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<b>14. ABSTRACT</b> Presents an argument that current amphibious forcible entry doctrine has been rendered obsolete by the technology and complexities of the 21st century combat environment based on physical limitations, vulnerability, affordability, and design potential of surface connectors. Instead, recommends an air-centric approach in which assault forces use vertical connectors across vast distances to seize inland objectives which are then resupplied by strategic airlift using precision parachute aerial delivery systems ranging from 2000-60,000 pounds which will resupply and reinforce a growing ground force with ammunition, fuel, food, water, wheeled vehicles, and mobile weapon platforms. This concept circumvents the complexities and risks of a hybrid and A2AD environment and permits expeditionary forces to strike deep. It uses existing technology and platforms and represents a disruptive rather than sustaining doctrinal innovation.					
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**FUTURE WAR PAPER**

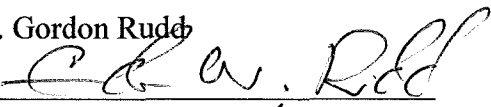
**RETHINKING THE AMPHIBIOUS PARADIGM:  
PROJECTION OF COMBAT POWER FOR THE 21<sup>ST</sup> CENTURY**

**SUBMITTED IN PARTIAL FULFILLMENT  
OF THE REQUIREMENTS FOR THE DEGREE OF  
MASTER OF OPERATIONAL STUDIES**

**STEPHEN H. IRVING, MAJOR, USA**

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Background: The ability to project power across water has remained a critical capability throughout history, from the Greeks at Troy in 1200 B.C, to the Allies at Normandy in 1944, to British forces at the Falklands in 1982.<sup>1</sup> Julian Corbett argued that sea power was essential to enabling ground forces to close with and destroy an enemy.<sup>2</sup> However, projecting military power across great distances is not without difficulty. In 1939, B.H. Liddell Hart held that “landing on a foreign coast in the face of hostile troops has always been one of the most difficult operations of war.”<sup>3</sup> Given the former combined with the ever advancing technological character of modern warfare this author will argue that traditional surface-based amphibious doctrine has been rendered obsolete by the high-tech character of the 21<sup>st</sup>-century operational environment. Instead, United States’ amphibious forces should adapt what this paper refers to as an Air-centric Expeditionary Operations (AEO) approach, which capitalizes on speed, range, and agility to project combat power across great distances and through enemy 21<sup>st</sup> century defenses.

Recent trends indicate a growing aversion toward amphibious assaults against conventional forces. The last amphibious assault conducted by the United States military forces took place 64 years ago at Inchon, South Korea, against a light coastal defense. From 1965 to 1969, United States Marines in Vietnam conducted a total of 62 amphibious operations; however, they were directed against guerilla threats, none involved enemy contact, and the operations were deemed “ineffective” according to a Center for Naval Analysis 2002 study.<sup>4</sup> During the Gulf War in 1990, an amphibious landing was planned but not executed, due to anti-ship missile and mine warfare threats and casualty projections.<sup>5</sup> Since 1950, amphibious operations have focused more on movement of personnel and equipment into permissive or slightly restricted environments, and less on the ability to project offensive combat power into a non-permissive environment.<sup>6</sup> The facts beg three questions: First, why has the United States Marine Corps organized, trained, and equipped for a doctrine that’s challenged by the high-tech operational environment of 21st century? Second, would current amphibious doctrine succeed

against a modern adversary such as China, Russia, or North Korea? Third, how can forcible entry doctrine be enhanced to succeed in current and future combat environments?

Despite this shift away from offensive amphibious operations, projection of combat power across great distances into non-permissive environments is a critical requirement for the United States as it confronts a variety of global threats. United States combat power creates a stabilizing presence in key regions across the globe and the United States must remain capable of responding to crises despite limited access, a shrinking force size, and anti-access/area denial (A2AD) efforts of competitors.<sup>7</sup> To facilitate this, the United States Marine Corps is specifically tasked to serve as the nation's expert on expeditionary and amphibious operations. Title 10, U.S.C., states, "the USMC will be organized, trained, and equipped [for the] seizure and defense of advanced naval bases and for the conduct of such land operations as may be essential to the prosecution of a naval campaign."<sup>8</sup> Furthermore, DoD Directive 5100.1 tasks the USMC with the "primary responsibility for the development of landing force doctrine, tactics, techniques, and equipment that are of common interest to the Army and Marines Corps."<sup>9</sup> According to the Commandant Marine Corps and Chief of Naval Operations, this translates into being able to project and sustain at least two Marine Expeditionary Brigades (MEB) into a combat theatre.<sup>10</sup> Clearly, the end and the means have been identified, but the method, or way, is open to interpretation.

