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When deploying and conducting dispersed maritime operations, speed and tempo are of the essence. An emerging concept called expeditionary advanced base operations (EABO) requires scalable forces to maneuver with a sustained tempo to exploit advantages over an adversary by establishing an expeditionary advanced base (EAB) to support maritime operations. When conducting EABO, the traditional centralized logistical process the military has utilized will not be sufficient. Through proper refinement, a sea basing concept that is mobile, flexible, properly sized, and fused with emerging technologies can provide decentralized logistics to support EABO. Once an EAB has been established, they can mutually support each other as a naval expeditionary force in readiness to outpace the enemy.

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MASTER OF MILITARY STUDIES

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SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF MILITARY STUDIES

Major Troy D. Goss, USMC

AY 2020-21

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Executive Summary

Title: The Refinement of Sea Basing: A Logistical Concept for Expeditionary Advanced Base Operations

Author: Major Troy D. Goss, United States Marine Corps

Thesis: A sea basing concept that is fused with emerging technologies may be able to operate as a logistical node that can defend itself while simultaneously providing supporting fires to the expeditionary advanced base (EAB).

Discussion: When deploying and conducting dispersed maritime operations, speed is of the essence. An emerging concept within the Marine Corps called expeditionary advanced base operations (EABO) requires scalable forces to establish and move the EABs location in order to exploit an enemy weakness. Furthermore, for multiple EABs to support combat operations, a revised logistical concept is needed to meet the demands of sustainment and maneuverability. Such a revised concept will allow for multiple expeditionary bases to co-exist with the capability to quickly maneuver them to essential geographical locations that are equipped to strike the enemy. While conducting distributed maritime operations, the traditional logistical process that the military has always utilized will not be sufficient to support these expeditionary advanced bases due to lack of mobility, flexibility, lethality, and protection against anti-access/area denial (A2/AD) systems such as anti-ship missiles and mines.

Newly constructed expeditionary sea base (ESB) ships and light amphibious warships (LAW) can be equipped with emerging technologies in weaponry such as the aegis combat system, artificial intelligence, and additive manufacturing, which may provide a decentralized logistical support to EABs. ESBs and LAWs can be organized to provide logistical and fire support in a nonlinear manner to mitigate sea lines of communication (SLOC) from becoming critical vulnerabilities to the United States forces. When refined in size, mobility, and flexibility, sea basing can provide a decentralized logistical support concept along with supporting fires to the expeditionary advanced base during distributed maritime operations which will assist the joint force with the capacity to outpace the enemy.

Conclusion: When equipped with the proper speed, stealth, and lethality, sea basing can support the logistical requirements, along with providing mutually supporting fires when conducting distributed maritime operations. By decentralizing the sea basing concept to be a more mobile, flexible, and lethal force, multiple sea bases can serve as nodes to support the EABO concept. The sea basing concept calls for ships to mutually support each other along with prescribed EABs to provide logistical resiliency in the operational area.

DISCLAIMER

THE OPINIONS AND CONCLUSIONS EXPRESSED HEREIN ARE THOSE OF THE INDIVIDUAL STUDENT AUTHOR AND DO NOT NECESSARILY REPRESENT THE VIEWS OF EITHER THE MARINE CORPS COMMAND AND STAFF COLLEGE OR ANY OTHER GOVERNMENTAL AGENCY. REFERENCES TO THIS STUDY SHOULD INCLUDE THE FOREGOING STATEMENT.

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Preface

When discussing new concepts such as expeditionary advanced base operations (EABO) amongst Marines, the first question generally asked is, "how we are going to support the logistical requirements for the expeditionary advanced base (EAB)?" One naval concept that has existed for many decades is sea basing. The idea of sea basing is predicated on the ability of large ships to hover around forces that are on or near a coastline to provide forces ashore with fire and logistical support. Incidental to the discussion is the concept of a maritime preposition force (MPF). In today's operating environment, the traditional sea basing paradigm is not practical. Sea basing, in its original form, requires ships to sit off a nation's coast to supply resources or the MPF to offload supplies in a non-contested environment. This is not practical with today's enemy threats of long-range precision missiles and other anti-access/area denial (A2/AD) capabilities. A new approach could leverage emerging technologies to increase mobility and flexibility to meet the challenge of A2/AD systems.

When I approached the problem, I began researching sea basing: specifically, where it originated, how it has been utilized in past conflicts from the works of Captain Henry Eccles, United States Navy, and how it could evolve to support the EAB. There are currently new innovations in artificial intelligence, machine learning, offensive and defensive weaponry, and the additive manufacturing field that can assist in evolving an old concept such as sea basing to provide the needed logistics and fire support to mutually protect an EAB, naval ships, and embarked and landing forces.

I tackled this problem with a singular question in mind: how could these naval concepts mutually support each other to outpace the enemy by leveraging emerging technologies? This question led me to approach sea basing in an evolving fashion by way of a decentralized function

or node for the swarming logistics concepts that were previously addressed in “Swarming Logistics: The Enabling Concept for Expeditionary Advanced Base Operations,” by Major Andrew Glindmeyer, USAF, to support EABs, along with leveraging diplomatic efforts to position the logistics required for a future fight.[1] By supplying the naval service with multiple ships that are smaller, which ostensibly have greater mobility, and increased flexibility allowing for logistical and resupply resiliency. Working in this distributed manner allows sea bases to be a harder target when supporting forward forces that can swarm an adversary.

I would like to thank my MMS mentor, Dr. Donald Bittner, Ph.D., for his guidance during this entire process. He provided sage guidance that assisted me in narrowing a broad topic that could easily meander from one good idea to the next. It was a privilege to work under his mentorship and tutelage.

I would also like to thank Captain Andrea Slough, USN, for her assistance in researching future naval concepts. Working and corresponding with her was serendipitous, yet highly rewarding. I am grateful for her guidance in translating my unconventional ideas for naval logistics to paper.

Finally, I would like to thank my wife, my best friend, and life partner, Jana, thank you. You have always been the backbone of our family. We (Troy Jr., Tyson, Tinley, and I) know how lucky we are to have you. Your support for me during this time can never be replicated. Thank you for your irreplaceable love and patience during this period.

Introduction

In a fight with a peer competitor, the proliferation of long-range precision fires and early detections systems will create a robust anti-access/aerial denial (A2/AD) environment. Nations such as China, Iran, and Russia have procured long-range precision weapon systems that threaten United States military bases in the Pacific region.[2] The Navy and Marine Corps team are no longer able to project power from the sea via traditional means. Maneuvering ships that are at a close distance to an adversary's coastline are now subject to these A2/AD systems from greater distances. The 38th Commandant of the Marine Corps, General David H. Berger believes future warfare will consist of dispersed units that will conduct integrated operations in a contested operational environment.[3] To compete in this dispersed battlespace, the Navy and Marine Corps have introduced a future concept called expeditionary advanced base operations (EABO).

