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*United States Marine Corps  
School of Advanced Warfighting  
Marine Corps University  
3070 Moreell Avenue  
Marine Corps Combat Development Command  
Quantico VA 22134*

**FUTURE WAR PAPER**

PENETRATING THE A2AD ENVIRONMENT IN 2035:  
THE CONNECTOR PROBLEM AND A WAY AHEAD FOR  
THE U.S. NAVY-MARINE CORPS TEAM

**SUBMITTED IN PARTIAL FULFILLMENT  
OF THE REQUIREMENTS FOR THE DEGREE OF  
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*Authors*

Major Jason Garza  
Major Brandon Turner

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**Mentor: Dr. Rudd**

**Approved:** \_\_\_\_\_

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**Part I: The Future Operational Environment and the Connector Problem**

The 2035 Operating Environment (OE), peer competitors will provide determined opposition extending their current defense in depth deeper into the sea and inland through supersonic long-range missile salvos, cyber warfare, drones, unmanned-manned teams, and extensive air and naval superiority. In this future OE, the Marine Operating Concept (MOC) is designed to achieve the effect of mass without concentration, but requires appropriate and abundant landing craft to get ashore. Furthermore, the MOC is intended to compliment the Navy's Distributed Lethality Concept of creating Hunter-Killer Surface Action Groups (SAG) to conduct a breakthrough and exploit an enemy's Anti-Access Area-Denial (A2AD) environment.

Russian and Chinese A2AD environments are designed to attack and destroy the U.S. Navy's capital ship, the nuclear-powered aircraft carrier (CVN) at a fraction of the cost in producing a formidable opposing fleet. Therefore, the U.S. Navy wants to create smaller and more numerous SAGs to break through the defense and operationally exploit within the A2AD environment.<sup>1</sup> The A2AD OE in 2035 projects deep into the sea creating an effective first line barrier with unmanned surface vessels, manned and unmanned teams of SAGs to pin American forces along the first or second island chain.<sup>2</sup> The A2AD environment makes the fight too costly to the U.S. Navy, politically untenable for politicians, and at a cost too high in blood and treasure for the public.

The United States can do little to stop the proliferation of additive manufacturing (3D printing) and the innovative use of emerging technologies. These technologies will include

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<sup>1</sup> Vice Admiral Thomas Rowden, Rear Admiral Peter Gumataotao, and Rear Admiral Peter Fanta, *Proceedings Magazine* (Washington DC: US Naval Institute), January 2015 Vol. 114/1/1, 343, 1.

<sup>2</sup> Headquarters US Marine Corps, *Marine Operating Concept* (Washington, DC: Headquarters US Marine Corps, September, 2016), 10.

conventional and fifth generation anti-ship ballistic missiles, loiter capable automated systems, weapons of mass effect. These technologies will provide an opposing force with highly sophisticated connected unobservable surface-to-surface and surface-to-air missile systems established in a mutually supporting positions within a defensive perimeter along interior sea and air LOCs that saturate the OE. Although this future OE is formidable, no opposing force can defend everywhere, thus gaps will be present within A2AD environment. There will be islands or beaches left uncovered, enemy garrisons operating at the very edge of support with minimally protected sea lanes. This is where the future U.S. Navy-Marine Corps will operate.

The proposed way to protect the Carrier Strike Groups (CSG) in this OE is to push smaller more lethal ships as a part of the SAG into the gaps of their defense. The SAG may find a weakness in the enemy defensive belt, but as this attack unfolds with enemy air and naval forces being rushed into the gap, this penetration will become a direct assault. Once this penetration becomes a direct assault, it is Amphibious Force (AF) as ESGs with MEBs or MEFs that will penetrate, breakthrough, and operationally exploit within the A2AD bubble. And this is where the future force will face one of many obstacles.

