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Manned reconnaissance is an essential component of the Fleet Marine Force because of its unique ability to conduct multi-domain reconnaissance and counter-reconnaissance in the contested littorals. An amphibious multi-domain reconnaissance vehicle that operates in both land and sea domains will enhance littoral mobility and can potentially integrate into the ACV family of vehicles. However, it may be more cost-effective and timelier for the Marine Corps to acquire existing patrol craft for the purpose of amphibious reconnaissance operations. Another course of action would be to partner and integrate with Naval Special Warfare (NSW) or Navy Expeditionary Combat Command (NECC) who already own and operate vessels suitable for littoral operations.

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TITLE:

The Utility of Ground Reconnaissance in Contested Maritime-Littoral Operations

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Executive Summary

Title: The Utility of Ground Reconnaissance in Contested Maritime-Littoral Operations

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Thesis: Manned ground reconnaissance remains relevant to a future contested maritime-littoral conflict. A multi-domain reconnaissance vehicle (MDRV) enhances intelligence collection, facilitates littoral mobility, and enables a Marine Littoral Regiment (MLR) to execute expeditionary advanced based operations (EABO).

Discussion: On December 5, 2019, General Berger wrote a commentary for War on the Rocks titled *Notes on Designing the Marine Corps for the Future*. As Commandant, his number one priority is designing a "force suited to the reality of the pacing threat as prescribed by the *National Defense Strategy*."[1] His plan is to divest from legacy systems and capabilities in order to invest in the future. "While I have repeatedly stated that all-domain reconnaissance and counter-reconnaissance will be a critical element of any future contingency, I remain unconvinced that additional wheeled, manned armored ground reconnaissance units are the best and only answer – especially in the Indo-Pacific region. We need to see more evidence during Phase III to support this conclusion…"[2] This paper argues that manned ground reconnaissance can play a significant role in future Fleet Marine Force operations, but it must identify a solution to its lack of littoral mobility.

Conclusion: Manned reconnaissance is an essential component of the Fleet Marine Force because of its unique ability to conduct multi-domain reconnaissance and counter-reconnaissance in the contested littorals. An amphibious multi-domain reconnaissance vehicle that operates in both land and sea domains will enhance littoral mobility and can potentially integrate into the ACV family of vehicles. However, it may be more cost-effective and timelier for the Marine Corps to acquire existing patrol craft for the purpose of amphibious reconnaissance operations. Another course of action would be to partner and integrate with Naval Special Warfare (NSW) or Navy Expeditionary Combat Command (NECC) who already own and operate vessels suitable for littoral operations.

DISCLAIMER

THE OPINIONS AND CONCLUSIONS EXPRESSED HEREIN ARE THOSE OF THE INDIVIDUAL STUDENT AUTHOR AND DO NOT NECESSARILY REPRESENT THE VIEWS OF EITHER THE MARINE CORPS COMMAND AND STAFF COLLEGE OR ANY OTHER GOVERNMENTAL AGENCY. REFERENCES TO THIS STUDY SHOULD INCLUDE THE FOREGOING STATEMENT.

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Introduction

The US military has focused its efforts and resources in the Middle East over the past three decades, compelling US peer competitors to build economic and military strength. On its current path, China will rival the US economy and will be able to project military power that threatens US interests and partners, especially in the East and South China Sea, in the next 10-50 years. While the US designed its force for desert warfare, China anticipated a conflict with the US within its sphere of influence and went about constructing an anti-access area denial (A2AD) system. This complex system is comprised of ballistic missiles, anti-ship cruise missiles, advanced radar and sonar, ground, air, and sea intelligence surveillance and reconnaissance (ISR) platforms, aircraft carriers, naval ships of various sizes and capabilities, integrated air defense, fifth-generation fighter aircraft, submarines, mines, satellites, and advanced systems designed to dominate the electromagnetic spectrum. China also strengthens its A2AD threat by occupying and developing islands within the East and South China Sea. Non-kinetic and kinetic aggression can lead to a flashpoint where the US will have to penetrate China's sphere. China declares its rights to the natural resources in the East and South China Sea while various countries like Taiwan, Philippines, Vietnam, Brunei, Malaysia, and Indonesia claim rights to the same areas and resources. China is attempting to influence shipping lanes where, in 2016, $3.4 trillion dollars in trade transited.[3]

The US Navy will take the lead in sea denial operations with the full support of the Marine Corps. As part of the Department of the Navy, the Marine Corps and Navy are natural partners in an integrated littoral conflict. Marine Expeditionary advanced bases (EAB) are the ground forces protecting and enabling naval forces as they compete in contested waterways. The Marines will employ advanced weapons including cyber-attacks and missile systems to augment

naval operations but require target acquisition through intelligence collection. A naval commander can always use more intelligence to reduce the uncertainty of littoral terrain and adversary actions. Ground reconnaissance teams collect information on the terrain, amphibious environment, adversary and due to their versatility, provide a capability that unmanned sensors do not. Also, teams can be enhanced with SIGINT, Ground Sensor, and HUMINT Marines enabling combined arms collection. However, as the importance of littoral mobility becomes more apparent due to the nature of distributed littoral operations, ground reconnaissance may need an additional capability. A multi-domain reconnaissance vehicle that can travel at high speeds and support clandestine operations may solve the littoral mobility problem and increase the utility of ground reconnaissance in sea denial operations.

The Armored Reconnaissance (ARV) family of vehicles is the potential future ground reconnaissance platform for ground centric reconnaissance. Although it's a highly capable platform, there is a gap in collection capabilities geared toward the seaward portion of the littorals. An MDRV fills that gap as an amphibious platform that conducts reconnaissance missions that bridge the seam between the sea and land domains. Whether tracked or wheeled, it should be designed to transport between two and four Marines at a range of at least 200 nautical miles (NM). An MDRV's speed and low signature are key for clandestine reconnaissance, so armor and firepower are minimized. It will serve as a long-range insert/extract platform, on land or sea, for reconnaissance teams in a distributed operating environment. Integrating an MDRV into the ARV family will harmonize reconnaissance operations and enable the synchronization of vehicles, unmanned systems, robots, and sensors within the littorals. Because the acquisition process for new equipment is lengthy and costly, other options, like buying small patrol craft, may be preferable and are discussed later in this paper.

