

# REPORT DOCUMENTATION PAGE

*Form Approved*  
OMB No. 0704-0188

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<b>1. REPORT DATE (DD-MM-YYYY)</b> 13-04-2015		<b>2. REPORT TYPE</b> Master of Military Studies Research Paper		<b>3. DATES COVERED (From - To)</b> September 2014 - March 2015	
<b>4. TITLE AND SUBTITLE</b>  HIMARS: Redesigned into a Multi-role Platform				<b>5a. CONTRACT NUMBER</b> N/A	
				<b>5b. GRANT NUMBER</b> N/A	
				<b>5c. PROGRAM ELEMENT NUMBER</b> N/A	
<b>6. AUTHOR(S)</b>  DeLuca, Joel A., Major, USMC				<b>5d. PROJECT NUMBER</b> N/A	
				<b>5e. TASK NUMBER</b> N/A	
				<b>5f. WORK UNIT NUMBER</b> N/A	
<b>7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)</b> USMC Command and Staff College Marine Corps University 2076 South Street Quantico, VA 22134-5068				<b>8. PERFORMING ORGANIZATION REPORT NUMBER</b>  N/A	
<b>9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)</b>  N/A				<b>10. SPONSOR/MONITOR'S ACRONYM(S)</b>  N/A	
				<b>11. SPONSOR/MONITOR'S REPORT NUMBER(S)</b>  N/A	
<b>12. DISTRIBUTION / AVAILABILITY STATEMENT</b> Approved for public release; distribution is unlimited.					
<b>13. SUPPLEMENTARY NOTES</b>  N/A					
<b>14. ABSTRACT</b>  The rise of A2AD weapons systems and tactics poses a major challenge that can affect the U.S. military's ability to operate around the world. If the U.S. military does not address the A2AD threat, it could cripple the United States' ability to project forces around the world during crisis or leave them vulnerable during military operations. Overcoming the A2AD threat is possible, but requires a new focus that currently is lacking. HIMARS, although used as a surface indirect fire asset to engage land targets, can and should have its ballistic computer and its munitions modified with an active seeker to serve as a multi-role platform capable of engaging both sea and land targets. HIMARS has the range, lethality, speed, fire power, deliverability, and survivability, to attack adversaries' threat systems with a high volume of lethal precision fires in all weather conditions and then quickly displace to another location prior to being detected. If the HIMARS launchers ballistic computer is updated and ATACMS are modified with an active seeker to engage moving targets, it would create a multi-role platform that could support conventional deterrence capabilities on both land and sea. Finally, HIMARS and its munitions, if upgraded with an increased ability to seek, acquire, and destroy moving targets, would have the capability to defeat all types of A2AD threats with a precision strike.					
<b>15. SUBJECT TERMS</b> High Mobility Artillery Rocket Systems (HIMARS); Army Tactical Missile System (ATACMS); Anti-Access Area-Denial (A2AD); Ac					
<b>16. SECURITY CLASSIFICATION OF:</b>			<b>17. LIMITATION OF ABSTRACT</b>  UU	<b>18. NUMBER OF PAGES</b>  37	<b>19a. NAME OF RESPONSIBLE PERSON</b> Marine Corps University/Command a
<b>a. REPORT</b>  Unclass	<b>b. ABSTRACT</b>  Unclass	<b>c. THIS PAGE</b>  Unclass			<b>19b. TELEPHONE NUMBER (include area code)</b>  (703) 784-3330 (Admin Office)

United States Marine Corps  
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MASTER OF MILITARY STUDIES

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**TITLE:** HIMARS: Redesigned into a Multi-role Platform

SUBMITTED IN PARTIAL FULFILLMENT  
OF THE REQUIREMENTS FOR THE DEGREE OF  
MASTER OF MILITARY STUDIES

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## Executive Summary

**Title:** HIMARS: Redesigned into a Multi-role Platform

**Author:** Major Joel A. DeLuca, United States Marine Corps

**Thesis:** In order to conduct successful military operations in an A2AD environment, the U.S. Marine Corps needs to upgrade its current HIMARS launchers and munitions into a multi-role platform that can deny adversaries sanctuary and freedom of maneuver and action.

**Discussion:** The rise of A2AD weapons systems and tactics poses a major challenge that can affect the U.S. military's ability to operate around the world. If the U.S. military does not address the A2AD threat, it could cripple the United States' ability to project forces around the world during crisis or leave them vulnerable during military operations. Overcoming the A2AD threat is possible, but requires a new focus that currently is lacking. HIMARS, although used as a surface indirect fire asset to engage land targets, can and should have its ballistic computer and its munitions modified with an active seeker to serve as a multi-role platform capable of engaging both sea and land targets. HIMARS has the range, lethality, speed, fire power, deliverability, and survivability, to attack adversaries' threat systems with a high volume of lethal precision fires in all weather conditions and then quickly displace to another location prior to being detected. If the HIMARS launchers ballistic computer is updated and ATACMS are modified with an active seeker to engage moving targets, it would create a multi-role platform that could support conventional deterrence capabilities on both land and sea. Finally, HIMARS and its munitions, if upgraded with an increased ability to seek, acquire, and destroy moving targets, would have the capability to defeat all types of A2AD threats with a precision strike.

**Conclusion:** The U.S. must maintain its ability to project forces in areas in which potential adversaries challenge our freedom of navigation and access. In these areas, technologically advanced adversaries will use asymmetrical weapons and capabilities to deny us access. The U.S. military must invest in advanced capabilities that allow it to continue to operate effectively in anti-access area denial environments. HIMARS needs to be modified as a multi-role platform capable of defeating A2AD threats in order to allow U.S. military forces to defeat threats that challenge its' ability to power project or threaten its freedom of navigation.

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## *Preface*

Anti-access area denial concerns are not new and are a serious threat to the U.S. military's ability to operate around the world. Today, both state and non-state adversaries are increasingly embracing a strategy of anti-access area denial to counter American power projection capabilities. The intent of this paper is to examine the A2AD threat and how US Marine Corps HIMARS launchers loaded with ATACMS modified with an active seeker would create a sophisticated multi-role platform capable of engaging moving targets which would be capable of countering any land or sea A2AD threats employed against U.S. military forces.