Within the EABO concept, maritime forces will establish temporary operational areas called expeditionary advanced bases (EAB). As a future operating concept, survivability and sustainability are essential for an EAB to be successful. During these distributed maritime operations, a protection and logistical concept should be established to support the fluidity of the EABO design. Ideas have been introduced regarding a swarming logistical concept that uses nonlinear paths of distribution from redundant hubs utilizing different nodes during distributed operations.[4] Plausible logistical hubs, however, are still needed to support this concept. This paper asks this question: Can an old concept with refinements such as sea basing be the remedy to properly support and defend the EAB once they seize or occupy key terrain? A sea basing concept that is fused with emerging technologies can properly operate as the logistical nodes that can defend itself and provide mutually supporting fires to the EAB. When refined in size, mobility, and flexibility this paper shows that sea basing can provide a decentralized logistical

support concept along with supporting fires to the expeditionary advanced base during distributed maritime operations that can boost the joint force with the capacity to outpace the enemy. Once an EAB is established, an EAB and sea base can mutually support each other as a naval expeditionary force in readiness that can assist the joint force with the capacity to outpace the enemy.

Background

Expeditionary Advanced Base Operational Concept. With two decades of engagement in Middle East wars, the Marine Corps has lost its focus as part of the maritime service, leaving the Navy and Marine Corps team not adequately structured or equipped to deal with future threats of peer competition. The Marine Corps is currently structured to accomplish a land-based war that is focused on the global war on terror versus accomplishing missions in the maritime theater.

Adversaries have made tremendous advancements in the procurement of long-range precision fires and other A2/AD systems that pose a significant risk to the Navy and Marine Corps' forward maritime presence to conduct sea denial operations. This includes long range precision missiles, anti-ship missiles, mines, cyber capabilities, and electronic warfare capabilities to degrade command and control and destruction of Naval surface ships and forces. These A2/AD systems heighten the need for the Marine Corps to increase its naval integration. In his 38th Commandant's Planning Guidance, United States Marine Corps Commandant General David Berger stated,

> By developing a new expeditionary naval force structure that is not dependent on concentrated, vulnerable, and expensive forward infrastructure and platforms, we will frustrate enemy efforts to separate U.S. Forces from our allies and interests. EABO enables naval forces to partner and persist forward to control and deny contested areas where legacy naval forces cannot be prudently employed without accepting disproportionate risk.[5]

The Navy and Marine Corps team must revitalize its maritime skills to compete with the proliferation of these A2/AD capabilities.

The *EABO Handbook-1.1* assists in the thought process behind the EABO concept, and the significance it will bring to the joint force. The *EABO Handbook-1.1* defines the EABO concept as, "a future naval operational concept that meets the resiliency and forward presence requirements of the next paradigm of US joint expeditionary operations."[6] The EABO conceptual framework provides the naval or joint force commander a scalable, flexible, and persistent forward naval force that can operate inside an enemy's weapons engagement zone (WEZ).[7] These forces allow strategic leaders alternative opportunities through sea denial to de-escalate situations of potential kinetic conflict.[8] Most recently during the construct of this paper, a tentative manual for EABO was published titled *Tentative Manual for Expeditionary Advanced Base Operations* (*TM-EAB*O) that has expanded the works of *EABO Handbook-1.1*. The *TM-EABO* states, "EABO are 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."[9] Furthermore, EABs are to not be misconstrued with traditional bases [or forms of bases]. Specifically, an EAB is, "a locality within a potential adversary's WEZ that provides sufficient maneuver room to accomplish assigned missions seaward while also enabling sustainment and defense of friendly forces therein. Its expeditionary nature means it is not permanent and must be able to change location quickly enough to maintain relative advantage."[10] Stated another way, an EAB is a scalable, temporary base that provides supporting fires and aviation support during maritime operations within the WEZ.

Vital to EABs, as identified in the *TM-EABO* is the introduction of stand-in forces — meaning the forces are low signature, designed to assume risk while operating in an environment that is inside an adversary's WEZ to support a host nation, deter adversary actions, or engage the enemy. Stand-in forces will be needed throughout the range of competition. Conversely, stand-off forces have long range capabilities that are operated outside an opponent's WEZ to reduce as much risk as possible. In competition below a kinetic level, stand-in forces at an EAB work with allies and partners, preserve future admittance, and conduct shaping operations. During armed conflict, the combination of stand-in and stand-off forces can put the adversary into a predicament.[11] The EABO concept can deploy numerous detachments to key terrain with an adequate, yet scalable force to gain an asymmetric advantage over an enemy that restores a strong-willed advantage and strategic initiative.[12] These smaller forces compliment the Navy's distributed maritime operations, preventing the adversary to mass on a single friendly target.

Sea Basing Operational Concept.

"In any exchange of blows, the side which pushes its bases toward the enemy while keeping the enemy at a distance from its home territory is going to come out on top."[13]

- Admiral Raymond A. Spruance

Sea basing has taken on many forms over the years and was arguably first introduced at the beginning of the 20th Century by an engineer name A.C. Cunningham. Cunningham's concept imagined ships that were individually equipped to move with or behind the naval fleet to provide the essential services of a land base. However, no actions by the Navy were ever taken to adopt this concept.[14] But, it was United States Navy Logistician Captain Henry Eccles' work with Service Squadron Ten of the Service Force, U.S. Pacific Fleet in World War II where

modern-day sea basing was born. In his book *Operational Naval Logistics*, Eccles introduces the sea basing concept as "floating base support" and defines it as, "…a system of logistic support whereby the supplies, services and replacements of equipment and personnel are provided from auxiliary ships and craft based within an anchorage."[15]

Captain Eccles believed there were four major considerations when employing a floating base: mobility, flexibility, economy, and simplicity. With respect to mobility and flexibility, Eccles believed that every ship should be able to exceed ten knots, and that floating sea bases should have the capability to conduct multiple logistical functions for combat forces.[16] Having both mobility and flexibility provides economy to the force because the floating bases can provide numerous services in many different theaters. When considering simplicity, Eccles believed that floating bases reduced interservice friction through autonomous communication.[17] Overall, Eccles envisioned a floating base capable of providing full scale logistical and supply needs necessary during combat. He believed floating bases could be equipped with full scale hospitals, water distillation services, full scale aviation maintenance hangers, ship repair and replenishment services, and morale services.[18]