Problem Statement

Why is ground reconnaissance a relevant capability the Marine Corps must possess in a future conflict? Currently, the Marine Corps is analyzing how ground reconnaissance can be employed in the future operating environment. The National Defense Strategy specifically talks about contested operations within the littorals and expects the Marine Corps to make force design changes to conduct those operations. The littorals are comprised of complex terrain and without intelligence, the adversary will maintain the advantage. Concepts like LOCE and EABO do not explicitly state the need for ground reconnaissance, however there are implicit reconnaissance tasks throughout both concepts. Without ground reconnaissance, the FMF will be "leading with its face" as reconnaissance units are the eyes and ears that enable informed decision-making. It also provides a limited-scale raid capability if a quick, lethal strike is necessary. The aim of this paper is to illustrate how ground reconnaissance supports the Fleet Marine Force by facilitating maneuver and enhancing littoral mobility.

US peer adversaries possess and are developing capabilities to detect and sense Marine Corps collection platforms which, once detected, can be targeted through kinetic or non-kinetic means. Although airborne ISR platforms in Iraq and Afghanistan were effective, an over reliance on those types of platforms may prove fatal in the future A2AD environment.

In the air and on the ground, friendly signatures must remain low to avoid discovery. Signature management eludes detection because it minimizes physical characteristics and electromagnetic spectrum emitters. The Marine Corps desires collection assets with small signatures that are capable of massing to enhance its effects. Deception will also need to be integrated into contested littoral operations. Deception plans are used in combination with

signature management to confuse enemy collection efforts and obfuscate friendly maneuver. Ground reconnaissance teams have small signatures, can mutually support each other, and can facilitate deception operations.

Ground reconnaissance enables littoral mobility which allows the Marine Corps to maneuver within the contested maritime-littoral environment. Littoral mobility is the ability to maneuver within the littorals to establish EABs in a timely manner that can fire ground-based weapon systems in support of naval operations. EABs will execute kinetic and non-kinetic fires within an A2AD umbrella to support Naval operations but will be detected and targeted instantly after a fire mission. Ground reconnaissance will identify and locate potential EAB sites to enable the EAB to displace to a survivable location and reconstitute for its next fire mission. Although EAB sites will have been identified prior to conflict, reconnaissance teams may have to identify alternate EAB locations during combat operations. The intelligence they provide will substantially increase the littoral mobility and survivability of EABs.

Littoral mobility is facilitated through traditional ground reconnaissance operations which include ground and amphibious reconnaissance and surveillance, battlespace shaping, specialized insertion and extraction, and specialized limited-scale raids.[4] However, in a dispersed littoral environment, there will be a requirement for reconnaissance teams to be fast, mobile, and lethal. A MDRV enhances littoral mobility, extends the range for collection, increases EAB survivability, and amplifies lethality. Historical case studies and analysis of the future operating environment will highlight the utility of ground reconnaissance and why a MDRV is necessary in sea denial operations.

Literature Review

History of US Ground Reconnaissance

Scouting units have conducted ground reconnaissance operations throughout the history of military operations. Being able to determine the composition, disposition, and strength of an enemy prior to battle offered a tremendous advantage because of the valuable intelligence it fed to battlefield commanders. Sun Tzu tells us that the more military leaders know about their enemy, the greater the chance of victory. No one knew this better than George Washington.

The first American ground reconnaissance unit of the Revolutionary war was formed in 1776 after several intelligence failures in early battles.[5] Washington appointed Lt. Col. Thomas Knowlton as commander of the Continental Army's intelligence unit which would later become known as "Knowlton's Rangers". The unit, roughly the size of a Marine infantry company, was tasked with "conducting reconnaissance, carrying out raids against British facilities and other dangerous covert missions."[6] One of its captains, Nathan Hale, is famously quoted as saying just before his execution by his British captors that "I regret that I have but one life to give for my country."[7] These men were fierce and dared to operate behind enemy lines.

During the War of 1812 and American Civil War, the terms "spies" and "scouts" were used interchangeably, however, horseback cavalry scouts were used for ground reconnaissance operations. They would locate enemy positions to determine their size and strength as well as identifying weaknesses in friendly formations. The Union Jessie scouts were especially effective at terrorizing and gathering intelligence behind Confederate lines. They were skilled volunteers selected from cavalry regiments tasked with moving in advance or on the flanks to prevent enemy surprise attacks.[8] Like current ground reconnaissance teams, they operated in enemy territory beyond the forward line of troops.

The era of horseback cavalry scouts ended with WWI even though all armies entered the war with large numbers of cavalry units. The onset of trench warfare crippled cavalry units and their ability to conduct reconnaissance.[9] Interestingly, when the US Army organized their infantry divisions to fight in France, they did not contain organic reconnaissance elements.[10] In 1918, one squadron of American cavalry were able to support operations in St. Mihel and the Ardennes providing "tactical reconnaissance" for several divisions.[11] By the end of WWI, reconnaissance operations were conducted almost entirely by the air component. Cavalry reconnaissance was obsolete because of the "immobility of the entrenched opposing forces and firepower in the defensive"[12] Similarly, in World War II, the characteristics of the war in the Pacific required a new method of employment for ground reconnaissance units.

Marine Ground Reconnaissance in WWII

The infamous Marine Raiders were responsible for several ground reconnaissance operations conducted during the island-hopping campaign of WWII. These specialized units were the precursor to the Marine reconnaissance units of today. Examining Raider operations is important because, although they took place nearly 80 years ago, amphibious operations in contested maritime-littoral environments share similar characteristics to the war in the Pacific. Characteristics like well-defended islands and beachheads, enemy weapon and air defense systems, vast distances between land, suitable beach landing sites, and ship to shore operations in general are a few similarities that will present themselves again in the future.

One of the most important lessons learned from Guadalcanal was the necessity of amphibious reconnaissance. During the Guadalcanal campaign, amphibious reconnaissance was not used prior to the landing force hitting the beach but there are several instances when it was

used for the purposes of collecting critical information. Division intelligence needed to confirm the location and strength of Japanese forces east of Henderson Field because of the threat it posed to US air operations. A Raider Platoon Sergeant named Francis Pettus was tasked to conduct an amphibious reconnaissance patrol because a foot patrol through the jungle would be too dangerous. Pettus commandeered a Higgins boat, rigged with two machine guns on its bow, with a small crew and maneuvered eastward along the coast to stealthily reconnoiter Japanese bivouac locations.[13] His amphibious reconnaissance patrol confirmed the composition, disposition, and strength of several enemy units and provided critical intelligence for follow-on operations on Guadalcanal.