The Problem: Traditional, surface-based, offensive amphibious doctrine has been rendered obsolete by complexities of the 21st-century operational environment. Since the Greeks landed at Troy, *surface-based* amphibious operations have faced three types of challenges: First, the physical environment creates friction and obstacles for amphibious forces: weather conditions can delay execution; sea state hinders loading; surf conditions disrupt surface

connectors movement enroute; shore conditions can foul landings; and coastal terrain slows movement inland to objectives. Second, coastal defenders hold a clear tactical advantage over amphibious assault forces for many reasons.<sup>11</sup> Defenders have the benefit of planning and concentrating both direct and indirect fires on likely landing sites; obstacle belts may either deny or delay coastal landings; and movement off the beach to establish a lodgment may be met by mobile counterattack forces. Defenders traditionally have an advantage over the attackers with prepared positions and probably possessing a more favorable force ratio to the attacker. Third, every amphibious assault is made vulnerable by what Dr. Carter Malkasian, an Naval Analyst, refers to as “operational pause” and is defined as the period between landing and movement to inland objectives. This pause diminishes offensive initiative and permits enemy counterattack, and is the primary reason a variety of amphibious assaults fall short of operational expectations.<sup>12</sup> During this critical period, a foothold must be established, follow-on forces arrive, and logistics are established in the face of enemy resistance.

Recent technology has exaggerated the traditional challenges of amphibious assault operations making them significantly more vulnerable: long-range surveillance in the form of unmanned platforms and satellite reconnaissance has eliminated the element of surprise, which is essential for an amphibious landing. A variety of air and space based platforms can now track surface-based fleets and landing forces real-time allowing adversaries to concentrate defense systems prior to amphibious landings. Precision-guided munitions (PGM) can now target the amphibious fleet and landing craft with more precision and at a greater distance than ever before. Long-range PGM, such as the Chinese DF-21<sup>13</sup> or the Russian P-800 Oniks<sup>14</sup> anti-ship ballistic missiles (ASBM), are capable of striking ships up to 900 miles away, destroying ships ranging from cruiser to carrier. Worse yet, short-range PGMs, guided by wire, laser, or infrared, are

widely available and have high probability of destroying surface connectors such as the AAV or LCAC as they helplessly approach the coastal objective. The Russian-made AT-3, 4, 5, 7, 13, 14, the U.S.-made Javelin, or Israeli-made Spike missiles are known to be in the hands of adversaries and are capable of hitting targets in the water up to 4,700 meters away.<sup>15</sup> Counter-mobility and counter-survivability systems have also been enhanced by technology presenting a variety of sub-surface threats to the amphibious fleet as it enters an operational area and admittedly challenging the limits of U.S. mine warfare capability.<sup>16</sup> Once ashore, the landing force must confront a variety of anti-personnel and anti-vehicle mines, unknown to previous landing forces, as the use of IEDs in the previous decade of war has illustrated. It is important to recognize that surveillance, precision weapons, and anti-personnel/vehicle devices are not limited to peer threats of the United States. A 2013 study found there are nearly 60 groups of non-state actors in possession of a variety of anti-tank guided weapons (ATGM) that could be used to defend coastal areas.<sup>17</sup> Given the increased range, precision, and proliferation of modern weapons and sensors, it seems unlikely that a surface based amphibious assault would succeed. As the character of warfare has changed over time, so to must the doctrine.

Some changes have been implemented over the last few decades in an attempt to make amphibious doctrine a better fit against the challenges of distance, time, and long-range precision weapons. The concepts of Operational Maneuver from the Sea (OMFTS), Ship-to-Objective Maneuver (STOM), Over the Horizon (OTH) operations, and Maritime Pre-positioned Forces (MPF) were designed to mitigate enemy coastal defenses and exploit gaps in a defense through the use of improved surface connectors such as the Landing Craft Utility (LCU), the Amphibious Assault Vehicle (AAV), and the Landing Craft Air-Cushioned (LCAC), in conjunction with vertical lift platforms such as the MV-22 Osprey and CH-53 Sea Stallion. While traditional

amphibious doctrine tended to conduct assaults on a front about one mile wide and 1,000 yards deep, OMFTS, OTH, and STOM would assault from outside enemy weapons' range, on a front 230 miles wide and 100 miles deep into enemy territory, to seize key objectives, and build combat power by enhanced logistics offered by the maritime prepositioned force ships.<sup>18</sup> The problem is that the precision and range of defensive weapons has significantly increased beyond 100 miles since the United States amphibious doctrine was updated, which places United States carriers, amphibious ships, and the MPF at risk. This increases the requirement for standoff, creating a "distance gap", which requires surface connectors to travel distances for which neither the platform, the occupants, nor the doctrine was designed.

This "distance gap" between the minimum range of the amphibious fleet and the maximum range of the surface connectors is the crux of the problem and the reason for which a new doctrine outside the current amphibious paradigm must be developed. The minimum distance the U.S. Navy will allow its ships to approach a hostile shore has been a recent topic of debate: during a 2011 Congressional Subcommittee meeting, senior Marine Corps and Navy officers stated the Navy's minimum distance to shore was 12 nautical miles but, based on recent weapon developments, it should be increased to 25 nautical miles.<sup>19</sup> In 2014, the Marine Corps released its Expeditionary Force 21 concept, which states that U.S. Navy vessels must standoff at least 65 nautical miles from shore-based threats.<sup>20</sup> Furthermore, former Marine Corps Commandant, General Amos, recently stated the planning factor for ship standoff is now closer to 100 nautical miles and is expected to increase.<sup>21</sup> Surface connectors such as the AAV, LCU, and LCAC were not designed, nor are they practical, for use across such great distances, based on safety and travel time.