The discussion in this paper illustrates that sea basing is not a novel concept. However, over the last two decades the naval force has not provided the necessary attention to sea basing to match current technological defensive advancements due to focusing on the sustained land-based wars in the Middle East. *Joint Publication 3-02: Joint Operations* defines sea basing as, "the deployment, assembly, command, projection, reconstitution, sustainment, and re-employment of joint combat power from the sea without reliance on land bases within the JOA."[19] This definition is important because it establishes a common sea basing concept for the joint force. In 2002 Chief of Naval Operations Admiral Vern Clark established a new operational construct for

sea basing, entitled "Sea Power 21." "Sea Power 21" asserted that sea basing would be a mutually supported concept for the joint force. Admiral Clark's highly touted sea basing plan described its offensive and defensive capabilities, and the support it would provide to forces ashore.[20] "Sea Power 21" envisioned sea basing would provide both sea power and air superiority in the 21st Century. Upon revisiting "Sea Power 21" today, it reflects the fact that A2/AD systems were not as robust then as they are now.[21] The United States' adversaries have heavily invested in low-cost long-range precision missile systems, mines, and cyber capabilities along with long range early detection systems that have the capability and capacity to threaten the US military force projection from thousands of miles away from the homeland.[22] Ships can no longer float along a coastline without being seriously threatened by adversary weapon systems. This notion raises two questions: how can sea bases operate inside an adversary's WEZ to support an EAB? And, how might a sea base properly protect and sustain an EAB?

The current sea basing plan restricts the Navy's ability to offensive and defensive strikes only, assuming forces are ashore.[23] Due to shifting priorities and ongoing operations in the Middle East, proper attention to the sea basing concept has been overlooked. Furthermore, traditional sea basing is dependent on sea and air control, which demands additional resources from the other services. While America's ability to traverse the winds of the sea are not yet broken, they are becoming increasingly frail with many littoral states acquiring sophisticated A2/AD capabilities.[24]

Looking at a historical case, the United States was fortunate to overcome the logistical hurdles of the Pacific Theater during World War II. Prior to World War II, the Navy and Army prepared for a war with Japan. The plan was called War Plan ORANGE. Throughout the interwar period, ORANGE was continuously refined to deal with challenges that arose. The

Navy planners of ORANGE were very offensively minded, and in 1938, came to the conclusion that the United States would have time to undertake a readiness position by mobilizing 750,000 personnel to vital areas of the Pacific to deal with Japan.[25] Admiral James Richardson, USN, was relieved of his command of the United States Fleet over his criticism of ORANGE. Admiral Richardson contested that the Navy did not have enough ships, personnel, or forward bases to support an operation in the far Pacific.[26] Admiral Richardson's concerns proved to be correct as the onset of fighting in the Pacific demonstrated America's unpreparedness. The United States was hindered by lack of logistical preparation demanded by a fight over great distance. Without a logistical resupply plan to support the operational tempo during island hopping campaigns, the US might have suffered. In reviewing this historical portion of World War II, this section analyzes how the United States overcame logistical restraints and evaluates how a decentralized logistical concept is needed to support EABO.

World War II Case Study

Background. The Pacific Theater of operations during World War II was a new experience for the United States military. At the end of World War I, the United States had an estimated four million personnel in its military.[27] Concluding there to be no imminent threat, the United States made considerable budget cuts to the War Department that substantially decreased both personnel and equipment. After the attack by the Japanese on Pearl Harbor in 1941 along with the subsequent seizure of the Philippines, and other areas in the Southern and Central Pacific area, the United States government realized it was not adequately equipped. It had logistical shortages on small arms, ammunition, and the surface and aviation platforms required to transport its forces.[28] Furthermore, the Pacific Theater during World War II was unique to the United States due to the continuous need for sea transportation in a contested environment to

support maritime operations. Japan's seizure of several island chains in the South and Central Pacific increased Tokyo's operational reach. Australia faced a sincere threat after Japan's seizure of former European colonies in the Pacific region. To ensure future success in the Pacific campaign, the United States established a supply base in Australia to serve as a rear logistical hub for combat operations.[29] This forward base alleviated logistical ships from having to continuously sail through contested waterways that had an austere Japanese presence. However, logistical planning was always hindered by time due to the vast space of the Pacific Theater.

After the successful victory by the United States Navy at the Battle of Midway, the Joint Chiefs of Staff began planning for an attack to regain control of key islands that threatened the lines of communication from Hawaii to Australia. The senior commanders in the Pacific Theater began planning, however, quickly saw their plans upended by insufficient logistics. This was due to the aforementioned issues of long shipping distances and lack of sustainable advanced bases to sustain the operational tempo required. All commanders lobbied to acquire the same platforms and classes of supply to effectively accomplish their mission.[30] Without these resources, their operational reach would be limited, and the continuous pausing of operations to wait for logistical trains to catch up would allow the Japanese to reconstitute and fortify their positions. Understanding the interdependency between shipping and advanced forward bases, the United States had to adapt.[31] Shipping was required for the massive amounts of logistics needed to support the offensive island-hopping operation in the South and later Central Pacific against the Japanese. Hence, further advanced bases were needed to stage the supplies for refueling and refitting of the United States forces. Furthermore, the logistical elements required to support the advance bases were centrally organized. These supporting commands reported to and requested resources from their parent agencies back in Hawaii and San Francisco rather than through the

command staff in the Pacific.[32] This centralized repository for processing requests put constant strain on the logistical and supply chain management system.

From Guadalcanal to the Gilbert and Marshall Islands, Sea Basing Emerges. During the 1942 landings at Guadalcanal, the United States military faced similar issues of shipping distances with no adequate assembly areas. At the beginning of that operation, Marines were forced to forage for subsistence from Japanese soldiers' rations.[33] Furthermore, Admiral Jack Fletchers withdrawal of his fleet in August of 1942 left the 1st Marine Division at Guadalcanal unsupported from the sea.[34] Admiral Fletcher believed his carriers were strategically important and his primary concern was to not lose them.[35] It is also worth noting that that the United States closest advanced base was fifty percent farther away from Guadalcanal than Japans closest advanced base.[36] To overcome these shortfalls, the Navy and Marine Corps team began utilizing a basic sea basing concept. Naval vessels and other cargo ships were able to float near and around the main supply bases of New Zealand and in the Southern Solomon Islands. These anchored floating bases were imperative to the Marine Corps amphibious landings and future resupply that assisted in the long supply lines from San Francisco and Hawaii. These sea bases assisted in shortening the lines of communication until Admiral William Halsey Jr., USN, could establish a logistical support base in Noumea, New Caledonia in October 1942.[37] The floating bases permitted landing forces to be able to continuously push forward on the Solomon Islands by receiving constant resupply more efficiently than the Japanese counterparts. Furthermore, it laid the groundwork for the sea basing concept to be developed throughout the rest of the war.