Another example was when a lieutenant and sergeant from 3d Raider Battalion conducted a two-man amphibious reconnaissance of Pavuvu and Banika in the Russell islands. Possessing these locations would create an allied airbase closer to New Britain which would then allow for the seizure of Rabaul, a major Japanese base.[14] After the team confirmed the lack of an enemy presence at the beach landing site (BLS), 3d Raider Battalion followed by the 159 Infantry Regiment went ashore without opposition and successfully occupied their objectives.[15] In this case, amphibious reconnaissance facilitated the landing of the main force where the enemy did not hold defensive positions.

One of the first missions assigned to a Raider unit during the island-hopping campaign was a limited-scale raid on Butaritari Island before the main assault on Makin Island was to take place. They were tasked with destroying a garrison of Japanese, withdrawing that evening, and then making a landing at Little Makin Island.[16] Whether it was successful or not is debatable, but drawing the similarities to that mission and potential mission in the future is important.

Another example is the raid on Tasimboko, a Japanese logistical hub, on Guadalcanal. Raiders went ashore in the enemy's rear area and after a long-range reconnaissance patrol, were able to strike the rear guard of a Japanese brigade. This small unit was able to disrupt command and control, fire support, and logistics while gathering critical intelligence on the brigade's intentions. The limited-scale raid had tactical significance and hurt Japanese morale.[17]

Analyzing some of the islands the Chinese are occupying and creating today in the SCS indicates the presence of various weapon systems, radars, integrated air defense systems, garrisons, logistic nodes, and other military facilities which may become potential targets. Not all targets can be prosecuted by missiles and bombs and may require a quick lethal raid force, like the Marine Raiders on Butaritari.

Marine Raider operations highlight how amphibious reconnaissance and limited-scale raids were critical to the war in the Pacific and because the SCS possesses similar characteristics, there will be a requirement for ground reconnaissance in the future. This is not an argument to fight another WWII, but it is an argument for the effectiveness of ground reconnaissance units in a contested maritime-littoral environment. Additionally, the character of future dispersed littoral operations will require ground reconnaissance to possess additional capabilities and equipment. The Raiders used submarines, seaplanes, inflatable boats, civilian boats, Navy ships, Higgins boats, and anything else that could float in order to execute amphib recon and raids. Some of these platforms worked with varying degrees of success while others proved fatal. The Marine Corps has the luxury of learning from the Raiders and has time to develop a platform suitable for reconnaissance operations in the contested littorals.

The history of ground reconnaissance demonstrates its utility however, there is uncertainty of its future within the Marine Corps. The Secretary of Defense has directed the

Marine Corps to modernize which is forcing the Commandant to divest from antiquated capabilities and equipment. Without careful analysis, the Marine Corps may decide to discard its organic ground reconnaissance capability in favor of expensive technologies or weapon systems. Guidance from strategic planning documents like the National Defense Strategy (NDS) and Commandant's Planning Guidance (CPG) indicate there is still a need for ground reconnaissance.

National Defense Strategy and Commandant's Planning Guidance

The NDS is an important document because it shifts the Department of Defense's focus to prepare for a potential conflict with China which is driving force design changes. The NDS states "China is a strategic competitor using predatory economics to intimidate its neighbors while militarizing features in the South China Sea."[18] It describes how it is directing the joint force to increase lethality and specifically, to modernize key capabilities. Most importantly and for the purposes of this review, the strategy emphasizes "joint lethality in contested environments". It goes further and explains how "the Joint Force must be able to strike diverse targets inside adversary air and missile defense networks… this will include capabilities to enhance close combat lethality in complex terrain."[19] The Commandant of the Marine Corps took this guidance and then gave his guidance to the Marines.

"The Marine Corps will be trained and equipped as a naval expeditionary force-in-readiness and prepared to operate inside actively contested maritime spaces in support of fleet operations." – Commandant of the Marine Corps[20]

Force design is the Commandant's number one priority within the CPG because he does not believe the Marine Corps is manned, trained, and equipped for the type of conflict

foreshadowed within the NDS. Also, he states that results from wargaming and experimentation conclude that reconnaissance teams, integrated with F-35s and rifle squads, are a dominating and decisive force.[21] The necessity of littoral mobility and amphibious reconnaissance within wargames provide evidence that ground reconnaissance will have a substantial role in a maritime-littoral conflict.

The CPG addresses some of the new technologies, capabilities, and techniques that are rapidly evolving and are expected to change the character of warfare. Long-range unmanned surface vessels (LRUSV) are posited as a future amphibious reconnaissance asset that acts as a sensor, weapon, and sustainment platform.[22] The Marine Corps should use LRUSVs to supplement ground reconnaissance units, but not to replace them. A manned-unmanned team of ground reconnaissance and LRUSVs will be a force multiplier. However, relying solely on autonomous platforms and machines will not provide a complete and holistic intelligence picture that living, breathing human beings can provide. An LRUSV will only be able to maneuver on the water which limits its collection and strike capabilities on landward targets. Multi-domain reconnaissance elements can operate under water, on the surface, and on land which supports the argument of teaming them with LRUSVs. Also, LRUSVs are going to require communications over vast distances within an A2AD contested environment. While executing mission type orders, reconnaissance units can continue to operate in a communication denied environment. The LRUSV lacks the capabilities and flexibility to replace ground reconnaissance and will be better employed when teamed with ground reconnaissance elements.

LOCE

A subordinate concept, Littoral Operations in a Contested Environment (LOCE), was produced to support the Marine Operating Concept (MOC) from 2016. Although in the new Commandant's Planning Guidance the Commandant proclaims the MOC is no longer the Marine Corps' capstone operating concept, LOCE provides insights into the future characteristics of littoral warfare. These insights show how ground reconnaissance operations will play a role in the future and what reconnaissance Marines can provide to the Naval force. LOCE also explains how the littorals are comprised of two segments, the seaward and landward areas, which necessitates an operational approach in a singular battlespace.[23] Logically, it is advantageous to possess a multi-domain reconnaissance vehicle that bridges these domains to operate at sea and on land.

In a crisis response situation, the LOCE concept proposes the formation of a Littoral Combat Group (LCG) to establish sea control in a contested and uncertain littoral environment. The LCG requires certain capabilities to conduct sea control which requires innovation in a few key areas. One of the innovations annotated in the document are for Littoral Raid Forces to "provide the LCG a high-speed, long-range, low-signature combatant craft capable of projecting and recovering Marines for a variety of missions."[24] It further suggests Mark VI patrol boats and Riverine Command Boats may be useful surrogates for experimentation but, neither of these platforms are amphibious. Recommended for their speed and lethality, neither can support Marine operations both at sea and on land. This is a critical gap for a ground reconnaissance raid force striking a target inland.

