10–20 large surface combatants, and such tremendous aircraft losses to risk "running out" of fighter/attack aircraft in an initial campaign.[19] The loss of two carrier airwings alone equates to roughly 400 pilots and flight officers; each replacement would require approximately three years of basic proficiency training and the combat experience lost would be invaluable and irreplaceable.[20] Future wargames should continue the conflict after the initial campaign to incorporate actions after a mass casualty or loss of contact events to validate the full impact on subsequent phases of operation.

Personnel replacements are a difficult challenge and range in size from a single-seat fighter pilot to a 5,000 person aircraft carrier. To maintain the initiative after the loss of a platform, personnel recovery and reutilization is the preferred method to reconstitute forces and continue fighting in lieu of training new replacements. Ingress to the downed aviators or sinking ships and egress to safety requires balancing both established and innovative technologies to mitigate additional losses of recovery personnel and high-value assets. An in-depth look at personnel recovery in a contested environment and new advances in unmanned systems follows.

To approach mainland China, U.S. forces must navigate multiple island chains through the Northern Pacific, Philippine Sea, Sulu Sea, and Java Sea while deceiving and avoiding A2/AD networks.[21] The PRC's A2/AD systems are expansive but only one of many dangers in the region. Their advanced weaponry and buildup in the South China Sea, the Democratic People's Republic of Korea's ballistic missiles, Russian posturing in the Aleutians, and persistent violent extremist organization threats, all impact Joint force operations.[22] The Joint force must press the offensive on land and at sea to achieve combat objectives. Doing so encroaches on the PRC's established surface and air missile weapons engagement and intelligence, surveillance, and reconnaissance (ISR) coverage, increasing the risk of additional casualties to recovery forces.[23] Between the PLAN, PLAMM, and China's Coast Guard, the PRC is expected to have more than 800 maritime platforms concentrated in the Western Pacific by 2030.[24] Modern tactics sending manned search and rescue assets to the scene will result in additional loss of life. To counter, the United States should forward deploy a combination of manned and unmanned personnel recovery systems.

Current manned surface initiatives involve an in-development light amphibious warship (LAW, renamed medium landing ship) and a combination of Service capabilities. Codi Mullen's Naval Postgraduate School master's thesis suggests that the Navy and Marine Corps integrated model for LAW and litto-

ral marine regiment is a potential solution to personnel recovery and resupply.[25] LAW has sufficient capacity, but modeling leans toward recovery *or* resupply, not both. Also, production delays, speed, weather, and disaggregated operations may preclude LAW as a contested environment option. Mullen does, however, identify a requirement for an afloat command and control node as a means for execution. In Noble Vanguard 12-21, the Navy experimented with a mine countermeasures concept using an expeditionary sea base as an afloat base of operations supported by a littoral combat ship.[26] The lessons learned from that exercise retooled with expeditionary sea base, littoral combat ship, and LAW have the potential to address larger scale recovery, but without local sea control and air superiority, the size and slower speeds make the ships and crews susceptible to loss by A2/AD defenses. The impact can be mitigated using low-cost, unmanned connectors.

Commercial unmanned systems mitigate the potential loss of life, but none are consolidated as a scalable military capability. Many people are familiar with the Northrop Grumman MQ-4C Triton and Northrop Grumman MQ-8 Fire Scout due to widespread news and social media coverage and their routine role in maritime operations; however, in 2022, the U.S. Navy's Fifth Fleet "conducted the world's largest unmanned maritime exercise to date involving ten nations and bringing more than 80 unmanned platforms together."[27] The experimentation highlighted multiple commercial products with ISR applications. Of those, the Devil Ray T38 unmanned surface vessel resembles a medium-size speedboat and has the optimal capabilities of speed (71 knots), maneuverability (waypoint guided), and payload (4,500 pounds) tailorable to a smaller footprint personnel recovery mission.[28] In the air domain, AeroVironment Inc's SOAR glider is capable of autonomous flight and 500 pounds payload, with 18–30 stored on existing air mobility command platforms.[29] SOAR will not be able to recover personnel, but it will be able to provide sustainment and a low-cost targeting problem for adversaries until surface extraction. With existing technology, multidomain fielding and experimentation on a mass scale are required to validate capability.