A Floating Base Emerges. After the bloody Guadalcanal operation under General Douglas MacArthur, USA, in the South and Southwest Pacific, Admiral Chester Nimitz, USN, commenced operations in the Central Pacific. The main logistical issue in the Central Pacific

Theater was the lack of suitable advanced bases between Hawaii and the defended islands to be seized in the Gilberts, Marshalls, and Marianas islands. These island chains were over two thousand miles from Pearl Harbor, and over 1,000 miles from Guadalcanal. This led to the creation of Service Squadron 4, of the Service Fleet, U.S. Pacific Fleet, a floating base unit in the South Pacific. Specifically, this sea basing tactic was established right before the Marshall Islands operations by Vice Admiral William Calhoun, USN, in November 1943.[38] This was a novel experience for the Navy to replenish and support such a large armada and forward forces so far away from a land-based logistical node. These floating bases consisted of mine sweepers, tugboats, maintenance ships, fuel barges, and ammunition lighters, all of which were capable of providing a thirty-day supply for 20,000 personnel.[39]

The Navy further expanded this capability by establishing Service Squadron 10 in the Central Pacific in 1944. This is another example of the Navy putting together a "hodge-podge" of task-oriented ships to sustain combat operations in the Central Pacific. According to Captain Eccles, every type of logistical support service was made available to the fleet, including drydocking repairs and provide fresh supplies to forces ashore such as food, water, and ammunition.[40]

The United States military continued to use and refine this concept throughout the Pacific Theater in the retaking of the Philippines, Iwo Jima, and Okinawa.[41] These floating bases allowed the United States military to maintain operational tempo that the Japanese could not match. They also allowed the Pacific Submarine Force to maneuver their forward logistic hub from Hawaii to Guam.[42] It was not until the United States used decentralized logistics within the South and Central Pacific Theater, that forces could continue to seize the initiative.

Case Analysis. Prior to gaining a foothold at Guadalcanal, the United States military did not have any strategically sufficient forward operating bases that could serve as a logistical node. This hindered American forces from being on the offensive for many months until the operational initiative passed to American forces. American forces in the Pacific established key logistical nodes with airfields and ports that could support the speed and tempo while on the offensive. The ability to stay on the offensive did not allow Japanese forces the capacity to strike American sea basing assets with much resolve.

The challenge for all logisticians is getting the right supplies, to the right people, at the right time. Even though the logistical cautionary tales from the Pacific Theater still haunt many today, it was the United States' ability to intertwine shipping and forward bases that ultimately kept American forces resupplied during World War II. What the United States military has learned in the ensuing years is that forward operating bases and shipping are interdependent functions. Furthermore, combat support ships must be designed with what Captain Eccles describes as flexibility.[43] Sea basing ships must be able to conduct maintenance, store different classes of supply, and defend themselves when operating inside the WEZ.

Another lesson learned from sea basing during World War II is that a centralized linear execution of logistics with one or two logistical nodes did not work in the Pacific Theater during World War II, largely due the distance and inadequate assembly areas. It was a decentralized logistics plan that supported units in different locations, specifically from the United States Navy, that stimulated operational tempo to increase the reach and capabilities of the American forces.[44]

In the present day, the United States has forward military land bases with large numbers of troops and amounts of resources should a conflict arise. Having advanced bases with forward

resupply points supports maneuver of the United States forces. In the Pacific Theater during World War II, the United States Navy could float their cargo ships closer to the fight while being protected by other destroyers to help sustain frontline forces. However, tempo was halted periodically. Even after the seizure of Guadalcanal and the Japanese departure of the area in February 1943, the United States had to pause to allow logistical necessities to catch up opposed to continuing towards the next campaign expeditiously.[45] Unlike World War II, adversaries of today have more advanced A2/AD capabilities that can attack its logistics nodes and forward bases. Therefore, having one or two logistical nodes that are static and unable to properly defend themselves against long-range precision weapons will be useless against a peer adversary. Multiple ships that are smaller, with greater mobility, and increased flexibility will allow resilient logistical and resupply operations. The United States requires ships that can serve as both logistical nodes and provide a lethality in a contested environment, thus allowing redundant resupply and supporting fires the ability to deter an adversary; or perhaps, forcing an adversary to decide on how, where, and when to strike.

Sea Basing and EABO Concerns

There is no doubt that change brings risk, and the Marine Corps increasing its capacity for maritime operations and moving away from traditional land-based operations is no different. In his 2020 article, "The Marine Corps' Radical Shift toward China," Colonel Mark Cancian, USMC (ret) posits that if the Marine Corps shifts from traditional operational paradigms, future conflicts may yield an enormous disadvantage for US forces [or the like].[46] Cancian argues that once the Marine Corps moves away from land-based responses that it has been conducting over past two decades, it will not be properly structured and trained to deal with counterinsurgency or urban operations. The most pressing concern is that the Marine Corps will not be structured and

able to fight in a manner akin to Korea, Iraq, or Afghanistan.[47] These stability conflicts have proven that forces can acclimate to the mission; however, there is a delay due to the lack of proficiency in stability operations.[48]

As a concept, sea basing has never truly come to fruition. Pundits believe the sea basing concept is outdated, lacking enthusiasm from other services, and was poorly delivered by the Department of the Navy in 2002.[49] The main reason for this was due to the 9/11 attacks, as sea basing never received any value from Secretary of Defense Robert Gates whose vision was to win the war we are in, thus disregarding the need for advancing amphibious operations and being prepared for wars of the future.[50] Due to this disregard, the United States military has shifted its focus from asymmetrical warfare and is searching for new concepts to compete during great power competition.

When the Marine Corps envisions improvements in sea basing, it views improvements in amphibious lift and the advancements for the maritime prepositioning force (MPF). To further explicate the Marine Corps historical thought on sea basing, then Brigadier General David H. Berger described the differing views on sea basing within the Department of Defense (DOD). According to him, some believed sea basing was nothing more than floating warehouses while others believed sea basing provided a full crisis response capability to the geographic combatant commanders.[51]

Sea basing was intended to address the future of distributed maritime operations, and the need to provide offensive and defensive capabilities to the joint force.[52] As mentioned earlier, a review of "Sea Power 21" notes the US Navy had freedom of the seas in 2002, as adversaries did not have the A2/AD capabilities they do today. "Sea Power 21" addresses sea basing to support

the joint force offensive and defensive fires capabilities, as well as sustainability options for the joint force, but it did not address the need for support to amphibious operations.