LOCE determines that Expeditionary Advanced Bases (EAB) are necessary to mitigate the adversary's sensor and shooter capacity advantages in a contested environment.[25] EABs are land-based options where Marines, weapon systems, and other essential equipment can be staged

to supplement seagoing platforms, thereby increasing capability and access to restricted areas of the battlespace. A benefit of an EAB is that it positions ISR assets and platforms in advantageous locations to conduct screening/scouting tasks which increases friendly sensor/shooter capacity and complicates adversary targeting systems.[26] Ground reconnaissance teams, equipped with a multi-domain reconnaissance vehicle, will execute this critical role within the EAB construct.

The LOCE ends with identifying capabilities by warfighting function that demand further development. Under the intelligence function, LOCE focuses on three areas that ground reconnaissance can support. The first and second task is to establish battlespace awareness and to perform rapid and accurate mission assessment of fires respectively.[27] Ground reconnaissance units are collection assets existing for the purpose of building battlespace awareness and informing the decision-making process. Within reconnaissance teams, Joint Terminal Air Controllers (JTAC) and Joint Forward Observers (JFO) are trained to call in fire missions as well as assess the effectiveness of fires. Thirdly, ground reconnaissance can be critical to understanding the littoral operating environment. This includes not only military features, but also natural and man-made terrain, hydrography, the "human terrain" in the area (culture, society, economy, technology, and population concentration/dispersion), civilian traffic (air, sea and land), the climate, and regional weather patterns. Hydrography is important because it provides critical information on sea states, wave types, current, depth, and obstacles that affect naval operations.

LOCE signals the importance of intelligence, surveillance, and reconnaissance (ISR) and its applicability in the future operating environment but focuses on unmanned systems and sensors. It will be difficult to command and control these underwater, surface, and aerial sensors

as they collect terabytes of data for exploitation. Teaming ground reconnaissance with unmanned reconnaissance systems will facilitate command and control for the variety of sensors employed over an expansive area of operations.

Ground reconnaissance capabilities must be leveraged to support EABO and LOCE concepts. Ground reconnaissance missions are unique because Marines are sent beyond the forward line of troops (FLOT) to collect vital information to facilitate maneuver warfare. Recently in Iraq and Afghanistan, unmanned ISR assets were not able to answer all the Commander's Critical Information Requirements (CCIR) because of their sensor limitations. Ground reconnaissance teams can fill gaps or collect information where a human being is the better sensor.

Reconnaissance battalions are the only Marine Corps units that train to operate in the environments forecasted in EABO and LOCE. For instance, 3d Reconnaissance Battalion conducts theater security cooperation exercises regularly with countries like Thailand, Philippines, Indonesia, Malaysia, South Korea, Japan, Mongolia, and Australia. EABO is predicated on Marine units having access to and rotating within contested areas while surviving in austere environments. Reconnaissance Marines are screened and trained to accomplish tasks within the challenging complex terrain EABO and LOCE describe. Ground reconnaissance is most likely the only small unit in the Marine Corps prepared to operate in a maritime-littoral conflict.

Hypothesis

Ground reconnaissance operations remain relevant to a future contested maritime-littoral conflict. A manned-unmanned team of reconnaissance Marines and LRUSVs increases the

effectiveness of long-range strikes and intelligence collection efforts. A multi-domain reconnaissance vehicle will facilitate manned-unmanned teaming and increase littoral mobility. Ground reconnaissance teams equipped with a multi-domain reconnaissance vehicle is a force multiplier the Fleet Marine Force needs for future war.

Ground reconnaissance facilitates littoral mobility and enables the FMF to execute maneuver warfare within a contested littoral environment. Littoral mobility is identified as a critical capability that must be inherent in all expeditionary advanced bases (EAB). ARG ships, LHA/LHD, LPD, LSD, can maneuver forces into the area of operations (AO) however, they are not suited for maneuver within the AO. They are large targets with deep drafts making them unsuitable for the loading and offloading of EAB forces and incompatible with littoral mobility. A multi-domain reconnaissance vehicle dramatically increases a ground reconnaissance unit's littoral mobility and capacity for EABO.

An MDRV must be capable of achieving speeds between 20 and 30 knots on the water and have the range to team with Long Range Unmanned Surveillance Vehicles (LRUSV). Teaming a MDRV and LRUSV swarm will improve command and control of unmanned systems and facilitate collection and strike operations. Its signature must be small, transporting 2-4 Marines, ensuring a low radar cross-section. This signature and speed combination create a platform that is difficult to target. A MDRV must be able to operate at sea and on land to accomplish the spectrum of ground and amphibious reconnaissance tasks. A MDRV provides the FMF a capable reconnaissance platform designed for littoral operations.

Manned reconnaissance will be an important capability in the future operating environment. Potential amphibious landing sites, obstacles, exit points, current and tide calculations, depth, composition of the ocean floor, and other environmental intelligence

requirements that affect littoral operations can be collected and disseminated to decision makers. Special insert and extract capabilities give reconnaissance teams the ability to access remote areas to provide information. Reconnaissance Marines are proficient in small boat operations which gives them access to restricted areas within the littorals while still maintaining a low size and noise signature. Clandestine dive teams can be used when stealth is required and has a higher probability of mission success over parachute or boat insertion. High-Altitude High Opening (HAHO) and High-Altitude Low Opening (HALO) are parachuting methods of stealth insertion that allows for significant standoff from the insert platform to the drop zone.

If needed, reconnaissance teams can form in platoon size elements to conduct limited scale raids. They are proficient at building expeditionary antennas for high frequency communications and train to operate in communications denied environments. With attachments, they conduct advanced force operations by mapping human terrain or implanting ground sensors. Reconnaissance is needed to conduct hydrographic surveys, initial terminal guidance for amphibious landings, observation for fires, and other reconnaissance and surveillance activities. Manned reconnaissance remains relevant and is critical to future FMF operations.

