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The weight and size of the M1A1 Abrams combined with the limitations of amphibious shipping have seriously limited the ability of the Marine Corps and Navy to get the M1A1 Abrams to the right place, at the right time in accordance with the Marine Corps Operating Concept. The dilemma facing the Marine Corps today is whether to maintain the M1A1 Abrams or to pursue other courses of action that will ensure the continued support of precision armored firepower to the MAGTF in the future operating environment.

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MASTER OF MILITARY STUDIES

TITLE:

RELEVANCE OF MARINE CORPS ARMOR IN THE FUTURE OPERATING ENVIRONMENT

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

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Executive Summary

Title: Relevance of Marine Corps Armor in the Future Operating Environment

Author: Major Benjamin S. Adams, United States Marine Corps

Thesis: Given the challenges outlined in the *Marine Corps Operating Concept* the relevance of Marine Corps armor in the future operating environment will be determined by the ability to transport the M1A1 Abrams to the area of operations.

Discussion: Born out of the Cold War and entering production in the early 1980s the M1A1 Abrams tank has proven itself a formidable opponent against enemy armor on the conventional battlefields of DESERT STORM and against insurgents in Afghanistan and Iraq. Today the Marine Corps armor community is going through an identity crisis. Already one of the smallest combat arms units within the Ground Combat Element (GCE) of the Marine Corps Air Ground Task Force (MAGTF), tank battalions have been hit hard by the recent reductions in defense spending, experiencing force reductions from 116 to 88 M1A1 Abrams in the past fifteen months with more reduction likely to follow. The *Marine Corps Operating Concept* predicts that conflict will increase along the littorals and has given guidance on how the future MAGTF will get the right force, to the right place, at the right time. This paper will examine the utility of the M1A1 Abrams from a historical context. Next, this paper will analyze the current role of Marine armor in the MAGTF and the capabilities it provides the MAGTF commander. Additionally, it will discuss the future operating environment the Marine Corps is expected to face in the near future. Finally, this paper will address the limitations facing the Marine armor community and propose future tank platform options that will meet the requirements outlined in the *Marine Corps Operating Concept*.

Conclusion: Despite the proven performance of the M1A1 Abrams across the range of military operations, tank units in the Marine Corps are being significantly reduced as the Marine Corps shifts the focus of the role of the Marine Corps in future conflict. Although the mission of providing armored maneuver and close infantry support to the MAGTF is unchanged, the realities of the future operating environment have challenged the utility of the M1A1 Abrams and its role in future conflict. The weight and size of the M1A1 Abrams combined with the limitations of amphibious shipping have seriously limited the ability of the Marine Corps and Navy to get the M1A1 Abrams to the right place, at the right time in accordance with the *Marine Corps Operating Concept.* The dilemma facing the Marine Corps today is whether to maintain the M1A1 Abrams or to pursue other courses of action that will ensure the continued support of precision armored firepower to the MAGTF in the future operating environment.

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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Acknowledgments

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"I would eliminate the tank fleet found in the Marine Corps today if I could."

-General Charles C. Krulak, 31st Commandant, U. S. Marine Corps

I. Introduction

Shock, armored protection, speed, and precision fire are just a few of the words that are conjured when describing the Marine Corps M1A1 Abrams Main Battle Tank. Born out of the Cold War and entering production in the early 1980s the M1A1 Abrams tank has proven itself a formidable opponent against enemy armor on the conventional battlefields of DESERT STORM and against insurgents in Afghanistan and Iraq. Today, the Marine Corps armor community is going through an identity crisis. Already one of the smallest combat arms units within the Ground Combat Element (GCE) of the Marine Corps Air Ground Task Force (MAGTF), tank battalions have been hit hard by the recent reductions in defense spending, experiencing force reductions from 116 to 88 M1A1 Abrams in the past fifteen months with more reductions likely to follow. The *Marine Corps Operating Concept* (MOC) predicts that conflict will increase along the littorals and has given guidance on how the future MAGTF will get the right force, to the right place, at the right time. This concept advertises the Marine Corps as an expeditionary force that can be rapidly scaled and deployed to conduct missions across the range of military operations (ROMO) and demands a greater focus on organizing forces capable of executing low intensity stability operations from the maritime domain.[1] The size and weight of the M1A1 has increasingly become an issue for the Marine Corps and critics have challenged the utility of Marine armor in the future operating environment. Given the challenges outlined in the MOC, the relevance of Marine Corps armor in the future operating environment will be determined by the ability to transport the M1A1 Abrams to the area of operations.

The MOC presents many new challenges for the armor community. The fact that the Marine Corps is reducing one of its most capable maneuver forces while expanding its forward deployed presence is a dangerous precedent that will have a negative impact on the ability of the Marine Corps to fight future adversaries. Throughout its history, the Marine armor community has battled critics that have proclaimed the weight of the tank and the maintenance and logistical requirements of the tank make its employment cost prohibitive. This paper will examine the utility of the M1A1 Abrams from a historical context. Next, this paper will analyze the current role of Marine armor in the MAGTF and the capabilities it provides the MAGTF commander. Additionally, it will discuss the future operating environment the Marine Corps expects to face in the near future. Finally, this paper will address the limitations facing the Marine armor community and propose future tank platform options that will meet the requirements outlined in the MOC.

II. Employment of the M1A1 Abrams Since 1991

The Marine Corps love-hate relationship with tanks is highlighted by the quote from General Krulak at the beginning of this paper and can be traced back to its decision to accept the mission of forcible entry operations outlined in Lieutenant Colonel Earl H. "Pete" Ellis's study *Advance Base Operations in Micronesia.* The Navy's requirement to land Marine forces on a heavily-defended beach demanded armor protected firepower to support the advancement of infantry. As a result, the Marine Corps tested its first tank platoon comprised of three M1917 two-man tanks in Quantico, Virginia in late 1923.[2] World War II, the Korean War, and Vietnam would see the Marine Corps reluctant development of tanks in support of infantry without much change in Marine Corps doctrine. Marine Corps leadership, ever fearful about becoming another land army resisted any organizational changes that would detract from its characterization of

light infantry capable of vertical envelopments. Concern with mechanization was magnified by equipment costs, logistical sustainment, and naval and strategic lift requirements associated with tanks.[3] The U. S. Army's procurement of the M1 Series Abrams in the early 1980s made the M60A1 medium tank obsolete, limiting the Marine Corps ability to purchase parts and maintain the Vietnam-era tank. Reluctantly, the Marine Corps would replace its ailing M60A1 fleet with the newly developed M1A1 Abrams scheduled for delivery in 1991. Saddam Hussein's seizure of Kuwait in the summer of 1990 would force the Marine Corps to accelerate its procurement of the M1A1 Abrams.[4]

