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Evaluating the Logistical Supportability of Expeditionary Advanced Base Operations

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14. ABSTRACT

Expeditionary Advanced Base Operations (EABO) outlines how the Marine Corps can enable the naval force in future conflicts. While applicable throughout the conflict continuum, EABO will be most challenging logistically during an outright war. Vignettes for fires and forward arming and refueling point expeditionary advanced bases provide the daily resupply requirements for EABO. Analyzing the distribution network in light of complicating factors provides fidelity for the true challenge of sustaining EABO. Options from literature for executing the sustainment provide possible solutions but are not assured. The paper concludes that EABO is not logistically supportable in a high-end, modern conflict.

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INTRODUCTION

"In a distributed and contested environment, logistics is the pacing function of the Marine Corps."[1]

As the Marine Corps returns to its naval roots, there is a renewed focus on how the Marine Corps can support the naval force. Expeditionary Advanced Base Operations (EABO) has a foundation in the Marine Corps Operating Concept and outlines how the Marine Corps can enable the naval force. EABO is not the only role for the Marine Corps but is emerging as a critical role across the conflict continuum against peer competitors. It will be most challenging logistically during an outright war.

EABO describes how Marines will distribute among a series of Expeditionary Advanced Bases (EAB) to support the maritime portion of a peer conflict. EABs, characterized by their small size, dispersion, mobility, and low signature, are designed to operate in the littoral areas around key maritime terrain, within the enemy's weapons engagement zone (WEZ). These EABs are task-organizable to provide various capabilities, such as ground-based fires or logistical support for the fleet, as required by the Maritime Component Commander. Regardless of the EAB's capability, they will enable friendly operations while reducing the fleet's risk.

In a modern, high-end conflict, EABO is not logistically supportable given the need to persist and operate within the enemy's weapons engagement zone at a significant distance from friendly support bases. EABs used for fires in support of sea control or forward arming and refueling points (FARP) provide the required sustainment scale to appreciate the logistics dilemma. When these EABs operate simultaneously to realize operations at scale, a logistics distribution challenge arises that is greater than the Marine Corps or joint force can support.

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[1] U.S. Marine Corps, *Sustaining the Force in the 21st Century,* (Washington, DC: Headquarters U.S. Marine Corps) 2.

This paper focuses on evaluating the logistical supportability of EABO in a high-end modern conflict. Where applicable, factors such as geography and enemy threat are included but only briefly for their impacts on the supportability of EABO.

BASIC LOGISTICS REQUIREMENTS

Regardless of the EAB's function, the basic classes of supply required to sustain operations are common across them all. EABs will need all classes of supply to support operations, but selected classes of supply will allow for the supportability evaluation of EABO's logistics requirements.

Class I: Subsistence

All personnel operating at an EAB will require food and water for subsistence. Per Marine Corps doctrine, the sustained requirement is 60 pounds of food and water per Marine per day to operate in a tropical environment[2]. There is a lower minimum requirement, but EABs' persistency requires the sustained rate.

Class III: Petroleum, Oils, Lubricants

The most significant class III supply item is fuel for ground and aviation operations. Aviation operations evaluate fuel consumption in pounds, whereas ground operations utilize gallons. Each fuel type has a unique density, but conversion is considered 6.7 pounds per gallon based on standard fuels' average densities[3]. Table I outlines the capacities and burn rates for selected Navy and Marine Corps aircraft (as well as their ordnance capacities (class V ammunition, covered later, but included in this table for simplicity)).

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[2] U.S. Marine Corps, *MAGTF Supply Operations*, Marine Corps Technical Publication (MCTP) 3-40H (Washington, DC: Headquarters U.S. Marine Corps, 2019), B-1-2.

[3] U.S. Department of Defense, *Department of Defense Standard Practice Quality Assurance/Surveillance for Fuels, Lubricants, and Related Products,* Military Standard (MIL-STD) *3004D,* (Washington, DC: Department of Defense, 2016), 135.

Table I: Aviation fuel and ordnance specifications[4]

A/C	Fuel Capacity (lbs)	Burn Rate (lbs/hr)	Ordnance Capacity
MV-22	11,530	3,374	Small Arms
CH-53K	15,545	2,323	Small Arms
UH-1Y	2,584	1,735	2.75" rockets
AH-1Z	2,768	1,525	8 AGM-114, 14 2.75" rockets, 500 20mm
KC-130J	58,500	5,500	N/A
F-35 (B)	13,400	7,600	2xGBU-32, 2 AIM-120 AMRAAM
P-8	75,169	5695	129 Sonobuoys, 4 RGM-84 harpoons or 5 MK-54 Torpedos

Table II contains the capacity and consumption rates for ground equipment essential for enabling EABO. The total consumption for aircraft will depend on the aircraft's employment. In contrast, ground equipment operation is enduring, allowing for the constant consumption rates outlined in Table II. The basis for daily fuel consumption is 8 hours of operation per day with 50% idle.