HIMARS as a multi-role platform is something I became very interested in during my last assignment at the Marine Corps Warfighting Lab. Several times, during experimentation, HIMARS was looked at to perform tasks that were outside its original scope. It proved to be a very versatile fire support system with great potential. While researching and writing this paper, I received guidance and assistance from a variety of professionals at Marine Corps Command and Staff College. My Military Faculty Advisor, Lieutenant Colonel Winston Gould, United States Air Force, and my Civilian Faculty Advisor and mentor, Dr. James Joyner, provided superb instruction, guidance, and mentorship throughout the academic year. In addition, I would like to thank and acknowledge Colonel (ret) William D. Hughes III, Fires Experimentation Planner, Futures Directorate, Marine Corps Warfighting Lab, who I consider a great friend and mentor, who provided guidance, mentorship, and advice while I developed this paper.

Finally, I would like to thank my wife, Maureen, and our four children, Sydney, Makenna, Sean, and Maxwell, for supporting me and giving me the motivation, determination, and happiness in life.

## Table of Contents

	Page
EXECUTIVE SUMMARY .....	ii
DISCLAIMER .....	iii
PREFACE .....	iv
ILLUSTRATIONS .....	vi
Introduction.....	1
Background: Understanding the Challenges of Defeating A2AD .....	2
Current U.S. Military A2AD Capabilities and Challenges.....	11
Joint Doctrine.....	11
Air Force and Navy Capabilities.....	12
Air Sea Battle.....	14
Capabilities of the HIMARS Launcher and Rockets .....	16
HIMARS as a Multi-Role Platform .....	19
CONCLUSION.....	24
BIBLIOGRAPHY.....	28

## Illustrations

	Page
Figure 1. Depicts Chinese ASCMs and ASBMs Missile Coverage. ....	7
Figure 2. Depicts Iranian Missile Coverage in the Persian Gulf. ....	8
Figure 3. Depicts North Korea's Missile Coverage. ....	10

## Introduction

The U.S. military has not been significantly challenged in gaining or maintaining air and maritime superiority since the Vietnam War. Modern anti-access area-denial (A2AD) systems have given potential adversaries the ability to significantly challenge the U.S. military's ability to gain freedom of action and movement, by changing the character of modern warfare on land and sea. In order for the U.S. military to maintain freedom of action and maneuverability in future conflicts, it must mitigate and defeat these new capabilities and threats by developing a weapons system that has the ability to defeat A2AD threats on land and sea.

Currently the U.S. military does not possess a single weapons system with the fire power, speed, and survivability capable of defeating A2AD threats on land and sea. However, modifying the High Mobility Artillery Rocket Systems (HIMARS) fire control ballistic computer<sup>1</sup> and modifying the Army Tactical Missile System (ATACMS) with an active seeker would create a multi-role platform capable of engaging moving targets that would support conventional deterrence missions on both land and sea. HIMARS is a flexible, scalable, 24/7, long range, all weather, high rate of fire asset that has the ability to mitigate and defeat most state and non-state actors' capabilities that could deny the U.S. the ability to project forces ashore or deny adversaries the ability to access sensitive areas. In order to conduct successful military operations in an A2AD environment, the U.S. Marine Corps needs to upgrade its current HIMARS launchers and munitions into a multi-role platform that can deny adversaries sanctuary and freedom of maneuver and action.

*“The success of any major operation or campaign depends on the free movement of one’s forces in the theater. Without the ability to conduct large-scale movements on land, at sea, and in the air, operational warfare is essentially an empty concept.”<sup>2</sup>*

## **Background: Understanding the Challenges of Defeating A2AD**

A2AD is intended to serve two purposes: Anti-access (A2) actions are intended to slow deployment of friendly forces into a theater or cause forces to operate from distances farther from the focus of conflict than they would otherwise prefer. A2 affects movement to a theater. While area-denial (AD) actions are intended to impede friendly operations within areas where an adversary cannot or will not prevent access. AD by contrast involves short or medium range weapons and affects maneuver within a theater.<sup>3</sup>

A2AD capabilities seek to exploit a common axiom of warfighting, the notion that military strength degrades over distance. Both state and non-state competitors are increasingly able to combine geographic, political, and military impediments into a congruent strategy that extends across all domains to counter American power projection.<sup>4</sup> This comprehensive approach is fueled by the growing national power of countries with expanding economies, increasingly sophisticated long-range precision weapons, space and cyberspace attack capabilities, and the increasing vulnerability and weakness of the global economy.<sup>5</sup> Potential adversaries able to establish mutually supporting defensive belts with fully integrated anti-access area denial defenses in multiple domains may deny U.S. operational access altogether, while others with less robust and broad capabilities may rely on inflicting greater losses than they perceive the United States will tolerate politically.<sup>6</sup>

Warfighting that relies on A2AD capabilities is deliberately asymmetrical. The goal of A2AD:

[I]s to deny the opposing force the ability to gain operational access and freedom by preventing it from establishing a foothold that might allow the adversary to exploit advantages of a superior ability to project cross-domain superiority.

Weapons systems and capabilities employed in the pursuit of either longer range anti-access or shorter range area denial may themselves be technologically advanced or crude, but they must be wielded towards countering military mismatch.<sup>7</sup>

There are a variety of possible weapons systems available to wealthy large states, as well as smaller and non state actors to serve an A2AD purpose.

Anti-access area denial concerns are not new and are a serious threat to the U.S. military's ability to operate around the world. Since the mid-1990's, senior U.S. military leaders have been voicing strong concern over the U.S. military's ability to deal with anti-access area denial threats. General Ronald Fogleman, then Air Force Chief of Staff, observed in 1996 that:

Saturation ballistic missile attacks against littoral forces, ports, airfields, storage facilities, and staging areas could make it extremely costly to project U.S. forces into a disputed theater, much less carry out operations to defeat a well-armed aggressor. Simply the threat of such enemy missile attacks might deter U.S. and coalition partners from responding to aggression in the first instance.<sup>8</sup>

In November 1997, Admiral Jay Johnson, then Chief of Naval Operations, expressed very similar concerns when he stated:

Over the past ten years, it has become evident that proliferating weapon and information technologies will enable our foes to attack the ports and airfields needed for the forward deployment of our land-based forces.