Refining Sea Basing for a Future Fight

Since the late 20th Century, the Marine Corps has relied upon the MPF to provide the resources it needs at a forward location. The MPF consists of ships that are strategically deployed to assist a geographic combatant commander with all the equipment needed to rapidly support a crisis response mission in a benign environment.[53] However, the MPF has concerning shortfalls in an advanced A2/AD environment. In a 2019 article by Colonel Andrew J. Bergen, USMC, he notes that MPF's are primarily commanded by civilians and contracted mariners.[54] These vessels do not possess organic defensive measures, thus requiring protection from the likes of a Navy destroyer squadron when having to deploy inside an enemy's WEZ or other contested environments. Therefore, the MPF should not be compared to a combat logistical ship but to follow-on shipping. Furthermore, in 2016 the Navy introduced a distributed agile logistics concept to support its distributed maritime operations. Distributed agile logistics would leverage afloat sea-bases such as its existing dry cargo and ammunition auxiliaries. These sea bases would serve as intermediate level supply and maintenance centers for maneuver forces; however, the ships would still require a devoted escort to provide protection.[55] This is a problem that takes valuable assets away from a fleet that will need all of its ships and firepower to mutually support and swarm a peer adversary during a maritime fight.

Moving forward, sea basing, as a concept in support of EABO, should not be analogous to a MPF. Despite the realities of World War II, Captain Eccles foresaw the need to continuously refine his floating base concept to deal with new weapons and techniques.[56] While the MPF can still serve a purpose to support forward deployed forces, it is outside the scope of this paper. The

future of sea basing to support EABO should be tailored to the forces it supports. High emitting, slow moving targets that cannot mitigate A2/AD threats will not sufficiently support the EABO. When conducting distributed maritime operations, the naval force needs to look no further than Captain Eccles. The future of sea basing needs to focus on amending its concept to compliment the size, mobility, and flexibility to support EABO.

Some revisions are already underway with the Navy's new class of Alaska oil tankers. In 2017, the Navy ushered in the expeditionary sea base (ESB) United States Ship (USS) *Lewis B. Puller*. The *USS Lewis B. Puller* upgrades the sea base's ability to project a continual forward naval presence. The upgrades include the ability to sustain Naval helicopters, deploy small boats and unmanned craft, and to provide storage for other vessels and cargo.[57]

The *Puller* is initially commissioned to assist in the mine countermeasure operations, but it is flexible enough to do much more such has host a full-scale hospital or support amphibious operations for the Marine Corps.[58] However, there are noticeable short falls in this new platform. The *Puller* does not have adequate defense systems to protect it from aerial weapons, submarines, nor any form of electronic warfare systems or countermeasures to protect it from a non-kinetic attack. This poses an increased risk for putting this type of vessel inside the enemy's WEZ due to its high vulnerability from countries with anti-ship weapons.[59] On the surface, not producing defensive weapon systems as part of the ship's core can be construed as a vulnerability. However, the Navy has an opportunity to be creative. To counter this vulnerability the Navy should creatively develop a method to utilize containerized or vehicle-mounted defensive and offensive weapon systems, close-in weapon systems, and robust mobile electronic warfare systems to counter adversarial threats. For example, the Chinese military has recently developed sophisticated land-attack cruise missiles such as the DF-17 hypersonic missile that

travels five to ten times the speed of sound.[60] A ship that has a core defensive built into its core may not be able to be upgraded to mitigate a weapons advancement by an adversary. This would leave the ship vulnerable to an attack or potentially take it out of service for costly upgrades. As weapon systems and other technological advancements continue to emerge, not being constrained to one core system allows elasticity for the Navy and frees the ship from potential costly upgrades, out of service time, and future replacement to protect itself from anti-ship weapons. Furthermore, there is vast amount of open space on this vessel for emerging technologies such as autonomous aviation assets, surface vessels, and even submarines.[61]

Another option Navy and Marine Corps senior leadership are pursuing is a new program of amphibious ships called the light amphibious warship (LAW). In a review published to Congress in December 2020, the LAW would be much smaller and cheaper than the traditional big or small deck amphibious ship. With a smaller size, the LAW has the potential to blend in with other vessels in the commons, specifically in the littorals. It can integrate with larger naval defense systems along with EAB anti-ship cruise missiles to increase their survivability from attack. The LAW would possess the ability to embark a platoon of reinforced Marines and sustain itself in the open seas for 3,500 nautical miles.[62] As the day-to-day maneuver vessel for stand-in forces, the LAW has the mobility, size, and flexibility to traverse the littorals. As a smaller vessel that will not have as large of a draught as a normal amphibious ship, the LAW will be able to maneuver in a much broader distributed area in the littorals with the ability to survive an attack.

The LAW will be classified as a "Tier 2-plus" which means it will be able to absorb a strike from an adversary and still be able to keep its crew safe until it can be repaired while underway. The LAW also has a much more appealing price tag than the current amphibious

ships within the Navy. At a price tag of around 100 million dollars, the Navy can produce nearly 20 LAWS for one amphibious warship.[63] Furthermore, the LAW meets needed requirements for speed, stamina, protection, and intelligence, surveillance, and reconnaissance capabilities needed to sufficiently sustain an EAB.[64] This meets the requirements of the right size, mobility, and flexibility needed to support EABO.

Finally, the Navy and Marine Corps team should aspire to integrate the future sea basing concept with a missile defense system such as Aegis. The Aegis sea-based missile defense system can increase the capabilities of smaller ships from a mobility and survivability standpoint.[65] The Navy is currently in the testing stages of fielding the Aegis Virtual Twin. In 2019 the Aegis Virtual Twin was installed on the *USS Thomas Hudner* in a few suitcases that could be stored in an exceedingly small place. The virtual twin model uses virtualization technology to run the Aegis weapon system code at a small percentage of the typical required space, freeing up large amounts of space on a ship.[66] If the Aegis Virtual Twin is incorporated, the LAW will have an enhanced protection system that will allow it to maneuver deeper inside the WEZ, and if detected and targeted, the Aegis sea-based systems will increase the survivability rate. The lethality of these concepts can be increased for the Navy and Marine Corps team once an EAB is ashore. The EAB will be armed with mobile anti-ship and missiles defense platforms that can provide mutually supporting fires for each other, while forces ashore know they have a sustainability reach from the sea base if required. This could alleviate the need for a two-billion-dollar destroyer to provide security for logistical ships, freeing them to be the main effort for sea denial or freedom of navigation operations.