The U.S. Navy's means to land the AF is ill-equipped to deal with current and, even more so, with future enemy defenses. These landing craft include the Landing Craft Air Cushion (LCAC) (first fielded in 1987), the Landing Craft, Utility (LCU) 1610 class (1959) and Landing Craft, Mechanized (LCM) 6 and 8 (late 1960s).<sup>3</sup> The most modern landing craft with 71 in service today, the LCAC delivers a payload of up to 75 tons (1 M1A1 Abrams Tank) or 150 Marines and is capable of launching from 50 miles offshore at a speed of 40+ knots riding on a

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<sup>3</sup> Purposefully left out of this proposal is an Amphibious Assault Vehicle (AAV) replacement. Countless writings prior to this have been conducted on the need to replace the AAV, and steps are being taken today to continue the replacement of the AAV with a viable platform. Additionally, this problem is being approached from both the view point of both the U.S. Navy and U.S. Marine Corps perspectives in finding a solution for both services, not just one.

cushion of air. In the year 2000, the U.S. Navy started the Service Life Extension Program (SLEP) extending the service life from twenty to thirty years, and by the end of 2018, 64 will have undergone the service life extension. By 2034, 72 Ship-to-Shore Connectors (SSC) will replace the current LCAC. With the ability to carry 145 Marines or 74 tons at 35 knots from 50 miles over the horizon, the SSC gives the Navy no appreciable increase in capability.

Another means to deliver an AF ashore is the LCU with 32 LCU-1610s currently in service. Traveling up to 8 knots, the LCU-1610 is an ocean-going vessel capable of carrying 450 combat loaded Marines or two M1A1 Tanks to shore. Starting in 2022, the LCU-1700 will start replacing the current LCU-1610s. Although newer, the LCU-1700 is another replacement platform with little increase in capacity. All told, the U.S. Navy, using amphibious shipping or forward bases, will be able to employ nearly 100 landing craft of different types capable of delivering 11,200 Marines or 64 M1A1 Tanks on LCUs, and 10,800 Marines or 72 M1A1 Tanks to shore in the first lift.

Using 1st Marine Division as an example, the division has 22,000 Marines, 58 M1A1 tanks, 100 Light Armored Reconnaissance Vehicles, 204 Amphibious Assault Vehicles, 1,660 medium trucks, 464 heavy trucks, 48 Howitzers, and 24 High Mobility Artillery Rocket Systems to seize an Expeditionary Advance Base (EAB). Add to the AF the vertical envelopment capability of the MV-22 Osprey (84 total) and CH-53E or K Super Stallion (48 total), this allows an additional 2,640 Marines, or 48 LAVs, 48 Howitzers, and 960 Marines to be placed ashore. Surface and air assets complement each other, but all are still observable to radar or persistent Intelligence, Surveillance, and Reconnaissance (ISR) platforms. The lack of substantial connect lift and the signatures produced by these platforms do not and will not enable the AF to penetrate, breakthrough, and operationally exploit the A2AD environment to seize EABs. In order to

penetrate, breakthrough, and exploit within the A2AD environment, the future AF needs low-observable fast connectors that can maneuver with the SAG to swarm directly into the enemy defense with a Division sized unit from over 300+ nautical miles from shore.

## **Part II: A Solution for the Future Operating Environment**

### **Understanding the Missing Link between the Marine Operating Concept and Distributed Lethality**

In 2035, the future amphibious OE as defined by the United Kingdom's Ministry of Defense is an elastic defense-in-depth with the observation and engagement zone extending seaward upwards to 200+ nautical miles from the high-water mark.<sup>4</sup> This assumes that U.S. and allied forces will include the island nations in and around the East Sea (or East China Sea) and the Indian Ocean, the Commonwealth nations, and rising middle powers like India, Australia, Brazil, Indonesia, and Mexico.<sup>5</sup>

This Allied Force, structured as a Combined Joint Task Force (CJTF), will not look unfamiliar to today's planners and neither will the command and control (C2) structure. The C2 differences in the future reside in the U.S. Navy's procurement of more advanced radar, networking software, integrating weapon systems to unmanned and manned platforms surface, subsurface, and air. However, the United States and Allied Forces will have to become accustomed to peers, allies, enemies of the state, and non-state actors possessing similar technologies. The preferred method of engaging belligerent nations is partnership.