The M1A1 Abrams made its debut during Operation DESERT STORM with stunning results. Originally designed to battle Soviet T-72s and T-80s in the Fulda Gap during the Cold War, the M1A1 Abrams' superior armor, speed, precision fires, and mobility quickly outmatched the Iraqi defenders at every engagement. Designed for maximum survivability and lethality, the M1A1 Abrams easily breached Iraqi minefield, clearing the way for light armored wheeled and tracked vehicles to quickly penetrate Iraqi defenses with minimal casualties. During the "Reveille Engagement" in the early hours DESERT STORM, Marines from Company B, 4th Tank Battalion made contact and engaged a column of Russian made T-72 and T-55 Iraqi tanks moving towards the Kuwait border. In less than twenty minutes, Marine tankers had destroyed more than forty armored fighting vehicles and thirty Iraqi tanks without losing a single M1A1 Abrams.[5] Although Operation DESERT STORM lasted fewer than 100 hours, the M1A1 Abrams emerged a force multiplier for offensive ground operations by providing direct fire support and breaching capability to ground forces while maintaining dominant fire overmatch against enemy armor during high intensity operations. A year later the M1A1 Abrams would be tested again in Somalia during Operation RESTORE HOPE.

Although the M1A1 Abrams had distinguished itself during the high intensity conventional battles of DESERT STORM it remained relatively unproven with military operations other than war. Humanitarian mission Operation RESTORE HOPE demonstrated the diversity of the M1A1 Abrams while operating in low-intensity stability operations in Mogadishu, Somalia in 1993. In support of the 40,000 United Nations Combined Joint Task Force, the Marine Corps disembarked thirty M1A1 Abrams but only provided enough Marine tankers to crew a platoon of four tanks.[6] The effectiveness of the tank platoon is best described by Captain Campbell, the platoon commander:

> The rules of engagement allowed us to take any necessary actions to protect our forces and people in our charge… we fired nearly 1000 rounds of small-caliber…to use our exceptional accuracy to give a clear cut warning: " I could have killed you but I did not". With only our four M1A1s and our tank retriever, we could not only continuously protect the unarmored and relatively unprotected forces working us, but also we could bolster perimeter security…and act as the backbone for a robust reaction force. We became bullet magnets…to draw fire away from the less-protected unit.[7]

The M1A1 Abrams afforded Marines in Somalia the luxury of exercising tactical patience, greatly limiting the potential for collateral damage. The advanced fire control system in the tank provided the positive identification of targets allowing tank crews to engage with precision accuracy. The armored protection of the M1A1 afforded Marines freedom of movement to ensure the United Nations Combined Joint Task Force could successfully deliver humanitarian aid to suffering Somali citizens. Finally, the psychological impact of the dominating presence of an M1A1 significantly improved the morale of friendly forces while demoralizing the enemy. Ten years later the Marine Corps would combine lessons learned in Operations DESERT STORM and RESTORE HOPE to fight a war across the spectrum of conflict in Operation IRAQI FREEDOM.

The United States-led coalition invasion of Iraq in 2003 began with high intensity conventional combat and culminated almost nine years later in a protracted counterinsurgency. Over the course of almost a decade, Marine Corps armor went from conducting offensive conventional operations against Iraqi mechanized and armored forces to learning how to fight irregular insurgent warfare inside population centers. The M1A1 Abrams became an integral part of the MAGTF, leading the attack of the I Marine Expeditionary Force across the line of departure on 20 March 2003. The mobility, survivability, and lethality of Marine armor against conventional Iraqi mechanized forces in prepared defensive positions allowed the 1st Marine Division to penetrate deep into Iraq with elements of 1st Tank Battalion entering Baghdad fifteen days after Operation Iraqi Freedom began.[8] The M1A1 Abrams maintained combat initiative by maneuvering to seize key terrain, utilizing advanced fire control systems to overwatch friendly force movement, and psychologically impacting Iraqi forces by its mere presence.[9]

May 1, 2003 marked the end of hostilities and began the redeployment of Marine forces back to the United States. Eight months later Marines would return to Iraq to fight an embroiled counterinsurgency and a new kind of unconventional adversary. The M1A1, designed to fight conventional armored threats on open battlefields was thrown against the complex urban insurgent strongholds in Fallujah, Al Nasiriya, and Ramadi. Despite initial difficulties in infantry and tank integration in the urban environment, Marine Corps units quickly adapted, resulting in an unstoppable fighting force. This relationship is best described by Captain Robert Bodisch, Company Commander, Company C, 2nd Tank Battalion in 2004 during Operation PHANTOM FURY in Fallujah, Iraq:

> The tanks would lead down the streets as a section which allowed for overwatch and quick tow if necessary. The infantry would clear along both sides of the street from the trail tank back, providing close-in security for the tanks overhead, flanks and rear while other grunts were tasked with clearing buildings as required… Tanks would be used to

> soften enemy strongpointed buildings using tanks main gun…Tanks would then provide overwatch…while the infantry was poised to continue clearing operations. Tanks were often the weapon of choice against enemy in strongpoints taking cover behind walls…We even had situations where artillery forward observers and even ODA snipers requested tank support and talked on the tanks as they maneuver into firing positions to kill insurgents hiding behind walls…[10]

The versatility of the M1A1 demonstrated during the Battle of Fallujah was just one example of numerous engagements experienced by the Marines in the counterinsurgency environment following the 2003 invasion of Iraq. Employment of the M1A1 Abrams in complex, built-up urban terrain gave Marine forces an all-weather platform that allowed Marines to survive first contact with insurgents and react with precision, timely, and direct fire that was far more accurate and responsive than artillery or precision guided munitions, greatly reducing collateral damage.[11] Success of Marine armor in Iraq led to the rapid deployment of Marine tanks to Afghanistan in 2011.

A Marine Corps tank company deployed to Afghanistan in January 2011 in support of Operation ENDURING FREEDOM and marked the first time American tanks had ever operated in Afghanistan. Marine tanks played a decisive role in supporting infantry battalions conducting counterinsurgency operations. The precision direct fire capability of the M1A1 Abrams allowed Marine tankers to provide persistent overwatch to infantry patrols during day and night operations. The mobility and survivability of the M1A1 Abrams ensured the tanks could maneuver alongside dismounted infantry, absorbing improvised explosive device blasts and rocket propelled grenades without having to be recovered. The advanced weapon sensors on the M1A1 Abrams along with superior communication equipment significantly enhanced the situational awareness of dismounted infantry and greatly facilitated the targeting of insurgence with direct fire and supporting arms. The versatility of the M1A1 Abrams facilitated missions like route security and quick reaction force missions ensuring protection from enemy ambush

and promoting friendly freedom of movement along main supply routes. Unlike aircraft, neither terrain nor weather significantly impacted tanks ability to maneuver or provide precision overwatch to dismounted infantry.[12] As in previous conflicts the M1A1 Abrams proved that it could operate well outside its original design of fighting enemy armor formations. Once again, the M1A1 Abrams constant presence on the battlefield significantly improved stability efforts by providing accurate and responsive precision fires that greatly minimized collateral damage.