Nonetheless, the dilemma of defense contractors has become to develop an improved surface connector that offers mobility, speed, and protection across 100 miles of water, performing as a speedboat in the water and an M1 tank on land. The Expeditionary Fighting Vehicle (EFV), the Ultra Heavy-Lift Amphibious Connector (UHAC), and the Amphibious Combat Vehicle (ACV) serve as examples of this endeavor. Despite multiple designs and millions of dollars fielding such a surface connector has pushed the limit of what is technologically possible and the cost of such a ship-to-shore connector has been deemed unaffordable for the Marine Corps, according to Assistant Secretary of the Navy, Hon. Sean Stackley.<sup>22</sup> Finally, planners and strategists must accept the fact that even if it wanted to, the United States does not have the physical capability to support the two MEB expeditionary mission requirement based on USN ship platform. According to a recent Jane's Defense interview the USMC requires 38 amphibious ships in order to support the two MEB expeditionary missions. Based on budgetary constraints the USN is only able to provide 32, which will require finding another way to insert MEB forces into theatre.<sup>23</sup>

The amphibious dilemma essentially boils down to sustaining versus disruptive innovations. American military strategists and politicians can continue the frustrating search for a material solution to the complex A2AD problem, or they can recognize a bias for the current amphibious paradigm and instead pursue a non-material solution. Historically, the most successful innovations are those that combine new platforms with new doctrine to achieve an asymmetric advantage over the enemy; Napoleonic battle, Blitzkrieg, airborne operations, and airmobile operations represent the power of conceptual rather than equipment solutions.

Amphibious doctrine has been refined to some basic principles: JP 3-02 defines amphibious operations as “military operation launched from the sea by an amphibious force to

conduct landing force operations within the littorals.”<sup>24</sup> The objective of amphibious operations is to “achieve a position of advantage over the enemy.”<sup>25</sup> Amphibious operations should strive to “exploit the element of surprise and capitalize on enemy weakness.”<sup>26</sup> This description does not dictate that amphibious forces must travel to objectives by sea. Getting connectors out of the water is the key.

The future operational environment seems well suited to AEO doctrine (Air-Centric Expeditionary Doctrine), which is expected to be urban, coastal, three dimensional, and saturated with long-range sensors and weapons.<sup>27</sup> Experts predict that within the next 30 years, at least 85 percent of the world’s population will live within 50 miles of a coast, which will increase potential for conflict and crisis events. Unconventional forces similar to ISIS, Al-Qaeda, and Hezbollah will represent the low end of conflict. They may occupy the areas surrounding these large cities and attempt to influence the population through use of terror and control of outlying resources. Non-state actors may have the ability to use high-tech surveillance, networked communication, and short-range precision weapons against U.S. forces attempting to deploy against them. Conventional forces such as China, Russia, and North Korea may continue to remain a threat and represent the high end of conflict. They will continue to deploy successive A2AD belts comprised of long range sensors and precision munitions to target large U.S. platforms as well as frontal, mobile, or defense in depth in coastal objective areas. An environment and threats such as these will be difficult, if not impossible, for traditional amphibious forces to defeat. The United States needs a doctrine that is flexible, far reaching, and able to defeat irregular or conventional threats in an A2AD environment through asymmetric or indirect doctrine.

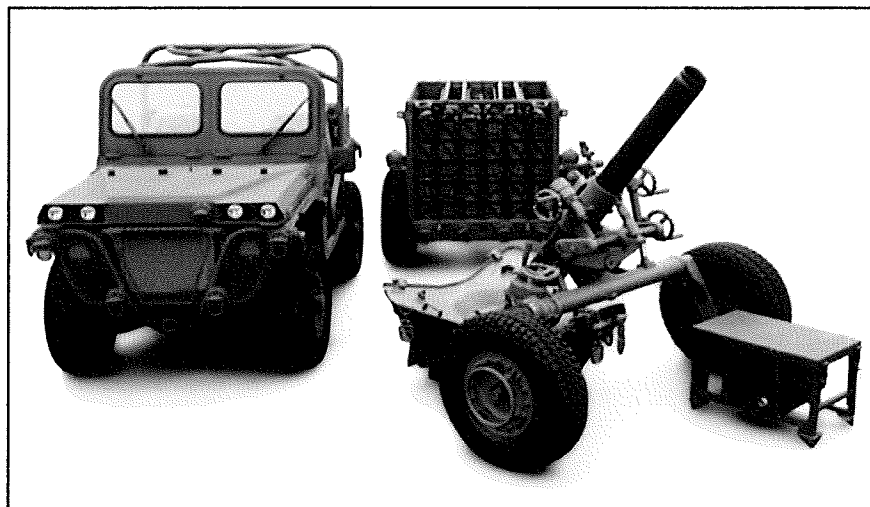
It is the recommendation of this author that the U.S. Marine Corps can redefine itself as a truly 21<sup>st</sup>-century expeditionary force by adopting an Air-centric Expeditionary Operations (AEO) doctrine that capitalizes on vertical lift, strategic airlift, airdrop resupply, and regional or expeditionary air logistic hubs. This concept allows expeditionary forces to deploy across great distances along multiple axis of advance, to avoid enemy defenses, seize key terrain, avoid operational pause, and rapidly build combat power for follow-on offensive operations. The following example scenario describes the AEO concept.