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<sup>4</sup> Ministry of Defence, Strategic Trends Programme: Future Operating Environment 2035, London, August 2015.

<sup>5</sup> The future OE also applies to the Baltic Sea with a different aggressor, and the allies being those of NATO.

The Marine Operating Concept (MOC) begins with a scenario predicated on deploying a Marine Expeditionary Force (MEF) in support of one of the United States' "key allies in repelling an aggressive neighbor, and quelling a proxy-force insurgency".<sup>6</sup> This scenario is not optimal to preparing the Marine Corps for the 2035 fight. Instead, a proposed scenario must be further along the A2AD spectrum in order to prepare for the future fight in 2035. Marine Battalion Landing Teams (BLT) will fight through a web or swarm of loiter capable drones each with very clear instructions: destroy anything in the kill box and return to base well within their A2AD bubble. The fight, however, was over quickly, in the proposed scenario--about 45 minutes. The Marine battalions were able to project from the sea and air assault on an island and establish an airbase to launch the F-35's upgraded cousin and continue to project power deeper into the OE.

The A2AD environment today and in the future is intended to challenge, threaten, and ultimately defeat America's will to intervene or fight Country Red because of the high costs: the loss of a 10.44-billion-dollar carrier with 2,600 sailors, and 90 Fifth Generation aircraft from a two-million-dollar anti-ship missile. The landing force will have to contend with the same anti-ship missiles fired from above, on, and below the surface. The missing piece of the MOC, is the requirement for the Marine Corps to fight within the A2AD bubble not only with the F-35, but as a MAGTF. Neutralizing or creating a gap within the A2AD bubble is not a task that can be conducted solely by the Joint Force (Air Force and Navy) with the F-35 prior to the ATFs insertion into the OE. Thus, the AF must contend with simultaneous surface and aerial losses to the force.

One of the MOC's critical tasks is "integrating the naval force to engage at or from the sea".<sup>7</sup> The U.S. Navy shares the apprehension of the Marine Corps and the future operating

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<sup>6</sup> *Marine Operating Concept.*

environment, and still insists that defense of the carrier for power projection is a core, if not critical task. Furthermore, the U.S. Navy has decided to pursue an offensive mindset with dispersion as a strength necessary to mass fires and cause the enemy to spread their forces too thin to prevent many “ice pick stabs” into the defense. What is unclear is if the many “ice pick stabs” into the enemy’s elastic defense-in-depth with unmanned drones capable of destroying a ship happens concurrent with gaining air and sea superiority or after.

The offensive capability and warfighting precept of the Navy’s Distributed Lethality (DL) is an elegant and simple solution to the growing trend of technological proliferation and the Navy’s decline in the anti-ship (ASW) and undersea warfare (USW). This ASW and USW second rate threat is present in 2018, but is not a concern to the first-rate navy of the