Adjustments in Marine reconnaissance force generation and structure may have to be made in order to support both Marine Expeditionary Unit (MEU) and Marine Littoral Regiment (MLR) operations. The Commandant's guidance is to maintain a 3:1 dwell ratio, which is problematic due to the small size of the reconnaissance community. Assuming there are three forward MEUs and three deployed MLRs, with each supported by two reconnaissance platoons, requires 12 reconnaissance platoons forward deployed at any given time. This means the Marine Corps needs 48 reconnaissance platoons in order to deploy 12 platoons and maintain compliance

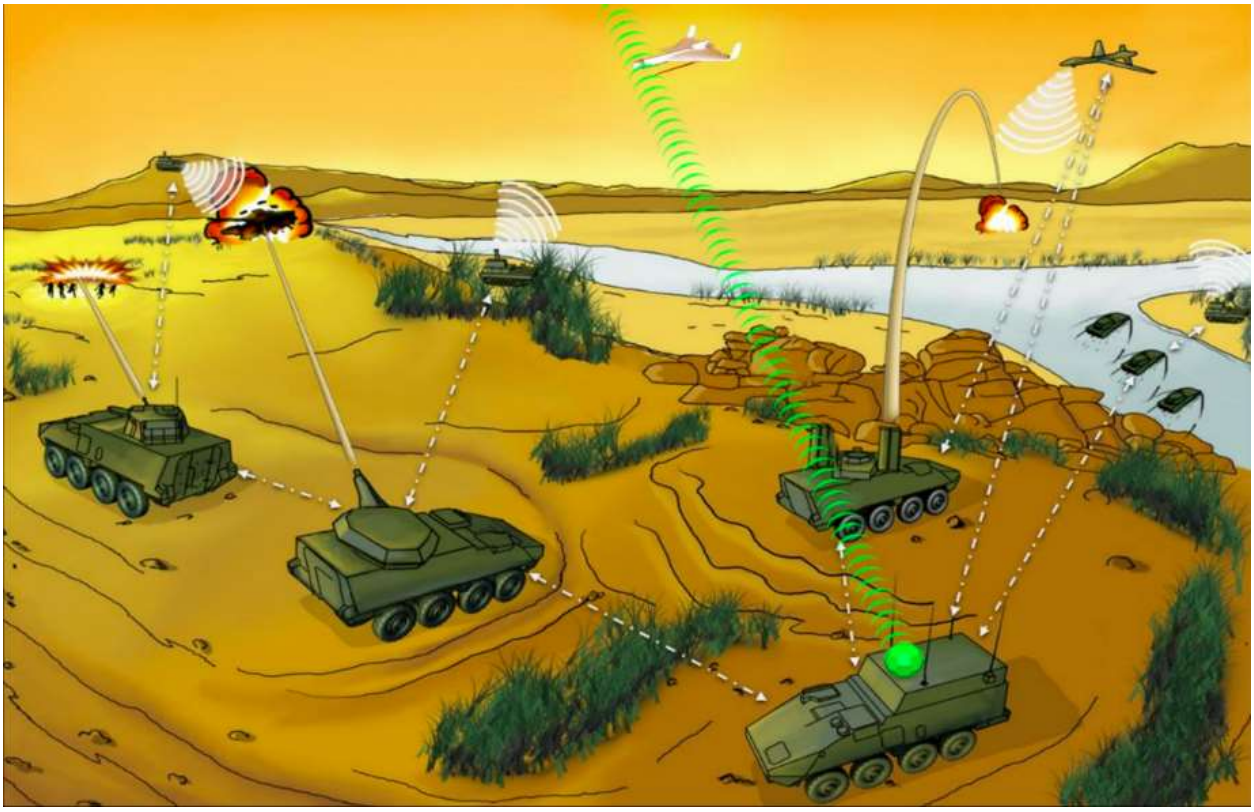
with a 3:1 dwell ratio. Although it makes an MLR more capable, growing the reconnaissance force to 48 platoons is not feasible due to fiscal and manpower restraints.

The size and structure of individual platoons has varied due to mission sets and manpower shortfalls. In the past, three six-man teams or two eight-man teams have been most common reconnaissance platoon structures. In the contested littorals, platoons consisting of four teams with four men in each team may be suitable. The size and structure of MLR reconnaissance platoons may have to differ from MEU reconnaissance platoons due to the nature of distributed littoral reconnaissance.

Central Idea

Armored Reconnaissance Vehicle

The Armored Reconnaissance Vehicle (ARV) is the proposed multi-domain platform for future ground reconnaissance operations. It will replace the light armored vehicle (LAV) platform, a Marine Corps asset since 1983. The ARV is an ambitious project, using cutting edge technologies for reconnaissance and counter-reconnaissance missions in contested environments. Like the F-35, originally a stealth strike fighter that evolved into an electronic/cyber warfare platform that can gather and "fuse" a vast amount of data, the ARV is aiming for similar capabilities.[28] An ARV will not be a single variant platform but a "networked family of manned vehicles, ground robots, and drones, collectively capable of not only reconnaissance but also electronic warfare and long-range precision strikes."[29]



Marine Corps notional depiction of various Armed Reconnaissance Vehicle (ARV) variants and drones working together[30]

The ARV family of vehicles are being designed with a multitude of technologies and capabilities to operate in a contested environment. These capabilities will allow the ARV to conduct deep scouting in distributed environments, requiring minimal resupply, while avoiding adversary precision strikes.[31] It will employ advanced long-range sensors and an advanced communications network that can operate in the face of adversary jamming and hacking.[32] Also, it will employ electronic warfare to detect, classify, and jam enemy transmissions including anti-UAS capabilities.[33] The complex integration of systems, including drones and robots, makes the ARV a formidable ground reconnaissance platform that can increase capability by including an MDRV into its family.

Although the ARV can integrate sensors within multiple domains, it is a ground centric platform. The ARV will have better amphibious performance than the LAV, but will still be transported by a Landing Craft Air Cushion (LCAC) or SLV on water.[34] As part of the ARV family of vehicles, the MDRV can reconnoiter the land and sea while feeding back intelligence for integration and synchronization. Also, integrating LRUSVs could further facilitate command and control and create a more holistic intelligence picture. The ARV is focused on the landward portion of the littorals and can be complemented with an MDRV/LRUSV team capable of reconnoitering seaward and landward areas. Including an MDRV/ LRUSV team makes the ground centric ARV a more capable family of vehicles.

Patrol Craft

Naval Special Warfare (NSW) and Navy Expeditionary Combat Command (NECC) employ patrol boats and small craft that have utility in littoral operations. Overlap in mission sets present Marine reconnaissance an opportunity to partner and integrate with existing platforms and capabilities within NSW and NECC. Both Navy units own and operate several small boats that possess the speed, agility, range, and maneuver for distributed reconnaissance operations. Although they are strictly seagoing platforms, they may provide an equitable solution for littoral maneuver and long-range amphibious reconnaissance in the contested littorals.