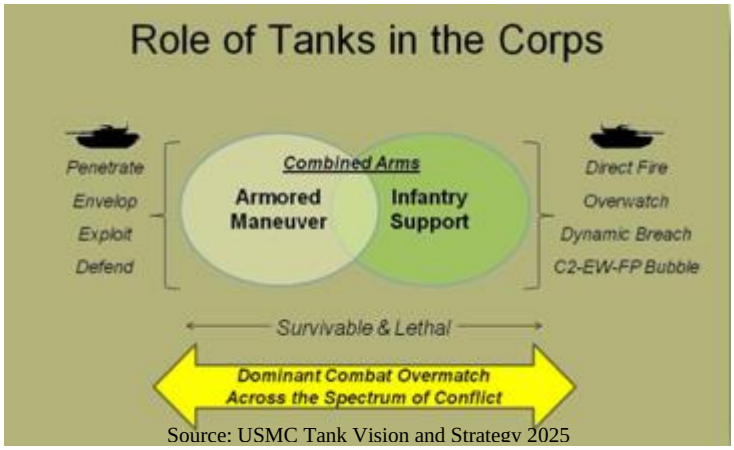
III. Support to the MAGTF

The past three decades of conflict have demonstrated the expanded role the M1A1 Abrams in support of the MAGTF well beyond its original design as a Soviet Cold War tank killer. Over the past ninety years Marine tanks have performed two functions: (1) provide support to the MAGTF with "armored maneuver" and, (2) provide support to the MAGTF with "lethal and survivable close tank support."[13] Today the primary mission of the tank battalion has remained largely unchanged and is to "close with and destroy the enemy using armor-protected fire-power, shock effect, and maneuver, and to provide antimechanized fire in support of the Marine Division."[14]

Despite the reduction of two of eight tank companies in 2015, the Marine Corps armor community continues to support the MAGTF Commander's ability operate across the range of military operations. At the high end of the spectrum tanks provide the commander with offensive armored maneuver to penetrate, envelop, exploit, and defend against a near-peer adversary. Advanced command and control systems provide the M1A1 Abrams with the capability to communicate over great distances and maximize command and control from ship to shore during combined forcible entry operations. At the low end, tanks can provide close tank support to the infantry using direct fire and overwatch with the advanced sensor package on the M1A1

Abrams.[15] Despite its size, the M1A1 Abrams is well suited to support infantry in any environment. In addition to the M1A1 Abrams' breaching capability, it also provides extended electronic warfare protection for the tank and surrounding infantry reducing the effectiveness of improvised explosive devices. The M1A1Abrams is much more responsive, accurate, and reliable than artillery and precision guide munitions during stability operations and is capable of operating in all weather and at night.[16] Regardless of the mission, tanks provide more survivability and lethality than any other ground weapon system in the Marine Corps (Figure 1).

Figure 1-Role of Tanks in the Marine Corps



Source: USMC Tank Vision and Strategy 2025

Although ground combat operations in Iraq and Afghanistan are over, tanks continue to support real world operations. Currently all Marine Expeditionary Units (MEU) with the exception of the 31st MEU, are deploying with four M1A1 Abrams as part of the battalion landing team (BLT). The presence of armor provides the MEU Commander additional capability against a variety of potential enemy threats. Additionally, tank companies are now part of the Marine Expeditionary Brigade (MEB) alert contingency force. Finally, tanks are supporting theater security cooperation (TSC) missions in Europe with the Combined-Arms Company (CAC) comprised of a tank company headquarters with a tank platoon and assault amphibian platoon.

Regardless of the capabilities the M1A1 Abrams brings to the modern battlefield, the Marine Corps armor community continues to remain under intense scrutiny due to the size, cost, and weight consistent with maintaining and operating tanks. Since Operation DESERT STORM,

the Marine Corps has lost more than 50% of one its most effective ground combat platforms, the M1A1 Abrams. At the start of Operation DESERT STORM the Marine Corps possessed three tank battalion totaling 193 tanks. Additionally, the tank battalion possessed a significant anti-armor capability with seventy-eight Tube-launched, Optically tracked, Wired guided missile systems (TOW). The draw down following DESERT STORM left the Marine Corps tank community with 160 tanks and 78 TOW systems. Reductions continued and by the time Operation IRAQI FREEDOM began the Marine Corps only possessed two tank battalions, totaling 116 tanks and 52 TOW systems.[17] Meanwhile, the requirement to provide tanks to MEUs was never reduced. Today the active duty Marine Corps only maintains one and a half tank battalions totaling 88 tanks and 26 TOW systems.[18]

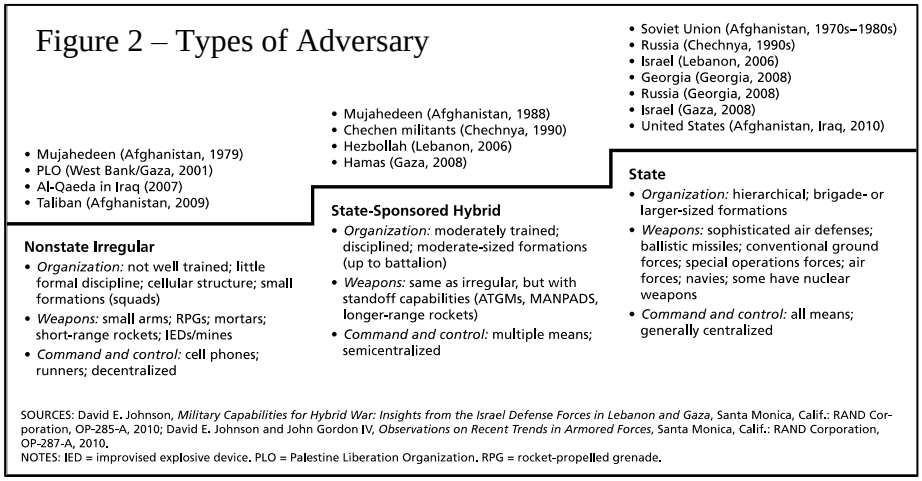
This reduction in tank capability within the Marine Corps has generated a dangerous imbalance within the Ground Combat Element (GCE). Second Marine Division lost two of four tank companies in 2015 and only possesses enough armor capability to support deploying MEUs. In a larger context, the Marine Corps currently only possesses six tank companies to support eight infantry regiments and six MEUs resulting in a significant degradation in the ability to form armor and mechanized task forces for the MAGTF.[19] These numbers are particularly disturbing considering the number of foreign tanks worldwide have tripled in the past twenty years.[20] The reduction in available M1A1 Abrams has limited the tank battalion's ability to support emerging contingency requirements and will limit how the Marine Corps will navigate the future operating environment as outlined in the MOC.