Normalizing mass unmanned systems in the U.S. Indo-Pacific Command (INDOPACOM) to discern patterns of life anomalies similar to other areas of operation is needed. U.S. Fifth Fleet's commander, Vice Admiral Brad Cooper's vision in Central Command was to create a digital ocean, "a resilient mesh network with every partner and sensor collecting new data, adding it to an intelligent synthesis of around-the-clock inputs, encompassing thousands of images from the seabed to space, from ships, unmanned systems, subsea sensors, satellites, buoys, and other persistent technology."[30] Central Command's model is supported by an information operations campaign focusing on maritime domain awareness and combating illegal regional activities. In the Indo-Pacific,

advocating for a similar "digital Pacific" with Association of Southeast Asian Nations (ASEAN) and Cooperation Afloat Readiness and Training (CARAT) partners, and the Oceania Maritime Security Initiative would create a broad network of systems supporting mutual security interests and humanitarian assistance/disaster response where those same passive sensors could vector in to assist short-notice personnel recovery.[31]

Guiding multiple unmanned systems to their destinations will require a resilient AI backbone. Service components have individual efforts underway to capitalize on AI, but no mature Joint architecture fusing the capabilities. Joint all-domain command and control (JADC2) is designed to interconnect sensors and integrate all the Service components to "tie every sensor to every shooter irrespective of service, domain, or partner," but it is still early in development.[32] JADC2 is progressing through the Navy's Project Overmatch, the Army's Project Convergence, and Air Force's Advanced Battle Management System, with the Marine Corps experimenting with networked and sensing expeditionary advanced base operations (EABO).[33] A mature, fully integrated, and trusted AI mesh network is critical to personnel recovery and allows the use of similar concepts and platforms to bring rear sustainment forward.

The Next Fight: Contested Logistics

Current logistics support techniques must be revised to provide the quantity of supplies required during a kinetic war with the PRC. A large fleet of ships and planes enabled logistics support during WWII. More than 50 percent of the USN ship inventory, 3,140 ships, had a logistics focused mission to support the Pacific campaign.[34] The sheer quantity of ships and planes dedicated to logistics greatly enhanced the responsiveness and resiliency of lines of communication. In terms of logistics, quantity of assets produced quality support.

Today, the foundation of operational logistics support in the Indo-Pacific is a network of bases and stations that serve as nodes for force generation, protection, and sustainment. Notably, there are at least 10 main operating bases in the region that the PLA targets as significant operational logistics sites that must be neutralized in the event of armed conflict with the United States.[35] These bases are linked by military and civilian sea and air assets, with host nations enabling operational logistics by allowing the United States use of civilian infrastructure. The requirement for increased force dispersion to cope with adversary long-range and precision fires creates exterior lines of communication and increases the likelihood that PLA forces will interdict sustainment operations.

The Navy and Marine Corps developed operating concepts emphasizing distributed forces, integrated networks of sensors and shooters, and delivering massed fires on targets to overwhelm adversary capabilities.[36] The Marine Corps EABO doctrine describes how Marines will fight in a tactical scenario like the

one presented by the PLA in the Western Pacific and South and East China Seas. According to the EABO manual:

> EABO is a form of expeditionary warfare that involves the employment of mobile, low-signature, persistent, and relatively easy to maintain and sustain naval expeditionary forces from a series of austere, temporary locations ashore or inshore within a contested or potentially contested maritime area in order to conduct sea denial, support sea control, or enable fleet sustainment.[37]