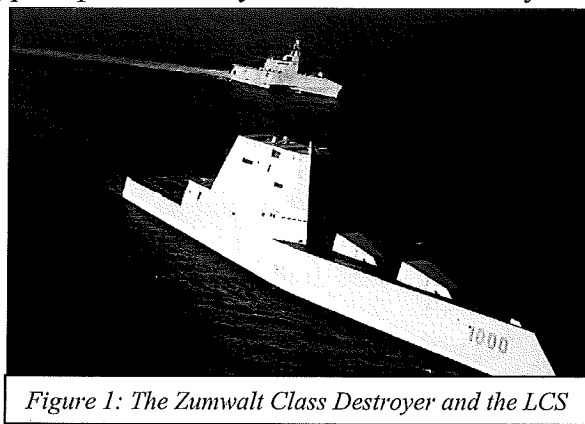


Figure 1: The Zumwalt Class Destroyer and the LCS

United States. The U.S. Navy projects power around the globe and ensures the liberal world order continues to move forward benefiting all those who operate within that organizational structure. However, Vice Admiral Thomas Rowden, Director of Surface Warfare Division (OPNAV-96), reminds everyone that it “is important to remember that as our interests lay thousands of miles from our own coastlines, sea-based power projection is both our main competitive advantage and an absolute necessity to retain influence and to exercise global leadership.”<sup>8</sup> The scenario depicted by the U.S. Navy is: “As an example, let us move ahead to the late 2020s and consider a scenario that emphasizes close Navy–Marine Corps integration: A hunter-killer SAG consisting of an LCS (ASW module), a Flight III *Arleigh Burke* –class

<sup>7</sup> *Marine Operating Concept*.

<sup>8</sup> Vice Admiral Thomas Rowden, Rear Admiral Peter Gumataotao, and Rear Admiral Peter Fanta, *Proceedings Magazine* (Washington DC: US Naval Institute), January 2015 Vol. 114/1/1, 343, 1.

destroyer, and a *Zumwalt* -class destroyer are ordered to deploy to the vicinity of a small, abandoned island with an airfield that the joint force's maritime-component commander plans to seize and use as a temporary expeditionary-operations base for six Marine Corps F-35Bs."<sup>9</sup> (See *Figure 1*.) "The U.S. hunter-killer SAG's mission is to place itself between the adversary and the island and conduct reconnaissance of the island, while also locating, targeting, and neutralizing adversary surface and subsurface forces in the area; and destroy any enemy attempt to garrison the airfield before the arrival of the Marine F-35Bs. Once those aircraft begin operations, the SAG will be required to provide for their defense from the sea."<sup>10</sup>

The proposed offensive capability of the hunter-killer SAGs is precisely what is needed to gain and maintain local air and sea control. Command of the sea is not necessarily a requirement for 2035. If the U.S. Navy armed with multiple hunter-killer SAGs roaming around the high-seas has local air and sea superiority and can deliver an AF into the teeth or soft underbelly of an A2AD environment then our enemies will have to contend with Expeditionary Advanced Bases (EAB) appearing within their supposed observation zone of an elastic defense-in-depth. What will not bring a quick conclusion to an abrupt rise in hostilities is a Mahanian-style battle on the high-sea in fleet-on-fleet engagement *then* delivering an AF to a hostile shore once air and sea superiority are an absolute guarantee. Hunter-killer SAGs linking on the high-seas with multiple Marine Expeditionary Units (MEU) or Marine Expeditionary Brigades (MEB) fighting into an elastic defense-in-depth is an operational requirement for the fight in 2035.

Today, delivering a BLT from an ARG/MEU is the core component of the U.S. Marine Corps. Delivering multiple regiments from distributed locations is how the U.S. Navy-Marine Corps team can and will fight and win within the OE of 2035. A swarm of hunter-killer SAGs

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<sup>9</sup> *Ibid.*, 7.

<sup>10</sup> *Ibid.*, 5.

with AFs capable of seizing, holding, establishing an airfield and recovering to seize another EAB is how the carrier can stay away from shore based anti-ship missiles, but provide the much-needed local air superiority for ground-based aviation to establish air superiority deeper within the A2AD bubble.

Furthermore, SAGs will ensure the logistics chain remains unbroken from the ASW and USW threat where loiter capable drones may not subside as the Marines continue to eat through the defense. The U.S. Navy establishing a series of mutually supporting hunter-killer SAGs could create a sea-borne elastic defense in depth able to meet and defeat any enemy fleet seeking to dislodge the “ice pick stabs” created by the Marine’s EABs. The CSG and the defensive network working to defeat the ASW and USW threat is the immediate counter-attack force to meet the enemy fleet. The MOC and DL swam can then operate within the physical and cognitive threat environment supported by the operational reach of the CSG.