III. Future Operating Environment

The Marine Corps over the next several decades will find itself engaged against a wide scope of potential adversaries in complex operating environments ranging from conventional to

irregular warfare. If the current operating environment is an indication of what the future will hold, then the challenges will be numerous. Almost daily, news agencies are reporting varying degrees of conflict and unrest around the globe. In the Middle East, Syria is entering its fifth year of civil war, sparking one of the of the largest transnational immigration crises in recent history. Iran is antagonizing the world with its clandestine nuclear program while posing a constant threat to shipping transiting the Straits of Hormuz. Saudi Arabia is engaged with fighting state sponsored terrorist organizations in Yemen, which are subsequently engaging U. S. warships transiting through the Gulf of Aden and the Red Sea. In Europe, Russia is provoking the West through its support to pro-Syrian forces in Syria while conducting operations along its border against former Soviet Bloc countries. Africa is fraught with conflict with Libya and Egypt on the cusp of civil war and parts of western Africa still recovering from the Ebola epidemic. In southeast Asia, China is exerting dominance in its seizure of territory in the hotly contested Spratly Islands of the South China Sea. The list goes on but the fact remains the threat facing the Marine Corps will encompass state and non-state actors with a full range of military capabilities.

Figure 2 – Types of Adversary



SOURCES: David E. Johnson, *Military Capabilities for Hybrid War: Insights from the Israel Defense Forces in Lebanon and Gaza*, Santa Monica, Calif.: RAND Corporation, OP-285-A, 2010; David E. Johnson and John Gordon IV, *Observations on Recent Trends in Armored Forces*, Santa Monica, Calif.: RAND Corporation, OP-287-A, 2010.
NOTES: IED = improvised explosive device. PLO = Palestine Liberation Organization. RPG = rocket-propelled grenade.

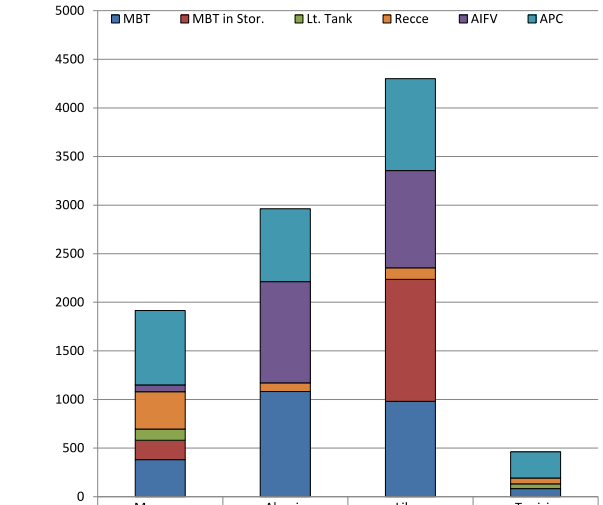
A recent RAND Corporation study by David E. Johnson on *Heavy Armor in the Future Security Environment* proposes that U. S. adversaries can be categorized into three separate groups ranging from low to increased capability (Figure 2).[21] The adversaries depicted in the

diagram, though historical in nature, suggest that the organization of these three different groups will be likely similar to adversaries in the future operating environment and will levy different demands on the U. S. military in designing forces to defeat them.[22] Although the possibilities for future conflict are endless, *Global Risks 2035: The Search for a New Normal* suggests that international crises are likely to spread with conflicts between Russia and the United States/NATO being the most dangerous outcome but less probable than continued regional conflict throughout the Middle East and Northern Africa.[23] For the purposes of this paper the focus of the future operating environment will be regionally centered on the Maghreb, Gulf countries, and the Levant where the Marine Corps is most likely to be employed. From an amphibious landing force perspective, one of the most concerning threats emerging from these different regions are conventional enemy forces that include both state and state-sponsored adversaries, specifically in the area of armor and anti-armor weapon systems.

When thinking about the future operating environment it is easy to fall victim to the last fifteen years of conflict involving ethnically or religiously motivated insurgents who fight using improvised explosive devices, rocket propelled grenades, and AK-47, where U. S. military equipment, training, and technology always provide an overwhelming advantage. But what if the Marine Corps is confronted with adversarial conventional forces possessing an armor capability? What if the Marine Corps does not have air superiority or dominance? In the future, this will be very likely scenario considering advancements in technology and the proliferation of armor around the world. Instead of becoming obsolete, the demand for armor has increased significantly with the number of foreign tanks tripling over the past twenty years.[24] Russian arms sales over the past two decades have ensured a steady flow of advanced tanks into Africa. Since 2015, Libya received 145 modernized T-72s. Syria contracted the upgrade of 200 T-72s to the T-

72M1M variant with 800 of 1000 already modified. Algeria signed a contract to purchased 185 T-90s, the most advanced tank Russia exports.[25] The likelihood of future instability in countries possessing main battle tanks will increase and potential for the Marine Corps to encounter a legitimate tank threat is highly probable.[26]

Figure 3 – Total North Africa Armor in 2010

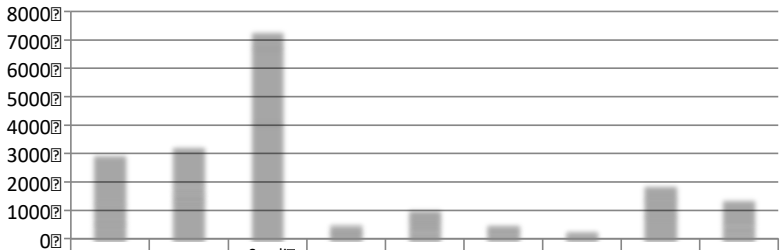


	Morocco	Algeria	Libya	Tunisia
APC	765	750	945	268
AIFV	70	1,040	1,000	0
Recce	384	90	120	60
Lt. Tank	116	0	0	48
MBT in Stor.	200	0	1,255	0
MBT	380	1,082	980	84

Source: Adapted by Anthony H. Cordesman & Aram Nerguizian from the IISS, *The Military Balance*, various editions.