Table II: Ground Equipment Fuel Consumption[5]

Platform	Operating Consumption (GPH)	Idle Consumption (GPH)	Fuel Capacity (Gal)	Daily Fuel Consumption (Gal)
JLTV	8.4	1.27	45	38.4
MTVR	13.3	0.94	80	56.8
LVSR	20	3.12	166	92.48
MHE	3.5	0.546	50	16
Generator[6]	4.7	4.7	varies	112.8

[4] Matthew Robinson, Robert Sullivan, and Jeremy Sepinsky, *Supporting and Sustaining a MEB from the Seabase in 2025: Volume II,* (Alexandria, VA: Center for Naval Analyses, 2014), 83; U.S. Marine Corps, *2019 Marine Corps Aviation Plan,* (Washington, DC: Headquarters U.S. Marine Corps); Janes, accessed 10 March 2021, https://customer-janes-com.usnwc.idm.oclc.org/.

[5] Stefanie Allen, Operations Analysis Directorate, Headquarters United States Marine Corps Combat Development and Integration, *Hybrid Electric MAGTF Operations Study Annotated Brief,* Staff Study, August 2020.

[6] Generator requirements vary significantly and will be required for powering equipment at each EAB. At minimum, generators can be used for powering communications equipment but will likely be widely used as additional, energy consuming technologies are integrated into our operations. Even with alternative sources for energy, generators will still be a requirement as a redundant power source to ensure continuity of operations if alternative sources are interrupted or not available.

Class V: Ammunition

Ammunition is another critical class of supply for the sustainment of EABO. Of significant importance are ground-based anti-ship cruise missiles (ASCM), such as the Naval Strike Missile (NSM), and aviation ordnance to support Navy and Marine Corps aircraft. Table III below outlines the key physical characteristics for essential ammunition items for EABO. This table's attributes are for only the weapon itself; each ordnance's actual size and weight will be larger for shipping.

Table III: Ordnance specifications[7]

Ordnance Nomenclature	Maximum Weight (lbs)	Maximum Length	Diameter
AGM-114 Hellfire	108	5'4"	7.01"
RGM-84 Harpoon	1729	15'2.25"	13.5"
Hydra 70 Rockets	23.4	4'7"	2.75"
MK-54 Torpedo	645	9'5"	12.76
NSM	881	13'	2'3.5"
ATACMS	3688	13'	2'
AIM-120	358	11' 11.75"	7.01"
GBU-32	1015	9'11.5"	1'7.5"

These selected classes of supply create the baseline for establishing the logistics requirement. The following vignettes for fires supporting sea control and FARPs supporting aviation operations estimate the total logistical requirements to support EABO.

FIRES EAB VIGNETTE

An EAB supporting sea control using land-based ASCMs will require shooting platforms, personnel to operate the platforms, ordnance, and fuel to support operations. While the Marine Corps does not have a shore-based ASCM firing capability yet, a High Mobility Artillery Rocket System (HIMARS) or Joint Light Tactical Vehicle (JLTV) like platform firing the NSM is the

[7] Janes, accessed 10 March 2021, https://customer-janes-com.usnwc.idm.oclc.org/.

envisioned solution[8]. Those systems provide an example from which size and fuel consumption can help determine EAB logistics requirements. Each platform is assumed to carry and shoot one NSM at a time based on similarities to the current HIMARS capability to carry and shoot one Army Tactical Missile System (ATACMS), which has similar physical dimensions to the NSM. The NSM and its shooting platform provide the critical component of fires EABs.

A fires EAB needs to produce a salvo sufficient to achieve a mission kill on an enemy combatant to prove effective in supporting sea control. In the Wayne Hughes book *Fleet Tactics*, a historical analysis of ASCM missile engagements outlines that the probability of a missile hit against a defended ship is 0.264[9]. Assuming a shot doctrine of two missile hits to achieve the desired mission kill, the EAB would need to be capable of firing eight missiles against one defended enemy ship. The shooting platforms do not have to be collocated but need to be close enough to mass their fires on the enemy ship within the overlapping ~100nm range of the NSM. It is prudent to anticipate that enemy ships will not operate independently in a conflict but instead in a surface action group of at least three ships. Therefore, additional ordnance would be required to be on hand for rapid reloading and engaging the other ships in that group. The capability for multiple salvos from each shooting platform will require an ammunition truck to carry ordnance for a quick reload to continue to provide effective sea control.

Using the Marine Corps proposed Navy-Marine Expeditionary Ship Interdiction System (NMESIS) force structure, a platoon would consist of 9 launchers and 30 personnel, not including attached support personnel from the battery HQ[10]. An additional 12 MTVR like

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[8] Megan Eckstein, "Marines Will Field Portfolio of JLTV-Mounted Anti-Ship Weapons in the Pacific," news.usni.org, 11 March 2020, accessed 5 March 2021, https://news.usni.org/2020/03/11/marines-will-field-portfolio-of-jltv-mounted-anti-ship-weapons-in-the-pacific.
[9] Wayne P. Hughes and Robert P. Girrier, *Fleet Tactics,* (Annapolis: Naval Institute Press, 2018), 271.
[10] U.S. Marine Corps, *Tentative Manual for Expeditionary Advanced Base* Operations, (Washington, DC: Headquarters U.S. Marine Corps, 2021), A-10.

vehicles would transport supplies and ordnance for multiple salvos. 24 Marines would operate them from the HQ battery, also filling vital roles such as communications, ordnance, and service personnel. Finally, an additional platoon of 36 Marines would be required to provide local site security, including 9 JLTV-like vehicles to provide their needed mobility. In total, a fires EAB would require 90 personnel, 18 JLTV-like vehicles, and 12 MTVRs. Sustainment would require 5,400 pounds of subsistence and 9,956 pounds of fuel per day; each 8 missile salvo would require a resupply of 7,048 lbs of ordnance.