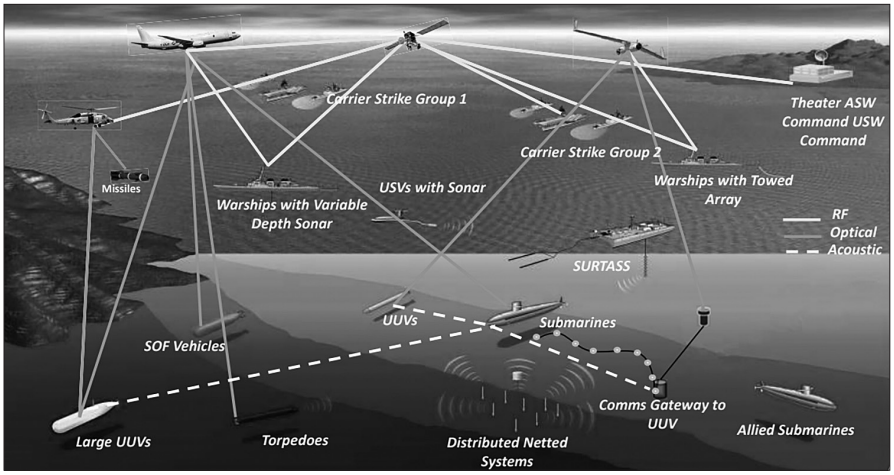
The doctrine presents how dispersed Marine formations operating from temporary expeditionary advanced bases within the weapons engagement zone of an adversary will conduct sea denial, sea control, maritime domain awareness, forward command, control, communications, computers, combat systems, intelligence, surveillance, reconnaissance, targeting (C5ISRT), counter-C5ISRT, and forward sustainment to Joint forces and allies.[38]

The employment of dispersed expeditionary advanced bases within littoral areas and along enemy shipping routes increases the risk of isolation. Under these conditions, the PLA could viably interdict the expeditionary advanced base lines of communications. Tactical formations such as EABOs are designed to have the capability to operate in isolation for extended periods; however, certain supply items such as ammunition, fuel, and critical parts must be continuously sustained.

Ammunition resupply is essential for distributed forces operating under EABO, but the characteristics of ammunition types required to support modern war make resupply challenging. The size, weight, and increasing rate of ammunition consumption in combat limit the throughput of resupply. For example, more bombs were dropped on North Korea during the Korean War than the amount dropped in the entire Pacific theater during WWII.[39] Similarly, twice the tonnage of bombs were dropped on targets during the Vietnam War in Vietnam, Laos, and Cambodia than in the European and Pacific theaters during the whole of WWII.[40] Since the advent of precision guided munitions in the late twentieth century, this type of ammunition has increasingly become the preferred solution to prosecute targets across the battlespace, including the Gulf War, Kosovo, Operation Enduring Freedom, Operation Iraqi Freedom, and many other operations across the globe.

Recent wargames, as well as lessons learned from sustained combat operations in Libya and Ukraine, have shown that the expenditure rates for precision munitions would likely be extremely high during combat operations against the PRC. A wargame conducted by the Center for Strategic and International Studies resulted in simulated Joint forces expending more than 5,000 precision munitions in three weeks of conflict, including 450 antiship missiles.[41] Ukrainian

Figure 1. Notional concept of employment for maritime fires



Source: courtesy of Congressional Research Service, adapted by MCUP.

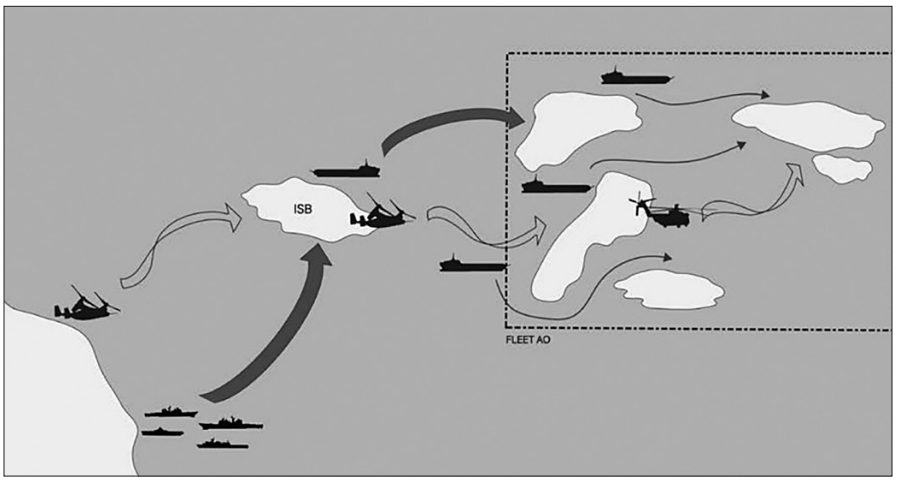
forces have expended more than 9,500 High Mobility Artillery Rocket Systems rockets in less than 12 months against Russian forces.[42] The increased emphasis in U.S. military doctrine on leveraging kill chains and kill webs to prosecute enemy targets sets the conditions for increased use of precision munitions. The likelihood is significant that precision munition resupply will be required for isolated forces.