I anticipate that the next century will see... [our] foes striving to target concentrations of troops and materiel ashore and attack our forces at sea and in the air. This is more than a sea-denial threat or a Navy problem. It is an area-

denial threat whose defeat or negation will become the single most crucial element in projecting and sustaining US military power where it is needed.<sup>9</sup>

In addition, in 2002, then-Secretary of Defense Donald Rumsfeld noted, "[P]otential adversaries...see that our ability to project force into the distant corners of the world where they live depends, in some cases, on vulnerable foreign bases."<sup>10</sup> Then-Deputy Secretary of Defense Paul Wolfowitz, expanded on Rumsfeld's observation to the House Budget Committee, stating,

US forces depend on vulnerable foreign bases to operate-creating incentives for adversaries to develop 'access denial' capabilities to keep us out of their neighborhoods. We must, therefore, reduce our dependence on predictable and vulnerable base structure, by exploiting a number of technologies that include longer-range aircraft, unmanned aerial vehicles, and stealthy platforms, as well as reducing the amount of logistical support needed by our ground forces.<sup>11</sup>

If the U.S. military does not address the A2AD threat, it could cripple the United States' ability to power project forces around the world during crisis or leave them vulnerable during military operations.

During the August 2002 Millennium Challenge wargame, Retired Marine Lieutenant General Paul Van Riper demonstrated the vulnerability of U.S. naval ships and the importance of a counter to A2AD tactics. Van Riper applied asymmetric tactics against U.S. naval forces, using numerous small rapid attack boats to swarm the U.S. Navy vessels. Within the span of approximately ten minutes, he sank sixteen U.S. Navy warships.<sup>12</sup>

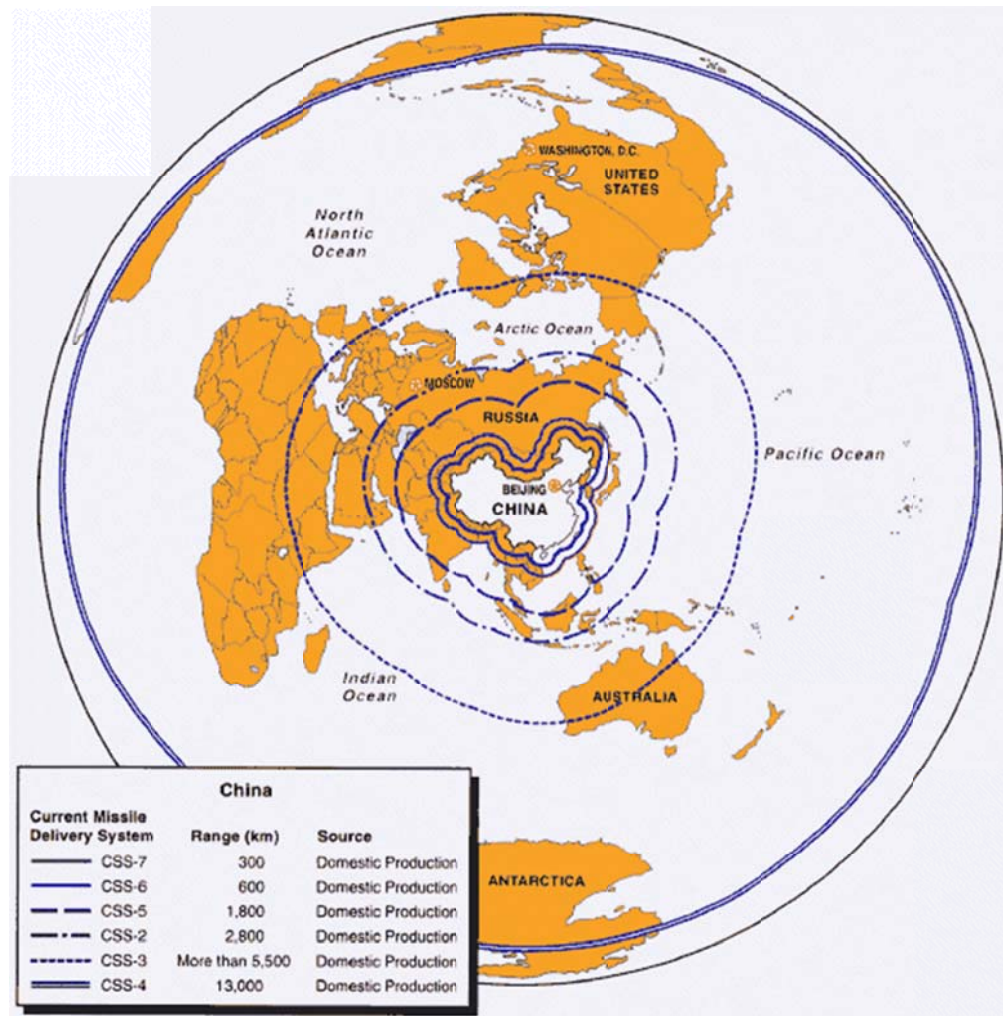
During operations over the past quarter century, the United States military has had the ability to project power uncontested at the time and place of its choosing. However, today several nations' A2AD capabilities could challenge the United States' ability to project military

force. According to the Joint Operational Access Concept (JOAC) document, future state and non-state adversaries “see adoption of anti-access/area-denial strategies against the United States as a favorable course of action for them.”<sup>13</sup> Strategically, A2AD restricts the U.S. military's ability to protect its vital interests in key regions. Operationally, A2AD negates the U.S. military's the ability to fight the way it prefers. Tactically, A2AD presents the U.S. military with a challenging multi-domain defense with long-range offensive capabilities and fires.<sup>14</sup>