Although the number of countries possessing main battle tanks are too numerous to discuss in this paper, there are several countries that should be considered based on the likelihood for future conflict. Morocco, Algeria, Tunisia, and Libya form what is commonly known as the Maghreb and have been a constant battleground for radical Islamic groups. Figure 3 shows the distribution of armored mechanized forces throughout the Maghreb with Libya possessing the greatest number of main battle tanks. Although these four countries are relatively stable, the introduction of Marine Forces in the future could be confronted with a significant amount of armor requiring a substantial Marine

Figure 4 – Comparative Armor Estimate Between Gulf Countries in 2012



	Iran	Iraq	Saudi Arabia	Bahrain	Kuwait	Oman	Qatar	UAE	Yemen
MRAPs		1344		55					
MBTs	1663	336	565	180	293	117	30	471	856
AIFV/RECCE/LT TNK	725	193	2647	55	463	183	108	595	330
APCs	640	1455	4160	320	357	279	226	892	258

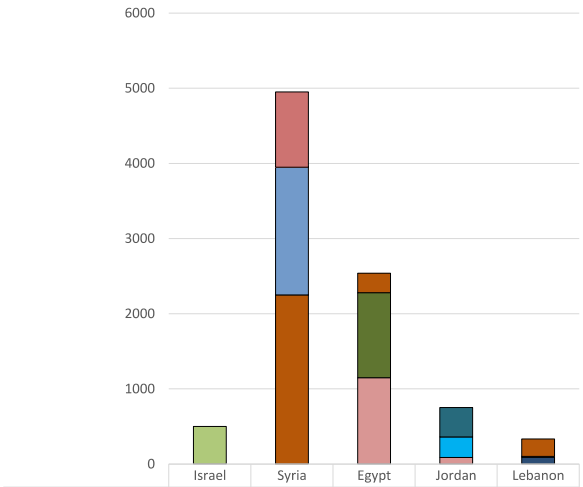
Source: Adapted by Anthony H. Cordsman from CSIS *The Military Balance, 10th Edition*

armored force to maintain dominant overmatch.

An unstable region that could pose a significant armored threat in future conflict are the nine Gulf States (Figure 4). Iran possesses a significant number of main battle tanks that alone presents a threat that cannot be ignored. Despite aging Iranian military equipment, the Marine Corps would require several Marine Expeditionary Brigades and the remaining (88) M1A1 Abrams inventory along with air superiority to maintain a military advantage if conflict occurred. Conversely, Saudi Arabia possesses many fewer main battle tanks but balances its forces with a significant number of light tanks and armored personnel carriers.[27]

Finally, a region that currently is experiencing significant instability that will most likely continue into the future are the five countries that comprise the Levant (Figure 5). Except for Syria, all Levant countries have diplomatic relations with the United States. Syria, which has entered its fifth year of civil war, possesses nearly 5000 tanks. The precarious political and military situation in Syria is alarming. For now, Syrian President Bashar Al Assad maintains control over his conventional forces. However, a future intervention within Syria by Marine forces may encounter an irregular threat with substantial armored capabilities. The

Figure 5 – Comparative Armor Estimate in Levant in 2015



	Israel	Syria	Egypt	Jordan	Lebanon
Merkava Mkl-IV	500				
T-62		1,000			
T-72		1,700			
T-54/55		2,250	260		232
Challenger 1/Al Hussein				390	
Chieftain/Khalid				274	
M-1			1,130		
M-60A1/A3			1,150	88	10
M-48A5					92

Source: Adapted by Anthony H. Cordsman from CSIS *The Military Balance: Levant*

question remains, will Marine forces have the capability necessary to establish and maintain dominance for ground forces? The recently released MOC describes how the Marine Corps will evolve to meet the demands of the future operating environment past 2025. The MOC is disturbingly void of the potential enemy threat described in previous parts of this paper.

The MOC emphasizes the Marine Corps return to maneuver warfare as a combined arms force and highlights the requirement to operate from the urban littorals against a technologically advanced adversary. The MOC describes the future operating environment as a system constructed of complex human populations where the proliferation of technology will give state and non-state actors new capabilities specifically in the realm of anti-access/area denial (A2/AD). Additionally, the MOC warns that the future operating environment will see the maritime domain increasingly contested with the increased use of information as a weapon where detecting enemy signatures and protecting Marines' own signatures becomes essential.[28] To meet the challenges of the future operating environment the MOC describes its operating concept as,

> The 21st century MAGTF conducts maneuver warfare in the physical and cognitive dimensions of conflict to generate and exploit psychological, technological, temporal, and spatial advantages over the adversary. The 21st century MAGTF executes maneuver warfare through a combined arms approach that embraces information warfare as indispensable for achieving complementary effects across five domains – air, land, sea, space, and cyberspace. The 21st century MAGTF avoids linear, sequential, and phased approaches to operations and blends maneuver warfare and combined arms to generate combat power needed for simultaneity of action in its full range of missions. The 21st century MAGTF operates and fights at sea, from the sea, and ashore as integrated part of the Naval force and the larger Combined/Joint force.[29]

Although this concept is in line with the Marine Corps Title 10 requirements, significant work will have to be undertaken in terms of organizing, training, and equipping a force capable of operating from the sea across the ROMO.

At first glance the MOC seems sound, addressing the requirements of the Marine Corps to conduct operations from forcible entry to distributed operations. Throughout the MOC, the role of the infantry is defined and great emphasis is placed on describing how infantry units will evolve to meet the challenges of the future operating environment. The Marine Corps fascination with light infantry and the vertical envelopment in ship to objective maneuver seems to be the focus. The only mention of armor comes from the requirement to support crisis response and sustained operations.[30] In fact, the word "tank" is never mentioned. This lack of attribution is problematic for two reasons. First the MOC specifically states that the MAGTF must be capable of conducting large-scale forcible entry operations. Secondly, these operations must take place from the maritime domain utilizing naval amphibious shipping. Given the potential armor threat previously discussed, forcible entry operations will require a significant Marine Corps armor capability, specifically the M1A1 Abrams, disembarked from amphibious shipping, to establish a lodgment against a mechanized adversary at a contested beachhead. Neither the Marine Corps nor the Navy are equipped to conduct a large scale amphibious assault across a contested beach and will not possess the capability for decades.