Even with new ships and emerging technologies, the United States will not be able to conduct maritime operations against threats effectively without international support. The United

States must cultivate relationships with international partners and allies to allow these concepts to prevail.

International Partnerships and Alliances Are Needed.

> *"By working together with allies and partners we amass the greatest possible strength for the long-term advancement of our interests, maintaining favorable balances of power that deter aggression and support that stability that generates economic growth."*[67]
>
> *- 2018 National Defense Strategy, January 2018*

The EABO and sea basing concepts will not succeed with only United States assets. For an EAB to be a viable option to the joint force, the sustainability of it will require international alliances and partnerships. Alliances and partnerships are made by the United States government through the Department of State and further developed and enhanced by the United States military. Military activities should align with diplomatic activities to promote basing rights, staging rights, and information sharing.[68] Much of this relationship building can be fostered during security cooperation exercises. Just as in World War II, relationships will prove to be of vital need if a conflict with China, Russia, or Iran were to take place in the future. The Naval service will need these partners for the likes of sea basing and EABs. This will allow logisticians to forage all classes of supply at closer proximities to meet capacity needs for an extended period. This will be vital, especially at early stages of conflict against an adversary.

A recent example of the military aligning with diplomatic efforts is when General James Mattis garnered assistance from Pakistan before conducting the invasion into Afghanistan in 2001. As a land locked country, the Navy and Marine Corps team did not have the adequate connector assets to move troops and supplies from naval shipping to the objective if they had to

go around Pakistani airspace. General Mattis met with diplomats and the Pakistani military to broker a deal that allowed his forces to utilize Pakistani airspace.[69] With the utilization of the Pakistani airspace the military was able to insert more rapidly into Forward Operating Base Rhino. This illustrates the importance of international relationships for EABO and sea basing to be successful and will cultivate a constant stand-in force.[70]

The Department of Defense needs a coordinated strategy with the Department of State to explore the ideas of pre-arrangements, short-term use of commercial sea port of debarkation (SPOD) and aerial port of debarkation (APOD). These relationships will assist the concepts of a swarming logistic strategy to support EABO by allowing rapid insertion force and staging of resources should a conflict occur.

Sea Basing Serving as a Logistical Node for Swarming Logistics during EABO

To effectively put the enemy in a dilemma, the EAB and sea basing concepts must be a mutually supporting concepts that integrate Marine Corps and Navy weapon systems. War game research has proven the naval ships supporting the EAB would provide a defensive posture to protect Marine units from adversary fires. The EABO concept does not leave Marine units out to dry, sporadically on islands to fight for their lives.[71] Therefore, Marine integration into naval concepts is imperative. However, the Navy and Marine Corps team must think logistics and survivability first to win against a peer competitor.

History has taught present day militaries how and why armies forward progress was nullified by their logistical impediments that will lead to a culminating point. The notion of the culminating point was identified by Prussian military theorist Carl Von Clausewitz and he described it as, “their remaining strength is just enough to maintain a defense and wait for peace.”[72] In modern day, the culminating point is when an attacking force loses the ability to

continue the attack due to logistical resupply and the continuation of the attack would increase risk of failure. To ensure EABs have the ability to swarm and seize the initiative, the supporting concept should be outfitted to match.

EAB's must be logistically sustainable to maneuver at a higher speed than an adversary. Research conducted by Major Andrew Glindmeyer, USAF, introduced a new swarming logistical concept with connecting nodes to dispersed operations. The swarming logistical concept features a non-linear distribution system that can decrease the risk of an enemy attack on one logistical node as a friendly critical vulnerability.[73] The question that was not answered in Glindmeyer's research was how the Navy and Marine Corps could physically provide these logistical nodes. Mobile, flexible, and lethal sea bases can be the nodes for a swarming logistics concept. As mutually supporting nodes, sea bases can be equipped to serve as a re-supplier, an asset prepositioning force, and a forward production and manufacturing hub.[74] As noted by Glindmeyer, the traditional logistical tail that the military has always utilized will not be sufficient for the EABO concept because it cannot sustain the tempo or the dispersion of potential units. Utilizing a concept of swarming logistics will provide an EAB with a resilient sustainment when conducting distributed maritime operations.[75] The swarming logistics concept to support EABO can be operationalized by utilizing the potential from the *USS Puller* and the LAWs.

As previously discussed, the *USS Puller* is flexible and has the potential to support in a variety of ways. Multiple ships like the *USS Puller* or another ESB can serve as the motherships outside of an enemy's WEZ to conduct operational logistics for the joint force. The ESB can produce, and manufacture needed parts and supplies while forward deployed. This can save time, thus not disturbing operational tempo. This can be accomplished by leveraging artificial

intelligence and three dimensional (3D) printers.[76] While the ESBs are serving in the role of operational logistics, the LAWs range allow it to conduct tactical logistics and fire support to support the EABO concept. As seen in Figure 1 below, LAWs are incorporated in a non-linear method to have redundancy. Each LAW will have a primary and secondary mothership and will be tasked to support another LAW in the operational area. Theater commanders will have the flexibility to task organize these ships within the joint force. Furthermore, each LAW can provide support to other prescribed EABs to provide logistical resiliency.

