

[H.A.S.C. No. 115-45]

HEARING  
ON  
NATIONAL DEFENSE AUTHORIZATION ACT  
FOR FISCAL YEAR 2018  
AND  
OVERSIGHT OF PREVIOUSLY AUTHORIZED  
PROGRAMS  
BEFORE THE  
COMMITTEE ON ARMED SERVICES  
HOUSE OF REPRESENTATIVES  
ONE HUNDRED FIFTEENTH CONGRESS  
FIRST SESSION  
SUBCOMMITTEE ON SEAPOWER AND  
PROJECTION FORCES HEARING  
ON  
**AMPHIBIOUS WARFARE IN A  
CONTESTED ENVIRONMENT**

HEARING HELD  
MAY 18, 2017



U.S. GOVERNMENT PUBLISHING OFFICE

25-838

WASHINGTON : 2018

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## **AMPHIBIOUS WARFARE IN A CONTESTED ENVIRONMENT**

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HOUSE OF REPRESENTATIVES,  
COMMITTEE ON ARMED SERVICES,  
SUBCOMMITTEE ON SEAPOWER AND PROJECTION FORCES,  
*Washington, DC, Thursday, May 18, 2017.*

The subcommittee met, pursuant to call, at 2:00 p.m., in room 2212, Rayburn House Office Building, Hon. Robert J. Wittman (chairman of the subcommittee) presiding.

### **OPENING STATEMENT OF HON. ROBERT J. WITTMAN, A REPRESENTATIVE FROM VIRGINIA, CHAIRMAN, SUBCOMMITTEE ON SEAPOWER AND PROJECTION FORCES**

Mr. WITTMAN. I call to order the House Armed Services Subcommittee on Seapower and Projection Forces. I want to welcome everyone here today. I thank our witnesses for being here. We do have votes that will be called at some point. So what we are going to try to do is to get through our opening statements and the witnesses' opening statements and then take a short recess to go vote, and then we will be back.

Well, again, I want to thank our witnesses for joining us today and our members. As the Seapower and Projection Forces Subcommittee chairman, I lead a group of my colleagues with broad jurisdiction over naval and Air Force programs. And I must admit that I have a particular affinity to the United States Marine Corps and its amphibious warfare role, because I represent Marine Corps Base Quantico in Virginia's First Congressional District.

Because of my district and because of this subcommittee's jurisdiction, I am particularly interested in our subject today of assessing our Marine Corps' ability to project forces in a contested environment.

Late last year, I was particularly intrigued to read a report authored by one of our witnesses today entitled "Advancing Beyond the Beach: Amphibious Operations in an Era of Precision Weapons." In this report, the authors propose that the current approach to amphibious operations needed, and I quote, "new operating concepts and capabilities that circumvent or defeat increasingly effective coastal defenses." Their report proposes a new strategic approach that emphasizes lighter vehicles, a rebalancing of the surface and aviation assault capabilities, an emphasis on surface connectors that optimize ocean travel, and improved armament on amphibious ships.

I believe that the Center for Strategic and Budgetary Assessment has accurately assessed the problems associated with amphibious assault in a contested environment.

Projecting power in close proximity to shore in a contested environment is fraught with challenges which may require a shift in our approach. Fundamental changes to the Department of Navy's strategic amphibious warfare investments may be necessary to move more effectively above—to move Marines ashore. I believe that it is incumbent upon the Marine Corps to rapidly change their legacy force structure toward a capability that is more expeditionary, capable of fighting in the littorals, and, when called upon, able to project power ashore in even the most challenging of environments.

To better assess this issue, I am pleased to have two respected authors on amphibious warfare with us today: Mr. Jesse Sloman, Center for Strategic and Budgetary Assessments; and Dr. Brad Martin of the RAND Corporation.

Gentlemen, thank you for your willingness to testify before our subcommittee today, and I look forward to your assessment and recommendations to make our Marine Corps forces more lethal and effective than ever.

I now would like to turn to our ranking member, Joe Courtney, for any opening remarks that he may have.

[The prepared statement of Mr. Wittman can be found in the Appendix on page 27.]

**STATEMENT OF HON. JOE COURTNEY, A REPRESENTATIVE FROM CONNECTICUT, RANKING MEMBER, SUBCOMMITTEE ON SEAPOW AND PROJECTION FORCES**

Mr. COURTNEY. Thank you, Mr. Chairman, for holding this hearing on the future of amphibious warfare in a contested environment. As you noted, this has definitely been a real focus and passion of yours. So, again, we appreciate your leadership on this issue.

As we have heard throughout our hearings this year, the U.S. Navy and Marine Corps team must be prepared to meet new challenges as our potential adversaries rapidly improve their tactics and technologies to counter America's longstanding superiority. This challenge is particularly true in examining the future of amphibious warfare.

The United States Navy and Marine Corps team remains the most lethal and advanced amphibious force ever put to sea. As recent events around the world have shown, however, we cannot afford to rest on our laurels. Rather, we must continue to adapt and advance new technologies, tactics, and operational concepts to maintain our capacity to strike from the sea wherever needed and whenever called.

However, we must also recognize the realities and limitations of existing platforms, equipment, and personnel who have not engaged in a contested amphibious assault from the sea in more than six decades. We must explore not only how these platforms can be modernized to maintain relevancy but also to examine how new technologies and operational concepts can be employed to ensure America's security and to respond to world crises.

Since the cancellation of the expeditionary fighting vehicle in 2011—and I was trying to remember how many hearings we had on that; yeah, it was at least close to a half dozen before, finally,

that decision was made—the Navy and Marine Corps have wrestled with what is the right distance for the Marines to disembark the ship and what type of vehicle that should be in. This is not an easy debate and is one I am sure we will talk more about today. However, there is more to this than just what distance an amphibious ship should launch its vehicles or what type of vehicle that should be. Our military is a joint force and will always operate that way in any contingency so that we need to be talking about how to fully integrate our amphibious forces and ensure that they are leveraging the technologies that other forces are relying on.

I have no doubt of the value that our amphibious force provides in responding to an array of contingencies, from supporting non-combatant evacuation operations to being the on-the-scene responder to the world's next humanitarian disaster. However, I also recognize that modeling, simulation, and exercises predicated on uncontested ambitious operations are becoming more outdated by the day. We must be trained, ready, and equipped to operate in a contested environment.

Today, we welcome two experts in this field, Dr. Brad Martin and, a graduate of Tufts University, Mr. Jesse Sloman—we don't see too many Jumbos here, so it is great as a graduate to see you here, Mr. Sloman—to help us better understand the many underlying challenges of operating in a contested littoral environment. I thank them for being here today. I look forward to your testimony.

Mr. WITTMAN. Thank you, Mr. Courtney.

We are going to go to our witnesses now.

Dr. Martin, we will begin with your testimony. Then we will go to Mr. Sloman.

#### **STATEMENT OF BRADLEY MARTIN, SENIOR POLICY RESEARCHER, RAND CORPORATION**

Dr. MARTIN. Thank you, Mr. Chairman. Chairman Wittman, Ranking Member Courtney, I appreciate the opportunity—

Mr. WITTMAN. Dr. Martin, just for a second, we will get you to pull that microphone closer to you. There you go.

Dr. MARTIN. Okay. Well, Chairman Wittman, Ranking Member Courtney, I appreciate the chance to testify today.

Amphibious operations in benign environments are obviously something that are of great importance to the Nation. Amphibious forces can be used across a range of military operations. And, in fact, they are a normally deploying part of our Nation's forward presence. They are marked by flexibility, mobility, and scalability, and they can be used in a variety of threat environments. They bring the virtue of capability that is based and sustained at sea with the ability to rapidly project various different types of capabilities ashore, ranging from the provision of humanitarian assistance, all the way through significant kinetic strikes.

Navy and Marine Corps continue to make investments in force structure capabilities that will both improve and sustain these capabilities well into the future. However, a variety of actors have acquired ways to contest aspects of amphibious forces and landing force movement, and these range from the types of weapons that nonstate actors have used against forces in Iraq and Afghanistan, such as IEDs [improvised explosive devices] or explosive boats—or

things of that nature, through more advanced and sophisticated systems, such as land-based missiles, all the way through sophisticated anti-access and area denial capabilities.

In some of these cases, the threats are significant but manageable, but in the most stressing environments, those in which opponents have significant A2/AD capabilities, anti-access/area denial capabilities, the challenges are significant, and there are some shortfalls that we are going to need to address in the near and far term, and much of my testimony deals with this.

However, as we discuss this, it is important to remember as context that amphibious forces have always assumed a hostile environment requiring that the force overcome opposition. A benign environment was not and is not assumed to be necessary for operations to take place. Moreover, the threats posed in A2/AD environments face all conventional forces. So aircraft carrier strike groups, tactical aviation flying from fixed air bases, large ground force elements: All of those are things that have to be overcome if they are going to operate in a place where the enemy is making a significant attempt to deny access. So solving some of those problems for the amphibious force also assist in solving problems for these other forces.

Navy and Marine Corps, to their credit, understand the challenges and have acted to meet them. The Navy continues to develop and purchase amphibious ships and surface connectors. The Marine Corps is experiencing significant improvement in its aviation capability, which I would describe as being nearly revolutionary, with the introduction of the CH-53 Kilo, MV-22 Osprey, with its many variants, and, in particular, the F-35B. Moreover, the joint force continues to seek ways to effectively operate in an environment in which sophisticated anti-access/area denial capabilities exist and need to be neutralized.

There are, however, places where shortfalls could impact the ability to conduct future amphibious operations and warrant either additional investment and/or changes in operational concepts.

The top three of these are—I hope we can get into more detail on each of them—is, first, the Navy continues to face difficulty fielding systems that deal with the threat from mines laid at sea and in the surf zone. Mines are relatively easy to acquire and deploy, and in some ways, the challenges posed are more direct against the amphibious force than they are against most others. And while there are promising efforts for unmanned solutions, this remains a challenging area as it has historically.

And the second issue is the Marine Corps continues to require the movement of amphibious assault vehicles as a lead element in an assault echelon. The legacy amphibious assault vehicles required that the ships close the beach to 1 to 3 miles to allow a launch. And this was a movement that both exposed the amphibious ship to threats, but perhaps more importantly, it telegraphed the force movement in ways it could endanger the landing force.

And the program replacements that Marine Corps are looking at are improvement in terms of range and speed, but the most fundamental issue here may be requiring these to be among the—or may be in requiring this type of force to be among the first elements ashore during ship-to-shore movement. This may be more a matter



of changing operational concept and doctrine than investment in new capabilities.

And, finally, while Navy and Marine Corps will be making near revolutionary—or Navy and Marine Corps, in particular, will be making near revolutionary improvement in its aviation capabilities, and while some of these may, in fact, be a big part of the solution to some of the challenges we have noted, it is not clear that the aviation support platforms that Navy is delivering are optimized to take advantage of this improvement.

For example, the Marine Corps insisted that the well deck capability that was absent from the LHA 6 and 7 amphibious assault ships be put back in LHA 8. And while this was understandable, this was done at the expense of aviation maintenance and ordnance storage capability, and ship options that allow more spots, more ordnance, more aviation fuels and stores probably should be looked at as we move into the next—into further development of the force structure.

Now, to conclude, amphibious operations have never been conceived as occurring absent a threat. Combatant commanders value these forces, and Navy and Marine Corps have significant and well-thought-out investment strategies to retain many capabilities. However, there are some significant challenges—some of them are very longstanding—that require conditional or additional emphasis.

And so, with that, I will conclude and stand by for questions.

[The prepared statement of Dr. Martin can be found in the Appendix on page 29.]

Mr. WITTMAN. Thank you, Dr. Martin.

Mr. Sloman.

#### **STATEMENT OF JESSE SLOMAN, ANALYST, CENTER FOR STRATEGIC AND BUDGETARY ASSESSMENTS**

Mr. SLOMAN. Chairman Wittman, Ranking Member Courtney, and distinguished members of the committee, thank you for inviting me to testify today on the future of amphibious warfare in a contested environment.

I wanted to make a few quick points regarding the current challenges the Navy and Marine Corps are facing and how they can overcome those challenges. The margin of superiority that the U.S. military can expect to enjoy on the battlefield has eroded over the last several decades as potential adversaries have developed new capabilities specifically intended to counter American strengths.

Those capabilities mean that, in order to fully contribute to a campaign against a capable adversary, amphibious forces will need to adopt new concepts of operation and field new equipment or use existing equipment in novel ways.

We also need to move beyond our bifurcated understanding of conducting amphibious operations whereby the Navy drives the Marines to the shore, then the Marines take over and execute a ground fight to one where we also acknowledge the contributions the Marine Corps can make to the Navy's fight for sea control. One of these new concepts is the use of expeditionary advanced bases. Advanced bases are small, temporary outposts that could constrain the enemy's freedom of action through anti-air or anti-ship attacks. For example, advanced bases positioned along island chains can

employ anti-ship cruise missiles to form—fired from mobile launchers to form a barrier to ships attempting to reach the open water.

The Marine Corps should also expand the use of amphibious raids, a traditional Marine mission, to support sea control in littoral areas by attacking enemy anti-air and anti-ship missile batteries. And amphibious forces would be an important enabler for blockade operations because they would be able to contribute a large forwarding force as well as small craft to enable those forwardings.