Several nations, particularly China and Iran, are rapidly becoming capable of challenging the status quo. The United States faces competitors that have the ability to inflict heavy costs on its air and naval forces. Maintaining stability in East Asia will therefore require significant changes to U.S. military capabilities and posture. For the past two decades, China has been increasing its defense spending, developing new warfighting strategies, and fielding advanced weapons systems.<sup>15</sup> Currently, during any conflict in East Asia the United States can only count on its land-based tactical aircraft capabilities. However, those bases they operate from are becoming more vulnerable to attacks from China's ballistic and cruise missiles. China has the capability of launching extremely accurate missiles along with its increasingly modern air forces, which can be armed with a variety of precision-guided munitions.<sup>16</sup> A coordinated Chinese offensive attack utilizing ballistic and cruise missile could overwhelm U.S. military base defenses. An attack of this nature could crater runways, damage aircraft parked in the open, and destroy infrastructure such as weapons depots and fuel storage facilities.<sup>17</sup> The increased threat to U.S. military bases in the region will force the United States to utilize remote bases that are less vulnerable. This however, will significantly reduce the amount of combat power that can be projected into the region, because the majority of U.S. airpower consists of short-range fighters.

During a time of crisis or conflict, the United States would depend on its aircraft carriers to project military power into adversaries' regions. When dealing with an adversary like China, U.S. aircraft carriers are at extreme risk, due to China's large inventory of anti-ship cruise missiles (ASCMs) and its supersonic ASCMs that can be launched from hard-to-detect diesel-electric submarines.<sup>18</sup> In addition, China has fielded the DF-21D (CSS-5) anti-ship ballistic missile (ASBM), which has an estimated range of more than 800 nautical miles, carries a maneuverable warhead to strike mobile targets while avoiding sea-based defenses, and has been dubbed the "carrier killer".<sup>19</sup> Although there is no guarantee Chinese ASBM would work effectively, the potential threat alone could deter U.S. carriers by forcing them to remain outside the range of the missile and ultimately the effective range of their embarked aircraft.

China is heavily involved in the development of ASCMs and ASBMs with capabilities that span ranges and payloads from theater to intercontinental (Figure 1). The Chinese have developed a robust anti-access capability with its ASCMs and ASBMs. These systems have the capability to pose a serious threat to any force that wishes to operate in the near seas along China's coasts or in international waters. China's military has intently studied America's victory in the First Gulf War and subsequent operations.<sup>20</sup> In an event of tension in the East and South China Seas or the area around the Taiwan Strait, the Chinese could engage any target with an abundance of cruise and ballistic missiles from various locations. In addition, the Chinese would utilize a robust cyber, submarine, and surface forces that could deny access across multiple domains, putting U.S. military forces in a situation to withdraw unless they are willing to accept high levels of casualties.<sup>21</sup>



**Figure 1. Depicts Chinese ASCMs and ASBMs Missile Coverage.**<sup>22</sup> (The China's have four DF-21 variants: The DF-21 and the DF-21A are the theater-range nuclear missiles, the DF-21C is a theater-range conventional missile, and the DF-21D is an anti-ship ballistic missile with a range exceeding 1500 km. All four DF-21 variants are road-mobile and use solid fuel, which increases their survivability and decreases their maintenance costs.<sup>23</sup>)

Since 1979, the relationship between China and Iran has grown stronger, because of bilateral trade of Chinese consumer goods and weapons for Iranian oil.<sup>24</sup> This Sino-Iranian military relationship concerns many observers in the West. China and North Korea have both played a critical role in the development of Iran's A2AD capabilities, supplying Iran with a variety of A2AD weapons systems.<sup>25</sup> Iran's increased focus on stockpiling A2AD weapons capabilities with agility, speed, and decentralized command and control (C2) tactics, combined with advanced anti-ship and anti-aircraft weaponry, indicates its desires to wage an asymmetric

fight against a more conventionally capable foe by acquiring assets that will enable it to defend its mainland (Figure 2). China’s ongoing support of Iran’s A2AD military program suggests that they view Iran as a proxy military power in the Middle East, and may hope to use Iran to apply pressure on U.S. forces and to restrict Western oil supplies in the event of a Sino-American conflict in the Pacific.<sup>26</sup>



Figure 2. Depicts Iranian Missile Coverage in the Persian Gulf.<sup>27</sup> This picture does not depict the Ying Ji-7 (C-701) anti ship missile with a range of 25 kilometers.

Iran does not have a strong enough military force to engage in a conventional military engagement with American military forces. However, if Iran did find itself in a conflict with the U.S., it would depend heavily on its asymmetrical military capabilities, which has the capabilities to inflict significant problems for the U.S. military. Iran's unconventional naval and air A2AD capabilities, enhanced by decentralized command-and-control (C2) assets dispersed deep inside Iran's mainland, could affect U.S. operations in the Persian Gulf. In particular, traversing the narrow Strait of Hormuz could cause serious challenges to American or coalition forces.<sup>28</sup> The Strait of Hormuz at its narrowest point is only 21 miles across.<sup>29</sup> In the face of a coordinated Iranian offensive involving fast attack craft, suicide boats, anti-ship cruise missiles, and mines, navigating the Strait would be extremely difficult and a dangerous task. In addition, the Strait is one of the worlds' most important oil shipping lanes. Approximately twenty percent of the world's petroleum is shipped through the Strait, any major disruption to this strategically important shipping lane would significantly disrupt the international oil markets, raising gas prices in the U.S. and elsewhere, and undermining public support for a sustained conflict with Iran.<sup>30</sup>

Iranian anti-ship missiles pose a serious threat to U.S. naval forces in the Persian Gulf. Iranian anti-ship missiles are capable of traveling at supersonic speeds and at low altitudes just above the surface of the water, which help them evade radar systems and defeat ships defensive measures.<sup>31</sup> Iranian guided missiles can be launched by sea, land, or air, and are highly effective against small and medium-size naval vessels.<sup>32</sup> Though Iran domestically develops and produces a variety of anti-ship missile systems, much of its current anti-ship capability stems from Chinese technology.