As discussed, the future operating environment over the next few decades will require the Marine Corps to operate against a wide range of adversaries with diverse resources and capabilities. Most conflict will take place along the urban littorals in built-up populated areas. Added to the complexity is the proliferation of mechanized and armored vehicles resident in many of the areas in which the Marine Corps will find itself operating. As the MOC suggests, the Marine Corps must capitalize on combined arms forces maneuvering from the sea capable of operating across the ROMO. Marine armor will be essential to fully realize combined arms maneuver against a near peer mechanized force. However, the current trends suggest that neither

the Marine Corps nor the Navy are adequately preparing to meet these challenges. Instead of increasing the armor capability, the Marine Corps has reduced it by twenty-five percent in the past year. The Navy's ailing connector fleet of Landing Craft Air Cushions (LCAC) and Landing Craft Utility (LCU) coupled with the lack of cargo space aboard amphibious shipping to store an adequate number of M1A1 Abrams to conduct forcible entry operations makes the proposition of truly conducting missions across the range of military operations unachievable. If the Marine Corps and the Navy cannot effectively deliver tanks to the area of conflict, then it remains likely that the M1A1 will quickly become irrelevant to the Marine Corps.

IV. Role of the U. S. Navy

The MOC reinvigorates the requirement to develop closer coordination and integration with the U. S. Navy to facilitate littoral maneuver. Central to this relationship are the amphibious warfare ships and surface connectors required to conduct maneuver, power projection, sea-basing, and most critically – forcible entry operations required under Title 10. The M1A1 Abrams is critical to forcible entry operations, weighs 70 tons, and takes up premium cargo space on amphibious shipping often contributing to the dilemma of deciding to keep or leave behind tanks when embarking. The Marine Corps current operating concept calls for two Marine Expeditionary Brigade Assault Echelons (MEB AE) complimented by two additional MEBs supported by Maritime Prepositioning Forces (MPF).[31] The Marine Corps estimates that a minimum of thirty-eight amphibious ships will be required to support two MEB AEs although some studies suggest that the number is actually closer to 50 amphibious warfare ships. The Navy however, has only agreed to maintain thirty-three amphibious warfare ships and will not be increasing this number in the foreseeable future.[32] The lack of adequate amphibious shipping is problematic if the Marine Corps intends to conduct forcible entry operations utilizing the M1A1

Abram platform. The MEU/ARGs generally struggle to embark four M1A1 Abrams and one M-88 Tank Recovery vehicle and are constantly under pressure to leave them behind. At the time this paper was written, the 15th MEU has decided not to embark tanks because the Navy is forcing the utilization of its latest amphibious class LHA, the USS *America*, which does not possess a well deck. Instead, a tank platoon will be forward deployed ashore at an undisclosed location for the duration of the MEU's deployment greatly decreasing its utility and employment potential.

Another issue affecting the Marine Corps ability to conduct forcible entry operations is a reduction in suitable ship to shore connectors required to move an M1A1 Abrams ashore. The thirty-two Landing Craft Utility (LCU) currently in the Navy's inventory were built in 1959, long before the seventy-ton requirement to move an M1A1 Abrams ashore was generated.[33] A 2014 letter from the Amphibious Warfare Program Manager issued the following guidance concerning the LCUs ability to transport the M1A1 Abrams,

> Throughout the service life of LCUs, alterations and modifications have been made to improve reliability and performance….along with increasing LCU weight the weight of the M1A1 MBT has also increased…after conducting simulations…the analysis revealed that the LCU 1610 class no longer has adequate intact stability to transport two (2) M1A1 MBTs given their improved side armor configurations…the LCU 1610…was originally designed for tanks lighter than the present M1A1 MBT and is not capable of withstanding the acceleration loads encountered during transport of M1A1 MBT without added deck structure to prevent deformation.[34]

The LCU 1610, which was originally modified to carry two fully loaded M1A1 Abrams can now only carry a single M1A1 Abrams, significantly reducing the Marine Corps ability to rapidly build up combat power ashore during forcible entry operations.

Originally deployed in 1987, the Landing Craft Cushions (LCAC) was the Navy's "high-speed, over-the-beach fully amphibious landing craft" designed to carry up to a seventy-two ton payload.[35] There are several existing problems with the craft that will continue to hamper the

Marine Corps and Navy's ability to conduct forcible entry – specifically in moving the M1A1 Abrams from the ship to the shore. First, the LCAC is unarmored and cannot be on the first assault echelon without being exposed to significant risk. It requires a semi-permissive beach environment for full utilization. Secondly, a single M1A1 Abrams already maximizes the seventy-two ton payload of the LCAC which means no additional fuel or equipment can be carried with the tank. Additionally, the lack of adequate tie-down points and limited approach angle of the LCAC does not permit a Track Width Mine Plow (TWMP) to be attached to the M1A1 Abrams during transport.[36]

Surface connectors will continue to be a major obstacle for the Marine Corps during forcible entry operations. The LCU is almost forty-five years old and will be significantly challenged in meeting the demands of the future operating environment. The LCAC has already exceeded its twenty-year shelf life with the Navy extending the LCAC service life another ten years through the Service Life Extension Program (SLEP).[37] The current outlook for the seventy-two LCACs and thirty-two LCUs presently in use is that they will be maintained and replaced by 2028.[38] In order to remain relevant the M1A1 Abrams must be transported ashore operationally ready to conduct forcible entry operations. Until all surface connectors are replaced the Marine Corps must rely on the Maritime Prepositioning Force (MPF) to get its armor to the fight.

The MPF has been the backbone of full scale MAGTF operations since becoming operational in 1984. Capable of providing a MEB's worth of equipment and sustainment for 30 days the MPF has provided augmentation to the MAGTF during all major conflicts since 1984 to include Operations DESERT STORM, RESTORE HOPE, and IRAQI FREEDOM. In fact, MPF augmentation is the only way the Marine Corps has historically delivered tank battalions to the area of operations. With the exception of the four M1A1 Abrams on a MEU, the Marine Corps

has never landed a company of M1A1s or larger tank element from amphibious warfare ships to a contested landing beach. The MOC states that the Marine Corps must "tailor current and develop future forces and equipment that can readily deploy aboard amphibious warfare ships," including "armored firepower to meet requirements for both crisis response and major sustained operations."[39] As previously discussed, the availability of M1A1 Abrams aboard amphibious warfare ships will be problematic due to the lack of adequate amphibious shipping and the limited capacity and availability of surface connectors. Maritime Prepositioning Forces although capable, require a "secure environment" that permits the arrival and offload of MPF ships.[40] Additionally, this environment requires suitable port facilities, secure airfields, and suitable transportation networks to adequately support MAGTF operations.[41] In the future operating environment the Marine Corps will be operating increasingly along the littorals and from the sea requiring armored firepower but lacking the secure environment needed to conduct an MPF offload of the M1A1 Abrams. Without a responsive armored capability, the MAGTF will be at a significant disadvantage when conducting forcible entry operations.