*Scenario: An earthquake and subsequent tsunami has struck a small island in the South China Sea. The west coast of the island, including the capitol, is devastated, resulting in great loss of life, a crippled infrastructure, and instability due to looting and local Communist guerillas. Despite increased regional tensions with China and North Korea, the United States has anticipated supporting such an event and distributed three WASP Class Amphibious Ready Groups (ARG) arrayed within 500 miles of the island. The ARGs are aware of the A2AD threats due to long-range anti-ship weapons and will maintain standoff. Two of the ARG LHA are equipped with ten MV-22 each, the others with eight CH-53. On order, a force of 320 Marines departs one LHA via CH-53 while a force of 480 Marines departs the other two LHAs via MV-22. The three flights proceed toward the island objective 500 miles away at a rate of 170 and 250 knots, respectively and an altitude of 25' over the water. Chinese coastal defense forces are monitoring USN ARGs with DF-21 ASBM, ready to launch, but never have the range. Additionally, Communist guerilla forces are over-watching likely beach landing sights with portable guided weapons but never see a surface landing force. Within 2.5 hours of notification, a ground force of 800 Marines have arrived at inland landing zones, secured the airport, the naval port, and the capitol. Marine forces are now in a position to assess the situation, assist*

*local forces, provide security, and establish drops zones for follow-on disaster relief supplies and personnel. Two hours after securing the airport, a flight of four C-17 cargo planes from a supply depot in Japan are approaching. They are unable to land due to the damaged runway, but still deliver 320 tons of palletized water, food, and medical supplies via precision guided parachute, using the airport as a secure drop zone. Marines then use forklifts included in the supply drop to clear the drop zone and distribute the supplies. One hour later, flights of fifteen MV-22 and eight CH-53 land on cleared pads at the airport with an additional force of 350 Marines and 20 wheeled vehicles equipped with 7.62mm machine guns, a UAV control platform, a C2 suite, and litter assembly, providing the Marine force mobility for security patrols, search and rescue, and casualty evacuation. Ground forces are now fully tied in and supported by a variety of manned and unmanned aerial platforms, which provide recon and strike capability. Within 24 hours, the airport and naval port have been cleared and secured enough to permit the inflow in civilian disaster relief via air and sea.<sup>28</sup>*

An air-centric concept such as this is often discredited on the basis of platform availability, lift capacity, and vulnerability. However, if the Marine Corps reduces weight, leverages organic and joint airlift, and adopts resupply from the air rather the sea, this concept is possible. To be truly expeditionary and adopt an air-centric concept Marine forces must become a light force in terms of weapons, vehicles, and logistics. After a decade of sustained COIN operations, the USMC has “gained weight.”<sup>29</sup> It’s added to its Cold War structure of HMMWVs, M1 tanks, and AAVs an entire family of up-armored and counter-IED vehicles. Typically, the lighter the organization, the more rapidly it can deploy. For example, U.S. Army’s 82nd Airborne Division has a requirement to deploy worldwide within 18 hours via C-130, C-17, or C-5 strategic airlift.<sup>30</sup> The unit is able to achieve this task because is has trained and equipped to

operate as a light force, stripping itself of armor and heavy weapons thereby gaining speed, agility, and surprise. A recent study by the Congressional Research Service reinforced this notion, arguing that employing smaller, lighter, company-to-battalion sized Marine units would place the service in the “sweet spot” for supporting anticipated future scenarios with assets on hand.<sup>31</sup> The primary ground vehicle for the Marine Corps is the M998 HMMWV with a curb weight 6,000 to 10,000 pounds and an average fuel efficiency of 12 miles per gallon. However, if the USMC were to discard the outdated HMMWV in exchange for a lightweight, air-deliverable, fuel-efficient ground vehicle such as the General Dynamics-manufactured the Light Strike Vehicle (LSV) and Expeditionary Fire Support System (EFSS), an infantry battalion could be delivered three or four times the number of vehicles and days of fuel supply. The LSV is a light, air-deliverable vehicle that provides ground units mobility and firepower, at 3,900 pounds, with 32 MPG, and air-deliverable by the MV-22, CH-53, C-130, and C-17. This is significant, considering that a Marine infantry battalion requires over 4000lbs of fuel for each day in combat per Table 1.<sup>32</sup> Adopting a more fuel-efficient vehicle could cut fuel supply requirements in half. A Marine infantry battalion in the field requesting aerial delivery of the LSV/EFSS could receive 20 vehicles via two C-17s, along with a 30-day supply of fuel.<sup>33</sup> The LSV/EFSS system is also available in variety of mission configurations to include crew-served weapon, command and control, and UAV control and launch, which make it extremely versatile. Additionally, it is capable of towing a 120mm mortar, antitank gun, or heavy machine gun, providing a light unit with significant firepower. The only real advantage the M998 HMMWV has over the LSV/EFSS system is horsepower and towing, however this should be a priority for heavy, not expeditionary units. Recent operations in Iraq and Afghanistan have suggested that units which employ a variety of light weight vehicles, such as Special Forces use of dirt bikes and Polaris all-terrain



vehicles (ATV), have been better equipped to combat insurgent threats and more difficult for adversaries to target, simply due to speed and agility.<sup>34</sup> Conversely, forces employing up-armored/counter-IED vehicles often prove slow, predictable, and easy for the enemy to target and destroy.