To execute these and other operations against future threats, the Navy and Marine Corps should prioritize six areas for investment.

First, increase the armament of amphibious ships. Amphibious ships today contribute little to the strike capacity of U.S. naval forces beyond what is carried by their aircraft. The Navy should modify its small deck amphibious ships, so the LPD [amphibious transport dock] 17 and the follow-on LXR class, to include vertical launch systems so these platforms have a greater offensive and defensive capacity.

Second, increase the size of the amphibious readiness group [ARG]. Today, the air element of a Marine expeditionary unit would be challenged to provide the volume of fires necessary to support the concepts described above. Adding more strike aircraft to the big deck ships in an ARG would displace rotary and platforms that are needed to allow the Marines to execute assault and airlift operations. Expanding the current three-ship ARG to a four-ship formation that includes a third small deck amphibious ship would enable the Marines to field a force with more strike aircraft without sacrificing its airlift capacity.

Third, expand the aviation capabilities of the amphibious assault ship. The LHA flight zero, LHA 6 and 7, sacrificed a well deck to increase their aviation capacity. The Navy and Marine Corps added a well deck back in for LHA flight 1 or LHAs 8 and beyond, albeit at the loss of roughly half the vessel's aviation gas storage capacity.

The only way that you can have a well deck and expanded aviation capacity in a ship is to have a bigger ship. One option is to lengthen the LHA flight 1 design, which would be similar to a course of action the Navy and Marine Corps examined in the mid-2000s for a “plug plus” variant of the LHD 8, which would lengthen the hull by about 80 feet and widen the flight deck by 10 feet. Eventually, the United States should consider developing a light aircraft carrier that potentially includes both a well deck and a catapult and arrested recovery system.

Fourth, optimize surface connectors for ocean transit. Minimizing the on-land requirements for connectors would drive down costs while allowing the platforms to retain a high water speed, a characteristic that will be critical to their survivability. It would also drive us away from the problems we encountered with the expeditionary fighting vehicle where you try to have a high water speed and survivability on land, which means you end up with a surface connector that is suboptimal for driving on the ocean and a land vehicle that is suboptimal for operations on land.

Fifth, the Marine Corps should acquire lighter vehicles. The Corps' ability to move forces ashore has been hampered by the steadily growing weight and size of its vehicles. To capitalize on

the mobility of the V-22 Osprey, the Marines must continue to acquire vehicles and fire support systems small enough to fit aboard the Osprey. In addition, the Corps should prioritize modernizing and upgrading its existing light armored vehicles, which is the lightest armored vehicle in the Corps' inventory, and begin a new program to replace them with an entirely new vehicle that weighs the same amount or less.

Lastly, the Corps should acquire cross-domain fires. The Marine Corps currently lacks the ability to influence the sea domain with its ground systems. The Corps should procure a multidomain weapon with an anti-ship and land-attack capability which can be fired by the Marine Corps HIMARS [high mobility artillery rocket system] launchers. The Corps should also acquire additional HIMARS launchers to supplement its two batteries of missile artillery—two battalions. Sorry.

That concludes my prepared remarks. I look forward to your questions and want to thank you, again, for inviting me to speak here today. And go Jumbos.

[The prepared statement of Mr. Sloman can be found in the Appendix on page 42.]

Mr. WITTMAN. Thank you, Mr. Sloman.

I am going to turn it over to a Jumbo, to Mr. Courtney.

Mr. COURTNEY. Thank you Mr. Chairman. And thank you to the witnesses. I am going to ask one question, and then that will be hopefully good for the break.

To both of you, one distinguishing difference between the capabilities resident in a carrier air wing and that of the aviation combat element aboard a big deck amphib is E-2D. This capability allows the carrier to be fully networked with the rest of the strike group and thus leverage all of their capabilities.

Are there ways, in your view, where the Navy could better integrate amphibians with other surface forces in order for them to better leverage capabilities like NIFC-CA [Navy integrated fire control], counter air?

Mr. SLOMAN. Sure. You know, I think the Navy, as they look to a situation where the Marine Corps has F-35Bs and the Navy still has legacy fighters, has been potentially valuing some options for operating a carrier with all of the aviation enablers as well as its four-and-a-half, fourth-gen, fighters alongside a carrier or LHA operating in a carrier mode with fifth-gen fighters.

I also think that if we provided the Marine aviation combat element with some sort of airborne early warning capability, that would significantly increase the survivability of the ARG/MEU [amphibious ready group/Marine expeditionary unit] as well as just dramatically increase the offensive capability of those F-35Bs. And the lack of an AEW [airborne early warning] capability on amphibious ships has been a problem since the British executed the Falklands campaign without an airborne early warning asset and had trouble trying to do defensive counter-air against the Argentinian fighters.

I think some potential options for doing that mission cheaper without an E-2D if you are operating ARG/MEU without a catapult could be putting some sort of less capable radar platform on an unmanned air vehicle, like the MUX, and that might get you

some of the way there because you could get persistence in a platform that could stay aloft for a lot of time and still provide you with some sort of radar overwatch.

Dr. MARTIN. The provision of airborne early warning is going to be absolutely essential for survival in the A2/AD environment. And the limitation right now is that—one of the major limitations, even with the F-35B for an ARG/MEU or even a larger amphibious force to operate would be the absence of that.

There are a couple of different ways that could be handled. One is to—that the deployment concept will always—for which an ARG/MEU or an ATF [amphibious task force] would enter into a contested environment—would always involve a carrier strike group with an E-2 in the vicinity. That is one thing that can be done.

Across the longer term, though, I think we are going to need to look at options that make it more organic to the force. And those could include developing different aircraft which carry an awful lot of expenses with them. The bill for developing a new aircraft that can do all of the things that you would like an E-2 to do can be quite large.

Another possible option, which I think both organizations have looked at, is a possibility of building a bigger amphibious ship that can—has catapults and arresting gear that allows the provision of something like an E-2. Now, this isn't something we are going to do in the next 5 years, but it is something we can be working toward as we—as we assess future force structure.

Mr. COURTNEY. I yield back.

Mr. WITTMAN. Thank you, Mr. Courtney. We do have time for additional questions.

Dr. Abraham.

Dr. ABRAHAM. No, I am good.

Mr. WITTMAN. You are good? Okay.

Mr. DesJarlais, I think he has stepped out.

Mr. Byrne. We are going down through the list, so—

Mr. BYRNE. I thank the gentlemen. I appreciate your testimony.

Back in 2014, the Deputy Commandant for the Marine Corps—I am sorry.

We lectured you on using the microphone, now we have to lecture ourselves.

Back in 2014, the Deputy Commandant for the Marine Corps said that the Marine Corps will be looking to, quote, “exploit the gaps and seams in future amphibious operations.”

So are we still talking about pitting force on force in a contested landing given that that was what he said back in 2014?

Dr. MARTIN. I would say that the future employment of amphibious forces is going to be maneuver-based and is going to involve the use of intelligence and mobility to take advantage of the gaps and the seams. And that is the future that the Marine Corps ought to be thinking about, the Navy and Marine Corps need to be thinking about.

Part of the challenge, however, is, as long as we are married to the idea of amphibious assault vehicles being the first thing across the beach, you are pretty much in a force-on-force engagement to begin with. So that is the type of capability we would probably want to maintain, but it is probably important to rethink the con-

cept such that there is more reliance on the inherent value of mobility, agility, speed, hitting them where they ain't.

Mr. BYRNE. Well, if the future of ship-to-shore connectors are more than likely going to be conducted in a benign environment or during an exploited gap enabled by local sea control and air dominance provided by the Navy and Air Force, is it wise, in a constrained budget environment, to increase the cost of these connectors by adding requirements for contested environments we won't be sending them into?

Dr. MARTIN. The connectors themselves need to be capable of moving around a lot. I mean, connectors apply to both the aviation and to the surface connectors.

Mr. BYRNE. Right.

Dr. MARTIN. And the requirements that we are talking about adding aren't necessarily things that are going to add a lot to the cost. I mean, what we are trying to do is—say, the MV-22, for example, is a connector; H-53 Kilo is a connector. Both of those things are part of the program of record and are going to be delivered. And, really, part of the challenge is how to better exploit the capabilities that they provide.

I can certainly see an argument that says that an amphibious assault connector that is launched from a ship is maybe not your better investment. I think we both would agree with that. I would agree with that.

Mr. SLOMAN. Yes, sir. I agree with Dr. Martin. And I would add I think that even if you had a connector that had some—you know, some amount of survivability in an environment where you are doing an imposed landing, the ship would have to be so close to shore that you would create, you know, just tremendous risk for a capital ship.

So I think the Marine Corps has been trying for decades to use range and maneuver, you know, on the sea side to try and find those gaps and seams. I think there is great potential here for unmanned systems. So the Marine Corps just completed an experimentation exercise called ANTX [advanced naval technology exercise] out in the west coast recently, and they have looked at concepts for using Navy small unmanned surface vehicles to be part of the first wave of some sort of landing against a concentration of enemy forces if you have to do that. That might help bring down the risk for platforms that carry people and also because using unmanned systems maybe can reduce the costs of those. But I think it is—you know, I think the Marine Corps today would be certainly challenged to execute an imposed landing against modern threats.

And the Marine Corps has been—would have been challenged for quite some time. And it is not just the connectors. Some of it is the loss of naval gunfire support, for example. You know, if you look at the amount of naval gunfire support you could use to prep a beach today versus in, like, the 1940s, it is a tremendous delta there.

Mr. BYRNE. Well, I wonder if it would make some sense to focus on more flexible, agile, and fast connectors to move our Marines to shore swiftly such as the expeditionary fast transport ships we already have. Would those make sense?

Dr. MARTIN. The expeditionary fast transport ship is certainly a very valuable capability. One of the things about flexibility and agility, though, is not so much with the connectors but with the platforms themselves. They need to be able to provide at least—the amphibious platforms need to be able to provide some level of self-defense capability. And that would be—that is, really, what distinguishes an amphib from something that is, you know, has a “T” in front of it. That is going to be part of being able to move into certain places, and it is part of the risk assessment about how close a force could afford to get.

But, in general, the presumption that we need to be looking more at maneuver and flexibility and the lightness is exactly the right way to go. And the idea that we are going to be able to knock down the door with something is probably not the way to go.

Mr. BYRNE. Well, if you listen to what the Deputy Commandant was saying, he is saying, let’s go to the places where we don’t have to knock down the door.

Dr. MARTIN. Exactly.

Mr. BYRNE. So, if we are not having to knock down the door, we can take something that is lighter, faster, more agile, get in there, get out, and get it done cheaper. That is my only point there.

Does that make sense?

Dr. MARTIN. I think we are in violent agreement.

Mr. BYRNE. Good. Thank you. I yield back.

Mr. WITTMAN. Thank you, Mr. Byrne.

We are going to take a quick recess. We should be back right around the 4 o’clock timeframe. So I urge our members to come back. I know there are lots of questions that are needed to be asked. So we will ask our witnesses if they will stay with us, and we will recess. Two votes. And we will recess. We should be back in the 4 o’clock timeframe.

[Recess.]

Mr. WITTMAN. We will reconvene the Seapower Subcommittee.

And now we go to Ms. Bordallo for the next set of questions.

Ms. Bordallo.

Ms. BORDALLO. Thank you very much, Mr. Chairman. And thank you, gentlemen, for being at the hearing today.

This, I guess, whichever one of you would like to answer: The latest Marine Corps operating concept outlines the desire to see a second amphibious ready group in the Pacific by 2018.

Now, we understand that that relies on variables, such as funding and vessel availability, but in your view, what capability would a second ARG provide for the Marine Corps, and what resourcing or logistical challenges would need to be prioritized?

Dr. MARTIN. A second amphibious ready group would be quite valuable in enabling theater security cooperation. Marine forces, amphibious ready groups, and Marine expeditionary units are extremely useful for exercises, for working with regional allies. It would also reduce the reaction time for certain types of contingencies. So, in fact, that would be, in my view, a very good use of the force.

The sourcing challenges would be largely a matter of force structure. As far as the Navy’s ARGs go, it probably would not be as big a deal because it—effectively, we would be moving something

out of the continental United States and putting it somewhere in the Western Pacific and having it be there. With the Marine expeditionary unit, it would likely be partly composed of a rotational force and partly composed of people who are stationed there permanently, just like we have now in Okinawa now.

But in terms of sourcing, in terms of support, typically, this is done with an agreement with the host nation, and it is typically a mutually beneficial type of relationship, which, in my view, would be something very much worth pursuing.

So Pacific Command's desire to do this seems to me very consistent with what would be in the best interest of the Nation.

Ms. BORDALLO. Thank you. Thank you, Dr. Martin.

Mr. SLOMAN. I would also add, more broadly, you know, one of the recommendations I reported was to add a fourth ship to the ARG. And, obviously, that is a heavy lift in terms of shipbuilding and, you know, actually building enough ships to achieve that requirement. So you may not be able to do that with all of your ARGs.

But one way you can get more presence from a fewer number of ships to the same number of ships is to put more of them forward. They can rotationally deploy faster. They don't have to transit all the way from the west coast or the east coast.