V. Current Marine Corps Tank Acquisition Strategy

Although the Marine Corps has led the Department of Defense in many areas of innovation, armor development is not one of them. Due to the limited size of tank units, the Marine Corps has been forced to align its training and procurement for the M1A1 Abrams with the U. S. Army through the year 2050. For the foreseeable future, the Marine Corps will continue to make limited upgrades in tank suspension, communications, and weapon sensors without upgrading the armor package or deviating significantly from the original design of the M1 Abrams series tank. Fiscal constraints along with size and weight limitations have seriously impacted the Marine Corps ability to modernize the tank. The Marine Corps M1A1 Abrams

variant is already dangerously close to the Navy's weight limit of seventy-two tons which means that future armor upgrades are not a possibility, unlike the Army's M1A3 Abrams variant which could approach eighty tons when fielded. Meanwhile America's adversaries continue to procure and upgrade their armor forces. It is possible that in the near future, the Marine Corps M1A1 Abrams will no longer enjoy dominant combat overmatch if the Marine Corps continues on its current acquisitions trajectory through 2050. Reductions in dominant combat overmatch coupled with the challenges associated with the lack of adequate cargo space for the M1A1 Abrams aboard amphibious warfare shipping and accompanying ship to shore connectors may influence the Marine Corps to consider new tank design options capable of meeting the requirements of the future operating environment.

VI. Future Options for Marine Corps Armor

The relevance of tanks in the future operating environment will depend on the Marine Corps and Navy's ability to deliver tanks to the point of conflict. As discussed, this endeavor may be too great to overcome in the future considering the current limitations of the Marine Corps and Navy. Furthermore, the prudence of promoting an acquisition strategy that continues to modify a vehicle platform designed for the Cold War could result in a tank that no longer meets the requirements of the MOC. In the near term, the M1A1 Abrams will continue to provide support to the MAGTF as it is currently organized. However, as the MOC becomes implemented, several options need to be considered for tanks to remain relevant in the Marine Corps.

In 2011, the Marine Corps tank community developed tank precepts that defined three criteria that would guide Marine Corps tank modernization efforts to maintain the competiveness on the battle field. The three precepts are defined as:

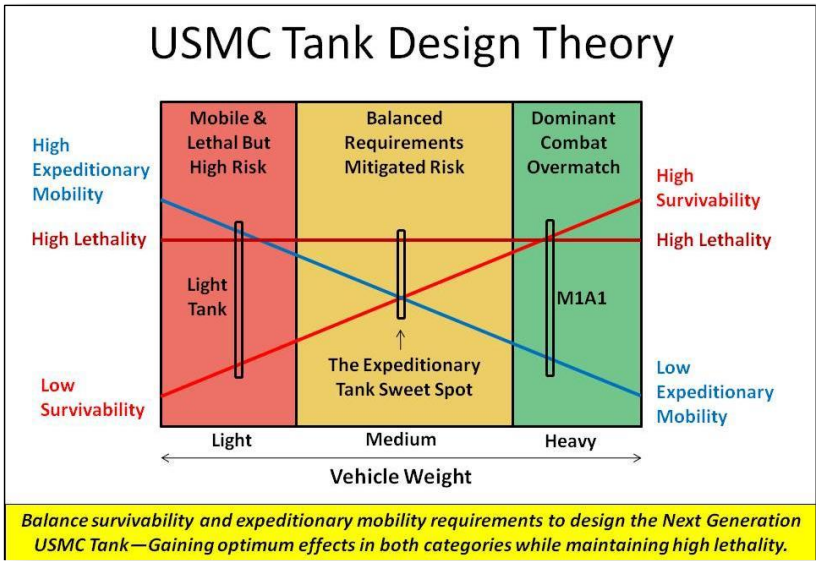
> (1) *Reasonable Assurance of Survivability and Lethality Overmatch.* The Marine Corp needs a tank to locate, close with and destroy the enemy with a reasonable assurance of survival and lethality overmatch. For operations in current and future threat environments, the tank must be capable of surviving hits from increasingly anti-armor weapons.
>
> (2) *Expeditionary Armored Firepower and Shock Effect.* The Marine Corps needs a tank to provide expeditionary armored firepower and shock effect. An expeditionary tank must be transportable by C-17, LCAC, and LCU. Thus, Marine Corps tanks cannot exceed 75 tons.
>
> (3) *Persistent Overwatch and Precision Direct Fire in Support of Infantry.* The Marine Corps needs a tank able to provide persistent all-weather overwatch and precision direct fire in support of infantry operations. The tank is the only supporting arm that can go where the infantry goes with a reasonable assurance of survivability while providing immediate support with high tech optics and precision direct fire. Further, the tank can provide a C2/EW/Force Protection bubble around infantry operating in close proximity to the tank. Further enhancing such capabilities in future modifications will enable the infantry to lighten their load and operate with greater versatility.[42]

Presently the M1A1 Abrams meets the criteria defined by these precepts. However, for all the reasons discussed, precept criteria (1) and (2) are rapidly becoming more difficult for the M1A1 Abrams to meet and will most likely fall short of these requirements after 2025. Debates surrounding tank design have always revolved around differing views on how to prioritize lethality, survivability, and expeditionary mobility.[43] Advocates for the M1A1 Abrams argue that survivability and lethality in achieving battlefield dominant combat overmatch outweighs the tanks low expeditionary mobility in terms of weight, fuel consumption, and reliability. Critics of the platform argue that embracing the minimal acceptable level of survivability while maintaining a high degree of lethality creates a platform much more suitable for the expeditionary environment. A medium or light tank could be designed with all the advanced weapon sensors employed by the M1A1 including the 120mm main gun without the challenges involved with the extreme weight of the M1A1 Abrams. As described in Figure 6, the balance achieved between survivability, lethality, and expeditionary mobility is known as the “sweet

spot" for Marine Corps armor.[44] Moving forward, the Marine Corps has four options it could pursue as the Marine Corps prepares for the future operating environment.

The MOC implores Marines and Sailors to explore "creative solutions" for the future challenges the Marine Corps is expected to encounter.[45] The tank precepts established by the tank community are sound and can be applied in exploring four options for Marine Corps armor in the future operating environment: (1) Continued modification of the M1A1 Abrams, (2) Upgrade M1A1 to U. S. Army's next generation M1 series tank, (3) Develop a Joint Light or Medium tank, or (4) develop a heavy-medium or light combination of tanks.[46]

Figure 6 – USMC Tank Design Theory



Source: USMC Tank Vision and Strategy 2025

Option (1), continued modification of the M1A1 (Appendix A), is in line with the Marine Corps current acquisition strategy for tanks through 2050.[47] Beyond limited modifications to the suspension system, fire control and turret modernization, improved ammunition, and command and control systems very little capacity is left to fully modernize the M1A1 Abrams without exceeding the seventy-two ton weight limit of the platform. The U. S. Army is already past the shelf life of the M1A2 Abrams and is developing the M1A3 variant of the future. By maintaining the M1A1 Abrams the Marine Corps will absorb increased costs associated with losing commonality between the two acquisition strategies. Although this option currently meets the

criteria of all three precepts it is becoming dangerously close to losing relevancy based on the MOC.