Fuel is another indispensable sustainment requirement for isolated forces. Even low signature, small formations envisioned by EABO still require fuel to power generators and vehicles necessary for command and control and tactical weapon systems. Additionally, one of the missions of a sustainment expeditionary air bases is to function as a forward arming and refueling point (FARP). An effective FARP, by definition, requires both ammunition and fuel supplies.

Critical parts for high-tech weapons and command-and-control equipment are also vital. These complex "systems of systems" are made up of an array of interconnected electronic and mechanical components. Broken or malfunctioning parts often make the entire piece of equipment inoperable. For example, a faulty electronic component in the antiship Navy Marine Expeditionary Ship Interdiction System would significantly reduce the capability of a fires focused expeditionary air base. Critical repair components are often necessary to maintain or restore combat power.

The relative ease of sustainment may be underestimated, and the Joint force must consider how the expeditionary advanced bases will be reliably resupplied. Enemy action to block or interdict exterior lines of communication creates a distribution issue between an afloat sea base or another EABO. Even with flexible maritime connectors, a gap exists in tactical logistics distribution capability

Figure 2. EABO network



Source: official U.S. Marine Corps image, adapted by MCUP.

to cover the last tactical mile. Ships such as the light amphibious warship and other connectors/sea-basing platforms are expected to be pushed out of range and unable to provide sustainment to isolated forces. This problem can be addressed with an AI-enabled network of persistent autonomous unmanned systems. Nodes in the network would deliver supplies point to point or could form a relay where supplies are handed off from one type of node to another until the final point of distribution is reached. For example, an aerial unmanned system that picks up supplies at one point may hand off its cargo to an unmanned surface system to complete the journey to the isolated EABO. The network can react quickly because the nodes are distributed throughout the region and at the ready. AI enables command and control, dynamic tasking, and decision support and is the basis for the autonomous capability of each node, highlighting the ability to perform a task without human control.[43]

AI-enabled logistics systems present optimized solutions to resupply problems involving mixed unmanned systems with machine learning.[44] This allows the persistent unmanned network to adapt to enemy interdiction and increase the probability of delivery success.[45] Terminal control of an approaching unmanned system can be executed by a person in the receiving unit guiding the system to a safe or alternate destination using a handheld device.[46]

Autonomous unmanned systems could operate as individual systems or as a collaborative network.[47] The number of unmanned assets integrated into this AI-enabled network has no upper limit. Network scalability presents the possibility that hundreds of unmanned systems could be distributed throughout the area of operations. Command and control of these systems would require a level of resiliency to maintain situational awareness. The network would provide the

type of sustainment quality through quantity that enabled U.S. forces during WWII.

Conclusion

In a modern-day conflict in the Indo-Pacific, the primary limiting factor to executing effective resupply and personnel recovery for distributed forces is the quantity of transportation platforms capable of operating in contested air and sea domains. The current and forecast U.S. inventory of ships and aircraft capable of supporting resupply and personnel recovery is insufficient to sustain the Joint force and must be addressed. Fielding new and existing technologies, continual doctrine refinement, and tailored wargaming is vital. Large quantity AI-capable unmanned systems and a scalable force concept able to penetrate the A2/AD and recover and resupply the Joint force may be the solution to a significant capability gap. Doctrinal documents such as the *Tentative Expeditionary Advanced Base Operations Manual* and *Distributed Maritime Operations* recognize the gaps in these capabilities and the potential for unmanned systems to play a critical role in the solution but need to provide more meaningful detail. Additionally, wargame scenarios must expand to incorporate operations to rescue servicemembers after the loss of major assets or after a unit is cut off from consistent resourcing. As Mark Cancian, Matthew Cancian, and Eric Heginbotham state, "A war over Taiwan is not certain, but it is not unimaginable either; for that reason, wargaming such a conflict is important for developing US policy" and also identifying a requirements list that validates future capabilities and resourcing.[48] Experimentation with new technologies and doctrinal changes in robust wargame scenarios is imperative to adequately prepare the Joint force for the potential next fight in the Indo-Pacific.