It must be noted that Marine forces conducting forced-entry operations will most likely do so to seize key terrain, establish a lodgment, and buy time for follow-on forces. This implies a quick response by a light unit rather than a heavy force expected to strike a decisive blow. Recent studies by the Center for Naval Analysis and Marine Corps Capability Development have suggested that light units can prosper through the use of precision weapons and air support.<sup>35</sup>

<b>Table 1. Ground Vehicles by Weight in Pounds and Fuel Efficiency (mpg)</b>		
M1 (Main Battle Tank)	122,000	0.6 mpg <sup>36</sup>
AAV (Amphibious Assault Vehicle)	58,000	10 mpg
LAV-25 (Light Armored Vehicle 25 mm)	28,400	10 mpg
JLTV (Joint Light Tactical Vehicle)	21,000	10 mpg
M1151 HMMWV	11,500	10 mpg
M998 HMMWV	6,000-10,000	12 mpg
CERV (Clandestine Extended Range Vehicle)	4997	25 mpg
HDT (Storm)	4300	24 mpg
<b>EFSS (Expeditionary Fire Support System)</b>	<b>3,900</b>	<b>28 mpg</b>

<b>LSV (Light Strike Vehicle)</b>	<b>2100</b>	<b>32 mpg</b>
LT-ATV (Light All Terrain Tactical Vehicle)	1300	40 mpg

Vertical lift could be used in lieu of surface-based connectors to mitigate distance, avoid coastal defenses, and maneuver landing forces to a variety of objectives. A comparison of the platform types listed in Table 2 supports shifting to an air-centric concept. While surface connectors are affordable, crews are easy to train, and they support the iconic image of Marines assaulting the beaches, they are slow, have limited range, and are extremely vulnerable to enemy fire. While the LCU and LCM class craft are capable of moving significant tonnage, they have an average maximum speed of 9 knots and range of 150 miles. If OTH doctrine were stretched to its maximum distance of 200 nautical miles, it would take a wave of LCU/LCM 20 to 25 hours to reach the coastal objective. Even the LCAC, which is considered a high-speed connector at 30 knots, would require six hours and 40 minutes to assault the objective only to return to the ship, refuel, and end mission for the day. Distance and travel time aside, surface vessels would still be subject to surf conditions, mines, shallow water obstacles, and infantry armed with precision munitions.

	<b>SURFACE<sup>37</sup></b>				<b>AIR<sup>38</sup></b>	
	<b>LCM 6</b>	<b>LCAC</b>	<b>LCU 1610, 37, 46</b>	<b>LCM-8</b>	<b>CH-53K</b>	<b>MV-22B</b>
<b>Cargo Capacity (lbs)</b>	68,000	120,000	250,000	360,000	17,000 int 36,000 ext	20,000 int 15,000 ext
<b>Troop Capacity</b>	80	120	400	200	37	24
<b>Vehicle Capacity</b>	1 HMMWV 1 5 Ton Truck	1 M1 Tank 2xHMMWV 4x LAV-25	1 M1 tank or 4 HMMWV	1x M1 Tank 3 x HMMWV	2 wheeled ext 1 LAV ext	1 wheeled ext
<b>Speed (kts)</b>	10	30	8	9	170	265

	<b>SURFACE<sup>37</sup></b>				<b>AIR<sup>38</sup></b>	
	<b>LCM 6</b>	<b>LCAC</b>	<b>LCU 1610, 37, 46</b>	<b>LCM-8</b>	<b>CH-53K</b>	<b>MV-22B</b>
<b>Combat Radius (nm)</b>	130	200	120	190	110 msn 510 max	325 msn 2100 max
<b>On Hand +/-</b>	30	38	80	25	131 (78 PACOM)	237 (40 PACOM)

Alternatively, Marine Corps vertical lift connectors offer improved speed, distance, and survivability that are desirable for expeditionary forces seeking to cross great distances and avoid precision defense systems. The Marine Corps maintains an impressive array of vertical lift with 131 CH-53 and 237 MV-22 providing heavy lift and long-range vertical assault capability. The CH-53 is capable of transporting 37 Marines or up to 36,000 pounds of cargo approximately 510 miles at a speed of 170 knots. In other words, a single flight of four CH-53s is capable of transporting the same amount of troops and equipment in one-sixth the time it would take three

<b>Table 3. Marine Infantry Supply Requirements and Weights per MTSP 5-0.3<sup>39</sup></b>
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LCACs. Unlike the LCAC, the CH-53 is capable of using speed and three-dimensional maneuver to avoid enemy defenses and insert assault forces on the assigned objective, as opposed to stopping at the beach. What the MV-22 lacks in lift capacity it makes up for in range and speed: the Osprey is able to transport up to 24 Marines or 21,000 pounds up to 2,100 miles at a speed of 265 knots. Both aircraft are capable of in-flight refueling, significantly extending their range and operational endurance. It is interesting is that the United States Navy only has a combined 173 surface connectors in the inventory, while the USMC has 368 vertical lift platforms on hand (Table 2).