All three components—the CSG, hunter-killer SAGs, and MEU/MEB/MEFs—will give the United States and her partner allies the offensive capability to survive, thrive, and divide the enemy’s observation zone from a series of mutually supporting and flexible forward bases to unsupported strong points that can be defeated, flanked, or bypassed. The MOC cannot, under any circumstance, pass on this most significant linkage. The current critical task 6.1 of integrating the Naval Force to fight at and from the sea needs the next step: integrating the DL of hunter-killer SAGs to fight two MEBs ashore in a contested and volatile environment. As described in *A Cooperative Strategy for 21st Century Seapower*, Naval forces perform these essential functions: all-domain access, deterrence, sea control, power projection, and maritime security, and it must now include DL as a core competency to achieve all the aforementioned functions.<sup>11</sup>

## Current and Future Connector Technology: The Marine Corps' Bid for Penetration

The future connector fleet should include not only surface connectors but also semisubmersible and submersible connectors. The LF, through the use of connectors, must be able to successfully penetrate the A2AD bubble. In order to penetrate, connectors must be low observable and capable of delivering the LF in a timely manner. Current technology exists that can provide the U.S. Navy-Marine Corps team a capacity to penetrate the 2035 OE.

Prototypes like the Ghost provide MEBs and MEFs options for insertion of the LF in a swarm fashion.<sup>12</sup> The Ghost, developed by United States based Juliet Marine Systems, is capable of traveling at 50+ knots carrying up to 15 combat loaded troops for insertion.<sup>13</sup> (See *Figure 2 and 3.*) With its high speed, even in surf up to 10 feet, combined with its radar reducing

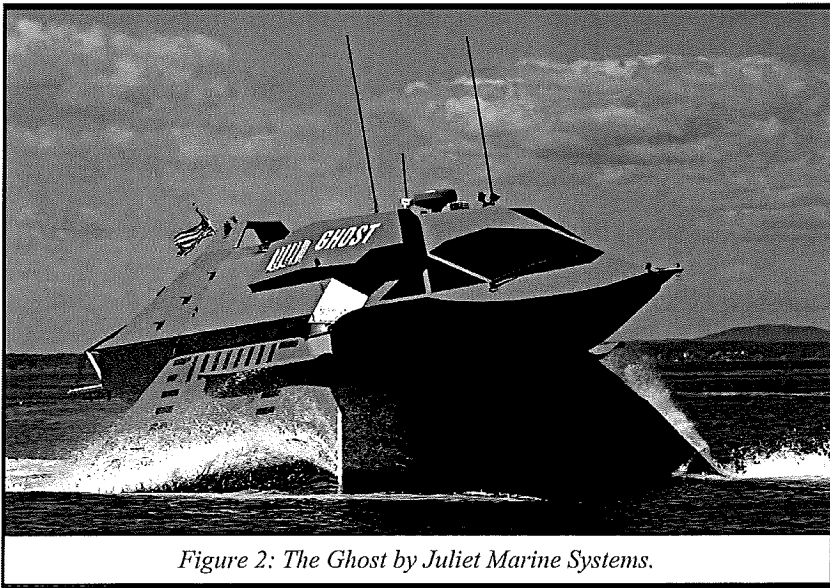


Figure 2: The Ghost by Juliet Marine Systems.