So, when we look at potential posture options that go along with some of those recommendations, and this also feeds into the fleet architecture study that CSBA [Center for Strategic and Budgetary Assessments] recently completed for the Navy, a large part of that is posturing more ships forward to enable them to have a higher presence.

Ms. BORDALLO. Well, thank you. Thank you, gentlemen.

Both of you identified the challenges of sea-based mines, particularly for amphibious operations.

Dr. Martin, you referred to the challenges associated with legacy systems and opportunities specifically with unmanned and underwater systems.

Now, I echo your concern regarding the very real and unique A2/AD threat of mines and would be interested to hear your perspective on what the Navy should be doing to strengthen its mine countermeasure toolbox.

Dr. MARTIN. There are a number of things the Navy should be considering as it moves forward with the mine countermeasures problem. One is unmanned is the future of mine countermeasures, and we need to be moving out of the legacy systems that are manned and require exposure of personnel to the threat as they attempt to clear things.

I think one of the big challenges is that the very shallow water has been a place that has historically been a real challenge. And the types of things that would help us there would be improved unmanned aerial systems to allow better battlespace awareness of what is going on, the fact that people are laying mines. Other parts of it would be unmanned systems that could be put into very shallow water and can track the, assist in mine hunting and assist in neutralization. And in addition, I think this has got to be coupled with some changes to the operational concept such that you are not—that the landing force is not necessarily always going where—

it can go other places. That is part of strengthening the aviation capability.

Ms. BORDALLO. Thank you. Thank you very much.

And, Mr. Chairman, I yield back.

Mr. WITTMAN. Thank you, Ms. Bordallo.

We will now go to Mr. Gallagher.

Mr. GALLAGHER. Thank you, Mr. Chairman.

I thank both of you for your extremely thoughtful testimony in joining us in what is a critical conversation.

Mr. Sloman, it is always good to meet another Marine intelligence officer. Every day on the Hill, I endure some joke about whether Marine intelligence is an oxymoron. So your thoughtful testimony is helping to prove that it isn't, and I appreciate that very much.

And you mentioned something about the ANTX exercise, if I am getting that right. And I would like to dig into that a little bit, because when it comes to this conversation about our Navy/Marine Corps team operating in a contested environment, my concern is we are sort of always on the wrong side of the cost curve at every step.

And from our amphibious to our aircraft, our rotary-wing assets to our sea-based connectors, it seems like our adversaries are always able to target that equipment at a lower cost than we are able to protect them.

And I appreciate that we can—it seems like we can achieve some cost savings in the requirements process, such as minimizing on-land requirements for connectors, but I am afraid that this bigger picture remains: The relative cost of our systems and the high value we rightly place on survivability may make political leadership less likely to deploy them in a risky expeditionary environment.

So, on the subject of a greater role for unmanned systems, which may be a way of getting on the right side of that cost curve, could both of you just comment on, if we were going to invest heavily in that approach, what would that look like? How would we change how we are operating?

Mr. SLOMAN. So, specifically with reference to the ANTX exercise, I think one of the two most potentially fruitful areas for using those unmanned systems would be the counter mine mission, you know, so—or sort of a beach reconnaissance role: so having small unmanned vehicles that could operate well forward of the manned assets to really determine what the, sort of, picture of defenses are at whatever beach you are landing at and especially mines and then, also, potentially as a host for the sort of fires that you would need as you close to the beach. The Marine Corps kind of has this problematic gap where you have a lot of fires potentially resident on your platform, your capital ships that you are launching ships from, especially if you add a VLS [vertical launch system] capability, like we proposed. And then you potentially have a lot of fires once you kind of establish your forces ashore and you can put your artillery in place and also use air support. But as the forces are transiting to the beach, they don't really have right now any fires capability. This is something you had in World War II and subsequent, but we have sort of lost in the force.



So having small unmanned vehicles that had fires that could provide fire support for forces as they are doing that long transit from wherever they left the capital ship to where they are landing I think is a potentially very useful job for the unmanned vehicles.

Dr. MARTIN. I agree completely with what Mr. Sloman just said.

I would add that the ability to establish wide area battlespace surveillance is an important feature of being able to operate in this type of environment. Unmanned aerial vehicles that are organic to both the ARG and the MEU would be helpful in that respect. Also, the whole capability of doing beach surveillance from unmanned system would be—is another important feature.

And the last thing is it—we talk—I talked earlier about the issue with surf zone mining. And that may be a particular area where we have to look at specialized types of unmanned vehicles that may be expendable that we are effectively using to neutralize the broad range of mines that have been laid in the surf zone and are going to be difficult to deal with in any other way. And, right now, effectively, the only way we have got to deal with it is blow them up or send somebody in to countermine or whatever. And unmanned systems are probably going to be very effective in that area.

Mr. GALLAGHER. And, Mr. Sloman, I would just be interested. As a Marine intel officer, do you think—are we doing a good job in that community thinking creatively about the future threat environment and really challenging the assumption upon which our amphibious doctrine is based? I mean, it has been my experience, laying my cards out there, that we sort of prioritize the short-term thinking over that real long-range analysis. I just would be interested in your thoughts, given your experience.

Mr. SLOMAN. Yes. I completely agree. You know, I mean, as you have experienced, sir, when you are in a billet or you are in the aligned unit, you are worried about the next exercise, which usually is about some very near-term threat, or you are going off and doing some sort of kind of narrowly scoped operational problem. I don't know how many Marine officers get the freedom to think, you know, about those mid- to long-term threats.

And then I also am concerned if the Marines start spending more time and sending more personnel to do the kind of GWOT [global war on terrorism] type missions that, you know, may be ascendant, we might run—end up in a situation like we have for the past decade where we really become like a second land army or the Marine Corps really becomes a second land army, executing mostly counterinsurgency, counterterrorism type missions and, again, sort of that amphibious knowledge base kind of starts to drop out of the force.

Mr. GALLAGHER. Sure. Thank you both.

I yield.

Mr. WITTMAN. Thank you, Mr. Gallagher.

We will now go to Ms. Hanabusa.

Ms. HANABUSA. Thank you, Mr. Chair.

One of the most interesting part about the amphibious operations is, as it was described once, about the image that we all have is World War II and the wave and wave of amphibious vessels. I tell people: Imagine the opening scene of "Saving Private Ryan" and that is the image that most of us have.

But we also realize that that is not the way we are going to, quote, “fight” in the future. It is just not part of it.

Dr. Martin is concerned about A2/AD. I represent Hawaii. Believe me: We are very familiar with it, and we are also very concerned. I am not sure that the amphibious vessels are the way you counteract A2/AD. And then, as well, the whole issue that we were discussing earlier, which is the role of the unmanned. As we know with the FSA [fleet size assessment], which was done, which the fleet size assessment with Secretary—former Secretary Mabus’ 355 and everyone else, and I think your organization, Mr. Sloman, had a large number of unmanned.

So, given what you are describing as you see potentially as the role of the amphibious vessel, why do you not think that you are actually moving towards a recommendation towards unmanned versus on an increase in amphibious vessels with Marines? Right now, we are, what, 10 vessels, 6,000 Marines that are being deployed in any one day. So why do you not think that that is not the way that the future is? Because it seems like we have got to think about the future. What is the effective way to do this battle? Whichever one of you wants to start.

Dr. MARTIN. Well, obviously, Mr. Sloman has some thoughts on this too. But I will start by saying, I would agree that amphibious vessels in and of themselves are not the things that are going to overcome an A2/AD environment. They are something that we have to—we, the Nation—would have to address, the military would have to address, to enable the use of that type of capability. That type of capability is useful in achieving certain types of effects, but my argument is that we should consider the ability to carry out those types of effects as being useful and find ways to enable them and use aspects of the amphibious force to allow that to happen.

Countering A2/AD is going to involve a large component of unmanned vessels that are unmanned capabilities. That is a place we should be investing. I think that the major capability enhancements that we are talking about for the amphibious force largely deal with ways to exploit the potential capability of the manned and also to exploit the inherent value of mobility and scalability. So those are the things that the amphibious force will continue to bring with us even as we move into the other areas where challenges still exist.

Mr. SLOMAN. Specifically on the unmanned systems. I mean, obviously, those have a role to play in this A2/AD environment. I think we are at different levels of maturity with respect to integrating those in the force. So I think unmanned air systems, we have a lot of experience with, and there are some technical reasons that we were just—it is easier to use those.

I think—and in the CSBA for the architecture study, we were somewhat conservative, actually, about our use of unmanned surface vehicles and even unmanned undersea vehicles, partly because there are a lot of technical and policy challenges that we have to work out, and I think we are not 100 percent certain exactly the maximum extent that we can use those systems.

So, for example, from a policy standpoint, how willing are you to put munitions on those systems? How willing are you to grant—or how much autonomy could you potentially grant an unmanned

system if you expect to be operating in an anti-access/area denial environment where your communications will be disrupted and you may not be able to communicate that easily with your unmanned systems? Do you mind if the enemy takes them if it is an unmanned surface vehicle and it is operating at peacetime? Theoretically, someone could just grab it, which has happened in real life. You know, we don't have good norms for protecting our unmanned vehicles right now.

So, you know, we opted to be a little bit conservative, and I think we still have to work through those challenges.

Ms. HANABUSA. I am running out of time, but I just would like to ask you to consider this: I believe that we set policy by acquisition. So, as we talk about the balance here, when we buy an amphibious vessel, it could be a lot of money versus an unmanned.

So that is the tradeoff that we, I think, have to decide on this particular area as to who better serves it with the limited resources that we have.

Thank you, Mr. Chair. And I yield back.

Mr. WITTMAN. Thank you, Ms. Hanabusa.

We will now go to Mr. Hunter.

Mr. HUNTER. Thank you, Mr. Chairman.

And if you already answered this, please tell me, and I will ask the staff what the answer was.

It is a really simple question, though. Where could you do a contested amphibious landing right now? Tell me, and obviously, the countries that are peer competitors and also nonpeer competitors, tell me, where could you actually do it at?

Dr. MARTIN. There are a number of places you could do it without getting into the actual plans. Anyplace that offers a littoral type of—

Mr. HUNTER. China has got littoral type of stuff. You couldn't do China.

Dr. MARTIN. You couldn't do China without a whole lot of prior preparation. There are places.

Mr. HUNTER. I think that is arguable, but—

Dr. MARTIN. Yeah. There are places that—I don't know that we would do China. There are places where it could be done with—it could be done with an adequate amount of prior preparation, prior dominance, and all the rest of it.

I would say that the areas that are most susceptible to it would be the places where there is a moderate level of A2/AD capability, which we are capable of overcoming. It would be places where there is some strategic advantage to gaining parts of the coast or gaining an island, and it would be places where it would be valuable to have a level of force that might not be the same as an out-right major contingency operation but would be in the nature of a limited type of response.

So there are—off the top of my head, I could think of many places where that could be done and could be done in an incredible way. I am a little reluctant to name specific places.

Mr. HUNTER. Let me ask it this way: So let's look out 15 or 20 years, right, when everybody, when even nonpeer competitors have ballistic missiles to be able to shoot at ships, do you think amphibious warfare may be going away? You are never going to have a

“Saving Private Ryan” or Iwo Jima again. You are never going to have that because you are not going to make it to shore, ever.

Dr. MARTIN. No, you wouldn’t do “Saving Private Ryan” because it involves putting the ships so close to shore that they would be vulnerable to a number of different things.

Mr. HUNTER [continuing]. You would have to have the ships close to shore by definition, right?

Dr. MARTIN. Well, part of the discussion we are having is the ability to move around and stay out of range and provide deception and provide surveillance and to attack the seams. So, in a case where you—I can foresee a situation in 15 or 20 years where we have established sufficient dominance in a particular part of the operating area that we would want to be able to move forces other than aircraft, for example, where we would want to be able to move forces into an area to achieve some effects.

Mr. HUNTER. But that wouldn’t be a contested amphibious assault. That would be an amphibious landing where you already have dominance, where you have air dominance and so forth, and you are not going to get hit with a cruise missile 500 miles offshore.

Dr. MARTIN. Well, probably not that far. But it would be an amphibious operation in an environment where you had to—you had to figure out ways to counter the threat before carrying out the operation, and that is part of it. And I can think of many places where that could occur. And I guess and what I would also emphasize is that this is not something that only amphibious forces would have to deal with. Any conventional force is going to have to be able to overcome some portion of the A2/AD threat in order to be able to carry out any operation.

And that is—and part of the balance between offense and defense is something that is just part of the threat assessment that we continually have to make. So I would—so, anyway—

Mr. SLOMAN. Sir, just real quick. I would offer that if you can get the ships far enough offshore, so maybe 200 miles, for example, against a competitor that doesn’t have huge stores of precision weapons, you may be able to thin the salvo, the offensive salvo, from their end to the point that you could potentially defend against that or at least you would reduce the amount of weapons you might face to a pretty small number, depending on your adversary’s inventories.

And then I would also offer, with respect to China, it is difficult, very different, certainly, to imagine landing on the shores of mainland China, but I think there is a great potential for using amphibious capabilities in some of the claimed islands, for example. I could see a scenario where you might want to put forces there or to regain control of some disputed territories after they have been seized by an opponent.