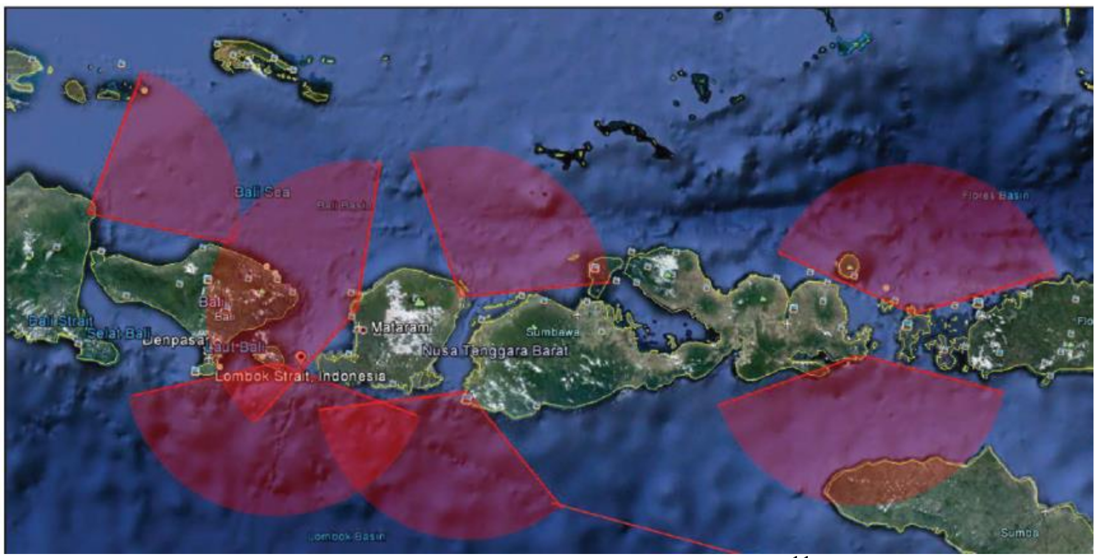

Figure 1: Example Fires EAB Laydown[11]

A 2013 RAND study provides several potential employment scenarios that detail the EAB locations required to establish sea control along the first island chain[12]. Using the Lombok Strait and surrounding passages in Figure 1, seven separate EABs will be necessary. Given the geographic separation, each EAB will need to produce its own eight missile salvo. This requirement drives each EAB's need to have the complete set of personnel and equipment

[11] Terrence K. Kelly et al., *Employing Land-Based Anti-Ship Missiles in the Western Pacific,* (Santa Monica: RAND, 2013), 24.
[12] Terrence K. Kelly et al., *Employing Land-Based Anti-Ship Missiles in the Western Pacific,* (Santa Monica: RAND, 2013), 23-28.

outlined in the previous paragraphs. Of note, these EABs are not specific sites but instead broadly defined Position Areas Artillery where NMESIS platoon and attachments will be able to fire, displace, reload, and be prepared to fire the next salvo[13]. The previously mentioned mobility is vital to their ability to execute survivability displacements after firing.

When scaled to the Lombok Strait and surrounding passages, the associated set of EABs would require a total of 63 shooting platforms, 84 supply vehicles, 63 security vehicles, and 630 personnel. For sustainment, the fires EAB vignette requires 37,800 pounds per day of subsistence, 69,673 pounds per day of fuel, and 7,048 pounds of ordnance per salvo or more likely 21,144 pounds per engagement with a 3 ship surface action group. Assuming one engagement per day, this vignette requires approximately 65 short tons per day of sustainment delivered to the 7 geographically separated sites.

FARP EAB VIGNETTE

A FARP EAB supporting aviation operations would provide rearming and refueling for Marine Corps and Navy aircraft to extend time on station or increase sortie rates[14]. These EABs will require aviation fueling equipment, vehicles to transport equipment and supplies, and material handling equipment to support ordnance movement from storage or transportation to the aircraft. Again, any equipment that is not self-mobile would require transportation assets to enable mobility within the area of operations. Distributed Short-Take Off Vertical Landing Operations (DSO), as a subset of Distributed Aviation Operations, outlines the concept for the employment of mobile FARPs in EABO[15].

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[13] U.S. Marine Corps, *Artillery Operations,* Marine Corps Warfighting Publication (MCWP) 3-16.1, (Washington, DC: Headquarters U.S. Marine Corps, 2002), 3-5.

[14] U.S. Marine Corps, *Expeditionary Advanced Base Operations Handbook,* (Washington, DC: Headquarters U.S. Marine Corps, 2018), 43.

[15] Greg LaRow, *2d Marine Aircraft Wing (MAW) Aviation Operations in Amphibious Environment Study,* DSIA Report, (Belcamp, MD: Defense Systems Information Analysis Center, 2019), 5-17.