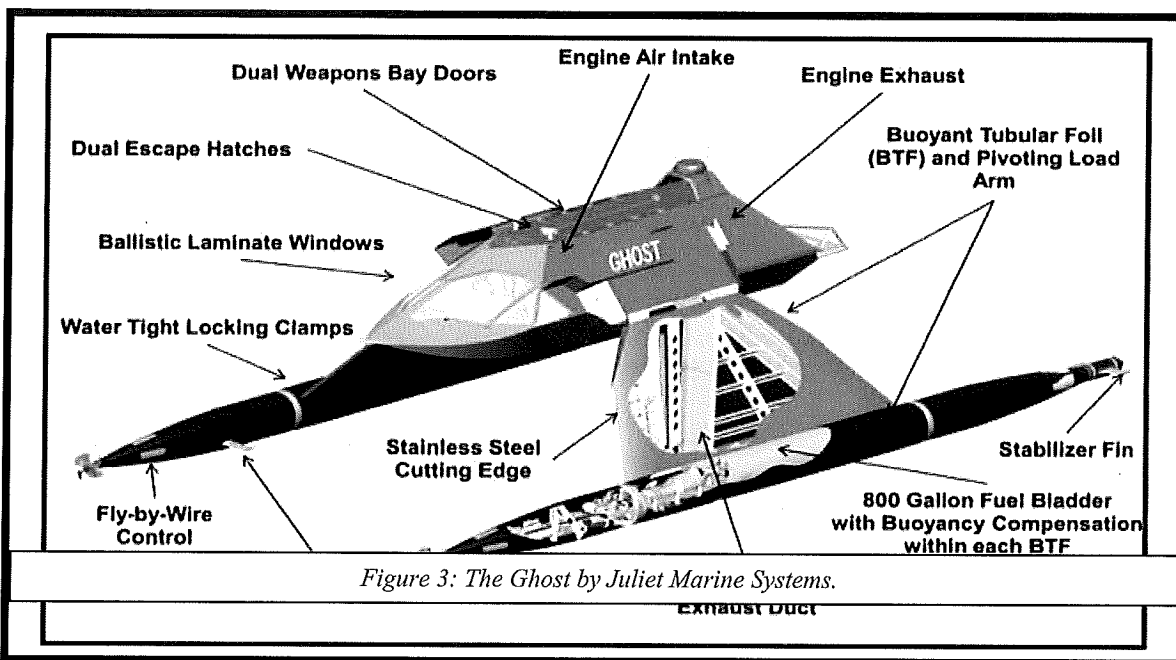
technology, the Ghost is a viable insertion platform. Although the insertion of 15 Marines is far from optimal, such technology can be expanded upon to carry larger sized forces, platoon minus to a

<sup>11</sup> General Conway, James T., Admiral Gary Roughead, and Admiral Thad W. Allen, *A Cooperative Strategy for 21st Century Seapower* (Washington D.C.), October 2007, 12-13.

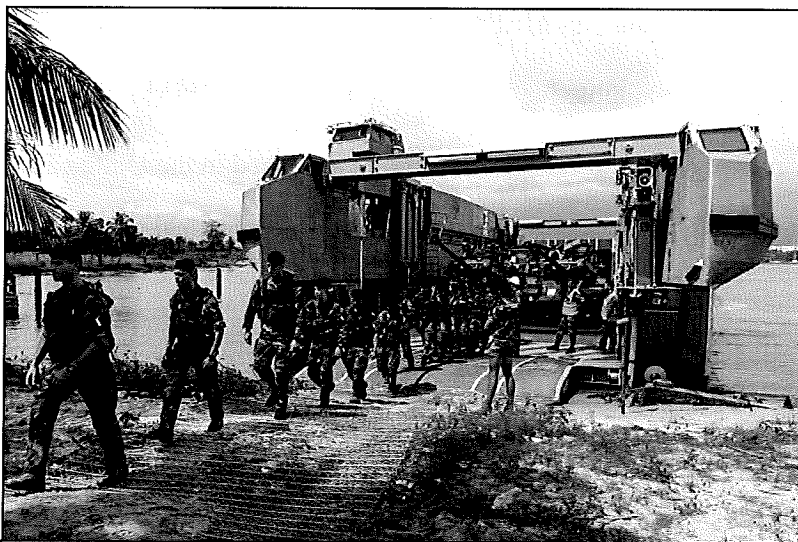
<sup>12</sup> The manufacturing of the Ghost is currently on hold by the DoD and the U.S. court system pending a trial between the U.S. Navy and Juliet Marine Systems.