The 11-meter rigid hull inflatable boat (RHIB) is familiar to Marine reconnaissance and other special operations units. Counting the crew, it holds 11 operators and can be equipped with medium and heavy machine guns. It's a fast mover, 45 knots depending on passenger weight and cargo, with a 200 NM range.[35] RHIBs are used for insertion/extraction, maritime

interdiction operations (MIO), and visit board search and seizure (VBSS) operations. The special operation craft-riverine (SOC-R) is a modern version of the RHIB with updated communications, unmanned options, speeds over 50 knots, and a range that extends beyond 200 NM. Both are capable small boats; however, they are not a "true over-the-horizon capability necessary for persistent crisis response and partnership with host-nation forces."[36]

SOC-R (*Photo courtesy of swiftships.com*)

Mark V and Mark VI Special Operations Crafts are another option to support littoral reconnaissance operations. Both sacrifice a larger signature (25 meters long) for longer endurance, which the Marine Corps may calculate as a worth-while tradeoff. The Mark V has a larger troop and cargo capacity (21 Personnel) ranging 550 NM and reaches speeds up to 50 knots.[37] Recently, the Mark VI replaced the Riverine Command Boat under the command of NECC. Along with robust communications and weapon systems, the Mark VI is fitted with "ramp and rails to launch sleds for autonomous vehicles, which means the boats can be

employed for mine countermeasures operations in the littorals."[38] Mark VI's can travel at speeds over 40 knots and have a 500 NM range. The Marine Corps may determine that Mark V or Mark VI boats are suitable solutions for littoral operations because it can capitalize on existing capable platforms.

Mark V *(Photo courtesy of navysealmuseum.org)*

The Marine Corps can benefit from either partnering with NSW and NECC or purchasing its own patrol craft. This may be more cost-effective than going through a lengthy acquisition process that produces an MDRV decades in the future. The downside of the RHIB and SOC-R are its ranges while the Mark V and Mark VI are disadvantaged by their large signature. None of the patrol craft mentioned fully embrace the concept of an amphibious MDRV; however, their capabilities make them practical solutions for reconnaissance operations in the maritime littorals.

Amphibious Combat Vehicle

Shelving the amphibious assault vehicle (AAV) and replacing it with a modern, survivable, dependable, and lethal amphibious platform was long overdue for the Marine Corps. The cancellation of the Expeditionary Fighting Vehicle (EFV) in January 2011 by then Secretary Gates had left an equipment void for future amphibious operations.[39] Although wheeled, the amphibious combat vehicle (ACV) was developed to fill that void and replace the tracked AAV. The ACV is a highly capable platform designed to enable the Fleet Marine Force to maneuver in a contested littoral environment. However, its speed and signature do not lend itself to littoral mobility, a critical capability for littoral warfare, or clandestine reconnaissance.

Speed is an essential attribute of a multi-domain reconnaissance vehicle which must travel substantially faster on water than an ACV. Speed will aid in stealth, decrease the duration of an amphibious reconnaissance mission, and increase survivability by making adversary target acquisition increasingly difficult. In 2011, the operational requirement for an ACV was it must achieve speeds up to 8 knots in seas with 1-foot significant wave height.[40] In comparison, the amphibious assault vehicle (AAV) travels at 7 knots in similar conditions meaning the ACV is not significantly faster. At 8 knots, adversary A2AD defense systems will effectively target slow moving ACVs.

***ACV** (Photo courtesy of media.defense.gov)*

Along with its speed, an ACVs signature is problematic in a contested littoral environment. The operational requirement for the ACV is to be capable of transporting 17 combat loaded Marines.[41] The overall length of the vehicle is 8.9m (29 ft), while its width and hull height are 3.1m (10ft) and 2.8m (9ft) respectively.[42] The ACV is 1 meter longer than the assault amphibious vehicle with similar width and hull height dimensions. This means that the ACV and AAV present an almost identical signature to adversary targeting systems. The Commandant mentions low-signature platforms 13 times in the CPG because he understands that large platforms make for easier targets in a contested littoral environment.

Ghost Fleet Wargame

Peer adversary competition in the future operating environment poses a threat to the United States and its global interests. The Commandant's Planning Guidance (CPG) articulates

fundamental changes the Marine Corps is making to counter those threats and intends to build a Fleet Marine Force (FMF) that supports the Navy in a littoral maritime fight. The Ghost Fleet 1 Wargame tested force design constructs by wargaming a Marine Littoral Regiment (MLR) against a peer-adversary while executing Expeditionary Advance Base Operations (EABO). Many important insights were gleaned from the wargame, however; ground reconnaissance was highlighted as a critical capability that enabled the Marine Littoral Regiment (MLR) to support FMF operations.

Wargame Methodology

The purpose of the Ghost Fleet Wargame was to inform upcoming force design decisions putting the Marine Corps in a better position to support the Navy in a littoral maritime fight against a peer adversary. The wargame scenario was fought in a notional contested maritime-littoral environment over a three-day duration, D-1 to D+1, including preparations for imminent kinetic operations on D-1 and kinetic operations on D-day through D+1. Structured discussions captured blue and red player's opinions and views throughout the wargame with daily wrap-ups and a final discussion at the end.

The wargame consisted of three tables of 5-6 players which divided into blue (friendly) and red (adversary) teams. Each table fought a different scenario within a contested littoral environment with the scenarios rotating between the tables each day. This gave three different perspectives on a force design issue and its ability to support sea denial operations. Blue players wargamed organizational designs that resulted from initial planning teams (IPT) while red players countered blue maneuver using realistic adversary capabilities expected in a future maritime-littoral conflict. Red players also helped blue players prepare for adjustments and

provided feedback in between blue actions. A Navy lead player, Surface Warfare Officer (SWO) was an adviser to the blue team and a critical enabler because of his experience and knowledge in Naval operations, resulting in a realistic and holistic wargame. A control section monitored overall game execution and, on occasion, served as an adjudication authority. Each table had a recorder that did not partake in the wargame but recorded the results of actions and captured dialogue between players.