North Korea is the most immediate military threat to U.S. interests. Although North Korea's ability to sustain an invasion of the South may have deteriorated, its ballistic missile and nuclear weapons programs continue to grow (Figure 3). The uncertainty about stability under Kim Jong-un are forcing the United States and the Republic of Korea to consider additional contingencies, including the potential for North Korean to use weapons of mass destruction (WMD) during war fighting scenarios, horizontal proliferation, provocations comparable to the attacks on the Republic of Korea's Cheonan naval vessel and the island of Yeongpoo,<sup>33</sup> and regime collapse or instability.<sup>34</sup>



Figure 3. Depicts North Korea's Missile Coverage.<sup>35</sup>

## **Current U.S. Military A2AD Capabilities and Challenges**

The rise of A2AD weapons systems and tactics poses a major challenge that can affect the U.S. military's ability to operate around the world. Overcoming the A2AD threat is possible, but requires a new focus that currently is lacking. HIMARS, although used as a surface indirect fire asset to engage land targets, can and should have its ballistic computer and its munitions modified with an active seeker to serve as a multi-role platform capable of engaging both sea and land targets. The HIMARS launcher is currently capable of shooting both GMLRS and ATACMS munitions; however neither munition is capable of hitting a moving target. The intent of this paper is to examine the A2AD threat and how US Marine Corps HIMARS launchers loaded with ATACMS modified with an active seeker would create a sophisticated multi-role platform capable of engaging moving targets which would be capable of countering any land or sea A2AD threats employed against U.S. military forces. In addition, due to its high rate of fire, precision, range, and lethality, HIMARS if modified could serve as a defensive weapons system to prevent adversaries the ability to access sensitive areas and attack U.S. Navy ships anchored in ports, transiting straits, or conducting amphibious landing operations.

### **Joint Doctrine**

The U.S. military has two joint documents that address A2AD. The Joint Operational Access Concept (JOAC) is the Chairman of the Joint Chiefs of Staff vision for overcoming emerging A2AD challenges.<sup>36</sup> The second document is the Joint Concept for Entry Operations (JCEO), which is the Chairman of the Joint Chiefs of Staff's focus on the integration of force capabilities across domains in order to secure freedom of maneuver.<sup>37</sup> Both fail to take in to consideration current U.S. military capabilities and the challenges it will have to contend with in an A2AD environment. JOAC and JCEO are relatively concise documents, describing in broad

terms how joint forces will operate in response to emerging A2AD security challenges. The documents try to translate the A2AD threats into operational concepts intended to guide the U.S. military on how to train, man, equip, and deploy forces. The JOAC is the principal model that is supposed to guide U.S. military to counter adversary's A2AD threats. The intent of the document is to describe how joint forces will gain operational access against an armed adversary as part of a broader national approach. Although it is supposed to look at A2AD threats at the operational level, it really does not provide much guidance past the strategic level.

### **Air Force and Navy Capabilities**

The Air Force and Navy provide a vital air and surface delivery and attack capability to Army and Marine Corps forces in order to allow and support them to conduct freedom of action and movement into an adversary's territory.<sup>38</sup> If these capabilities are challenged, it could seriously affect and limit U.S. military operations around the world. Currently, in an A2AD environment, the Air Force is challenged by long range precision ballistic and cruise missiles. Adversaries today have the capability to shoot ballistic and cruise missiles at U.S. airfields over 1,000 miles away.<sup>39</sup> These missiles have the capability of damaging runways and/or destroying aircraft on the ground unless the airfield is well defended with hardened hangars or defended by surface-to-air missiles. To compound this threat, it will compel the Air Force to operate further away from the threat of these missiles in order to protect its airfields. By doing this, the Air Force will expand its area of operation, increase distances to fly in order to support U.S. ground forces (reducing sorties and support), and increases its exposure to surface-to-air threats. This becomes even more dangerous when dealing with a country like China, which has a large arsenal of surface-to-air missiles and just recently announced a new very agile long range, high-altitude, surface-to-air missile, which possesses a dual seeker that can evade jamming and is effective

against both low and high altitude missiles and aircraft.<sup>40</sup> Countries with robust surface-to-air threats, like China, seriously threaten the Air Forces ability to engage A2AD targets and support ground forces.<sup>41</sup>

Similar to the Air Force, the Navy is challenged by both long and short range A2 threats that must be defeated in order to conduct successful operations. Navy ships conducting operations in the littoral are threatened by mines, fast attack boats, and rapid attack suicide boats employing swarming tactics,<sup>42</sup> and submarine.<sup>43</sup> These types of tactics can damage or destroy Navy ships by creating distractions and leaving it susceptible to an anti-ship ballistic missile attack. Because of this, the A2 long range ASBM threat will create havoc for Marine Corps amphibious operations. It will force Navy ships to operate much farther from adversaries coastlines, this in turn will requiring the landing force to have to traverse greater distances in slow moving crafts over a greater distance in open war. Conducting amphibious operations over a longer distance puts a greater risk on the landing craft and the ability to evacuate casualties or resupply forward troops.

The Navy does have a long and short range capability to provide Naval Surface Fire Support (NSFS) against A2 threats. Navy ships have several means to engaging surface targets, either with naval gunfire, Tomahawk Land Attack Missile (TLAM), or standard missile. Naval gunfire has the ability to engage land targets with a high volume of fire, very quickly while moving. This shoot and scoot method is very effective in defending the ship from counterfire, but in order for the fires to be effective, the ship needs to be within 16 miles of the target, which leaves the ship vulnerable to mines, fast attack boats, and ASBM attacks. In addition, naval gunfire is limited to targets it can engage due to the flat trajectory the round travels.<sup>44</sup> A round shot with a flat trajectory is unable to hit targets in a built up area (cities) or hilly terrain, due to

the round impacting the intervening crest prior to reaching the intended target. Usually a target located in this type of environment needs to be engaged from a high angle, which naval gun fire is not capable.

The TLAM can be launched from a Navy ship or submarine and carries a nuclear or conventional payload, capable of traveling over 500 nautical miles. Although it has proven extremely effective against targets; there is not a large quantity on board ships, and they are usually devoted to high value or time-critical targets; can only be used against fixed targets; it is not a high volume of fire weapon and leaves the ship vulnerable to ASBM attacks while it is in its launch area.<sup>45</sup> Navy ships also have Standard Missiles, which only can be used against air and sea borne surface threats and not land targets. Like the TLAM, there is not a large quantity on board ships and they are usually reserved for use against threats towards the ship.