Endnotes

1. James D. Hornfischer, *Neptune's Inferno: The U.S. Navy at Guadalcanal* (New York: Bantam Books, 2011).
2. Richard B. Frank, *Guadalcanal: The Definitive Account of the Landmark Battle* (New York: Penguin Books, 1992); Hornfischer, *Neptune's Inferno*; and John F. Wukovits, *For Crew and Country: The Inspirational True Story of Bravery and Sacrifice Aboard the USS* Samuel B. Roberts (New York: St. Martin's Press, 2013).
3. Frank, *Guadalcanal*; and Harry Butowsky, *Warships Associated with World War II in the Pacific: National Historic Landmark Theme Study* (Washington, DC: National Park Service, 1985). The author arrived at the number 10,000 sailors requiring rescue by utilizing estimates of vessels sunk as reported in the cited works and estimates of the number of crew aboard each type of vessel along with discussions of likely assigned crew with current naval officers to provide the best estimate of sailors requiring rescue.
4. Hornfischer, *Neptune's Inferno*.
5. Eric Schuck, "Shoestring Logistics Lessons from Guadalcanal: The Navy's Fast and Effective Logistics Response at Guadalcanal Can Help Modern Logisticians Plan for

Future Amphibious Landings," U.S. Naval Institute *Proceedings* 145, no. 11 (November 2019).

6. Schuck, "Shoestring Logistics Lessons from Guadalcanal."
7. Schuck, "Shoestring Logistics Lessons from Guadalcanal."
8. Schuck, "Shoestring Logistics Lessons from Guadalcanal."
9. *History of United States Indo-Pacific*.
10. John Wageman, *Chinese Grand Strategy: How Anti-Access/Area Denial (A2/AD) Fits in China's Plan* (Maxwell AFB: Air University, 2014).
11. Mallory Shellbourne, "China Has World's Largest Navy with 355 Ships and Counting, Says Pentagon," USNI News, 3 November 2021.
12. Shuxian Luo and Jonathan G. Panter, "China's Maritime Militia and Fishing Fleets: A Primer for Operational Staffs and Tactical Leaders," *Military Review,* January–February 2021.
13. Luo and Panter, "China's Maritime Militia and Fishing Fleets."
14. Shellbourne "China Has World's Largest Navy with 355 Ships and Counting, Says Pentagon."
15. Shellbourne "China Has World's Largest Navy With 355 Ships and Counting, Says Pentagon."
16. "U.S. Navy Active Ship Force Levels, 1938–1944," Naval History and Heritage Command, accessed 26 July 2024; and *Report to Congress on the Annual Long-Range Plan for Construction of Naval Vessels for Fiscal Year 2024* (Washington, DC: Office of the Secretary of the Navy, 2023).
17. Mark Cancian, Matthew Cancian, and Eric Heginbotham, *The First Battle of the Next War: Wargaming a Chinese Invasion of Taiwan* (Washington, DC: Center for Strategic and International Studies, 2023).
18. "Battle of Okinawa, 1 April–22 June 1945," Naval History and Heritage Command, accessed 26 July 2024.
19. Cancian, Cancian, and Heginbotham, *The First Battle of the Next War*.
20. Pilot numbers and training timeline are estimated based on the author's recent experience as a carrier airwing pilot.
21. "US Indo-Pacific Area of Responsibility," U.S. Indo-Pacific Command, 15 July 2023.
22. "Statement of Admiral John C. Aquilino, U.S. Navy Commander, U.S. Indo-Pacific Command," U.S. Committee on Armed Services, 20 March 2024.
23. Lee Knoell, *Adapt or Perish: Aeromedical Evacuation in the Contested Air Space of the Pacific Theater* (Maxwell AFB: Air University, 2016).
24. Kenneth Braithwaite et al., *Advantage at Sea—Prevailing with Integrated All-Domain Naval Power* (Washington, DC: Department of Defense, 2020).
25. Codi Mullen, "Leveraging the Light Amphibious Warship as a Mass Casualty Evacuation Platform in a Contested Environment" (master's thesis, Naval Postgraduate School, Monterey, CA, 2022).
26. "Miguel Keith, Charleston, Chief Conduct Exercise Noble Vanguard in the Indo-Pacific," Navy.mil, 24 May 2022.
27. John E. Jackson, ed., *One Nation, Under Drones: Legality, Morality, and Utility of Unmanned Combat Systems* (Annapolis, MD: Naval Institute Press, 2018); and Edward Lundquist, "Navy Establishing Unmanned Surface Vessel Fleet for Persistent ISR in Middle East," MarineLink, 15 July 2023.
28. "MARTAC's Devil Ray T38 Performs the Fastest Fully Autonomous International Run Ever," MARTAC, 15 July 2023.
29. *DINGO CRAW Integration on Long Range Air Deployed UAS* (Arlington, VA: AeroVironment, 2023).
30. John Doyle, "Creating a Digital Ocean," *Sea Power Magazine* 66, no. 4 (May 2023): 29–31.
31. John Marcario, "Filling the Gaps," *Sea Power Magazine* 58, no. 8 (October 2015): 44–45.
32. Thomas Cantrell, "JADC2 Culture at the Operational Level of War," *Air & Space Operations Review* 2, no. 1 (Spring 2023): 44–59.