Mr. HUNTER. Thank you. I just feel like, in some ways, we are in an amphibious box. I was a Marine too. And I did three tours, and I flew over all three times. I have never been on a ship for more than 3 days in the Gulf. But I think we kind of—we might put ourselves in an amphibious box where we assume that it is still going to be relevant in 20 years when it might not be.

Thank you.

Dr. MARTIN. Yeah. There is that possibility. At the same time, by that chain of reasoning, there is a whole bunch of things we couldn't do in 20 years. We wouldn't be able to fly out of—PACAIR [Pacific Air Forces] out of fixed bases in the Philippines. And there are ways to offset advantages, and part of the—rather than taking the step of saying it is irrelevant, part of the step we need to take is to figure out ways that, given that we think parts of it are useful, are there ways that it could be made?

Mr. HUNTER. Thank you. Thank you, Mr. Chairman.

I yield back.

Mr. WITTMAN. Thank you, Mr. Hunter.

We will now go to Mrs. Davis.

Mrs. DAVIS. Thank you, Mr. Chairman.

And thank you. I am sorry. I wasn't able to hear the remarks prior to the vote. But I had a few questions. They may have been asked.

One of the things that we are talking about here—and certainly, my colleague from San Diego in asking those questions—is part of it, you know, what does the future look like, and are the plans that we have today realistic or in some cases unrealistic?

And if you could put that in the framework of I think you may have mentioned on shipbuilding, you were—someone asked that question, and the integration with more forward operations versus not, and so what—you know, what is the proposed number of ships that support our amphibious operations as appropriate or not?

And then, when it comes to aviation, aviation readiness shortfalls in the Navy and Marine Corps, how do they affect, again, amphibious operations?

And, finally, the expeditionary support bases and advanced bases, how are they incorporated into the future of amphibious operations? If you could kind of go through that in a way that is a little specific for us, that would be helpful.

And if I could throw in one more thing. So, as we are talking about the updates to our connectors and—do we have gaps in training around new technology that are problematic? And how are we addressing those going forward?

Mr. SLOMAN. Yes, ma'am.

Mrs. DAVIS. And I am sorry if you have already addressed this in great detail.

Mr. SLOMAN. We have not.

So CSBA recommended in our fleet architecture study in response to an NDAA that we go from 16 small deck amphibians to be procured over the next 30 years to 25 small deck amphibians procured over the next 30 years. And we determined that that would be about a 4 percent increase on average in the Navy shipbuilding budget. That is averaged out over the entire 30-year period. So it might be more, significantly more, in the first 10 years, for example, depending on the rate at which you want to procure those ships.

And there are some things that you can do to bring the cost down a little bit of procuring extra small deck amphibians, like potentially speeding the procurement of the LXR, for example, the LPD 17 replacement.

With respect to advanced bases, I think the rationale for arguing for advanced bases partly has to do with some of the questions that the members have directed to us with reference to the cost-exchange balance. When you look at these A2/AD situations, our argument for using advanced bases or for creating some capability to put Marine units ashore that can implement the sea and air domains, is that that helps reverse the cost-exchange ratio. So our potential adversaries have tailored their capabilities to try and disrupt what is traditionally seen as our strengths. So carrier-based aircraft, short-range tactical fighters at large bases, surface vessels. Expeditionary advanced bases would create a mobile capability, certainly, for the bases close to an opponent to fire any ship or any air weapons that would force them to try and seek out smaller ground forces with low signatures that are relatively cheap.

This is the problem the U.S. has frequently encountered in our wars. You know, if you look at the Scud hunts in 1991, trying to find out these mobile launchers, very difficult problem. Trying to find mobile ground forces in Kosovo in 1999, extremely difficult problem.

We have never exactly solved the problem of how to find mobile transporter erector launchers that are driving about with very low signatures. And so creating—even if your offensive capacity isn't that high, but creating that threat that the enemy has to honor and potentially divert some of their spending towards and some of their military asset towards I think is one potential way to help try to flip that cost-exchange ratio and give them almost a mini A2/AD problem to help try and combat within their near abroad.

Mrs. DAVIS. And on the training, just going back for a second in terms of the shipbuilding, because we are also talking about the number of ships that support the operations, amphibious operations.

Mr. SLOMAN. Right.

Mrs. DAVIS. How comfortable do you feel we are moving ahead with that? And where does it not connect in the sense of the plans and what we would like to see are really out of whack right now?

Dr. MARTIN. We don't meet 2.5 MEB [Marine expeditionary brigade] lift.

Mr. SLOMAN. Certainly.

Dr. MARTIN. If the requirement is for 2.5 MEB lift, we are not going to be anywhere close. It is also true that every time you add an amphibious ready group and you project it to operate it in a contested environment, there will be surface ships that go with it, and all the services—Marine Corps has got a problem with aviation readiness, and Navy has got a problem with ship readiness. All of those things have to be addressed.

One of the problems with trying to greatly expand the size of the force would be it is not just the initial cost; it is the subsequent readiness costs that go along with this. So we would have to—the Nation—not we, but the Nation would have to consider all those things as it made a decision to seek a particular type of capability.

Mrs. DAVIS. Do you think we do that very well?

Dr. MARTIN. I think the Nation and the services occasionally do not take into account the long-term cost of operating a force and,

as a result, can make some investment decisions that become questionable over time.

Mrs. DAVIS. Okay. Thank you. I think my time is up. Sorry. Thank you.

Mr. WITTMAN. Thank you, Mrs. Davis. We appreciate that.

Gentlemen, I want to get your perspective on what we see today as the mix of capabilities within the amphibious force. We have connectors. About two-thirds of our connectors are to move amphibious forces ashore, and the other element is the aviation element that also moves the remainder of forces.

It has been suggested that we look at that ratio, and is that ratio correct today, the two-thirds to one-third connectors versus aviation? And those surface connectors—I think, you know, as we look at modernizing the surface connectors, that certainly is a situation.

Let me get your perspective. Do you think the current ratio is correct? And if not, what should be the ratio? And then, what would that new ratio mean for our legacy forces today, and what would a future Marine force look like with a different ratio of surface connectors to aviation assets?

Dr. MARTIN. As I said in my opening statement, the Marine Corps is facing an explosion of improvement in capability in aviation capabilities it has got, and it would be wise for the Marine Corps to exploit that to a greater degree.

What that implies is that more of the force gets moved ashore by aviation; less of the force gets moved to shore by surface. And the challenge that that would impose is that some of the things that the Marine Corps is used to requiring as part of the landing force would not get there as quickly as it might otherwise. And a lot of the fire support, for example, would be more dependent on aviation fire support than it would be that they—the tanks and armor, that type of thing, get moved ashore by surface.

So, across the long term, the need to reexamine concepts that depend heavily on armored forces moved by surface connectors needs to be reevaluated, and that will affect—doesn't really affect the Marine Corps aviation program of record all that much. What it does affect is some of the Marine Corps' thinking about its capabilities. It also affects—and doctrine, it also affects some of what would go into the amphibious shipping, what they are going to be optimized to carry.

Mr. WITTMAN. Mr. Sloman.

Mr. SLOMAN. Yes. I think the biggest factor that would affect that ratio, you know, if you sort of look at it from what do you need on the beach and what do you need to have ashore to fight and then you sort of backtrack it, think about what connectors can get that there, the biggest limitation right now is the vehicle weight problem. So there is really not that much the Marines can bring ashore just by air, which creates a challenge if you are a beachmaster trying to figure out what your amphibious loading plan is.

I think that if you can drive down the vehicle weight without sacrificing too much survivability—and we recommend acquiring lighter vehicles—then your aviation lift becomes much more useful and you can bring a larger percentage of the force ashore.

And in the long term, I think it is important to move—or to try and move beyond this paradigm where more survivability necessar-

ily equates to more weight. There are some DARPA [Defense Advanced Research Projects Agency] programs that are looking at ways that you could potentially have survivable ground vehicles that leverage agility or leverage active and passive defenses in addition to heavy armor.

But if every vehicle that you try to make more survivable becomes exponentially heavier, you really run into a big challenge trying to bring them ashore by aircraft. So then you have to go to surface connectors, which may reduce the vulnerability in the vehicles, because they have all this armor, but it dramatically increases their vulnerability during the ship-to-shore transit stage.

Dr. MARTIN. Absolutely.

Mr. WITTMAN. Very good.

Mr. Sloman, let me ask this: Mr. Hunter talked about what the future environment will look like, and much of this is a discussion about Marine Corps' capabilities, both in a benign environment and a contested environment, and that obviously is going to change as we look at it into the future.

Can you explain how the Marine Corps' approach to amphibious warfare in a benign environment and in a contested environment would be different? And is there a range at which you would project forces in a benign environment that may be different than what you would in a contested environment? So just kind of give us your range.

We had talked about the contested environment, but you also alluded to the ability to prosecute the seams or to find areas where it is less contested or even a benign environment. Then you have logistical issues about being able to move forces distances to the objectives.

So give us your perspective because I would like you to dive a little bit deeper into that realm of what was asked earlier just so we understand the benign versus contested environment in amphibious warfare capability.

Mr. SLOMAN. So I think one challenge when you look at a potentially benign environment is the proliferation of anti-ship cruise missiles with non-state actors. So environments that, maybe 20 or 30 years ago, we assumed were benign or at least benign for a ship that was stood off maybe 10 or 15 miles from the coast may no longer be benign, and we might not even know that it is not benign. In other words, a non-state actor might have some sort of weapon system that could target our capital ships. The Houthi attack on U.S. guided missile destroyers and then also the Saudi or United Arab Emirates' joint high-speed vessel, you know, brings that to mind.

I think in a truly benign environment or one where we can be assured that there would be no anti-ship missile threat within tens of miles of the coast, we would be able to bring in our maritime prepositioning force [MPF] sealift capability, and that would very much increase the—or decrease the offload time required to put significant forces ashore. Having a defensible port facility is hugely valuable if you are trying to move heavy equipment off of the ship. But I think it is important not to assume that that MPF shipping, so essentially civilian shipping, can be used in even a mildly contested environment, particularly close to shore.



And the Marine Corps and the Navy seemed to be moving a little bit in that direction kind of in the 2000s with some of the discussion about sea basing. I think that was a dangerous direction to go, to assume that your MPF shipping would be part and parcel of an amphibious force against even any enemy that had the capability to reach out and hit ships at 10 to 20 miles from the shore.

So I think we should acknowledge upfront that the MPF shipping is not a substitute for amphibious shipping, and it really can only be used if you assume that there is no threat at all from an anti-ship cruise missile armed adversary.

Mr. WITTMAN. Very good.

Dr. Martin.

Dr. MARTIN. The important thing is not so much the distance as the ability to not telegraph location, which may occasionally be a matter of deception that puts the force in range of anti-ship cruise missiles or the anti-access threat.

So the future probably doesn't mean that we should be—that the Nation, the Navy, the Marine Corps—should be developing long-range connectors that are supposed to move things hundreds of miles. It is more in the nature of locating ways of masking the movement, of finding ways to better understand what the adversary is doing, finding ways of suppressing aspects of the A2/AD network long enough to allow some significant part of the operation. And that will involve a fairly highly mobile and sophisticated effort that relies a lot on sensors, that relies a lot on intelligence fusion, and relies a lot on the ability to make the enemy fire the anti-access weapons into open ocean. But trying to construct a situation where it is all range based, it will never work. Range can always get increased.

As far as the general ability to operate in a close to shore, not everybody is going to have an A2/AD capability equivalent to what the Chinese or the Russians would be putting out. There are lots of places where the contested environment is such that it can be handled with less risk to the force. And the way to be able to operate in those types of environments is to accurately assess the threat and provide sufficient organic capability for the landing force and for the amphibious force to be able to operate in a fairly—in a more limited way.

And we have talked about a couple of other things that would involve. Some of it is better unmanned surveillance sensors. Some of it is possibly being able to organically assign airborne warning. There are a lot of different things that could enable that.

Mr. WITTMAN. Thank you.

Mr. Sloman, I wanted to pick up on the point that you made about weight of combat capability being moved to shore. And I want to ask you specifically about the Marine Corps' effort to recapitalize the amphibious assault vehicle [AAV] through the development of the amphibious combat vehicle [ACV] program, looking at that transition. As you know, part of that is doing a service life extension on AAVs, which is a 50-year-old vehicle and then building new ACVs. So, in the effort to recapitalize this legacy program, how does that fit into what you look into the future about the forcible entry component of an amphibious force? Do you see that direction in the recapitalization of legacy programs there and what

you bring up about a weight and capability? Give us your perspective on how that fits into where things need to be in the future.

Mr. SLOMAN. Yes, sir. I think the Marine Corps is moving in the right direction with having a replacement for the AAV have not a significant swim requirement. I think trying to build another EFV [expeditionary fighting vehicle] is the wrong road. You know, that creates significant engineering risk, very expensive vehicle, and one that just seems unlikely to be fielded anytime soon.

I am not sure that the ACV—the ACV is large compared to other equivalent types of ground vehicles, and it perhaps is underarmed relative to the threat. I think having a larger weapon on it would be—would be a very useful capability. But I think that generally having a vehicle optimized for the ground with minimal swim capability that would be brought close to shore by a connector and then disgorged is definitely the right direction for the Marine Corps to go rather than have a gold-plated, fantastically swimmable ground vehicle.