The premise of DSO is that F-35Bs[16] can operate from land or sea bases outside the enemy's WEZ, utilizing mobile FARPs to increase sortie generation[17]. A DSO study[18] outlines a scenario where nine mobile FARPs, supported by three mobile distribution sites (MDS), can provide 24/7 FARP support to 28 F-35Bs per day. Each FARP has mirrored personnel and equipment to provide all required aviation ground support capabilities. The MDSs facilitate sustainment to a subset of the FARPs within a geographic area. The FARPs collectively service each F-35B twice per day with fuel and ordnance. Not all mobile FARPs will be active at once; they will rotate sites as depicted in Figure 2 to increase survivability. While the FARP size is scalable, the medium size is the smallest that can provide 24/7 operations, requiring a total of 1,479 personnel and 387 vehicles to support the 9 mobile FARPs and 3 MDSs[19]. These sites would consume 88,740 pounds of subsistence and 162,213 pounds of fuel per day. Assuming the aircraft would require 12,000 pounds of fuel and resupply of ordnance each time, the daily requirement would be 672,000 pounds of fuel and up to 560,000 pounds of ordnance[20].

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[16] While rotary wing aircraft are not precluded from supporting EABO, their limited range would require basing or amphibious ships operationing inside of the enemy's WEZ, assuming significant risk. Moreover, the support requirement for those aircraft would be fuel and ammunition and the F-35B vignette combined with data from Tables 1 and 3 allow for a quick scaling of the logistic requirements that would be needed if included.

[17] Alan M. Pratt *F-35 Operational Concept and Training Requirements Technical Report for the 2d Marine Aircraft Wing (MAW) F-35 training requirements Study,* DSIA Report, (Belcamp, MD: Defense Systems Information Analysis Center, 2017), 5-15.

[18] Systems Planning and Analysis Inc completed a study titled "Distributed Short Take-Off Vertical Landing (STOVL Operations: An Initial Look at Concept Development Feasibility Final Report" that is referenced in the 2D MAW studies as well as several other sources discussing DAO and DSO. Despite all efforts to include assistance from library personnel, the primary resource could not be found. As a result, the report findings are cited from secondary sources for the development of the F-35 vignette in this paper. The medium size was chosen for the vignette as it is the smallest that is capable of providing 24/7 support required. Without the source report, the breakdown of vehicles required is not specified but is assumed to be an even distribution of MTVRs, LVSRs, and JLTVs.

[19] Greg LaRow, *2d Marine Aircraft Wing (MAW) Aviation Operations in Amphibious Environment Study,* DSIA Report, (Belcamp, MD: Defense Systems Information Analysis Center, 2019), 5-21.

[20] Robert C. Owen, "Distributed STOVL Operations and Air-Mobility Support: Addressing the Mismatch between Requirements and Capabilities," *Naval War College Review* 69*,* no. 4 (2016): 5.

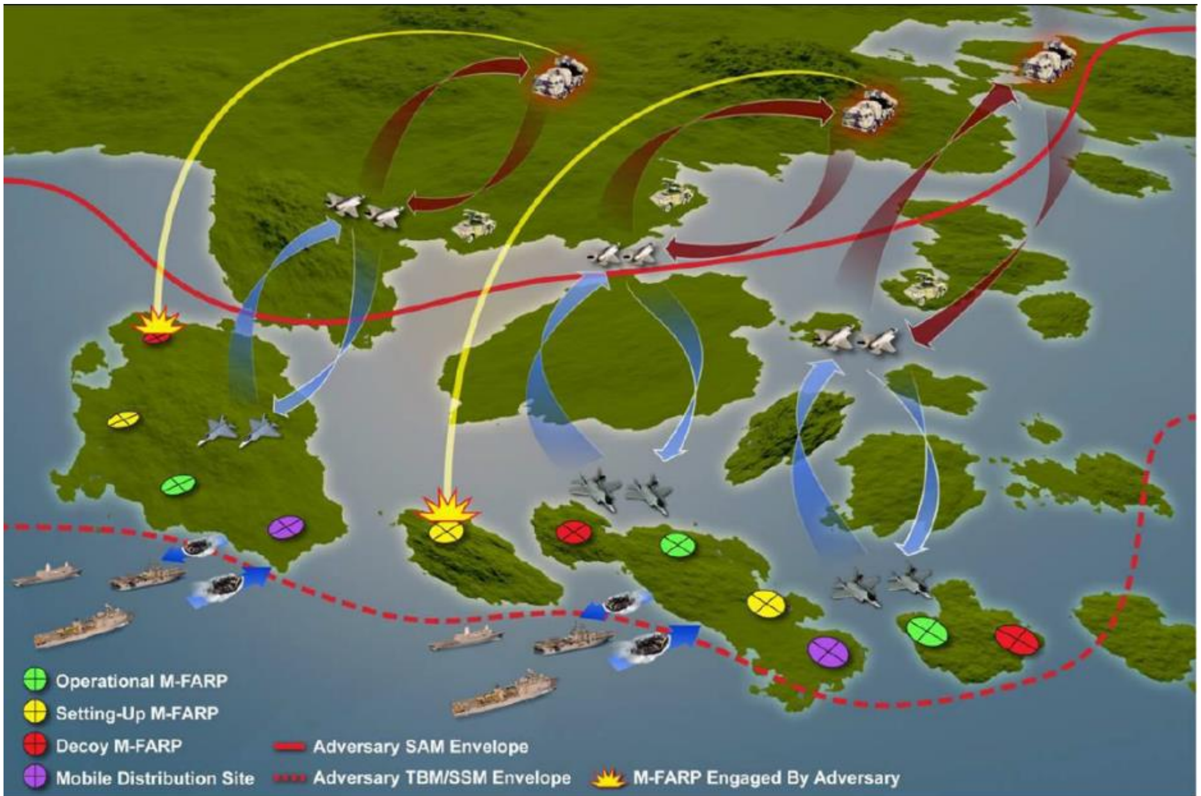

Figure 2: Notional Mobile FARP Laydown[21]