UNIT VS. SUPPLY CLASS	1 (Food & Water)	2 (Indiv. Equip)	3 (Fuel)	4 (Const)	5 (Ammo)	6 (Pers Dmd)	8 (Meds)	TOTAL	Essential Supplies (Class I, III, V)
Marine Infantryman	50.83	3.367	5.04	9.92	50.6	3.40	1.10	124.257	106.47
Inf Bn (800)	40,664	2693	4032	7936	40,480	2720	880	99405	85176
Inf Regt (2500)	127075	8417	12600	24800	126500	8500	2750	310642	266175

A common misconception among planners is that surface connectors provide a safer means to transport assault forces than aircraft.<sup>40</sup> In reality, a 2002 Center for Naval Analysis (CNA) study found casualty rates for amphibious forced entry operations since 1941 have averaged between 15 and 30 percent.<sup>41</sup> Vertical (air) connectors offer safer and more effective transport than surface connectors for three reasons: first, unlike surface connectors, the CH-53 and the MV-22 are equipped with aircraft survivability equipment which gives each aircraft active and passive protection against radar, laser, or infrared guided weapons. Surface connectors have none of these protections. Second, aircraft can select carefully planned flight routes that avoid known enemy locations and, unlike beaches, are difficult for the enemy to predict. Third, aircraft can use Nap-of-the-Earth (NOE) flight, traveling at such an altitude that the earth's curvature and terrain contours mask the aircraft from visual or electronic detection. Applying these three attributes, a flight of twelve CH-53 aircraft could safely transport 444 Marines across 300 miles, avoid enemy defenses, and maintain the element of surprise right up to the final objective. In fact, Marine Task Force 58 did this in 2001 when it transported a force of Marines from the Arabian Sea over a distance of 500 miles into Afghanistan.<sup>42</sup> True, the threat environment was permissive, but the concept was proven nonetheless. Imagine these operations on a larger scale, augmented by aerial recon, strike, and resupply.

Some may oppose an air-centric amphibious approach and claim that aircraft are simply incapable of transporting the tonnage required to sustain combat operations. To the contrary, since World War II, there have been multiple cases of ground units, isolated or in harsh terrain, being reinforced or resupplied solely by air. During the Battle of the Bulge in 1944, the soldiers of the 101<sup>st</sup> Airborne Division received over 976 tons of supplies daily, airdropped by Army Air Corps pilots.<sup>43</sup> In 1972, the U.S. Air Force airdropped over 200 tons of supplies daily during 66 days of combat, supporting the 15,000 troops defending An Loc Airbase against North Vietnamese attackers.<sup>44</sup> The harsh terrain and treacherous routes of Afghanistan continue to

AIRCRAFT (ON-HAND)	PAYLOAD (lbs)	CARGO	SPEED	COMBAT RANGE
C-130 (358-430)	45,000	6 pallets 2-3 HMMWV 2 M113	250	2050 nm
C-17 (196-215)	160,000 (Max) 110,000 (Air Drop)	18 463L Pallets 1 M1 Tank 3 LAV-25 6 HMMWV	450	2400 nm
C-5 (126)	204,000	36 pallets 2 M1 tanks 10 LAV-25 6 HMMWV	541	2400 nm