Mr. WITTMAN. Got you. Very good.

Dr. Martin, your perspective?

Dr. MARTIN. What this involves is the backing away from the idea that the first thing across the beach is going to be motorized as a mechanized inventory. And what that means is that the first parts of the assault element are going to be likely delivered by air and that these capabilities are going to be only delivered after some part of the beach is made secure enough that they can move this type of force over the beach.

If that were to occur, I am not absolutely certain that that would be the first thing to arrive. The first thing to arrive might very well be some other portion of the Marine landing force that is viewed as being more effective and useful.

So I think the major thing that we would like to have from this type of vehicle would be suitability as an infantry ashore weapon and not at all really an amphibious vehicle. There is really not a lot of value in having that capability, which I think is pretty much what we both—we both agree on that point.

Mr. WITTMAN. Very good. Thank you.

Mr. Byrne, do you have any additional questions?

Mr. BYRNE. I do not.

Mr. WITTMAN. Okay. Very good.

Mr. Hunter, any additional questions?

Mr. HUNTER. Dr. Martin reminds me of Robin Williams, with all respect.

Dr. MARTIN. I have had other people say the same thing, so Nanu Nanu.

Mr. HUNTER. That is right.

Mr. WITTMAN. Well, with that, if there are no further questions, then this subcommittee stands adjourned.

And, gentlemen, thanks again for your testimony today.

[Whereupon, at 3:32 p.m., the subcommittee was adjourned.]

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# **A P P E N D I X**

MAY 18, 2017

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**PREPARED STATEMENTS SUBMITTED FOR THE RECORD**

MAY 18, 2017

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**Opening Remarks of the Honorable Robert J. Wittman**  
**“Amphibious Warfare in a Contested Environment”**  
**May 18, 2017**

As the Seapower and Projection Forces Subcommittee Chairman, I lead a group of my colleagues with broad jurisdiction over Naval and Air Force programs. I must admit, that I have a particular affinity for the Marine Corps and its amphibious warfare role because I represent Marine Corps Base Quantico in Virginia’s First Congressional district. Because of my district and because of this Subcommittee’s jurisdiction, I am particularly interested in our subject today of assessing our Marine Corps’ ability to project forces in a contested environment.

Late last year, I was particularly intrigued to read a report authored by one of our witnesses today entitled “Advancing Beyond the Beach, Amphibious Operations in an Era of Precision Weapons.” In this report, the authors proposed that the current approach to amphibious operations needed, and I quote, “new operating concepts and capabilities that circumvent or defeat increasingly effective coastal defenses.” Their report proposes a new strategic approach that emphasizes lighter vehicles, a rebalancing of the surface and aviation assault capabilities, an emphasis on surface connectors that optimize ocean travel and improved armament on amphibious ships.

I believe that the Center for Strategic and Budgetary Assessment (CSBA) has accurately assessed the problems associated with amphibious assault in a contested environment. Projecting power in close proximity to shore and in a contested environment is fraught with challenges which may require a shift in our approach. Fundamental changes to the Department of the Navy’s strategic amphibious warfare investments may be necessary to more effectively move Marines ashore. I believe that it is incumbent on the Marine Corps to rapidly change their legacy force structure toward a capability that is more expeditionary, capable of fighting in the littorals and, when called upon, able to project power ashore in even the most challenging of environments.

To better assess this issue, I am pleased to have two respected authors on amphibious warfare:

Mr. Jesse Sloman  
Center for Strategic and Budgetary Assessment  
and  
Mr. Brad Martin  
RAND Corporation

Gentlemen, thank you for your willingness to testify before our Subcommittee today and I look forward to your assessment and recommendations to make our Marine Corps forces more lethal and effective. I would now like to turn to our Ranking Member Joe Courtney, for any remarks he may have.



## Amphibious Operations in Contested Environments

### Insights from Analytic Work

Bradley Martin

CT-476

Testimony presented before the House Armed Services Committee, Subcommittee on Seapower and Projection Forces on May 18, 2017.



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*Amphibious Operations in Contested Environments*

Testimony of Bradley Martin<sup>1</sup>  
The RAND Corporation<sup>2</sup>

Before the Committee on Armed Services  
Subcommittee on Seapower and Projection Forces  
United States House of Representatives

May 18, 2017

Amphibious operations are intensive combined arms operations that require significant resources and support. They are included in the operational plans of combatant commanders and remain a significant area of investment for the U.S. Navy and Marine Corps. It is, however, also clear that amphibious operations involve the placement of forces into contested areas, the most stressing of which are subject to anti-access/area denial (A2/AD) capabilities.<sup>3</sup> Amphibious operations have always assumed the need to overcome an opposing force and to establish a degree of battlespace dominance before attempting operations, but the reach and lethality of modern weapons systems make aspects of amphibious operations particularly challenging today.

This testimony examines amphibious missions and operations, the challenges associated with such operations, and changes in future threats and capabilities. I will consider both items that the Navy and Marine Corps are currently developing and areas where different or additional investment might be appropriate.

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<sup>1</sup> The opinions and conclusions expressed in this testimony are the author's alone and should not be interpreted as representing those of the RAND Corporation or any of the sponsors of its research.

<sup>2</sup> The RAND Corporation is a research organization that develops solutions to public policy challenges to help make communities throughout the world safer and more secure, healthier and more prosperous. RAND is nonprofit, nonpartisan, and committed to the public interest.

<sup>3</sup> There are various definitions of A2/AD. *Anti-access* (A2) challenges prevent or degrade the ability to enter an operational area. These challenges can be geographic, military, or diplomatic. *Area denial* (AD) refers to threats to forces within the operational area. In this context, we are speaking of military capabilities impeding the movement of amphibious forces into an operational area, the movement of forces from shipping into an amphibious objective area, and the movement of the landing force once ashore.

## Summary of Conclusions

- Amphibious forces offer useful capability in a variety of operational settings, including many in which there is some level of opposing force.
- The most stressing “contested environment,” in which the opposing force has a significant A2/AD capability, will require extensive preliminary effort before amphibious operations can be attempted. These challenges are not unique to amphibious operations, and would affect to some degree any conventional force attempting to project power.
- The Navy and Marine Corps are aware of these challenges and have attempted to improve the ability of their forces to operate in a variety of environments. Improvements include upgraded equipment, new operating concepts, and enhanced training.
- However, there remain capability areas where even projected improvements may not be sufficient and which require either very significant upgrades or major doctrinal changes. These include ship-launched amphibious assault vehicles (AAVs) and organic mine countermeasures.

## Amphibious Operations Missions and Capabilities

Amphibious Ready Groups (ARGs), with Marine Expeditionary Units (MEUs) embarked, are normally deploying units of the Navy–Marine Corps team. ARGs have three ships: a big deck amphibious assault ship (LHA or LHD), an amphibious platform dock (LPD 17), and a dock landing ship (LSD 41/49). With the exception of LHAs 6 and 7, all these ships have well decks capable of receiving surface connector landing craft. MEUs are composed of three main elements: a ground combat element Battalion Landing Team; an Aviation Combat Element, composed of transport, fixed, and rotary fire support aircraft; and a Logistics Combat Element. MEUs have a defined set of mission-essential tasks that range from routine theater security cooperation through combat operations in denied areas, up to the level of an amphibious assault.<sup>4</sup> While provision may be made for escorts, these units are not intended for areas where there is a serious A2/AD threat. These units may be extremely useful in projecting power short of a full amphibious assault, and they do provide a means to put ground forces into areas of interest with logistics and fire support, but they are not equipped to overcome significant opposition—particularly maritime opposition.

An Amphibious Task Force (ATF), with an embarked Marine Expeditionary Brigade (MEB), is a larger force intended to support operations through Joint Forcible Entry Operations. An ATF would include shipping equivalent to three to five ARGs. A MEB is five times larger than a MEU. An ATF-MEB would always be expected to operate with naval escorts, potentially including full Carrier Strike Groups, and the projected environment would generally include some high level of resistance.<sup>5</sup>

Combatant commanders have requirements for ATF-MEB level forces, and indeed the 2005 Sea-Basing Joint Integrating Concept defines the general requirement for ship-to-shore

<sup>4</sup> Department of the Navy, Headquarters U.S. Marine Corps, “Policy for Marine Expeditionary Units,” Marine Corps Order 3120.13, October 29, 2015.

<sup>5</sup> Expeditionary Force 21, “Marine Expeditionary Brigade: Informational Overview,” undated.

movement as the ability to move two MEBs ashore in a single period of darkness.<sup>6</sup> That amounts to the movement of 30,000 Marines, with all required logistics and fire support, from amphibious shipping into operational objectives ashore. This assault echelon would then be augmented by an assault follow-on echelon, which would be moved from out of theater and married with equipment transported in the Marine Prepositioning Force (MPF).

#### *Sequencing Ship-to-Shore Movement*

Ship-to-shore movement is intended to put maneuver units in areas where they can best exploit operational and tactical advantages, then support them with a full array of fire support and logistics. Movement takes place out of amphibious shipping to ashore objectives via air and surface connectors, with air providing expeditious delivery and surface hovercraft and transport craft moving heavy lift cargo, such as tanks, artillery, and trucks. Specialized AAVs, which are armored personnel carriers capable of operation on sea and land, bring initial assault elements ashore. Fire support is provided from a variety of sources: close air support from fixed and rotary aircraft initially flying from amphibious shipping, organic fires from tanks and artillery, and naval surface-fire support from ships within range of ashore objectives.

The general sequence would be suppression of enemy shore defenses, followed by movement across the beach by armored AAVs with embarked infantry. This may occur simultaneously with movement of vertical-wing-transported assault elements. Surface-borne movement of armor and transportable artillery would follow, followed by large-scale logistics support. Throughout the movement, fire support elements are made available on call, receiving tasking from a Supporting Arms Coordination Center (which is initially located on a large deck amphibious assault ship but generally transitions ashore). Logistics support is intended to move with the maneuver elements, but both the amphibious ships and MPF will have supplies and sustainment capability to allow sea-based sustainment.

Amphibious forces may be either “administratively loaded” for efficient use of space in normal circumstances, or “combat loaded” to allow fastest sequencing of assault elements as they move ashore. This can affect the available space for loading and may impact the ability to perform sea-based sustainment for longer periods.

#### *Challenges of Operations in a Contested Environment—A2/AD Threats*

One of the major advantages of amphibious forces is their ability to use the ocean and coast as operating space and move into areas where the adversary has not prepared defenses. If the adversary has prepared defenses, the challenges can be formidable. Such defenses include:

1. **Antiship missiles and tactical aircraft.** While the ships of the ATF have point defense systems, their escorts have area defense systems, and the embarked F-35Bs have defensive counterair capabilities, adversaries can detect a large formation of ships and launch a large number of weapons over the horizon. The closer ships get to shore, the easier it is for adversaries to detect them and the shorter the ships’ reaction times; the adversary can also use a greater variety of weapons as well. An air and missile threat may

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<sup>6</sup> Department of Defense, *Seabasing Joint Integrating Concept*, Version 1.0, Washington, D.C., August 2005.

also limit the ability to use naval surface fire supports (NSFS), as this requires ships be close enough to the coast to reach targets with naval guns.

2. **Submarines operating in both the open ocean and littoral waters.** Nuclear submarines are fast enough and have sufficient endurance to be a threat to amphibious shipping even as it transits. Lower-speed diesel submarines lack the ability to prosecute targets across a wide area, but they are very difficult to detect and can be a very significant threat to amphibious ships as they slow down to launch and recover surface connectors and to NSFS vessels operating in near-shore fire support areas.
3. **Mines laid in approaches, in shallow water and in the surf zone.** Mines can threaten amphibious shipping, the surface connectors carrying the larger and heavier elements of the assault force, and the actual landing force equipment and personnel as they move ashore.
4. **Air defenses, ranging from sophisticated Integrated Air Defense Systems to short-range shoulder fired weapons and small arms.** These principally threaten transport and support aircraft but may also be used against fire support elements.
5. **Opposing forces ashore who directly oppose the movements of the landing force.** There may be relatively light opposition to movement ashore, but adversary infantry and other ground force elements can pose significant opposition to the landing force once it arrives.

None of these defenses are impossible to overcome, and the amphibious force does retain a number of ways to move forces and can move to multiple objectives. But exploiting these advantages will take considerable flexibility on the part of both the amphibious and the landing force. As a general matter, the more resources devoted to diminishing the threat environment, the fewer resources will be available to support landing forces.

#### *Challenges of Operations in Contested Environment—AAVs*

Although there is a programmed upgrade for the AAV, this portion of the amphibious assault remains one of the most challenging to execute. Legacy AAVs had a transit range of one to three nautical miles, and were delivered from a ship equipped with a well deck.<sup>7</sup> This required the ship to be within close range of the beach, not just within missile range but within the range of shore batteries and even some small arms. This was an issue not just because the ship became vulnerable, but because this clearly revealed the intent of the maneuver. Sea-based platforms would lose their advantage as soon as the adversary understood where the ships would deliver the first elements of the assault echelon. Even with upgrades to the legacy AAV to increase cruising speed, there is still a tradeoff between an hours-long transit time and a near-shore launch.