Support to Navy aircraft, like the P-8, will increase the fuel and ordnance requirements for these FARPs. For example, P-8s based out of Guam, conducting maritime patrol and reconnaissance somewhere inside the first island chain, could be supported by a FARP in the Philippines, such as one of the mobile FARPs above[22]. Departing from Guam and operating on station for approximately 4 hours, a P-8 would need 30,000 pounds of fuel to return to Guam safely[23]. It would require P-8s rotating every 4 hours to provide 24-hour coverage on a target area. The supporting aircraft would require refueling support from the FARPs in the Philippines six times a day and may need an entire reload of sonobuoys and Harpoon missiles or MK54

[21] Greg LaRow, *2d Marine Aircraft Wing (MAW) Aviation Operations in Amphibious Environment Study,* DSIA Report, (Belcamp, MD: Defense Systems Information Analysis Center, 2019), 5-32.
[22] Walker Mills et al., "Implementing Expeditionary ASW," *Proceedings,* April 2021, 41.
[23] Jared Stolle, interview with the author, 10 March 2021.

torpedoes[24]. The total sustainment would be 180,000 pounds of fuel and 63,096 pounds of ordnance and sonobuoys per day[25].

When you combine the support to Marine Corps and Navy aircraft, the subsistence requirement remains the same at 88,700 pounds per day, assuming supported aircraft crews require no subsistence. Daily, the fuel requirement aggregates to 1,014,213 pounds, and the total ordnance requirement is approximately 623,096 pounds. Therefore the complete daily support for FARP EABs would be 863 tons.

COMBINING THE VIGNETTES AND SUPPORTABILITY

As described, the proposed vignettes will each require significant logistical support to provide an enduring presence. Furthermore, the anticipated scale of EABO means simultaneous execution of the vignettes[26]. The result is that their logistics requirements are additive, there is no economy of scale to be gained, and they will likely compete for priority of logistics support. The vignettes' combination results in a daily sustainment requirement of 928 tons, establishing the logistics requirement for EABO.

There are countless permutations of combining connector types for accomplishing the daily sustainment requirement. Total deliveries will range from 8-180 per day using connectors outlined in Table IV. This quantity of deliveries places an extremely high demand on the distribution system and creates an EAB observation vulnerability. Any attempt to reduce

[24] Joe Gould and Aaron Mehta, "US could lose a key weapon for tracking Chinese and Russian subs," *defensenews.com,* 1 May 2019, accessed 1 April 2021, https://www.defensenews.com/digital-show-dailies/navy-league/2019/05/01/us-could-lose-a-key-weapon-for-tracking-chinese-and-russian-subs/.

[25] The defensenews.com article outlines the requirement for producing at least five different types of sonobuoy, wich of which would have their own specific physical characteristics. An assumed average weight of 30 pounds is used to determine the daily sustainment requirement. The complexity of having sufficient quantities of each type of sonobuoy on hand is not trivial but does not greatly impact the daily sustainment requirement, especially given their relatively similar physical characteristics.

[26] Megan Eckstein, "Early Experiments are Proving Out Tank-Free Marine Concept," news.usni.org, 1 February 2021, accessed 5 March 2021, https://news.usni.org/2021/02/10/early-experiments-are-proving-out-tank-free-marine-corps-concept.

deliveries by increasing the delivery size will require additional ground or mobile storage. With the distribution requirement established, additional factors only complicate the challenge.

Table IV: Connector Characteristics[27]

Connector	Capacity (Tons)	External (Tons)	Speed (Knots)
MV-22	5	5	240
CH-53K	8.75	15	150
C-130	24	N/A	340
C-17	82	N/A	440
LCU	120	N/A	8
LCAC	60	N/A	40

Supply and Distribution Network

In light of the enemy threat, supply points for distributed operations, like EABO, must evolve to be more dispersed and located outside the enemy's WEZ. The traditional model for an "iron mountain" assumes significant sustainment risk, which led to the idea of dispersing supplies to multiple "iron hills," which will avoid disastrous loss[28]. The risk reduction loses economy of scale. Increasing supplies and distribution capacity to manage stockage levels between these supply points provides partial mitigation to the loss of economy of scale[29]. The net result is the increased cost for extra supplies and a more complex, less efficient distribution network to overcome the dispersion. Figure 3 depicts the differences in the distribution and supply models and demonstrates the complexity and increased distribution capacity requirement resulting from dispersing supplies to multiple supply points.