<sup>13</sup> Szoldra, Paul, "This man built a cutting-edge stealth boat for the US Navy. Then the government tried to put him out of business." *Business Insider*, Nov 15 2016: <http://www.businessinsider.com/juliet-marine-systems-ghost-boat-2016-11> .

reinforced platoon, combined with multiple Ghost vessels to land a reinforced infantry company/ battalion, to penetrate the A2AD environment and establish EABs within the A2AD bubble.<sup>14</sup>



France currently manufactures and uses the L-CAT (Landing-Catamaran), capable of carrying 80 tons at 18 knots.<sup>15</sup> (See Figure 2.) This craft is not only faster than the current LCU-1600 series and the future LCU-1700, but is also a proven connector on French deployments as a viable landing craft. Combined with low observable radar absorbing



*Figure 2: The French Landing-Catamaran (L-CAT)*

<sup>14</sup> *Ibid.*

<sup>15</sup> Cavas, Christopher. "New L-CAT Amphibious Craft Being Offered." DefenseNews.com, October 20, 2016: <https://www.defensenews.com/naval/2016/10/20/new-l-cat-amphibious-craft-being-offered/> .

material, the L-CAT offers possibilities for force projection.



Figure 4: The Narco Submarine

AD bubble, if required, heavy  
d. Although the LCU-1600 is

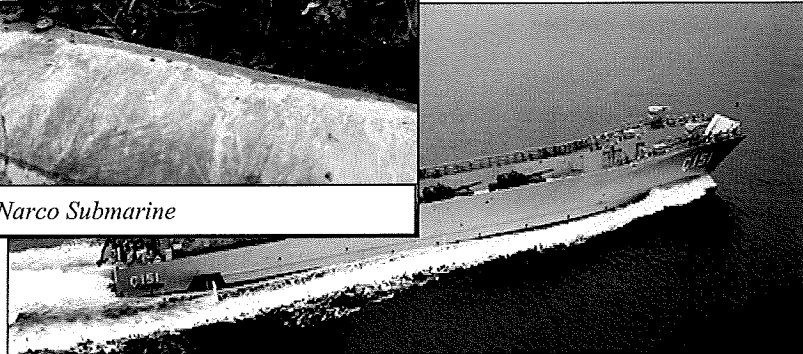


Figure 3: The Turkish Landing Craft, Tank (L-CAT)

although fast, is not capable  
of receiving direct fire (.50  
caliber and below) without

considerable risk to the platform being permanently disabled. A solution to this lack of adequate  
seaborne lift capability is the Turkish built LCT (Landing Craft, Tank).<sup>16</sup> (See Figure 3.)

Capable of traveling at 18 knots with three M1A1, the Turkish LCT can be a connector that  
allows the MEF or MEF to bring heavy firepower ashore. Although the length and height of the  
LCT is unsuitable for current U.S. amphibious shipping, the LCT is capable of a stern-gate  
marriage. If the LCT were forward deployed in the United States or Allied controlled areas, and  
considering its unloaded speed at 20+ knots, the LCT could be a rapid response vessel to support  
the MEB/MEF in the seizure of EABs.

All of the previously mentioned connectors are surface borne, and without radar reducing  
material are highly susceptible to surface to surface radars. Over the past 20 years, drug runners  
have had positive results in evading the U.S. Coast Guard off the shores of the United States.  
Drug runners use of semisubmersible and submersible crafts may be unorthodox, but these  
methods do work.<sup>17</sup> (See Figure 4.) With current guidance technologies and anti-mine

<sup>16</sup> Global Security, retrieved on 09 March 2018: <https://www.globalsecurity.org/military/world/europe/tcg-lct.htm>.

countermeasures added to crafts, the “narco submarine” offers another possibility for a LF in penetrating the A2AD environment.