The Marine Corps had hoped to meet this challenge with development of the “Expeditionary Fighting Vehicle”<sup>8</sup>, which had a threshold range of 25 nm. This program was cancelled due to development delays and costs, leaving Marine Corps with the legacy AAV. The Marine Corps has started development of the Amphibious Combat Vehicle (ACV), which should be more

<sup>7</sup> “Background on New Marine Amphibious Vehicle,” *USNI News*, July 2, 2013.

<sup>8</sup> “Background on New Marine Amphibious Vehicle,” 2013.

capable than the AAV and more affordable than EFV. Per the Marine Corps 2011 request for information from industry:

The proposed vehicle must be able to self-deploy from amphibious shipping and deliver a reinforced Marine infantry squad (17 Marines) from a launch distance at or beyond 12 miles with a speed of not less than 8 knots in seas with 1-foot significant wave height and must be able to operate in seas up to 3-foot significant wave height.<sup>9</sup>

However, 12 miles still is well within horizon range of enemy shore defenses. All the issues of telegraphing intention remain. Moreover, if launched at maximum range, the ACV would still require an hour and a half to move from the launch platform to the beach. The likelihood that the adversary will both see the launch and be able to track the ACV is very high.

#### *Aviation-Based Options*

Marine Corps aviation assets can reach target areas from well over the horizon and can transport personnel into an objective area in minutes to hours. In a 2015 RAND study on a platform designed to maximize aviation capability at the expense of some surface movement, we showed that ship-to-shore movement by air could move infantry elements ashore more quickly than legacy platforms and provide significant levels of close air support. Parts of logistics support would be delayed, and heavy armor would have to be moved from platforms with well decks. But this concept of operations would allow ships to operate at a greater distance from shore while still supporting ashore objectives. However, there are limitations to any air-based concept.

1. A2/AD capabilities include air defense, and this defense would need to be well suppressed before a landing force could attempt to fly troop transport and support aircraft into an area.
2. While the movement of infantry and other personnel would be rapid, they would be completely dependent on air resupply and fire support. Any disruption in either could have major impact on the ground maneuver element.
3. While surface movement could be reduced to a degree, it still must support the movement of armor and heavy logistics. A suitable beach landing zone would still need to be established, with approach lanes cleared of mines and other obstacles.

While air-based options may help reduce the vulnerability of amphibious ships and increase the maneuver space available from the sea, they do have limitations and should not be regarded as risk free.

#### **The Future of Amphibious Operations**

While the U.S. Navy and Marine Corps have not launched an actual opposed amphibious assault since the Korean War, we prepare for many types of operations prepared that are not actually executed. Many of the operations of a major contingency operation are not routinely

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<sup>9</sup> “Background on New Marine Amphibious Vehicle,” 2013.

executed—major fleet engagements, opposed airborne assaults, major tank engagements, defensive counterair—but few would say that these are capabilities that combatant commanders would agree to forego. If nothing else, amphibious forces receive frequent use in missions below the level of major contingency operations. They have not in general been a force behind a glass with a sign saying “open only in the event of war.” With the ability to move tailored and scalable forces ashore, they have proven in many cases to be uniquely useful, as we found in our 2015 study. However, it is true that A2/AD challenges complicate the ability to assemble and move big formations of armed personnel and move them at tactical distances in opposed environments. Some amphibious operations may be simply untenable.

#### *The Reality of the A2/AD Challenge*

The ability of even moderately sophisticated adversaries to complicate power projection is undeniable. A nation with a large and capable land-based air force, augmented with a capable air defense network, can make near-land opposed operations nearly impossible. On the other end of conflict, a nation with a fishing fleet numerous enough to crowd an adversary might make battlespace dominance difficult if not impossible. Even a nation capable of sowing a few mines can hamper a more-capable nation’s ability to effectively operate in a particular area.

However, the ability of nations to control the areas immediately around them is not new, and the ability of amphibious forces to overcome difficult conditions has been shown repeatedly. Amphibious forces have several capabilities that may offset some undoubted vulnerabilities, and some other adaptations may also provide additional capability. AAVs remain an area with significant shortfalls, with no obvious program for improvement.

#### *The Program of Record Force*

The Navy and Marine Corps recognize amphibious warfare as a key mission and have made investments to address key issues. These range from maintaining amphibious ship force structure to major improvements in Marine Corps aviation. Taken together, these represent a serious attempt to at least maintain the ability to carry out amphibious operations, even in contested environments.

#### *Amphibious Shipping*

The Navy is completing construction of the landing platform dock (LPD) 17 class and is set to begin recapitalization of the dock landing ship (LSD) class in 2020, using a hull based on the LPD 17.<sup>12</sup> LHA 8 is programmed in 2024 as a replacement for the first Wasp-class amphibious assault ship and, unlike LHA 6 and 7, it will have a well deck. The Navy is unlikely to reach the purported 2.5 MEB lift requirement that has served as the basis for programming, but it is at least keeping the lift it currently possesses and providing capable replacements for the legacy force.

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<sup>12</sup> “Document: Report to Congress on Next Generation LX(R) Amphibious Warship,” *USNI News*, March 20, 2017.



#### Battlespace Dominance Enablers

The Navy historically has struggled with overcoming littoral threats, particularly mines. The Navy and Marine Corps have both invested in unmanned surveillance capabilities that allow better awareness of potential threats ashore and in the littoral battlespace.<sup>13</sup> While the mine countermeasures module of the Littoral Combat Ship has been beset by delays and cost overruns, the Navy has developed several unmanned undersea vehicles that have proven effective in littoral operations.<sup>14</sup> These capabilities are not only effective, but also impose far less of a footprint than legacy capabilities.

The Navy is also attempting to improve active air and missile defense through continued deployment of AEGIS and surface-to-air missile upgrades on surface escorts; improved air-to-air missile capabilities to benefit both carrier air wings and the F-35Bs assigned to Marine Air Combat Elements; and integrated fire control systems.<sup>15</sup> The Navy is generally attempting to meet the challenge that near-peer adversaries would impose on power projection from the sea. While these improvements may not make near-shore amphibious operations capable in every environment, they will improve the Navy's ability to operate in environments where the threat is significant but not overwhelming.

#### Improved Connectors

The Marine Corps has already made significant investments in aviation connectors, including the rotary-wing CH 53K and the MV 22, and its ability to move personnel and cargo ashore rapidly has improved. Surface movement is still needed for the heaviest equipment, but aviation capability does create additional options for moving people and equipment ashore.

The Navy at one point had hoped to completely replace surface connectors with hovercraft variants, but has since determined that a replacement for the legacy LCU class will be required for future operations.<sup>16</sup> This implies that there will continue to be a need to move armor and heavy trucks ashore, even if ways are found to more rapidly build the force ashore through air movements. That appears to be a realistic assessment of continued MEB requirements and a responsible use of well deck space and transportation throughput.

#### The Expanded Role of Marine Corps Aviation

The F-35B is a fifth-generation, multimission fighter, easily an order of magnitude more capable than the AV-8 it is replacing. The ability of the F-35B to provide support, ranging from defensive counterair to stand-off weapons delivery to traditional close air support, is such that it will transform the way a MEU or MEB might fight. Previously, external assets might provide many of the defensive and long-range strike capabilities of a MEU or MEB, but the F-35B may

<sup>13</sup> Oriana Pawlyk, "Drone Swarms to Storm Beaches: Marine General," *Defensetech*, October 25, 2016.

<sup>14</sup> Kris Osborn, "Knifefish: The U.S. Navy's New Mine-Killer Is Here," *National Interest*, February 4, 2017.

<sup>15</sup> Megan Eckstein, "Navy Expanding NIFC-CA to Include Anti-Surface Weapons, F-35 Sensors," *USNI News*, June 22, 2016.

<sup>16</sup> Jon Rosamond, "US Navy Awards Design Study Contracts for Future Landing Craft," *Jane's 360*, June 3, 2016.

be able to provide much of this support organically. This represents more than incremental improvement in capability and potentially is a major shift in the role of ARG-MEUs.

#### *Capabilities Not Within the Program of Record Force*

The Navy and Marine Corps are well aware of the challenges posed by the A2/AD environment and are realistic about where and how such capabilities might be used. However, even with this realistic view, there are areas where the Navy and Marine Corps need to consider different approaches to ensure that the force is able to operate in conditions more stressing than normal peacetime operations.

#### *Aviation Support Platforms*

The Marine Corps found the lack of well deck capability in LHA 6 and 7 to be such a significant limitation that it insisted that LHA 8 include a well deck. A well deck does allow storage and movement of armor and surface-borne logistics, but it interferes with aviation maintenance and logistics support. A RAND study in 2015 examined the idea of a common mobile air platform that can interchangeably be used as a Navy carrier air wing or a Marine Corps MEU support unit. This platform would be larger than an LHA 6 and provides the MEU and MEB with more air capability than the LHA 6 provides. However, it would not have a well deck and any cargo or equipment requiring surface capability would be displaced on to ships with well decks. There would be some delay in moving armor and trucks. However, many aspects of ship to shore movement would be faster due to improved ability to host a larger air combat element, and the concept would allow flexible access to a larger number of fire support elements.

#### *Creative Use of Military Sealift Command Vessels for Support Now Provided by Amphibious Ships*

Amphibious ships are military vessels and have self-defense and survivability characteristics that assume they will be placed in the high threat environment imposed by forcible entry operations.<sup>18</sup> However, for other missions now performed largely by amphibious ships, civilian-manned ships could perform the missions adequately and thereby ensure that the amphibious force is available for the role on it can perform. A recently completed RAND study directly explored the support of embassy reinforcement from an expeditionary mobile base. We evaluated the possibility of using a ship operated by the Military Sealift Command to support operations ashore by a Marine Special Purpose Air Ground Task Force, predominantly operating MV22s and bound to a six-hour crisis response. The ship possesses no self-defense beyond crew-served weapons and small arms and so would not be suitable in any significant threat environment, but the study demonstrated that the ship could be used to enable the crisis response mission specifically assigned to a Marine Corps unit.

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<sup>18</sup> Deputy Commandant for Combat Development and Integration, *Afloat MAGTF Requirements: Annual Report*, U.S. Marine Corps, December 2012.

#### Assessment of Amphibious Assault Vehicles

While there appears to be a readily supported rationale for amphibious forces and capabilities, the AAV and its replacements do not appear to be viable in the presence of a robust A2/AD threat. The AAV foregoes all the advantages associated with maneuver from the sea, as it requires the launching unit be close to shore and is itself vulnerable to mining in both shallow water and on the beach itself. While there is doubtless value in providing infantry armored mobility, making AAVs the first element ashore in an assault may create vulnerabilities when other options are available. The Navy and Marine Corps could employ a number of different options, including securing a beach after a vertical assault to then allow the follow-on movement of forces transported by connectors. The AAV replacement in fact need not be amphibious, just capable of transport via amphibious connectors.

#### Conclusions and a Way Forward

Amphibious forces provide a useful capability in environments that require some level of force but not necessarily complete A2/AD suppression. No force is immune to every threat; no force can operate with impunity in a heavily contested environment. Amphibious forces will not reenact Tarawa or Inchon; airborne forces will likely not reenact Market Garden or the Ia Drang valley; carrier strike groups will likely not reenact the Battle of Midway. Amphibious forces bring virtues of flexibility and scalability that are of considerable value to combatant commanders now and likely into the future. However, it should be clear that amphibious forces likely cannot be employed in the absence of significant effort to shape the battlespace. The previous commandant of the Marine Corps, General James Amos, characterized the Marine Corps as a “middleweight force,” saying specifically

We are light enough to get there quickly, but heavy enough to carry the day upon arrival. We operate throughout the spectrum of threats—irregular, hybrid, or conventional—or the shady areas where they overlap.<sup>20</sup>

While amphibious operations likely will remain an important addition to national capability, challenges require continued attention and in some cases the development of alternative capabilities. The Navy and Marine Corps have made choices that reflect a highly realistic view of an amphibious force that can operate well and perform vital missions, but whose virtues are more associated with agility and responsiveness than the ability to overcome decisively an opposing force by itself. Marine Corps aviation is on a path to significantly alter what even ARG-MEUs are capable of doing, and it is important to shape the rest of the force to acknowledge this change. An ARG-MEU with F-35Bs and MV-22s is not just capable of local influence, but can project power and provide defense in ways impossible just a few years ago.

Where there are shortfalls in landing force capability, they arise largely from a desire to protect aspects of landing force capability that ensure that the commander has not just capability but self-sufficiency. Such a belief dictates that amphibious assault vehicles with Marines need to be across the beach first to ensure that mounted infantry is available and not relying on aircraft

<sup>20</sup> “MILITARY: Gen. James Amos Outlines Vision of Marine Corps,” *San Diego Union-Tribune*, February 8, 2011.

for movement. It also dictates that enhanced aviation capabilities should not be maximized at the expense of the ability to transport tanks and mobile fires ashore; relying on air-delivered sustainment and fire support is not sufficient. While this focus is understandable, given the well-established precedent of giving landing force commanders maximum organic support, it may interfere with an objective assessment of which capabilities ought to be developed to counter future threats.

Navy efforts to overcome A2/AD capabilities in very stressing environments to enable carrier strike group (CSG) power projection will likely make operations with amphibious forces more feasible as a byproduct. Capabilities that suppress enemy air defenses and shore-based strikes work as well for amphibious forces as they do for CSGs, especially if amphibious operations are preceded by significant efforts at battlespace dominance.