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[27] Matthew Robinson, Robert Sullivan, and Jeremy Sepinsky, *Supporting and Sustaining a MEB from the Seabase in 2025: Volume II,* (Alexandria, VA: Center for Naval Analyses, 2014), 130; Robert C. Owen, "Distributed STOVL Operations and Air-Mobility Support: Addressing the Mismatch between Requirements and Capabilities," *Naval War College Review* 69, no. 4 (2016): 9.
[28] Samuel R. Bethel, "Sustaiment in an Anti-Access/Area-Denial Environment," *Army Sustainment*, January-February 2016, 15.
[29] Jason Fincher, "Distributed Operational Logistics," *Marine Corps Gazette,* October 2019, 54-55.

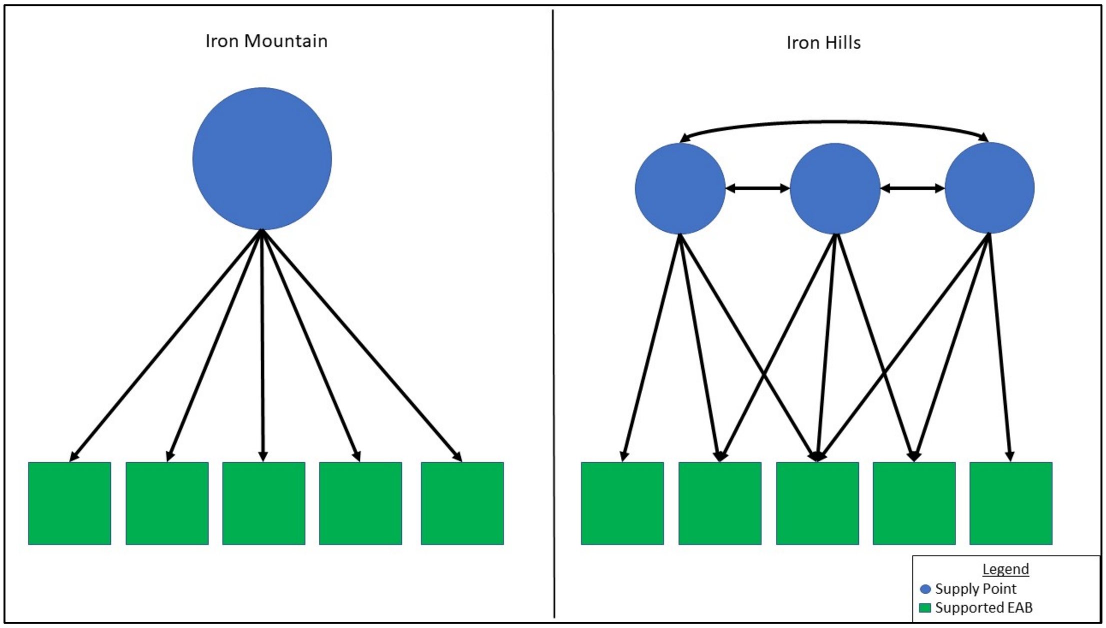

Figure 3: Notional supply and distribution networks

Additionally, geography, long distances, and enemy action complicate the distribution network. The most challenging geography for EABO is non-contiguous terrain, like the Lombok Strait and surrounding passages from the fires vignette. EABs operating in areas separated by water cannot leverage a common ground resupply point, requiring air or naval assets to distribute supplies. Furthermore, with supply points located outside the enemy's WEZ, lines of communication will be longer both in terms of distance and time[30]. This time-space challenge requires additional distribution capacity to ensure constant deliveries. Finally, enemy actions will result in losses in the distribution chain[31]. These cannot be avoided in a high-end, modern conflict and will destroy both the distribution asset and its payload. These factors' resulting impact is the requirement for redundant capacity that sits underutilized or gets re-tasked until losses occur.

[30] Samuel R. Bethel, "Sustaiment in an Anti-Access/Area-Denial Environment," *Army Sustainment*, January-February 2016, 15.
[31] Ryan Boone, Harrison Schramm, and Timothy Walton, *Sustaining the Fight: Resilient Maritime Logistics for a New Era,* (Washington, DC: Center for Strategic and Budgetary Assessments, 2019), 35.

Push vs. Pull Logistics

In addition to the intricacies of the distribution and supply network, push vs. pull logistics adds another complexity level. Push logistics are forecastable items, including the subsistence, fuel, and ordnance requirements outlined earlier. While less efficient than pull logistics, it is the best way to ensure logistics support given the time-space considerations for distribution. Conversely, EABs cannot forecast pull logistics which are often critical items such as repair parts. EABs can bring a Class IX block, but since it is impossible to bring every part, equipment will become degraded or deadlined due to lack of parts, negatively impacting the EAB's capability. While repair parts are a single example of a pull item, they illustrate any other unforecasted supply requirement's challenges. The timely delivery of logistics in EABO will depend on a robust and resilient supply and distribution system capable of meeting both forecasted and unforecasted requirements.

Other Logistics Function Requirements

Other selected functions of logistics highlight some additional sustainment challenges created by EABO. Distanced from higher levels of care, casualty and medical evacuation become incredibly challenging. Given the current doctrine's consolidation of medical capabilities, operations at distributed EABs will only be capable of minimal medical treatment for any sustained injuries. This increases the risk to personnel due to impacts on the "golden hour," and any casualty or medical evacuation will compete for the same distribution assets required for resupply.