### **Air Sea Battle**

In 2009, in order to address the growing A2AD challenges, the Navy and Air Force agreed to pursue a new operational concept called Air Sea Battle<sup>46</sup>. The purpose of this strategy was to address high-end military operations in the Western Pacific, by assessing how U.S. power projection capabilities can be preserved in the face of growing A2AD challenges, to include the most formidable challenges, which are posed by the Chinese military. Air Sea Battle is not a template for winning a war, but a guideline for things to consider while setting the conditions at the operational level to sustain a stable, favorable conventional military balance throughout the Western Pacific.<sup>47</sup> Air Sea Battle is an operational concept that is limited. It seeks to defeat a credible Chinese A2AD threat by blinding China's Intelligence Surveillance and Reconnaissance systems, neutralizing China's Second Artillery Corps missile capabilities, dominating the Chinese Air Force by taking air superiority from them, and defeating the Chinese Navy.

Unfortunately, Air Sea Battle does not address the complexity of the threat and the military weapons systems needed to defeat the A2AD challenges.<sup>48</sup>

Air Sea Battle, recently renamed Joint Concept for Access and Maneuver in the Global Commons (JAM-GC),<sup>49</sup> requires a significant amount of operational, organizational, and technological/material initiatives to be successful. In order for this to happen, it will cost a significant amount of money to implement and maintain. Most likely, the cost required to implement the JAM-GC concept will be significantly higher than the Chinese is spending on A2AD assets. During a time of military cut backs, this type of concept will require significant near-term tradeoffs in force structure and readiness combined with a reorganization of U.S. global commitments. Ultimately, Chinese A2AD increased capability is deterring the U.S. by increasing the cost the U.S. military must pay to maintain access to the Asia-Pacific.<sup>50</sup>

According to the JAM-GC concept, the Chinese A2AD capabilities rely on an integrated air, land, sea, space, and cyber systems.<sup>51</sup> Therefore, the U.S. military needs a capability to disrupt these Chinese capabilities. If the U.S. military develops a weapons system with the range and lethality to disrupt Chinese Navy (PLAN) ships, which is a critical vulnerable A2AD system, then the U.S. military can ultimately weaken Chinese anti-air, anti-ship, and anti-submarine capabilities. By doing this, it would reduce the probability of Chinese operational success and increase the likelihood and totality of costs of developing, fielding, and employing an A2AD capable military force. Attacking Chinese ships at sea and destroying its A2AD capability is less risky than the JAM-GC concept of just focusing on attacking and neutralizing Chinese capabilities on the mainland. By neutralizing Chinese ships first, it creates a standoff distance, which will provide protection for the U.S. military to focus on neutralizing mainland threats second. As a result, the U.S. could achieve significant asymmetric deterrent effects if it could

field an economical, expeditionary, rapidly deployable, survivable capability to accomplish the anti-surface warfare mission.<sup>52</sup>

### **Capabilities of the HIMARS Launcher and Rockets**

HIMARS is a wheeled, indirect fire, rocket/missile launcher capable of engaging a variety of targets while firing all rockets and missiles in the current and future Guided Multiple Launch Rocket System (GMLRS) and Army Tactical Missile System (ATACMS) Family of Munitions (AFOM). A Marine Corps HIMARS battery has six launchers and can fire thirty-six GMLRS rockets (6 per launcher) or six ATACMS (1 per launcher) out to ranges of 185 miles (300 km).

In 2007 the Marine Corps performed a supplemental historical study using Operation Iraqi Freedom data to examine the Marine Air Ground Task Force (MAGTF) fires in the full spectrum of warfare. The studies identified the need for a triad of Ground Indirect Fires.<sup>53</sup> This triad would provide the MAGTF with long (HIMARS), medium (M777 howitzer [155MM]), and short (Expeditionary Fire Support System [120 MM]) range indirect fires. HIMARS was developed to address the long range critical warfighting deficiency in the Marine Corps fire support systems. HIMARS accurately engages targets with a high volume of lethal precision fires in all weather conditions and throughout all phases of combat operations ashore to support the MAGTF to include irregular warfare and distributed operations. The purpose of HIMARS is to engage and defeat adversary's artillery, air defense assets, vehicles, armor, logistic hubs, and troop formations. Because HIMARS is a wheeled vehicle and has a digital fire control system, it does not have to be co-located with the Fire Direction Center (FDC) or other launchers. Once HIMARS launches its weapons, it can move away from the launch area at a high rate of speed before enemy forces are able to locate the launch site and return with a counter attack. This

capability gives the HIMARS launcher an increased survivability and makes it a prime weapons system to use in an A2AD environment.<sup>54</sup> Because of its lethality, range, and speed, adversaries will need to dedicate more assets to try and locate the launchers, which will tie up more assets and leave surface more susceptible to being attacked.

Currently the Marine Corps has four active component and three reserve HIMARS batteries. They can fight as a battery with 6 launchers or scatter across the battlefield and fight as platoons (2 launchers) or depending on the mission as a single launcher. The FDC is capable of coordinating fires for all six launchers from one location.

Logistically looking at HIMARS, the HIMARS launcher is mounted on a similar vehicle as its logistic vehicles. The launchers' prime mover is a Medium Tactical Vehicles five-ton (6x6) truck chassis, which is an extremely durable vehicle capable of rapidly deploying and operating in austere environments. Given that HIMARS launchers and ATACMS are fully fielded systems, the program is affordable. The ATACMS unitary warhead costs about \$725 thousand per missile and under \$1 million with an active seeker installed, which is a reasonable price tag in today's procurement environment.<sup>55</sup>

It has been proven in Operation Desert Storm and then again in Operation Iraqi Freedom that trying to find mobile missile launchers is a very difficult task. In doing so, it ties up significant amounts of dedicated reconnaissance and intelligence assets trying to pinpoint and locate the mobile launchers. This suggests that using HIMARS launchers and modified ATACMS employed in an anti-ship role from friendly territory or road accessible locations would be highly survivable.<sup>56</sup> When integrated with the full capabilities of a MAGTF conducting distributed operations, this enhanced capability for Marine artillery can make critical contributions to Joint sea control and sea denial operations.<sup>57</sup>