With any platform, crews must be recruited and trained in order to pilot these platforms. The U.S. Navy and Marine Corps have options in this matter. It is highly uncommon for soldiers to pilot boats and ships. Even within the U.S. Army, battalions exist that own, operate, and deploy amphibious ships. One example being the 10<sup>th</sup> Transportation Battalion (Terminal) stationed on the York River at Fort Eustis, Virginia as a part of 7<sup>th</sup> Transportation Brigade (Expeditionary).<sup>18</sup> The manpower to pilot the LF’s connectors could be as simple as a separate MOS within the U.S. Marine Corps, not unlike Amphibious Assault Vehicle crews currently serving.

As guidance technology improves, crafts could be piloted remotely. Guidance systems could follow way points to landing points. By using interconnected guidance systems, the craft could operate in a swarm fashion maintain optimal dispersion as the connectors transit from ship to shore. With U.S. Marines within these connectors, selected members could be trained to operate the craft during their release from ships and landing the LF. As the cyber threat continue to increase, these Marines could stand ready to take the helm in case the craft act erratically, or fall off course.

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<sup>17</sup> Woody, Christopher. “Watch the Coast Guard seize a narco sub laden with more than 5,600 pounds of cocaine”, Business Insider, October 31, 2016: <http://www.businessinsider.com/us-coast-guard-seize-narco-submarine-cocaine-pacific-ocean-2016-10?r=UK&IR=T>.

<sup>18</sup> U.S. Army’s 10<sup>th</sup> Transportation Battalion, 7<sup>th</sup> Transportation Brigade: <http://www.ible.af.mil/10TB/>.

Lastly, connectors of the future must have the capability hide their signature both physically and electronically.

Considering that the future connector must



Figure 5: Raytheon's Miniature Air Launched Decoy

travel for 300+ nautical miles, troops aboard will have the need to communicate as the situation changes at the beach landing site and/or the objective point. As these platforms travel such great

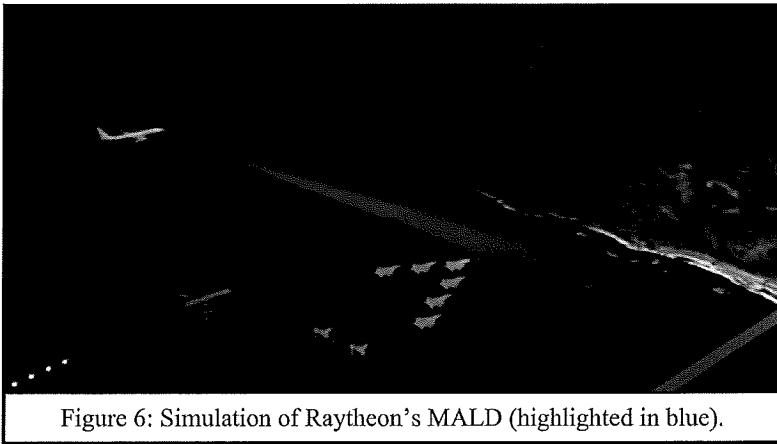


Figure 6: Simulation of Raytheon's MALD (highlighted in blue).

distances, current systems as Raytheon's Miniature Air Launched Decoy (MALD) can be reconfigured to provide the same effect in decoy/deception for surface forces.<sup>19</sup> (See Figures 5 and 6.)

### **Part III: Conclusion**

The U.S. Navy-Marine Corps team, as an Amphibious Force, must have the capabilities in the future to penetrate the A2AD environment and mass where required. Current connector

<sup>19</sup> Raytheon, retrieved 09 March 2018: <https://www.raytheon.com/capabilities/products/mald>.

technology limits the Marine Corps ability to penetrate without significant loss to personnel and equipment. The replacement to the current Amphibious Assault Vehicle combined with organic U.S. Marine Corps assault support will not be enough to provide the lift, lethality, and stealth in order to penetrate the A2AD bubble. Technology exists today that the U.S. Navy and Marine Corps can build upon to penetrate the A2AD environment, and achieve mass. Platforms like the Ghost, L-CAT, and LCT will allow this penetration, survival, and accomplishment of the mission in the future. The time is now to invest in these technologies and prepare for 2035.

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