Maintenance will be a challenge for EABs operating in austere environments with minimal supplies and personnel. As previously mentioned, EAB forces can bring a parts block, increasing their sustainability, assuming that the operators can repair the equipment. When special tools, equipment, or maintainers are required, they will either have to be part of the EAB force or be readily available for support to widely dispersed forces. Even if available, these personnel and equipment still have the challenge of getting to the EAB. If the equipment's repair cannot be done on-site, recovery and evacuation for maintenance add another complexity level.

While not all-inclusive, these selected functions demonstrate more competition for logistics priority within EABO. These competing logistics priorities are subject to the same distribution complexity resulting from inefficient distribution networks, losses to enemy actions, and unforecasted requirements. Moreover, logistics support will compete with the movement and maneuver operational function for the same surface or air assets. These factors only further complicate the daily challenge of distributing 928 tons of supplies, making EABO at scale unsupportable in a modern, high-end conflict. General Berger testified that "the operational logistics system, both ground and aviation is insufficient to meet the challenges posed by a peer/near-peer conflict, especially in the Into-Pacific where significant distances complicate sustainment of a deployed force."[32]

HOW IT COULD BE SUPPORTED

Others would argue that EABO is logistically sustainable and there are mitigations for the complexity and challenges. First, the Marine Corps is already executing limited EABO. Second, joint capabilities provide additional capacity for sustainment, enabling the expansion of EABO. Finally, future capabilities throughout the joint force are sufficient to provide the necessary support.

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[32] David Berger, "Statement,", Senate, *Senate Armed Services Committee Subcommittee on Readiness and Management Support on Marine Corps Readiness,* 116th Cong., 2nd sess., December 2, 2020, 5.

In 2019, the 31st Marine Expeditionary Unit (MEU) conducted EABO, demonstrating a FARP supporting aviation and support to HIMARs fires missions. The MEU seized an airfield and set up a FARP that could support both rotary-wing and KC-130J aircraft.[33] The ability to support larger fixed-wing aircraft demonstrates significant progress towards supporting EABO at scale in a conflict, given the increased sustainment requirements for providing that capability. The MEU then conducted a notional adjacent island seizure, leveraging the first EAB to support the operation. The second island served as a base for HIMARS to conduct long-range precision strikes. This is an example of EABs supported with equipment, personnel, and capabilities organic to a standard MEU.

The *Tentative Manual for EABO* identifies Operational Contract Support (OCS) and prepositioning as key enabling logistics capabilities. OCS can leverage local sources of supply to reduce distribution requirements for common logistics items significantly. Fuel and water are two of the most considerable sustainment requirements for EABO that OCS can fulfill. Prepositioning can provide the initial supplies while OCS gets up and running. Furthermore, it can reduce deployment requirements by having equipment staged in the operating area. Combined, OCS and prepositioning will lessen movement and sustainment requirements resulting in a significant reduction of distribution requirements.

From a joint perspective, the Air Force and Navy will also serve as critical enablers for EABO sustainment. The Air Force's air mobility assets provide a distribution capability that can access many of the forward areas utilized for EABs from bases outside of the enemy's WEZ.[34]

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[33] Megan Eckstein, "How to Seize Islands, Set up a Forward Refueling Point: Marine Crops Recipes for Expeditionary Operations," news.usni.org, 13 September 2019, accessed 25 February 2021, https://news.usni.org/2019/09/13/how-to-seize-islands-set-up-a-forward-refueling-point-marine-corps-recipes-for-expeditionary-operations.

[34] Robert C. Owen, "Distributed STOVL Operations and Air-Mobility Support: Addressing the Mismatch between Requirements and Capabilities," *Naval War College Review* 69, no. 4 (2016): 1.

With substantially more capacity than Marine Corps aviation, the Air Force will make considerable contributions to sustainment. From the Navy, the Marine Corps can "begin with leveraging joint maritime efforts such as Naval Logistics Integration, Seabased Logistics, and Distributed Agile Logistics."[35] The inherent lift capacity of ships, their ability to serve as mobile supply points, and their capability to carry surface connectors will be critical to enabling EABO at scale. These seabased assets will reduce the distances for lines of communication and provide significant increases in distribution capacity. Furthermore, the development of new platforms will increase distribution across sea lines of communication in the future.

The Marine Corps and Navy are pursuing new amphibious platforms to enable distributed operations. Most promising is the Light Amphibious Warship (LAW). Its design incorporates sufficient range to carry supplies from distant land-based supply nodes or seabased supply nodes from amphibious or maritime prepositioning ships[36]. The LAW, augmented by new unmanned surface and air vehicles, can drastically increase distribution capacity, making EABO sustainable.

REBUTTAL

Previous success in demonstrating EABO and joint force capacity does not guarantee supportability moving forward. The examples from the 31st MEU are not to scale, which fails to show EABO's true logistics challenge. The scope of EABO's logistics problem and the competition for distribution assets within the joint force will demand too much of current

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[35] U.S. Marine Corps, *Sustaining the Force in the 21st Century,* (Washington, DC: Headquarters U.S. Marine Corps), 16.

[36] Megan Eckstein, "Navy Officials Reveal Details of New $100M Light Amphibious Warship Concept," news.usni.org, 19 November 2020, accessed 25 February 2021, https://news.usni.org/2020/11/19/navy-officials-reveal-details-of-new-100m-light-amphibious-warship-concept.

capabilities and capacities. The joint competition extends to future budgets, which places the future programs intended to make EABO supportable at risk.

