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TESTIMONY

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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 21st 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.[1] 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 logistics vessel near Yemen last year.[2]

In confronting 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 buildup 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, 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.

[1] Nolan Fahrenkopf, "Anti-Ship Missiles: A Dangerous Gateway," *Bulletin of the Atomic Scientists*, February 9, 2016.
[2] "Israel Navy Caught out by Hizbullah Hit on Corvette," *Jane's Defence Weekly*, July 19, 2006; and "UAE Says Houthi Attack on Ship in Shipping Lane was 'Act of Terrorism'," *Reuters*, October 5, 2016.

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, or operations to deny or confuse enemy sensors. 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, not only can ground forces hide in a busy background of terrain, trees, and structures, but they can also 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 could 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 would 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 an adversary the imported materials and exported goods needed to support or fund its 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 amphibious force'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 to support multiple advance bases operating across a region such as Japan's Southwest Islands or the Philippines. A detachment of six F-35Bs 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.[3] 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.[4] 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

[3] Bryan Clark and Jesse Sloman, *Advancing Beyond the Beach: Amphibious Operations in an Era of Precision Weapons* (Washington, DC: Center for Strategic and Budgetary Assessments, 2016).
[4] Huntington Ingalls representatives discussion with the author, March 17, 2016.

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.[5] Today, the niche the EFV was designed to fill—an armored vehicle that can swim 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 four to an LCAC,

[5] U.S. Marine Corps, "Sea Skimmer: Technology Breakthroughs Lead to Dawn of EFV," Marine Corps Systems Command, Press Release 01-09, February 11, 2009.

allowing four LCACs to assemble an entire company of 32 vehicles in just two movements from a ship.[6] 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.

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.[7] 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 both the range at which amphibious operations must occur and the vulnerability of amphibious ships and Marines. 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.

[6] David C. Fuquea, "An Amphibious Manifesto for the 21st Century," *Marine Corps Gazette*, December 2012.
[7] Sydney J. Freedberg Jr., "Carter, Roper Unveil Army's New Ship-Killer Missile: ATACMS Upgrade," *Breaking Defense*, October 28, 2016.