Option (2) is to upgrade the M1A1 Abrams to the U. S. Army's next generation M1 series tank.[48] This option keeps the Marine Corps procurement process in alignment with the U.S. Army's tank acquisition strategy for the M1A3 Abrams through 2050. Synchronizing efforts in tank design and development along with increased interoperability between platforms will significantly reduce future costs once upgrades have been made to the currently Marine Corps and Army tank fleets. The Marine Corps would have a modern tank with guaranteed dominant combat overmatch on the battle field. The biggest drawback is that the anticipated weight of the M1A3 Abrams could easily approach eighty tons leaving the Marine Corps in the same dilemma it currently faces with the weight limitations of the M1A1 Abrams. If the Marine Corps cannot transport its armor to the fight, then armor becomes irrelevant regardless of how advanced Marine Corps tanks become in the future.

Option (3), development of a Joint light (Appendix B/D) or medium tank (Appendix C) would require the Marine Corps and U. S. Army to collaborate on developing an entirely new tank design based on analysis of the future operating environment and threat.[49] Advancements in armor, ammunition, and sensor technology since the development of the original M1 series tank make it possible to design a tank that maintains survivability, lethality, mobility required to operate in alignment with the MOC. Many off-the-shelf designs already exist world-wide and could be leveraged to build a tank ranging from 30-70 tons depending on the requirement. A thirty-five-ton tank for example would mitigate many of the issues associated with embarking tanks on amphibious warfare ships and accompanying connectors. The Navy could place two thirty-five ton light or medium tanks on a LCAC or LCU doubling the buildup of combat power

ashore during forcible entry operations. Additionally, a thirty-five-ton light or medium tank would increase the strategic lift throughput of the U. S. Air Force's C-17 fleet. Although there is no way to match the survivability of a heavy main battle tank, a light or medium tank would ensure armored firepower in support of infantry during crisis response along the littorals.

Option (4), developing a heavy and medium or light combination of tanks (Appendix E) for the Marine Corps would provide the ultimate level of flexibility and cost savings for the Marine Corps.[50] Although the considerations from Option (3) are still valid a greater emphasis would be placed on developing complimentary capabilities within a tank battalion that would ensure the Marine Corps armor could operate in any environment. A heavy and medium or light task organization of armor would ensure the Marine Corps maintains maximum flexibility when operating on a traditional conventional battlefield like Operation DESERT STORM or in the expeditionary environment outlined in the MOC. A RAND Corporation study determined that "it would be prudent to maintain a mix of heavy, medium-armored, and light forces that can be task-organized and employed in conditions that best match their attributes."[51] This option provides a cost effective method for the Marine Corps to maintain the relevance of the tank across the entire range of military operations without surrendering the lack of strategic mobility that will limit the ability of the current M1A1 Abrams ability to operate in the future operating environment described by the MOC.

Conclusion

Since 1923, Marine Corps tanks have played an integral role in helping the Marine Corps fight and win every major conflict it has been engaged in. Despite proven performance on the battlefield, Marine Corps armor is constantly under scrutiny and is one of the first communities considered for reduction when defense spending is limited. The MOC predicts that conflict will

increase along the littorals and has delivered guidance as to how the MAGTF will evolve to get the right force, to the right place, at the right time. The past three decades of conflict have demonstrated the expanded roles the M1A1 Abrams has performed in support of the MAGTF. Although the mission of providing armored maneuver and close infantry to the MAGTF have not changed the realities of the future operating environment have challenged the utility of the M1A1 Abrams and its role in future conflict. The weight and size of the M1A1 combined with the limitations of amphibious shipping have seriously limited the ability of the Marine Corps and Navy to get the M1A1 to the right place at the right time in accordance with the MOC.

The dilemma facing the Marine Corps today is whether to maintain the current M1A1 Abrams platform or pursue other courses of action that will ensure the support of precision armored firepower to the MAGTF in the future operating environment. This is not to suggest that the Marine Corps requires large fleets of main battle tanks like the U. S. Army. Instead, Marine Corps armor, whether in the form of the light or medium tanks of World War II or the M1A1 Abrams in Iraq and Afghanistan have always rounded out the Marine Corps as medium-weight force that can contend with a variety of threats across the range of military operations. Without armor in support of the MAGTF, the Marine Corps will be hard pressed to continue its claim as a middle-weight expeditionary force in readiness. Regardless of the direction the Marine Corps decides to embark upon the fact remains, the relevance of Marine armor in the future operating environment will be determined by the ability to transport its tanks to the area of operations.

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APPENDIX A

Main Battle Tank (Heavy)

M1A1 Abrams Main Battle Tank (USMC)

Source: Barrick, Timothy E. *Commander's Vision and Intent, 1st Tank Battalion.* PowerPoint presentation. Commanding Officer, 1st Tank Battalion, July 28, 2010.

APPENDIX B

Light Tank Prototype

General Dynamics Land Systems Griffin Demonstrator Vehicle – 3 October 2016

Source: http://www.janes.com/article/64287/ausa-2016-gdls-unveils-demonstrator-for-new-army-light-tank

APPENDIX C

Medium Tank

BAE Systems CV 90120-T Technology Demonstrator (off-the-shelf)
Armament: 120 mm Main Gun
Weight: 35 tons

Source: https://janes-his-com.lomc.idm.oclc.org/Janes/Display/1494391#Specifications

APPENDIX D

Light Tank

Source:

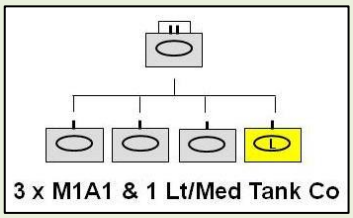
M-8 Buford Light Tank
Armament: 105 mm Main Gun
Weight: 23 tons

http://www.military-today.com/tanks/m8_buford.htm

APPENDIX E

Mixed Fleet of Tanks

The Mixed Fleet COA



Two of the existing light tank prototype options based on primarily 1990s technologies. The M60 was the last US designed medium tank.

Mixed Fleet Advantages:

-Enhanced deployability
-Tailorable Task Organization

Mixed Fleet Disadvantages:

-Complex Program Management
-Added Training Requirements
-Expanded Supply Chain
-Reduced Survivability

Source: "USMC Tank Vision and Strategy 2025." Working Paper, Tank Operational Advisory Group, 21 June 2011.