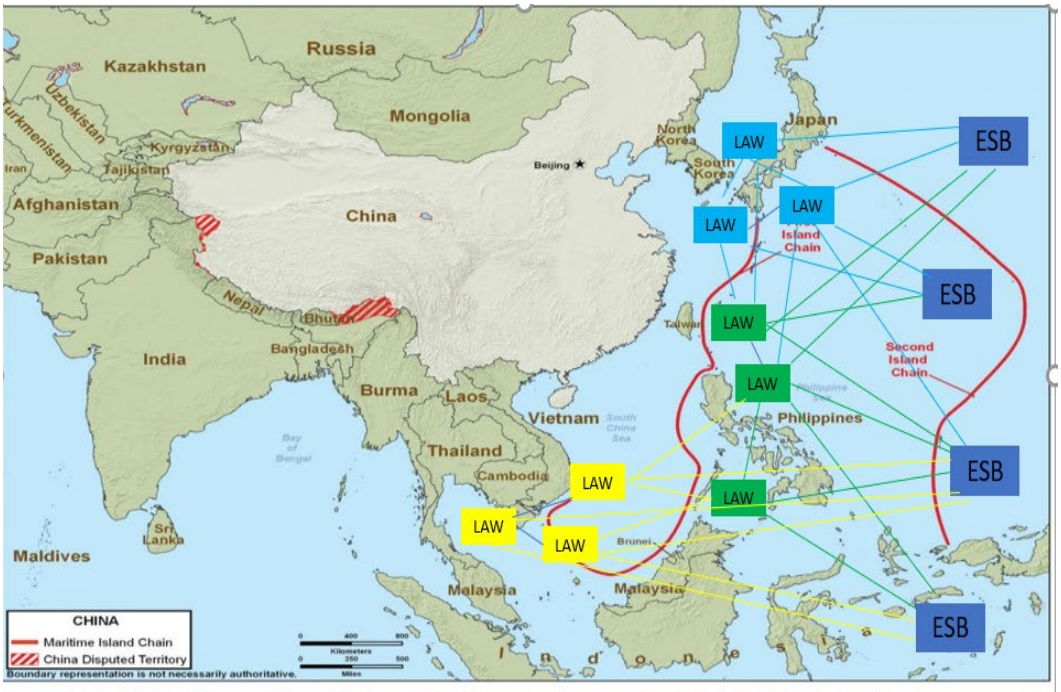

Figure 3. The First and Second Island Chains. *PRC military theorists conceive of two island "chains" as forming a geographic basis for China's maritime defensive perimeter.* 77

Figure. 1 – Example of ESB and LAW relationship to provide logistical resiliency.

Utilizing ESBs as the mothership to support numerous LAWs will provide a logistics concept to support EABO. The LAWS and EABs can then provide mutual offensive and defensive support to put the adversary at a disadvantage of not knowing exactly where to strike, thus having to show its hand. This maneuver warfare can be utilized to both escalate and de-

escalate a situation. Furthermore, ships can only carry so much of a certain item. New artificial intelligence (AI) technology now exists that can assist in predicting the types of supplies to have on hand.

Leveraging Artificial Intelligence and Machine Learning

Throughout history, technology has changed the character of war. The bow and arrow, machine gun, tank, and aircraft, have all played their part in complimenting this change, that arguably leads a transformation in techniques that are used in war. AI and machine learning (ML) might be the next big areas of technology that change warfare. Everyone uses some type of artificial intelligence in their everyday lives such as cell phones facial recognition programs, advertisements from retail stores that display items based on one's internet browsing history, smart home devices (e.g., virtual assistants like Alexa and Siri native to Amazon and Apple devices, respectively). Today, militaries strive to eventually take artificial intelligence to the next level. The future consists of autonomous ships, aircraft, and combat vehicles. The DOD defines AI as "the ability of machines to perform tasks that normally require human intelligence."[78] ML is a subset of AI that utilize complex algorithms to take human-provided datasets and infer patterns in order to learn and adapt without explicit instructions.[79] To appropriately leverage this new technology, AI and ML should be incorporated into a future sea basing concept that can assist in predictive logistics to improve resilience in the supply chain.

Artificial intelligence Usage in Logistical Resupply.

> "*We will build upon this progress and work rapidly, starting with POM-22, to develop a much broader family of unmanned systems suitable for reconnaissance, surveillance, and the delivery of lethal and non-lethal effects in the air, on land, and on and under the sea*."[80]

- General David Berger, 38th Commandant of the Marine Corps

In the private sector, companies are able to use AI and ML to deliver products to customers with minimal human input. Companies such as DHL and IBM are using AI to enhance human capabilities to exploit large amounts of logistical and supply chain data to optimize predictive resupply and transportation requirements.[81] DHL is utilizing algorithmic software analysis to predict which customers will need certain items based on consumer trend data. DHL is also using this same AI and ML to optimize which routes and warehouses are more cost efficient to supply their customers.[82] The military can strive to employ the same concept when utilizing AI and ML. This type of predictive analysis could give planners the tools they need to keep certain classes of supply on hand, and in a certain location.

The difficulty in implementing AI and ML is big data conditioning by entering the relevant data so the machine can properly learn to predict solutions. Many pundits believe we are still many years away from weaponizing purely autonomous systems such as unmanned aerial vehicles (UAV) or other autonomous vehicles. As of the time of writing this paper, AI and ML systems such as autonomous UAVs with zero human oversight do not have the knowledge with a high degree of certainty to utilize judgement against targets, thus leaving the debate ongoing for when that will be introduced.[83]

During future routine deployment cycles, exercises, and wargames, the Navy and Marine Corps should begin collecting large quantities of data by leveraging cloud-based computing to be properly stored, accessed, and linked across the enterprise. Properly conditioning datasets allows AI and ML systems to predict the amount of each different class of supply forces will potentially need in a future fight. Through clever software engineering, AI systems will learn habits and provide logistical and supply chain outputs that cannot be achieved in a timely manner by

humans. Before now, the military struggled to store and analyze large amounts of data to compute trends. The amount of incoming data has not been the issue; however, it is the inability of humans to store and analyze the massive quantity of data. With the creation of the cloud storage, the military can store all of its logistical and supply data and utilize AI and ML to analyze the data to more accurately track supplies for future operations based on consumption rates. Logisticians and supply chain subject matter experts can input these large amounts of data that will allow the machine to learn at a much faster pace versus having to rely on best guest estimates from humans. This can be crucial in planning for supplies to gather at the outset of a conflict for additive manufacturing. This data provided by the AI and ML system will allow logisticians and supply officers to estimate which classes of consumable supply are more likely to be needed. The military can also benefit from integrating AI with its allies and partners.

As stated by the Commandant of the Marine Corps in his Commandants Planning Guidance, "…our alliances are an essential factor to achieving success. We will fight in defense of our allies and will operate in close alignment with them, from their territories, alongside their ships and aircraft, and in cooperative and even integrated formations on the ground."[84] In a future fight, the United States military will be dependent upon not only products from the home front, but also their partners and allies. AI has the ability to interface with the global supply chain and logistics along with our partners and allies during operations overseas. The military can mimic the way Expedia overcame their language barrier for supply chain integration with foreign countries by utilizing AI. The company Expedia was able to utilize AI and ML to overcome language barriers for optimal outcomes for users looking to book a stay in a different country. In trying to optimize and conduct proactive logistics and supply management for distributed operations, the Department of the Navy could integrate AI and ML platforms, benefitting from

changing conditions.[85] Advancements in artificial intelligence and machine learning will assist the military in inventory management, warehouse efficiency, reduction in costs and waste, and assist in the on-time logistical planning before a specific unit may need it.[86]

As previously mentioned, predictive analysis is a cutting-edge strategy many businesses are utilizing to gain an edge in their supply chain management.[87] AI can assist logistical planners on when and where supported personnel will need the required gear for sustainment. By using different variables such as what items, how much of those items, and where the items need to go can assist in optimizing the logistics output to maneuver elements, thus allowing forward forces to not lose operational tempo. Incorporating artificial intelligence and machine learning to the sea basing concept will enhance their ability to be flexible logistical nodes to support distributed maritime operations.