However, while the Navy does not necessarily treat amphibious and landing force operations as secondary, it still continues to struggle to deliver capability against a threat that has been its historical nemesis: mines. The Navy continues to counter mines with an array of legacy or long-delayed systems that generally do not even address shallow-water or surf-zone mining. Promising commercially derived systems will likely help defend against mines, but, in general, the Navy is still not addressing what has been a major issue since the aborted assault on Wonsan in 1950, where Rear Admiral Allen Smith commented:

We have lost control of the seas to a nation without a navy, using pre-World War I weapons, laid by vessels that were utilized at the time of the birth of Christ.<sup>21</sup>

Mines are a longstanding issue that cycles through interest and neglect, but in the context of operating in contested environments, even if every other A2/AD threat were eliminated, the mine in itself is sufficient to make every amphibious capability other than air movement irrelevant. It is, moreover, a threat capability easy to acquire and deploy.

While every service views itself as the “kick in the door force” for major operations, the fact remains that many missions involve a measured reaction to lower-level threats. The Navy and Marine Corps offer an ability to carry out operations from a relatively self-sustaining sea base with a variety of different operational capabilities. These require continued emphasis and are in fact the basis for the ability to carry out amphibious operations in contested environments.

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<sup>21</sup> Tamara Moser Melia, *“Damn the Torpedoes”: A Short History of U.S. Naval Mine Countermeasures, 1777–1991*, Vol. 4, *Contributions to Naval History*, Washington, D.C.: Naval Historical Center, 1991.

**Dr. Brad Martin**  
**Senior Policy Researcher**  
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Brad Martin is a senior policy researcher at the RAND Corporation, where he has worked since November 2012. His areas of research include readiness and sustainment, ship maintenance, force structure alternatives, naval force concepts, Marine Corps and Navy requirements, and budget and planning processes.

Prior to joining RAND, he served in the US Navy as a surface warfare officer, retiring after 30 years of service as a Captain. During his time in the Navy, he commanded a coastal minehunter, an amphibious dock landing ship, an amphibious ready group, and the Naval Expeditionary Task Force for Europe and Africa. In addition to his command tours, he served on the staff of Naval Forces Central Command, US Forces Japan, the Chief of Naval Operations staff as an operations researcher, and as the Navy coordinator for participation in Joint Staff and Office of Secretary of Defense requirements and resources forums. His subspecialties included operations research, operational logistics, and strategic planning.

Brad Martin has a doctorate in political science from the University of Michigan, which he achieved prior to joining the Navy, and a bachelor's degree from the University of New Mexico.

## TESTIMONY

**STATEMENT BEFORE THE HOUSE  
ARMED SERVICES SUBCOMMITTEE ON  
SEAPOWERS AND PROJECTION FORCES****May 18, 2017****Statement by Jesse Sloman  
Analyst, Center for Strategic and Budgetary Assessments**

Chairman Wittman, Ranking Member Courtney, and distinguished members of the committee, thank you for inviting me to testify today on the future of amphibious warfare in a contested environment.

Since the earliest days of the Republic, the U.S. Navy and Marine Corps have carried out amphibious operations to attack lightly defended or key terrain, reinforce friendly forces, and support littoral sea control. In 1775, a raid against the British port of Nassau, Bahamas, allowed the fledgling Continental Navy and Marines to seize gunpowder and munitions to support the war against the British. During World War II, the Pacific “island-hopping” campaign provided American air and naval forces with operating bases near enemy-held territory that ultimately supported air attacks against the Japanese homeland. Today, the U.S. Navy and Marine Corps field the world’s largest and most capable amphibious fleet, with three Marine Expeditionary Units (MEUs)—totaling nine ships and over 6,000 sailors and Marines—deployed every day.

Despite the enormous combat power that a 21<sup>st</sup> century MEU can bring to bear, the margin of military superiority that U.S. amphibious forces can expect to enjoy has eroded over the last several decades. Potential adversaries have developed new capabilities specifically intended to counter American strengths. Nowhere are these threats more evident than in the Western Pacific, where the steadily increasing size and sophistication of China’s missile forces provide the People’s Liberation Army (PLA) with a potent means of contesting America’s regional presence. Chinese weapons include anti-ship ballistic missiles that can threaten U.S. surface vessels at distances of over 800 miles and ground-launched ballistic missiles that can reach both Guam and Japan, two locations that would serve as power projection centers for American forces in a large-scale Pacific contingency.

Like China, Russia has fielded weapons and sensors that allow it to threaten U.S. involvement in a regional clash. Smaller powers lack the full spectrum of capabilities available to Russia and China but can nevertheless field sufficiently advanced weapons to create severe operational challenges for the United States. Anti-ship cruise missiles (ASCMs) are a particular concern for maritime forces because of their relative affordability and simplicity compared to strike aircraft or ballistic missiles. More than 80 countries currently possess

ASCMs and 22 build them.<sup>1</sup> ASCMs have even found their way into the arsenals of non-state actors, enabling Hezbollah to damage an Israeli corvette off the coast of Lebanon in 2006 and Houthi rebels to destroy a United Arab Emirates high speed vessel near Yemen last year.<sup>2</sup>

To counter the lethality of modern counter-intervention complexes, current operational concepts require the United States to mount a lengthy rollback campaign prior to the commitment of the bulk of its forces. Initial strikes against enemy air defenses and other key targets would be carried out by stealthy aircraft and submarines. Once the enemy's most sophisticated weapons have been sufficiently reduced or neutralized, non-stealthy ships and aircraft could move into the theater and continue the campaign. These rollback efforts might eventually be successful against even the strongest opponent, but they could be protracted over weeks or months. An adversary might calculate that it could achieve a *fait accompli* by rapidly attaining a set of limited objectives before U.S. forces can complete their rollback actions. Faced with the prospect of a lengthy and demanding strike campaign to regain theater access—and an opponent that, having achieved its goals, is suing for peace—the United States might conclude that military intervention is not worth the cost.

America's ability to deter conflict will suffer if allies and potential adversaries doubt the ability or resolve of the United States to reverse the results of aggression. To sustain the credibility of its conventional deterrent, the United States should plan to respond to military aggression by immediately destroying an attacking force before it can achieve its objective or by inflicting so much damage on the aggressor that it chooses to halt its operation. For a denial and punishment approach to be effective, U.S. naval forces must be postured close to potential crisis locations, able to generate a sufficient volume of fires to inflict serious losses on an adversary, and resilient enough to survive until their offensive weapons are expended and the forces can withdraw to safer waters.

Amphibious forces have a critical role to play in such a strategy. As a maritime force, they can maintain a sustained posture close to a potential adversary's forces or objectives without requiring basing access or overflight rights. As a force with a ground combat element (GCE), they can take and hold territory, establishing a presence ashore and leveraging the ability of land forces to disperse, camouflage, and harden their positions against enemy attacks. And as an expeditionary force, amphibious elements are trained and prepared to respond to a crisis immediately with forces forward rather than waiting for the slow and sustained build-up of combat power inside the theater.

In order to fully contribute to a denial and punishment campaign against a capable adversary, amphibious forces will need to adopt new concepts of operation and field new equipment or use existing equipment in novel ways. These steps will make the force more distributed, survivable, lethal, and capable of supporting littoral sea control and power projection in highly contested forward areas.

### New Concepts

**Expeditionary advance bases.** Expeditionary advance bases are small temporary outposts for elements of between 100 to 1,000 personnel. Forces at these outposts could constrain the enemy's freedom of action through anti-air or anti-ship attacks, strikes against land targets, denying or confusing enemy sensors, or supporting manned or unmanned air

<sup>1</sup> Nolan Fahrenkopf, "Anti-ship missiles: a dangerous gateway," *Bulletin of the Atomic Scientists*, February 9, 2016.

<sup>2</sup> "Israel Navy caught out by Hizbullah hit on corvette," *Jane's Defence Weekly*, July 19, 2006; "UAE says Houthi attack on ship in shipping lane was 'act of terrorism'," Reuters, October 5, 2016.

platforms for defensive or offensive purposes. If several expeditionary advance bases were positioned along a littoral area, they could employ ASCMs and surface-to-air missiles (SAMs) fired from mobile launchers to form a barrier to enemy ships and aircraft attempting to reach open water. For example, advance bases could transform Japan's Ryukyu Islands and the Philippines archipelago into geographic obstacles to Chinese power projection.

A ground force that is sized and distributed appropriately can offer superior resiliency compared to aircraft and ships, allowing advanced bases to persist in areas where aircraft or ships might be neutralized or destroyed. First, a ground element can widely disperse its components, forcing an opponent to employ a separate munition for each component and driving up the total number of weapons needed to destroy the ground element. By contrast, all of the parts of a ship or airplane must necessarily reside on the same platform, rendering them vulnerable to defeat by just a small number of weapons. Second, ground platforms can be simpler and cheaper than ships or airplanes because they do not have to float or fly. Third, ground forces can hide in the busy background of terrain, trees, and structures, and further elude detection through camouflage, concealment, or burying, whereas air and sea platforms have identifiable signatures against plain backgrounds. Lastly, ground forces can minimize their electronic signatures through the use of physical datalinks, such as fiber optic cables, while ships and aircraft must rely much more on electromagnetic emissions to communicate.

These characteristics mean that adversaries seeking to counter U.S. advance base operations will need to carry out timely intelligence-gathering before an attack and use a large number of weapons during an attack to guarantee the destruction of a base. If the salvo size required to be assured of destruction becomes too large, the adversary may simply elect not to strike the target and live with the constraints the base will impose on that adversary's freedom of action.

An advance base's exact size and disposition would be tailored to a specific threat environment. Bases close to an enemy would be austere positions that rely primarily on mobility, camouflage, concealment, and deception to survive while bases farther away would be less mobile and protected by more robust air defenses.

A critical requirement for successful advance base operations would be continually exercising the establishment and disestablishment of bases during peacetime. This practice would prevent the United States from having to take the potentially escalatory, logistically challenging, and operationally dangerous step of deploying ground forces to an area once a regional crisis has already erupted. Instead, advance bases would be present at the outset to deny or punish an opponent immediately. The peacetime exercising of advance base operations would also provide the United States with an important tool for signaling resolve. Placing even a small number of troops on the ground demonstrates a degree of commitment to an ally that the episodic deployment of ships does not. In addition, the habitual exercising of advance base operations would allow Marines and sailors to become intimately familiar with the locations they may be required to fight from in the event of a war.

**Amphibious raids to gain access.** Amphibious raids are a traditional Marine Corps mission, but their purpose and the manner in which they are conducted will expand to accommodate contemporary threats. Historically, raids have been executed as part of power projection operations, such as amphibious assault. In the future, they will also be conducted to support sea control in littoral areas by degrading or destroying enemy anti-air and anti-ship missile batteries and associated sensors. These raids will need to be conducted from greater distances than they are today due to the threat to amphibious ships from ASCMs,



torpedoes, and mines. The MV-22 Osprey, F-35B Lightning II, and the forthcoming MUX unmanned air system will all be important enablers of this expanded raid capability.

**Surface warfare and strike.** Amphibious ships are armed solely with self-defense weapons and are not considered surface combatants. By adding vertical launch systems (VLS) to these advanced combat vessels—all of which are already constructed to the Navy’s rigorous warship survivability standards—amphibious shipping could be armed with more capable defensive weaponry as well as offensive anti-ship and land attack missiles. This additional armament would allow these vessels to add to the anti-surface warfare and strike capacity of Navy surface forces while also increasing the ability of the Amphibious Readiness Group (ARG) to support Marines fighting ashore.

**Mounting a blockade.** Amphibious operations can also support efforts by U.S. forces to fight a protracted campaign. One such approach would be to deny the adversary the imported materials and exported goods to support or fund the war effort. Amphibious forces, with their large complements of small boats and Marines, would be an essential component of the boarding element of a blockading force and would supplement surface combatants tasked with stopping vessel traffic at a chokepoint.

The Navy fields visit, board, search, and seizure (VBSS) teams on its surface vessels manned by sailors who take on the VBSS mission as a collateral duty. A large-scale blockade that required many boardings per day would tax the stamina of these VBSS sailors and degrade the readiness and effectiveness of their ships. The battalion landing team (BLT) of a MEU is composed of over 1,000 ground combat Marines who could easily shoulder the main responsibility for boardings during a blockade, freeing up the Navy’s surface combatant sailors to focus on their primary assignments. MEUs also deploy with elite force reconnaissance platoons capable of executing opposed boardings, a high-risk mission that regular Navy VBSS teams are not trained or equipped to carry out.

### Capability Implications

The Navy and Marine Corps today would be challenged to execute the full range of amphibious operations in contested areas due to limitations in the capabilities of current platforms.

Amphibious ships lack the defensive capacity to protect against the large missile salvos they will face as they close on an enemy’s shores and have no offensive firepower beyond what is loaded on their embarked aircraft. The preparatory fires for an amphibious assault and the supporting fires for forces ashore are therefore heavily reliant on the MEU’s air combat element (ACE). Although the F-35B is a potent weapons platform, the small size of the strike-fighter contingent on a typical MEU limits the volume of long-range offensive fires that an amphibious force can generate organically.