Wargame Conclusions: Ground Reconnaissance

The contested maritime-littoral environment presents a complex set of problems for the FMF. The results of the Ghost Fleet Wargame show maneuver and mobility are critical to lethality and survivability of a Marine Littoral Regiment as it competes and fights within an adversary's weapon's engagement zone (WEZ). Ground reconnaissance can reduce uncertainty and increase littoral mobility by conducting traditional reconnaissance missions and developing capabilities that support EABO.

In order to execute EABO, the Marine Corps will have to select and train MLR Marines using similar methods that it currently trains reconnaissance Marines. Reconnaissance Marines are selected and trained for the types of skills and attributes required for distributed littoral operations. The physical and psychological demands on a reconnaissance Marine are greater because they "operate far from friendly-controlled areas or deep in the enemy's rear areas, typically, surrounded by hostile forces."[43] Ground reconnaissance patrols require them to operate independently for long periods of time without an expectation of support.[44] Reconnaissance Marines are naturally suited for contested littoral operations.

Scouting and patrolling are fundamental to ground reconnaissance teams and are essential force protection measures for expeditionary advanced bases (EAB). Other skills include "combat swimming; small boat operations; close combat skills; helicopter insertion/extraction techniques; assault climbing; demolitions; forward observer procedures for supporting arms; initial terminal guidance (ITG) operations for heliborne, airborne, and waterborne forces; long-range communications; imagery collections; threat weapons and equipment identification; underwater reconnaissance, amphibious reconnaissance, and surveillance operations. Ground reconnaissance Marines are further trained as parachutists, combatant divers, jump masters, dive supervisors, helicopter rope suspension techniques (HRST) masters, and snipers."[45] For an EAB to shoot, move, and reconstitute in a short period of time, it must have pre-planned routes, alternate routes, pre-planned sites, and alternate sites. Route reconnaissance is a basic task which reconnaissance units can accomplish to shorten the amount of time it will take to shoot-move-shoot inside the WEZ. Ground reconnaissance forces possess a variety of skillsets the FMF requires.

Several actions throughout the wargame showed that ground reconnaissance operations enhanced the FMFs ability to support sea denial tasks. One of those actions was securing key maritime terrain in support of the Naval force. Key terrain may include locations at sea, land, islands, straits, chokepoints, or any other terrain giving the FMF an advantage in its sea denial mission. Ground reconnaissance can reconnoiter, patrol, scout, observe, or execute fire missions to secure key terrain in support of fleet operations.

Understanding hydrography in the littorals will facilitate littoral mobility and maneuver. Ground reconnaissance will conduct confirmatory beach reports (CONBEREP) to provide key information on the amphibious environment. At sea, they collect information on the depth,

composition of the ocean floor, obstacles, current, and wave height. On land, data is collected on the gradient of the beach, beach composition, trafficability, adversary locations, and exit/entry points. Ground reconnaissance will provide the hydrographic intelligence for an EAB to relocate and survive adversary targeting.

Counter-reconnaissance and human intelligence (HUMINT) can support advanced base operations. EABs will operate in permissive, semi-permissive, or hostile environments and are vulnerable to attack due to the lack of mutual support inherent in distributed operations. EABs will be targeted by local people and indigenous forces, putting Marines and critical equipment in jeopardy of being destroyed, sabotaged, or stolen. Ground reconnaissance will conduct counter-reconnaissance missions to prevent and disrupt adversary observation on friendly forces. Counter-reconnaissance patrols will detect adversary sensing capabilities and identify hostile intentions on an EAB.[46] Ground reconnaissance regularly teams with HUMINT Marines when patrolling in populated areas to serve as an insert platform and force protection. HUMINT will collect information on the local population, establish positive relationships for EABs, and provide early warning for adversary actions. Ground reconnaissance will strengthen an EABs defense by conducting counter-reconnaissance and attaching HUMINT Marines to collect priority information requirements.

Forward Arming and Refueling Points (FARP) sustain air operations which increases the effectiveness of sea denial and EAB survivability. They are key nodes within the Naval logistic network the adversary will identify as high value targets. During kinetic operations, FARPs will continuously need to break down and reconstitute at alternate locations to avoid enemy fires. Ground reconnaissance can support FARP operations by locating suitable FARP sites, a task similar to identifying and collecting on helicopter landing zones (HLZ). Ground reconnaissance

will navigate to potential FARP sites in difficult terrain and, after identifying a tenable FARP site, provide initial terminal guidance for the echelon of forces. FARPs, like EABs, will need a reconnaissance component to survive and remain operational once enemy missiles begin to target them.

The Ghost Fleet Wargame presented numerous problems for the FMF to solve in a contested littoral-maritime fight. Ground reconnaissance proved it can aid the FMF with intelligence collection on land and at sea. Due to the characteristics of the operational environment and value of timely intelligence, ground reconnaissance confirmed its utility to the FMF.

Recommendations

The Marine Littoral Regiment (MLR) requires ground reconnaissance assets to support the Navy in sea denial operations. An MLR's area of operations will cover hundreds or thousands of miles in which it is conducting expeditionary advanced base operations within an adversary's weapons engagement zone. Two reconnaissance platoons, an amphibious reconnaissance platoon and force reconnaissance platoon, support every MEU because they can simultaneously execute multiple tasks in dispersed locations. At a minimum, an MLR must have two reconnaissance platoons in direct support to collect on intelligence requirements in the MLR's close and deep battlespace. Answering the MLR's intelligence requirements will directly affect its ability to support the Navy and sea denial efforts.

A MEU possesses additional capabilities making a MEU/MLR team more effective in supporting sea denial operations. The MLR lacks organic air support hindering its ability to support a fleet commander during EABO. When the air component was unavailable during the

wargame, sea denial was severely degraded. In games where MEU air was present, the MLR was exponentially more effective. Also, when FARPs were unable to support an action during the wargame, gaps in air support strained sea denial. MLR reconnaissance can support FARP operations to minimize those gaps. Also, two reconnaissance platoons from a MEU can support an MLR if the MLR's Priority Information Requirements (PIR) are deemed critical to the sea denial mission. The MEU platoons can relieve pressure on an MLR as it maneuvers its EABs in the contested littorals. A MEU/MLR team is a more effective way for the FMF to support sea denial operations within the contested littorals.