Currently the Marine Corps only use one of the two variants of the fielded GMLRS rockets, the M31 GMLRS Unitary rocket. The M31 GMLRS Unitary rocket is a 200 pound class high explosive warhead. It is a precision strike rocket that integrates a multi-mode fuze with a high explosive warhead, which makes it an all-weather, low collateral damage rocket.<sup>58</sup> The rocket has impact, variable time (VT) and delayed fusing capabilities. It employs fully automated digital fire controls and inertial guided/GPS aided navigation system that use canards for corrections in flight which improves accuracy.<sup>59</sup>

A semi-active laser (SAL) seeker has already been integrated into the GMLRS and recently tested at White Sands Missile Range with great success. In an A2AD environment, the GMLRS is desired due to its high rate of fire; however, due to its small warhead and lack of terminal velocity it would have minimal effects against an A2AD target. The Marine Corps also can utilize the ATACMS, which is a deep strike precision weapon, capable of engaging time critical targets at high precision under all weather conditions, with a more powerful warhead and the terminal velocity to destroy or severely disable any potential adversary's target ship. As an A2AD munition, the Quick Reaction Unitary (QRU/M48) or ATACMS 2000 (T2K/M57) missiles, with a 500-lb high explosive warhead guided by a GPS aided navigation system would be the preferred missiles to attack maneuvering ships, if modified with an active seeker. The M48 and M57 missiles are capable of engaging point targets with minimal collateral damage at ranges of 300 kilometers.<sup>60</sup> The rate of fire for the M48 and M57 ATACMS is one missile per launch pod. It takes a crew approximately 5-6 minutes to reload a launcher with a new pod.<sup>61</sup> ATACMS have demonstrated their accuracy and reliability hundreds of times during combat operations in Iraq and Afghanistan. However, the current limitation of the missiles is the inability to attack moving targets.

## **HIMARS as a Multi-Role Platform**

HIMARS has the range, lethality, speed, fire power, deliverability, and survivability, to attack adversaries threat systems with a high volume of lethal precision fires in all weather conditions and then quickly displace to another location prior to being detected. If the HIMARS launchers ballistic computer was updated and ATACMS were modified with an active seeker to engage moving target, it would create a multi-role platform that could support conventional deterrence capabilities on both land and sea. With this increased ability to seek, acquire, and destroy moving targets, HIMARS would have the capability to defeat all types of A2AD threats with a precision strike. In addition, with this increased capability, HIMARS can serve as a defensive weapon capable of denying U.S. military adversaries the ability to gain access or influence friendly areas of operations.

During Exercise Valiant Shield-14 (VS14), a large military war game that was conducted in the Pacific Ocean near the Mariana Islands, III Marine Expeditionary Force (MEF) tested the versatility of using HIMARS as a multi-role platform. During the exercise, a HIMARS platoon from 5th Battalion 11th Marines (5/11) was used to see if it could "Provide shore based fires in support of sea control/denial missions."<sup>62</sup> Prior to execution, the following criteria were established for the task being assessed. The HIMARS platoon had to deploy from ship to shore, occupy a firing position on Tinian Island, and provide firing capability (FIRECAP) to all fire support and targeting agencies. Once ashore the HIMARS platoon had to utilize High Frequency (HF) communication in order to generate FIRECAP, surface danger zone information and receive targeting and fire support coordination information from higher and supported units.<sup>63</sup>

Following the exercise on Tinian Island, the following assessments were made about utilizing HIMARS as a multi-role platform. During the exercise, 5/11's HIMARS platoon was successful in completing all criteria established prior to the exercise:

The efforts of the 5/11 HIMARS platoon clearly demonstrate the use of a HIMARS like unit with active seeker missiles can provide the long range shore based anti-ship fires in support of the Joint Force Maritime Component Commander (JFMCC) sea control and denial mission. Marines armed with anti-ship missiles can serve as an economy of force effort and will bring capabilities into the fight that could allow larger forces freedom of movement in the Area of Operation (AO). The HIMARS platoon was very flexible, and was able to integrate supporting fires with great success.<sup>64</sup>

In addition to the assessment, the following recommendations were made in the After Action Report. HIMARS launchers proved to be adequately equipped to perform the sea denial mission, but "the missiles needed to be updated in order to strike seaward threats." Repurposing ATACMS into an anti-ship role would require integration of a seeker and modification of the flight software for terminal engagement against maneuvering ships. It was also recommended that a long range anti-air missile<sup>65</sup> also be developed, providing HIMARS with the capability of striking targets on land, sea, and in the air.<sup>66</sup>

During exercise VS14, III MEF demonstrated the usefulness of repurposing HIMARS, an existing weapon system, in order to enhance future MAGTF fires capabilities ashore. VS14 identified a capability gap and the need for a modified HIMARS missile capable of engaging moving targets on land and sea with an extended range that would defeat potential adversaries A2AD systems designed to challenge III MEF's maritime freedom of action in the Pacific.

Because of this capabilities gap/shortfall, III MEF has submitted a Deliberate Universal Need Statement (D-UNS) to Headquarters Marine Corps to procure HIMARS munitions capable of engaging maneuvering targets in a maritime environment. In the D-UNS, III MEF Fires Cell states the following:

These [A2AD] systems and emerging technologies directly threaten our ability to conduct joint and combined operations with allies by denying our access to key geography in and around the littorals. Marine Air Ground Task Forces (MAGTF) is capable of operating from forward areas and lodgments, but lack adequate all-weather surface-to-surface fires capabilities to counter adversary power projection forces or enable friendly offensive operations and maritime maneuver.<sup>67</sup>

In addition, III MEF added that as the A2AD systems expand:

[O]ur ability to rapidly respond in support of allies during a crisis, or execute deterrence options becomes increasingly difficult. The factors of time and space shift in favor of an adversary as our naval and air components operate from greater distances and intermediate staging bases are threatened. MAGTFs are ideally suited to counter this threat by operating within the area subject to A2AD systems. Properly task organized and equipped, MAGTFs can project power from forward lodgments or bases, reduce an adversary's freedom of maneuver, complicated his targeting problems and place his power projection forces in a defensive mindset. MAGTFs require shore-based, all weather anti-ship and counter-lodgment fires capabilities, which they currently lack.<sup>68</sup>

In the D-UNS, III MEF has endorsed the U.S. Army Long Range Precision Fires (LPRF) (ATACMS Block IA Unitary) missile for a HIMARS compatible all-weather system with an objective range of 499 kilometers and modified with an active seeker.<sup>69</sup>

If the Marine Corps modifies ATACMS with an active seeker to engage moving targets it would have a multi-role platform with the range and terminal velocity to attack and destroy an adversary's ship at sea. The M48 and M57 ATACMS, with a 500-lb high explosive precision warhead and point detonation fuses have the capability and terminal velocity to strike and destroy targets at distances of 300 kilometers.<sup>70</sup> With its fully automated digital fire controls and inertial guided/GPS aided navigation system, the AFOM is capable of rapid engagement of time sensitive targets.<sup>71</sup> Although tested during Exercise Valiant Shield-14, a live missile was not used or tested against ships. However, according to Marine Lieutenant Colonel Samarov (SIG Analyst) SIG Note dated September 2013, "ATACMS Program Managers believe that the system could achieve good effects in this role, especially given the weapon's speed of impact and top down attack profile."<sup>72</sup> According to the U.S. Army publication 6-60-30 the AFOM being a semi-ballistic missiles, "is generally not vulnerable to short range, low altitude air defense weapons. However, some potential enemies possess long range, high altitude air defense assets that are marginally effective against an AFOM missile."<sup>73</sup>

When fighting an adversary like China, a deployable Marine Corps anti-ship missile capability, as a complementary element of MAGTF single battle execution, would decrease the probability of success of an A2AD campaign. Once the potential for a kinetic situation arises, HIMARS platoons could be deployed across the AO on small islands or friendly territory during an unfolding crisis. Once in place, an adversary like China would have to utilize its Navy and other reconnaissance and intelligences assets to account for dozens of launchers capable of

operating as platoons or single launchers from almost any road accessible location. Given the difficulty of locating a mobile missile launcher and effective counter battery fire, Chinese surface ships would be forced to operate outside of the maximum effective range of the ATACMS. This would force Chinese Navy capabilities back towards their coastline, which would reduce their operating area and complicate China's layered anti-surface, anti-submarine, and anti-air warfare. Ultimately, it would reduce the operating area of the Chinese Navy, which would make it easier to locate and target those assets with Marine anti-ship ATACMS and Navy anti-surface warfare capabilities. In addition, because of the difficulty of locating a mobile missile launcher it would tie up a large amount of China's reconnaissance and intelligence assets that could be used for other means.

Repurposing HIMARS with modified ATACMS as an anti-ship platform would create financial challenges for China. In order to counteract this new system, the Chinese would have to spend a significant amount of money to field capabilities to detect, neutralize, and destroy HIMARS launchers scattered across the area of operation. Fielding such capabilities would be far more costly to the Chinese while being a relatively modest investment for the U.S. with this already existing program.

In addition, HIMARS is not a U.S. military only weapons system. The launcher and munitions have been cleared for foreign sales and have already been sold to Singapore, United Arab Emirates, Jordan, and Poland. If the U.S. could sell or provide HIMARS as a multi-role platform to partners and allies who feel threatened by Chinese, North Korea, or Iran's intimidation at sea would decrease the threat and these adversaries' ability to use A2AD as coercion.<sup>74</sup> If these threatened countries owned HIMARS, it would turn the tables against China, North Korea, and Iran, by either forcing them to spend more money on countermeasures or push

them outside the HIMARS threat ring, allowing U.S. partners and allied countries freedom of movement on the sea.<sup>75</sup>

To conclude, the U.S. must maintain its ability to project forces in areas in which our freedom of navigation and access are challenged by potential adversaries. In these areas, technologically advanced adversaries will use asymmetrical weapons and capabilities to deny us access. China and Iran will try to counter our power projection capabilities and freedom of navigation by utilizing asymmetric means, while non-state actors procure and use advanced weapons and technologies to their advantage. The U.S. military must invest in advanced capabilities that allow it to continue to operate effectively in anti-access area denial environments.

Modifying HIMARS into a multi-role platform would create an advanced capability that will allow U.S. military forces to defeat threats that challenge its ability to project power or threaten its freedom of navigation. During recent combat operations and Exercise Valiant Shield-14 both demonstrated that HIMARS have the range, lethality, speed, fire power, deliverability, and survivability, to attack adversary's threat systems with a high volume of lethal precision fires in all weather conditions and then quickly displace to another location prior to being detected. With these current capabilities and the addition of an ATACMS modified with active seeker, capable of striking moving targets would create a multi-role platform with devastating effects. The cost of upgrading the HIMARS launchers' ballistic computer and modifying ATACMS with an active seeker would be relatively inexpensive compared to the strategic benefits of fielding this capability. The Marine Corps is America's expeditionary force in readiness, must be able to power project forces. It needs to have a fire support system capable of supporting the MAGTF in an asymmetrical fight, which can defeat A2AD threats on both land and sea. Upgraded HIMARS

launchers and modified ATACMS with an active seeker is the advanced capability that will provide the Marine Corps with a tool capable of long range precision fires that can destroy adversaries A2AD threats on both land and sea.

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<sup>16</sup> Annual Report to Congress, "Military and Security Developments Involving the People's Republic of China 2013," Office of the Secretary of Defense.

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<sup>21</sup> Kazianis, Real Clear Defense, 2.

<sup>22</sup> U.S. Department of Defense, U.S. Army Publication, FM 100-12: *Army Theater Missile Defense Operations*, ch. 2.

<sup>23</sup> Ethan Meick, "China's Reported Ballistic Missile Sale to Saudi Arabia: Background and Potential Implications," *U.S.-China Economic and security Review Commission Staff Report*, June 16, 2014.

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