\*Performance data from <http://www.fas.org/man/dod-101/sys/ac/>

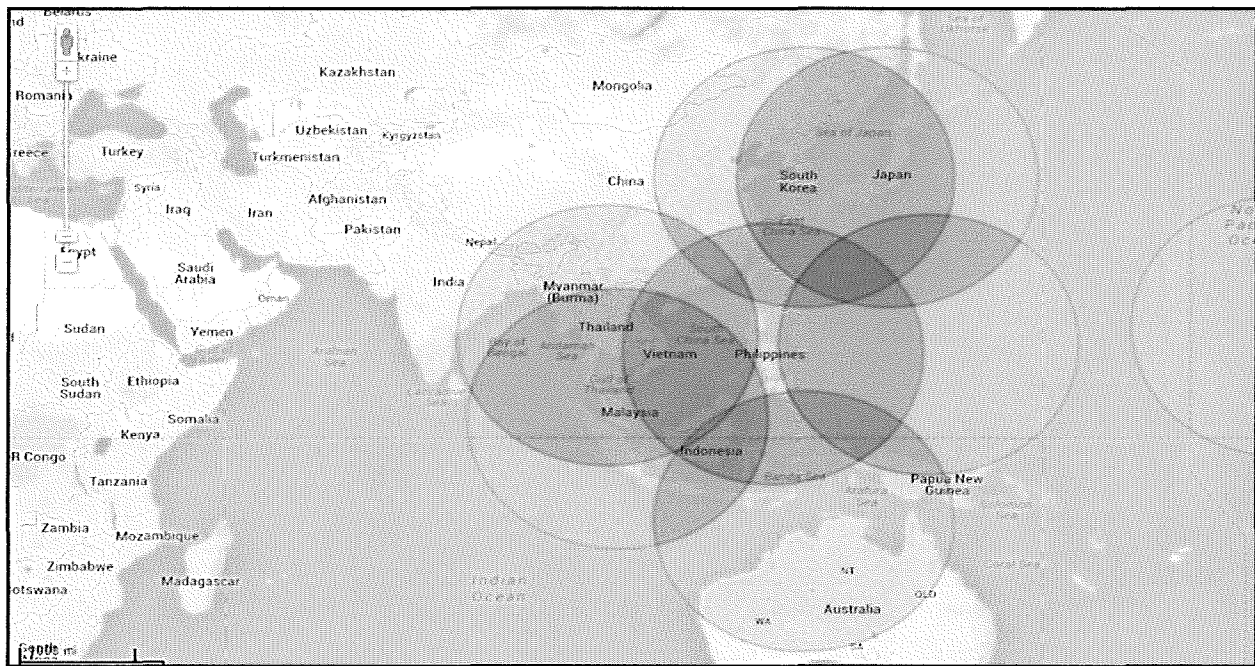
make aerial resupply a necessity as evidenced by the CJTF-101, which, as of 2009, have airdropped nearly 3 million pounds of supplies per month.<sup>45</sup> Resupply using organic vertical lift is not only possible and practicable, but reduces operational pause, risk, and ground supply trains.

*Revisiting our scenario: the Marine infantry battalion deployed to the small island in the Pacific has been asked to extend their stay on the island into the summer months in order to*

*combat guerilla fighters in the jungle. Extended operations require additional supplies into an inland area. Per Table 3, a Marine infantry battalion's daily requirement for class I to VIII supplies is 99,405 pounds. A daily resupply of this size is easily delivered by a flight of three CH-53 exterior sling loads or five MV-22 internal loads. Reducing the resupply down to only rations, fuel, ammunition (Class I, III, V) reduces the weight by 15,000 pounds, requiring one less CH-53 or MV-22 per day.*

Based on the previous scenerio it could be feasible to rely less on the slow, vulnerable, and cumbersome Maritime Prepositioned Force (MPF) and more on air-centric reinforcement and resupply. Performance data of the USAF C-130, C-17, and C-5, depicted in Table 4 supports, this recommendation. The combat logistic requirements (Table 2) for the Marine unit in the above scenario could be delivered by a flight of two C-130s. Two days' worth of supply could be delivered by a single C-17. Either supply mission is capable of departing from an airstrip over 2,000 miles away from the objective, increasing the flexibility of the platforms. Furthermore, supplies by airdrop would reach field units 20 times faster than by MFP.

It could be possible to provide fixed-wing logistic support to the Asia-Pacific region using existing platforms and current U.S. bases. This course of action will be discussed using the C-130 as an example because, at 2,050 nautical miles, it has the smallest combat radius of the three primary fixed-wing platforms. Figure 1 depicts the range of the C-130 from existing U.S. bases in Japan, South Korea, Hawaii, Singapore, Guam, and the Philippines. The coverage and overlap illustrate that aerial resupply is a viable option for Marine forces operating anywhere in the Asia-Pacific. Imagine that all supplies and equipment were pre-staged in a warehouse at existing U.S. Asia-Pacific bases. The supplies could be requested by the unit in the field, loaded



on a fixed wing platform, and delivered to the unit in the field in an efficient and timely manner using a variety of parachute delivery systems.

In contrast, MPF are stocked with supplies that may or may not be needed by units on the ground, meaning that some of the unit's needs may not be met. When the MPFs are loaded, they are done so in the order in which it is anticipated that the equipment and supplies will be used, which may or may not be correct. When required, supplies and equipment could be transferred

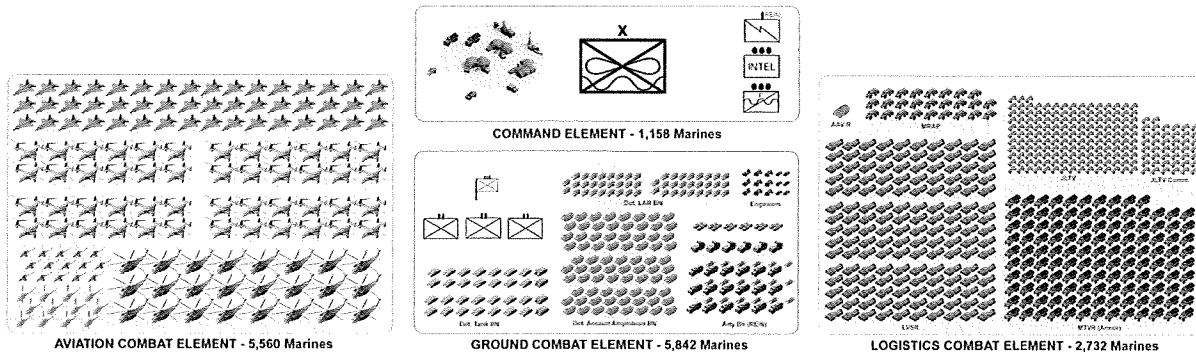
from the ship to a surface connector (LCU/LCM), which moves the supplies at a rate of 8-12 knots to shore, transfers the supplies onto wheeled vehicles, then delivers the supplies to the unit in the field. This process is inefficient and creates long logistics trains, which are vulnerable to attack. Additionally, the inefficiency of this system contributes to outdated supplies, such as expired batteries, medical supplies, ammunition, or equipment services. A land based, aerial-resupply depot, could sort and manage supplies much more efficiently than the MPF at sea and unlike the MPF, the land depot could be hardened against long-range weapons.