A multi-domain reconnaissance vehicle (MDRV) can fill a critical equipment gap for ground reconnaissance and the FMF. The importance of littoral mobility stresses the need for reconnaissance teams to have the capabilities a MDRV provides. If a conflict were to arise in the near future, the FMF needs a fast, low-signature, versatile platform that facilitates clandestine intelligence collection operations. Currently, the unmanned LRUSV will fall short of fulfilling all long-range amphibious reconnaissance tasks; however, teaming ground reconnaissance with LRUSVs can be a force multiplier for dynamic collection and targeting operations. A MDRV enables manned-unmanned teaming and facilitates command and control of LRUSV systems. Without a MDRV, reconnaissance teams cannot fully support FMF operations.

Ground reconnaissance is a critical capability the MLR must utilize in a littoral maritime fight. An area of operations that encompass vast complex littoral terrain will require two MLR reconnaissance platoons at a minimum. The MLR should be employed with a MEU because of the additional reconnaissance and air capabilities required to support sea denial. A multi-domain reconnaissance vehicle will enhance littoral mobility and increase the lethality and survivability

of an MLR. Sea denial operations are complex and dangerous, the MLR needs robust multi-domain reconnaissance capabilities.

Counterargument

Opponents of ground reconnaissance may argue that commanders in future war will want to employ assets that do not risk Marines lives to answer their intelligence requirements. Commanders will be less willing to employ ground reconnaissance because they involve inherently dangerous operations and will seek alternate options. Ground reconnaissance may be replaced with less costly collection platforms that mitigate the potential loss of life. Nevertheless, commanders will want the unique capabilities manned reconnaissance provide and which autonomous machines and sensors lack.

It is difficult to quantify the intangibles of having reconnaissance Marines on the ground. A reconnaissance Marine makes decisions using commander's intent and uses his intuition to solve problems. This allows him to navigate restricted terrain that machines can not access, giving him unique perspectives of the operating environment. Unlike unmanned platforms that require consistent and reliable communication networks, reconnaissance teams can collect as the enemy is actively jamming, hacking, or disrupting the electromagnetic spectrum. Also, manned reconnaissance has a wider collections aperture than ISR assets flying overhead collecting through a "soda straw". Besides the intangible qualities, the future operating environment favors the use of manned reconnaissance.

"One of the key concerns about ground recon units is risk. Risk to operating behind enemy lines such as in North Korea, China or Russia. Commanders don't like making those kind of risk decisions and would rather rely on unmanned solutions or national collection assets to

inform the deep picture. However, in the Western Pacific, most of the territory, if not all, is primarily friendly territory we are defending. The risk calculus therefore drops significantly and better enables manned recon employment. And, their small footprint is easily blended into a friendly population and terrain environment. All that to say, the risk decisions that drive people to want to get rid of manned recon are not present in the Western Pacific. We can employ reconnaissance largely at will given our relationships with these countries and can leverage that to our advantage."[47]

Collecting hydrographic data is critical to naval operations in the littoral environment and a unique manned reconnaissance capability. Potentially , autonomous amphibious drones will substitute for manned reconnaissance to gather hydrographic information, but this will create a gap in collection Reconnaissance Marines fill that gap by collecting valuable information from the sea, to the beach, and into the hinterland from a ground perspective. This is unique to ground reconnaissance and cannot be replicated by machines. The versatility of Marines and their ability to adapt to circumstances on the ground makes manned reconnaissance a powerful and risk-worthy collection asset.

Critics will contend the MDRV is unnecessary because the LRUSV fills the long-range amphibious reconnaissance and limited strike requirement. To the contrary, it makes the MDRV more relevant. Manned-Unmanned teaming enables better command and control of LRUSVs and enhances collection capabilities. Also, the MDRV will extend the reach of reconnaissance teams in distributed operations and facilitate a better understanding of the operational environment.

Assessment and Conclusion

Manned reconnaissance is a force multiplier for the Fleet Marine Force as a cross-domain collection capability in austere and uncertain environments. A demand for ground reconnaissance will increase as MEU deployments continue and MLRs are constituted. An MLR would benefit from having two reconnaissance platoons; however, the Marine Corps can only provide one under the current structure. Two platoons per MLR requires a significant force generation effort which the Marine Corps is unlikely to pursue.

Doctrine that describes how manned reconnaissance will support the FMF in sea denial operations will solidify its role for the future. The Ghost Fleet wargame exposed a lack of reconnaissance support for an MLR as it fought within contested littoral environments. Developing ground reconnaissance supporting concepts for LOCE and EABO can explain its utility and shed light on force design decisions.

Developing specific requirements for an MDRV will influence force design decisions as technologies and equipment are procured for the future. Unlike current amphibious platforms, an MDRV is a low-cost, low-signature amphibious platform that matches the speed of LRUSVs to facilitate manned-unmanned teaming. Enabling perpetually mobile loaded reconnaissance Marines, an MDRV increases littoral mobility and allows for rapid withdrawal from EABs. MDRVs will facilitate the collection of hydrographic data and reconnoitering of key terrain as the MLR maneuvers in contested space.

Marine reconnaissance has other options if an MDRV is not included in the future force design. An ARV may be a suitable insertion/ extraction platform for manned reconnaissance, although it does not solve platform shortfalls regarding amphibious reconnaissance. The gap in amphibious reconnaissance platforms can be solved in two ways. First, the Marine Corps can

acquire its own patrol craft like the RHIB, SOC-R, Mar V or Mark VI vessels. Another way is to partner and integrate with NSW or NECC, both already own and operate these platforms. Although sub-optimal, manned reconnaissance can use various platforms to execute littoral reconnaissance operations.

An MDRV is visualized as an optimal vehicle for both land and sea reconnaissance operations. However, it is a theoretical platform that does not reflect current fiscal and technological realities. Budget restraints will limit the Marine Corps' ability to develop and invest in an MDRV when it has higher priority fiscal obligations that it will invest in before an MDRV. Also, the technology for a high speed, low signature platform that ranges 200 NM on water while still capable of land reconnaissance operations, does not exist. Currently, the Marine Corps can develop a platform optimized for either land or sea, not both. Therefore, an alternative solution would be to create two platforms, one for land operations and one for sea operations. Although not viable due to current fiscal realities and technological limitations, future budgets and tech innovation could make an MDRV possible.

The Marine Corps is making force design decisions primarily based on the results from wargames and analysis of expeditionary advanced based operations within contested littoral environments. Some results show the Marine Corps needs to make dramatic changes in technologies, capabilities, and units in order to support future naval sea denial operations. One of the key takeaways from the Ghost Fleet wargame was the role ground reconnaissance plays in sustaining littoral mobility of an MLR. There is utility for manned ground reconnaissance in future FMF operations, like there was for Marine Raiders in the Pacific.

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