Many logistical corporations are beginning to research and develop methods of autonomous delivery. A recent study at Stanford University predicts that autonomous transportation will soon be normalized.[88] Being able to utilize smaller autonomous vehicles can be the impetus of a swarming logistics concept. However, as stated by the Marine Corps Commandant in the quote above, the Navy should be leveraging unarmed autonomous surface vessels, like the Orca system, to enhance maritime operations. Orca is an autonomous submarine that has the flexibility to conduct numerous maritime operations. Its size of fifty-one feet long, and range of 6,500 nautical miles gives it the mobility and flexibility to enhance the sustainability of sea basing and EABO.[89] The Orca could easily be stored and then deployed on a larger vessel such as the *USS Puller*, or employed by a numbered naval fleet to logistically support an EAB. Furthermore, the cost of thirty Orcas is the equivalent to one Virginia class submarine. A Virginia class submarine is more capable than the Orca in every way; however, the

Orca is a tremendous feat with endless potential.[90] These futuristic autonomous vessels can increase operational reach, and keep sea basing and EABO concept unpredictable to an adversary.

Conclusion

The characteristics of warfare have arguably been changed by the proliferation of highly technological weapons systems. Current logistical concepts that are linear in nature lack the agility and surprise that make them critical vulnerabilities. While the current sea basing concept provides large maritime ships that can deploy and provide support and sustainment to forces, it is highly vulnerable to advanced A2/AD capabilities. EABO is meant to be scalable, fluid, and unpredictable thus requiring a logistical concept that can match these same characteristics. These characteristics also include a logistical concept that is stealthier, more maneuverable in the littorals, with increased lethality.

The future of EABO and sea basing depends on the ability to leverage emerging technologies and work together to mutually support one another. Furthermore, sea basing and EABO concepts can provide the joint force an operational advantage inside an enemy's WEZ by swarming an area. Together, these two concepts provide the conceptual framework enabling the joint force to harness and employ its full spectrum of capabilities. By existing and persisting within the WEZ, the naval service creates uncertainty for its adversaries and puts them on the "horns of a joint force dilemma." The principal characteristic of this concept is speed and tempo; the ability to maneuver faster than the adversary, and at the sustainable desired rate of march to keep pressure on your adversary. Proliferating a sea basing concept in concert with a swarming logistics concept by increasing the offensive and defensive capabilities of the vessels can deliver the required performance at the speed of relevancy.

However, sea basing and the EABO concepts alone will not provide the adequate support required to win against a formidable opponent. The military must match the efforts of our diplomatic organizations that can provide much needed springboards when needed. These springboards are not just imperative when the violence begins, however, they are arguably more important to prevent the violence from ever beginning.

A sea basing concept that is fused with emerging technologies can properly operate as the logistical nodes that can defend itself and provide mutually supporting fires to the expeditionary advanced base. When refined in size, mobility, and flexibility sea basing can provide a decentralized logistical support concept along with supporting fires to the expeditionary advanced base during distributed maritime operations that can assist the joint force with the capacity to outpace the enemy. When properly equipped with advanced offensive and defensive weapon systems, the ability to leverage AI and ML in the military logistic and supply chain management system, advanced manufacturing capabilities, and sea basing that is decentralized and can swarm in many different locations can provide the joint force with the capacity to outpace the enemy. Accordingly, sea bases and EABs will be hard targets that can survive and protect themselves, and not a traditional vulnerability for the enemy to attack.

Appendix A – Definitions

Anti-Access (A2): Those actions and capabilities, usually long-range, designed to prevent an opposing force from entering an operational area.[91]

Area Denial (AD): Those capabilities, usually of shorter range, designed not to keep the enemy out but to limit his freedom of action within the operational area.[92]

Artificial Intelligence (AI): the ability of machines to perform tasks that normally require human intelligence.[93]

Distributed Maritime Operations (DMO): "DMO is a combination of distributed forces, integration of effects, and maneuver. DMO will enhance battle space awareness and influence; it will generate opportunities for naval forces to achieve surprise, to neutralize threats and to overwhelm the adversary; and it will impose operational dilemmas on the adversary."[94]

Expeditionary Advanced Base (EAB): a locality within a potential adversary's WEZ that provides sufficient maneuver room to accomplish assigned missions seaward while also enabling sustainment and defense of friendly forces therein. Its expeditionary nature means it is not permanent and must be able to change location quickly enough to maintain relative advantage.[95]

Expeditionary Advanced Base Operations (EABO): 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.[96]

Machine Learning (ML): the capability of machines to learn from data without humans explicitly programming the machines knowledge.[97]

Sea Basing: the deployment, assembly, command, projection, reconstitution, sustainment, and re-employment of joint combat power from the sea without reliance on land bases within the JOA.[98] (JP 3-02)

Stand-in Force: …forces equipped with disruptive new tactical capabilities that will persist and operate forward within a peer adversary's WEZ.[99] (This term is not yet doctrinally defined. This is a definition from a 2019 Marine Corps Gazette article)

Stand-off Forces: Platforms that possess the capability to employ long distance precision guided weapon system while operating outside an adversary's engagement zone in order to minimize risk. (Working definition)

Weapons Engagement Zone (WEZ): 1. In antisubmarine warfare, the area defined by a submarine datum expanded by a predicted furthest-on-circle and the maximum effective torpedo firing range (for a torpedo threat) or the maximum effective missile firing range (for an anti-ship cruise missile threat). A target should be engaged in this zone before the zone encroaches on the protected force.[100] (NTRP 1-02)

Appendix B – Acronyms

A2/AD	Anti-Access/Area Denial
AI	Artificial Intelligence
APOD	Aerial Port of Debarkation
EAB	Expeditionary Advanced Base
EABO	Expeditionary Advanced Base Operation
ESB	Expeditionary Sea Base
LAW	Light Amphibious Warship
ML	Machine Learning
MPF	Maritimes Pre-Positioning Force
SLOC	Sea Line of Communication
SPOD	Sea Port of Debarkation
TM-EABO	Tentative Manual - Expeditionary Advanced Base Operation
WEZ	Weapons Engagement Zone
UAV	Unmanned Aerial Vehicle
USA	United States Army
USAF	United States Air Force
USN	United States Navy
USMC	United States Marine Corps
USS	United States Ship

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