33. Capt Nicholas Royer, "United States: U.S. Marines, Joint Partners Test Networked Expeditionary Advanced Base Operations from Japan to Hawaii," Marines.mil, 18 March 2021; and Capt Kevin Buss, "13th MEU Conducts Sensing Expeditionary Advanced Base Operations," Marines.mil, 26 April 2023.
34. "U.S. Navy Active Ship Force Levels, 1938–1944."
35. Jon Thomas, "Bases, Places and Stations: Operational Maneuver and Sustainment in the Indo-Pacific Region," *Journal of Indo-Pacific Affairs* (2021).
36. Dimitri Filipoff, "Fighting DMO, PT. 1: Defining Distributed Maritime Operations and the Future of Naval Warfare," CIMSEC, 20 February 2023.
37. *Tentative Manual for Expeditionary Advanced Base Operations*, 2d ed. (Washington, DC: Headquarters Marine Corps, 2023).
38. *Tentative Manual for Expeditionary Advanced Base Operations*.
39. Josh Smith, "North Korea Says It Defused U.S. Korean War Bombs at Pyongyang Apartment Site," Reuters, 10 March 2023.
40. Cooper Thomas, "Bombing Missions of the Vietnam War," accessed 26 July 2024.
41. Seth Jones, "The U.S. Defense Industrial Base Is Not Prepared for a Possible Conflict with China," Center for Strategic and International Studies, June 2023.
42. Alex Marquardt, Natasha Bertrand, and Zachary Cohen, "Russia's Jamming of US-Provided Rocket Systems Complicates Ukraine's War Effort," CNN, updated 6 May 2023.
43. Paul Scharre, *Controlling Autonomous Systems* (Washington, DC: Center for a New American Security, 2016).
44. Michael Resig, Ronald (Fred) Woodaman, and Kevin M. Curtin, "Operational-Level Autonomous Logistics," *Military Operations Research* 25, no. 3 (2020): 23–42.
45. Can Kasapoğlu and Barış Kırdemir, *Wars of None: Artificial Intelligence and the Future of Conflict* (Istanbul, Turkey: Centre for Economics and Foreign Policy Studies, 2019).
46. Hai Wu Lee, "Research on Multi-Functional Logistics Intelligent Unmanned Aerial Vehicle," *Engineering Applications of Artificial Intelligence* 116 (2022), https://doi.org/10.1016/j.engappai.2022.105341.
47. Maaike Verbruggen, *The Question of Swarms Control* (Solna, Sweden: Stockholm International Peace Research Institute, 2019).
48. Cancian, Cancian, and Heginbotham, *The First Battle of the Next War*.