The vulnerability of amphibious shipping is exacerbated by the range and speed limitations of two of the three surface connectors in the Navy’s inventory: the Landing Craft Utility (LCU) and Amphibious Assault Vehicle (AAV). The LCU and AAV can only swim a few miles during an amphibious assault, forcing amphibious ships to operate very close to shore where they are more exposed to enemy fire.

The Landing Craft Air Cushion (LCAC) combines a high top speed with over-the-horizon range. However, the LCAC’s fragility makes it highly vulnerable to small arms fire and the growing weight of Marine ground vehicles limits the number that can be brought ashore by

LCAC's in the early stages of an operation. As a result, the Marines cannot rely solely on the LCAC to carry out the connector mission.

Amphibious ships could standoff from threats at much greater distances if they moved Marines ashore via airlift, but the increased size of ground equipment creates problems here too. Neither the HMMWV nor its replacement, the Joint Light Tactical Vehicle (JLTV), can fit internally aboard an MV-22 Osprey. Indeed, the JLTV cannot even be loaded internally in the Marine Corps' largest helicopter, the CH-53K King Stallion. Consequently, a Marine element transported via rotary lift would be limited in the type and volume of fires it could bring to the fight. The current situation stands in stark contrast to the 1980s, when Marine infantry battalions possessed helicopter-transportable Jeeps armed with heavy weapons.

To increase the firepower, mobility, and defensive capacity of U.S. amphibious forces, the Navy and Marine Corps should prioritize investment in the following six areas.

**Increase the armament of amphibious ships.** Amphibious ships contribute little to the strike capacity of U.S. naval forces beyond what is carried by their aircraft. The Navy should modify its LPDs and the follow-on LX(R) to include VLS so these platforms can launch offensive missiles to support Marines ashore in addition to transporting, launching, and recovering amphibious forces. VLS cells could also be loaded with anti-ship weapons that would allow amphibious ships to play a role in the Navy's distributed lethality concept for surface warfare and increase the overall firepower of the ARG.

Adding VLS cells to amphibious ships would improve their defenses as well as their offensive power. An LPD-17-class ship has sufficient excess capacity built into its design to accommodate a 16-cell VLS system and, with additional modifications, may be able to hold as many as 32 cells. The LX(R) is intended to be a modified version of the LPD-17 and will likely be able to incorporate a VLS of the same size. Adding a VLS to these ship classes would allow each vessel to increase its air defense capacity several times over and allow surface combatants that would have been tasked with an escort mission to be used for other assignments.

**Increase the size of the Amphibious Readiness Group.** Today, the MEU ACE would be challenged to provide the volume of fires necessary to support many of the concepts described above. Long-range raids and assaults executed by MV-22s would exceed the combat radius of the ACE's light attack helicopters, leaving only F-35Bs to provide fire support at the target. A typical MEU sails with six strike fighters and seven light attack helicopters; undertaking a mission without the combat power provided by the helicopters would mean a significant reduction in the volume of fires available for escort and close air support.

The current ACE would also be challenged supporting multiple advance bases operating across a region such as Japan's Southwest Islands or the Philippines. A six F-35B detachment would be able to carry out one or two missions at any given time. However, a MEU supporting three or more bases might need to provide fire support to all of its forces simultaneously. A MEU may also be required to sustain a defensive air patrol at the same time that it is conducting attack operations. The F-35B's ability to network with surface combatants to communicate targeting information means the aircraft will be in high demand as a defensive asset as well as an offensive weapons platform. A standard six-aircraft F-35B detachment would struggle to generate the sorties necessary to carry out all of these missions.

The Marine Corps has proposed a partial solution with a concept to create a 'Lightning carrier' composed of 16 to 20 F-35Bs aboard an amphibious assault ship. However, adding more

fighters to the ACE would displace the helicopters needed for airlift. To ensure that the MEU retains its vertical envelopment capability while also increasing its strike fighter complement, the Navy and Marine Corps should move from a current three-ship ARG formation to a four-ship formation that includes an additional small-deck amphibious ship. A four-ship ARG would enable the Marines to field a force with between 70 and 100 percent more strike aircraft while sacrificing little airlift capacity.

Increasing the size of the ARG would require a larger amphibious fleet with a different mix of ships. An alternative fleet architecture plan developed by the Center for Strategic and Budgetary Assessments (CSBA)—and briefed previously to this committee by Bryan Clark—proposed raising the total number of small amphibious ships procured in the next 30 years to 25 from 16 in the Navy’s 2017 plan. These extra ships would increase the overall cost of Navy shipbuilding by some 4 percent compared with the Navy’s 2017 plan. If this cost is unaffordable, more risk could be taken in regions where a continuous ARG presence may not be needed and some gaps could be accepted.

**Expand the aviation capabilities of the amphibious assault ship.** The LHA amphibious assault ship is the largest platform in the ARG and provides the bulk of the aviation support for an underway MEU. However, the growing size of the ACE is pushing the limit of what the LHA can support in its current configuration.

The LHA Flight 0 (LHAs 6 and 7) sacrificed a well deck to increase the aviation capacity of the ships in anticipation of the introduction of the F-35B. The Navy and Marine Corps added a well deck to the design of the LHA Flight 1 (LHAs 8 and beyond), albeit at the loss of roughly half the vessels’ aviation gas storage space.<sup>3</sup> As a consequence, LHA Flight 1 ships offer more flexibility to amphibious commanders but are less capable of supporting sustained flight operations.

The only way for the Navy and Marine Corps to have both a well deck and a significantly expanded aviation capability is to buy a bigger ship. One option is to lengthen the LHA Flight 1 design and widen its flight deck, a course of action that was considered in the mid-2000s for a “Plug Plus” variant of the LHD 8. An additional 70 to 80 feet of hull length could restore some or all of the aviation gas storage capacity of the LHA Flight 0 while allowing the new ship to retain a well deck and therefore participate in the full range of amphibious operations.

Eventually, the United States should develop a light carrier (CVL) that includes both a well deck and a catapult-assisted takeoff but with arrested recovery (CATOBAR) system. The addition of a catapult would allow non-STOVL carrier aircraft to operate from the CVL’s deck, expanding the range of platforms available for inclusion in an ACE to include combat enablers such as the EA-18G Growler electronic warfare aircraft and the E-2 Hawkeye airborne early warning aircraft. These CVLs would not be replacements for nuclear-power supercarriers. Instead, they would reflect the increased importance of the air component as an enabler for the ARG and would ensure that future amphibious forces can generate the volume of long-range fires necessary to undertake missions in a contested environment.

**Optimize surface connectors for ocean travel.** The Corps spent decades in a fruitless quest to develop and procure the Expeditionary Fighting Vehicle (EFV), a platform conceived with the goal of being able to carry 17 marines 25 miles to shore at a speed of more than 20 knots.<sup>4</sup> Today, the niche the EFV was designed to fill—an armored vehicle that can swim

<sup>3</sup> Huntington Ingalls representatives in discussion with the author, March 17, 2016.

<sup>4</sup> U.S. Marine Corps, “Sea Skimmer: Technology breakthroughs lead to dawn of EFV,” Marine Corps Systems Command Press Release 01-09, February 11, 2009.

ashore from over the horizon—is no longer relevant because 25 miles is not a sufficient standoff distance to protect an amphibious warship.

Instead of attempting to build a better EFV, the Navy and Marines should optimize their surface connectors for ocean transit. Minimizing on-land requirements for connectors could drive down cost while allowing the connector to retain a high water speed and the ability to carry large payloads. Reducing the swimming requirements for ground vehicles would have the extra benefit of allowing the Marines to purchase systems optimized for land warfare without having to accept the design tradeoffs necessary to provide an amphibious capability.

Unfortunately, adding ground vehicles with a minimal swim capability will increase the demand on a surface connector fleet that is already stretched thin. Growing the ARG from three ships to four ships would help alleviate that problem by adding an additional well deck to the ARG. The Navy and Marine Corps may also be able to leverage advances in autonomous systems to field cheap unmanned cargo platforms, such as autonomous barges, to carry out intra-theater transport between advance bases or ship-to-shore movement. These vessels would lack the speed and survivability of a sophisticated surface connector like the LCAC, but their comparatively low cost and the absence of a crew would make the systems relatively disposable.

**Acquire lighter vehicles.** The Marine Corps' ability to move forces ashore has been hampered by the steadily growing weight and size of its vehicles. This trend is the result both of survivability enhancements to existing systems and the fact that new vehicles are often bigger and heavier than the platforms they replace. For example, the JLTV weighs almost twice as much as the HMMWV. The result is that the MEU is increasingly overloaded and difficult to fit aboard amphibious ships and surface connectors.

To capitalize on the mobility the MV-22 permits, the Marines must continue to acquire vehicles and fire support systems small enough to fit aboard the Osprey. Small vehicles allow company-size units transported via tilt-rotor to bring more fires, C2 equipment, and supplies to an operation than a purely foot-mobile element could manage. Until recently, only one type of fielded vehicle—the Internally Transportable Vehicle (ITV)—could fit aboard the Osprey. However, the Corps stopped procuring the ITV in 2010 due to its high cost and poor reliability. Earlier this year, the Marines began purchasing the Utility Task Vehicle (UTV) to carry out the same mission. The UTV will be a welcome addition to the force and will make infantry units more lethal and self-sufficient. For example, a mortar or machine gun section equipped with UTVs could carry more ammunition while also moving throughout the battlefield faster than foot mobile Marines.

The Marine Corps is also challenged by the weight of its armored vehicles, which restricts the number that can be brought ashore by surface connectors or vertical lift platforms. The lightest armored platform in the Marines' inventory is the 16-ton Light Armored Vehicle (LAV). LAVs can be carried externally by the CH-53K or transported 4 to an LCAC, allowing 4 LCACs to assemble an entire company of 32 vehicles in just 2 movements from a ship.<sup>5</sup> By comparison, the Corps' new Armored Combat Vehicle (ACV) will weigh more than twice as much and only half as many can be loaded aboard the LCAC's successor. Despite its utility and age, there is no current program to replace the LAV. The Corps should prioritize modernizing and upgrading its existing LAVs and begin a program to replace them with an entirely new vehicle that weighs the same amount or less.

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<sup>5</sup> David C. Fuquca, "An Amphibious Manifesto for the 21<sup>st</sup> Century," *Marine Corps Gazette*, December 2012.

**Acquire cross-domain fires.** The Marine Corps currently lacks the ability to influence the sea domain with its ground systems. To help rectify this gap, the Corps should add additional capabilities to its existing missile inventory and increase the number of missile launchers in the force.

The Marines possess the Army Tactical Missile System (ATACMS), a precision-guided weapon fired from a high mobility artillery rocket systems (HIMARS) launcher that can reach targets at ranges of over 150 miles. The U.S. Army is adding a moving target capability to the ATACMS, allowing the same munition to service both naval and ground targets.<sup>6</sup> Procuring this type of multi-domain weapon would allow the Marines to maximize the utility of expeditionary bases as a platform for dominating the nearby sea and land battlespace while easing the logistical challenges associated with firing multiple ammunition types.

The Corps should also acquire additional HIMARS launchers. The Marines have been slow to adopt the HIMARS in large numbers out of concern for the high cost of both the launchers and ammunition compared with tube artillery. However, future amphibious operations will be distributed over more of the battlespace than they are today. As a result, meeting the fire support requirements of units that are widely geographically separated will require missiles with ranges well beyond what can be achieved from a howitzer.

## Conclusion

Potential adversaries will continue to improve their ability to contest the sea and air around their territory, increasing the range at which amphibious operations must occur and making amphibious ships and Marines more vulnerable. The United States must adopt new operating concepts and new or modified capabilities for amphibious operations that address these trends and enable the U.S. Navy and Marine Corps team to continue supporting American efforts to deter aggression, respond to crises, and exploit American maritime superiority as an asymmetric military advantage.

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<sup>6</sup> Sydney J. Freedberg, Jr., "Carter, Roper Unveil Army's New Ship-Killer Missile: ATACMS Upgrade," *Breaking Defense*, October 28, 2016.

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**QUESTIONS SUBMITTED BY MEMBERS POST HEARING**

MAY 18, 2017

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#### **QUESTIONS SUBMITTED BY MRS. DAVIS**

Mrs. DAVIS. How do you see expeditionary support bases incorporated into the future of amphibious operations?

Dr. MARTIN. [No answer was available at the time of printing.]

Mrs. DAVIS. How do you see expeditionary support bases incorporated into the future of amphibious operations?

Mr. SLOMAN. [No answer was available at the time of printing.]

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#### **QUESTIONS SUBMITTED BY MR. LANGEVIN**

Mr. LANGEVIN. The U.S. Navy is exploring advanced ship defense technologies—such as electromagnetic railguns and directed energy weapons—that could mitigate the vulnerability of U.S. Navy surface ships to anti-ship missile strikes. Additionally, the Navy is pursuing a frigate variant to the littoral combat ship with varying mission packages as a forward-deployed surface combatant. Could these assets extend the missile defense layer over the Marine expeditionary units or brigade sea-based connectors during ship-to-shore operations?

Dr. MARTIN. [No answer was available at the time of printing.]

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