Aerial delivery has proved to be an effective method of sustainment. Currently deployed units have sustained combat operations solely through aerial resupply as a result of refined aerial delivery techniques and enhanced parachute technology, as evidenced by CJTF-101 during its one-year deployment in an extremely remote region of Afghanistan in 2011.<sup>46</sup> Enhanced parachute technology has increased airdrop precision; for instance, the Joint Precision Airdrop System (JPADS) utilizes a combination of GPS location and steering controls to place a parachute drop ranging from 500-60,000 pounds to within 50 meters of the designated location.<sup>47</sup>

*Scenario revisited...The Marine infantry battalion operating in the interior of a remote Pacific island is requesting additional mobility, firepower, and protection based on increased enemy activity. They request four LAV-25 and ten EFSSs from a regional supply hub located 2,000 miles from the objective. The hub dispatches a flight of two C-17s, which drop the requested equipment using JPADS. The vehicles land within 50 feet of a designated point in an area drop zone planned by the battalions airdrop specialist and...only four to six hours after the request was submitted.*

This scenario may seem far-fetched, but has played out numerous times over the last decade by U.S. Army units conducting combat operations from remote mountain bases where aerial resupply was deemed necessary based on terrain and threat. In 2009, the U.S. Army delivered over 30 million pounds of supplies, equipment, and vehicles to Soldiers and bases that were inaccessible or imprudent by land.<sup>48</sup>

In order to take the concept a bit further it will be useful to apply it to today's forces and requirements. The United States Marine Corps is tasked by the Department of Defense to maintain the capability to deploy two Marine Expeditionary Brigades (MEBs) in support of crisis or contingency operations. The current force structure of a Marine MEB is illustrated below. A recent Naval Post Graduate School study estimated the total deployment weight for the MEB, including a 30-day operational supply, can amount to 140,000 short tons, or 280,000,000 pounds.<sup>49</sup> A later DoD study, investigating the feasibility of deploying the MEB by air, assessed transporting a MEB into a combat theatre would require 91 x C-17, 21 x C-5, and 34 x 747 aircraft for a total of 146 sorties.<sup>50</sup> Additionally, this study highlights that additional airlift support (747s) can be acquired through the United States Civil Reserve Air Fleet (CRAF) program which draws logistic might from the commercial fleet in time of need. Given the 146 sortie requirement, deploying a MEB over a thirty day period would require a mere 5 flights per day. Still, there is room to improve and make an Air-centric Expeditionary Operations (AEO) more feasible. As it stands, the MEB has roughly 165 Joint "Light"



## **MAGTF Composition - Marine Expeditionary Brigade (MEB)**

Tactical Vehicles (JTLV) which weight in a 21,000 pounds each and offer a 10 mpg efficiency. Replacing each JTLV in the MEB with an EFSS (only 3,900 pounds each) would reduce the MEBs deployment weight by 2,887,500 pounds or roughly 30 C-17 sorties. This figure does not additional saving in fuel resupply requirement attained by better efficiency.

The combined concept of air-centric expeditionary operations and precision airdrops from regional supply hubs offers several opportunities: a way around the A2AD operational dilemma by permitting expeditionary forces to penetrate defense systems from positions of standoff. It reduces the risk to surface amphibious fleets and the landing force. It applies current technology, current platforms, and is affordable. It is scalable, tailor-able, and flexible to a variety of scenarios across the range of military operations. It is a non-material and disruptive innovation, utilizing speed, mobility, and dispersion to avoid and overwhelm enemy systems.

There are several implications for adopting this future air-centric amphibious concept: first, services should accept the fact that the operational environment has evolved, requiring doctrinal adaptations based on tactical and operational needs, not service needs. Second, senior military leaders should be willing to sacrifice firepower and protection for speed and mobility.

Third, leaders should be willing to rely less on their own service, and embrace more joint operations.

The operational environment that gave birth to the “golden age” of amphibious operations has changed to such an extent that the current doctrine may be an imprudent means to project United States combat power. The United States can decide to continue the never-ending search for material solutions, or it can adopt a non-material solution. Most revolutionary changes to war fighting are those that combine new technology and new doctrine. Failure to adapt to evolving operational environment leads to defeat.

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