While OCS and prepositioning of resources can significantly reduce the sustainment distribution for EABO, they have inherent risks. For prepositioned equipment and supplies, there is the risk that they will be discovered or damaged before their use. If the compromise of these assets goes undiscovered, critical shortages will result that will degrade or prevent an EAB's operations. Similarly, OCS requires trust that the host nation's support will be available and reliable during a time of conflict. The sustainment requirements of EABO demand reliability and neither prepositioning nor OCS can provide guarantees.

The assets identified as critical joint enablers for EABO are the same resources needed to support competing concepts from other services. The Army's Multi-Domain Battle Concept advertises to provide very similar sea control capabilities to those outlined in the fires vignette above.[37] Sustainment for the Army will require many of the same seabasing and air mobility assets, competing with those necessary to support EABO. Additionally, the Air Force aims to distribute their aviation operations to increase survivability in a modern conflict, increasing requirements for finite and limited air mobility assets[38]. Finally, the Navy is likely to execute Distributed Maritime Operations, resulting in an increased distribution requirement for sustainment, which will demand more from an already stretched CLF fleet[39]. These CLF ships are the same that will be required to resupply any seabases supporting EABO. Given competing priorities across the services, the Marine Corps cannot expect to be the sole recipient of the joint

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[37] Robert B. Brown, "The Indo-Asia Pacific and the Multi-Domain Battle Concept," *Military Review,* September-October 2017, 18.
[38] Robert C. Owen, *Shaping Air Mobility Forces for Future Relevance,* AFRI Paper, no. 2017-1, (Maxwell AFB, AL: Air University Press, January 2017), 18.
[39] Ryan Boone, Harrison Schramm, and Timothy Walton, *Sustaining the Fight: Resilient Maritime Logistics for a New Era,* (Washington, DC: Center for Strategic and Budgetary Assessments, 2019), 35.

assets. When combined with the risk of losses due to enemy action discussed above, joint assets are not a guaranteed solution for supporting EABO.

The combination of the LAW and unmanned vehicles promises to provide relief in the future but provides no assurances. Acquisition programs, new and old, are plagued with schedule delays and cost overruns. For the fiscal year 2021, the LAW program's approved funding was $24 million, already 20% less than the requested $30 million[40]. There is no guaranteed budget to support future capabilities necessary for sustaining EABO. Each program competes for resources within the service, and the services compete within the Department of Defense[41]. The competition for funding is never-ending, and the possibility of reductions to the defense budget only exacerbates the problem. In a fiscally constrained environment, the prioritization of logistics programs, like the LAW, is doubtful. Despite these challenges, procurement must be sufficient to meet distribution throughput with enough redundancy to overcome combat losses to make EABO sustainable. Even if these programs make it through the acquisition process in the quantities required, they are subject to the same interservice competition outlined above.

Each service's distributed operations concept is likely individually supportable. The joint force cannot consider these concepts in isolation, though, as they all combat the same threat and are likely to be executed simultaneously. The competition for existing capabilities and capacities combined with future programs' uncertainty makes EABO unsupportable in a modern, high-end fight.

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[40] Ronald O'Rourke, *Navy Light Amphibious Warship (LAW) Program: Background and Issues for Congress,* (Washington, DC: Congressional Research Service, 2021), 20.
[41] Robert Work, "Storm Clouds Ahead: Musings about the 2022 Defense Budget," warontehrocks.com, 30 March 2021, accessed 2 April 2021, https://warontherocks.com/2021/03/storm-clouds-ahead-musings-about-the-2022-defense-budget/.

CONCLUSION

The vignettes demonstrate the enormous scope of the logistical requirement to sustain EABO. The distribution of these supplies would take a herculean effort, mired by the distribution challenges explored here, which only begin to scratch the surface of the issue's true intricacy. The scope and complexity of the logistics requirements clearly make EABO unsustainable in a modern, high-end conflict.

This analysis does not doom EABO to failure or unsupportability in the future. As discussed, the joint force may have the capacity, but the Marine Corps must compete for it. Likewise, future capabilities may prove successful in meeting the distribution challenge, but they do not exist yet. Using these logistics capabilities and capacity as planning assumptions would be irresponsible as they are too uncertain to be considered reliable. Knowing that the pacing function is logistics, sustainment must be prioritized and resourced now and in the future for EABO to be successful.

RECOMMENDATIONS

There is significant value in further developing a detailed concept of employment for EABO. Additional details for the various EAB types will provide more fidelity for the total logistics requirement. For example, the physical security requirements, tentative locations, and when displacement requires amphibious ships, especially given these ships' dual role of movement/maneuver and sustainment distribution. Better defining the concept of employment will enable the development of a feasible concept of support.

In developing the concept of support, several areas require further research. First is the prepositioning or caching of supplies. Specifically, what supplies does it make sense to preposition, is prepositioning affordable, and is it worth the risk? The second is OCS; what supplies does it make sense to contract, and what risks does this pose to EABO? Finally, there should be a detailed distribution analysis for proposed supply and distribution networks. There are many permutations for combinations of land and seabased supply points, distribution paths, and connectors. The most promising of these must be thoroughly developed and wargamed or experimented with to determine their ability to support EABO. In this analysis, interservice competition and future capabilities are critical factors.

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