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14. ABSTRACT
The future operating environment (FOE) will be characterized by increased technological proliferation, resulting in a rapidly changing, complex battlefield with increased precision and lethality. Future adversaries will adapt a combination of hybrid tactics and gray zone strategies to achieve their goals. The Marine infantry is not organized, trained, or equipped for the FOE. To innovate for the future the Marine infantry should organize and adjust manpower policies to adapt to the rapidly changing technological complexity, develop organic combined arms capabilities down to the squad level, and adapt training methods to increase the use of simulation and realistic force-on-force training.

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TITLE:
Preparing Marine Infantry for 2025
Three Hypotheses

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Executive Summary

Title: Preparing Marine Infantry for 2025: Three Hypotheses

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Thesis: The Marine infantry is not currently organized, trained, nor equipped for the future operating environment. To overcome these capability gaps the Marine infantry should organize and adjust manpower policies to better manage and adapt to the technological complexity of the future, develop organic combined arms capabilities down to the squad level, and adapt training methods to increase the use of simulation and realistic force-on-force training.

Discussion: The future operating environment will be characterized by increased technological proliferation, which will result in a rapidly changing, complex battlefield with increased precision and lethality. Additionally, revisionist states and non-state actors not satisfied with the current international order will challenge international norms and adapt hybrid tactics and combine them with a gray zone strategy as a means to achieve their goals. These hybrid tactics will include conventional, irregular, and unconventional means that will require forces that are capable of operating across the range of military operations. The gray zone strategy is the gap between war and peace that will not meet the threshold of war, and Marine forces will be required to operate in this zone. This paper outlines these hypotheses that the Marine infantry should test as it innovates for the future: 1. The Marine infantry must adapt its manpower policies to age its enlisted leadership corps and adapt its operational organizations in order to develop leaders that are better prepared for the rapidly changing complexity and the information warfare requirements of the future operating environment. 2. In order to locate, close with, and destroy future hybrid threats, the Marine infantry must invest in acquisition programs and Commercial off the Shelf (COTS) technologies to equip infantry forces with organic combined arms capabilities. 3. The Marine Corps must invest in simulation and force-of-force training capabilities that better replicate the hybrid threats of the future operating environment to provide Marine infantry forces the opportunity to train in realistic conditions.

Conclusion: The Marine Operating Concept states that the Marine Corps is not currently organized, trained, or equipped for the future. Adjusting manpower policies, creating organic combined arms capabilities within the infantry, and improving training via simulation and force-on-force training are three possible innovations that should be tested as the Marine infantry prepares for the future operating environment of 2025 and beyond.

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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Preface

This project is near and dear to my heart. As a Marine Infantryman, I, like my peers, have experienced first-hand what it means to engage in close combat with the enemy. There comes a point during combat operations when all of the military might of the United States becomes moot, and the infantryman must engage the enemy in close combat. The Marine infantry is renowned as some of the best infantry in the world when it comes to these situations, however, resting on our laurels will not translate into success in the next war. The world is rapidly changing, and learning the right lessons and implementing them to increase the capabilities of the Marine infantry is vital for future success. My hope in this paper is to provide the Marine infantry with a framework to begin its transformation into a force capable of fighting and winning in the future operating environment of 2025 and beyond. If history tells us anything about our adversaries, it is that they are not standing idle waiting for the next war to come - they are already evolving. The Marine Corps must innovate how it mans, trains, and equips to provide Marine infantry the tools needed to fight and win on future battlefields.

I would like to thank Dr. Craig Swanson, the Associate Dean of Academics at Marine Corps University for his guidance and mentorship throughout the project. I would also like to thank LtCol Steven Wallace, USMC for his detailed review of the paper and for his ability to challenge my biases. LtCol's Hunter Rawlings and Matthew Good candid comments on the paper significantly improved this project from its incipient form and dramatically improved its message, structure, and flow. Dr. Benjamin Jenson's review identified areas where I lacked academic rigor that I was (hopefully) able to correct; overall I am a better student because of his efforts to which I am indebted. I would also like to thank all of the Marines and Sailors I have

served with both in peacetime and in combat; the ideas and lessons in this paper are theirs – not mine. I owe them a debt of gratitude that I will never be able to repay. Finally I would like to thank my wife, Candice. She is the love of my life and the angel that provides me the support that I need, but probably do not deserve.

Introduction

The United States Marine Corps has a history of driving innovation as it prepared for future wars. The development of the *Tentative Landing Operations Manual* of 1934 is one example of a successful interwar innovation that had tactical, strategic, and operational effects for the United States, both during the defeat of Japan and for decades to follow.[1] Recent reductions of large ground forces in Iraq and Afghanistan have placed the Marine Corps in a position to capture the lessons from the last 15 years of combat and innovate for future crisis, conflicts, and wars. While the nature of war is static, its character is ever changing and only those who can adapt to that change will be ready for the battlefields of the future.[2]

Innovation is defined as "the act of introducing something new."[3] For the purposes of this paper, innovation is synonymous with military innovation: the act of developing material and non-material solutions for the military as it prepares for war. Material solutions can include new weapons and combat systems, while non-material solutions can include new doctrine, operating concepts, or methods of employment; neither list is all inclusive. Innovation can (and often does) occur while at war, but can also occur during times of peace. The intent behind military innovation is to be ready to fight – and win - in any armed conflict.

Many militaries desire to innovate for the future. This desire, however, is not enough to ensure success in war. During the period between the two World Wars, the French innovated by improving on the ideas of positional warfare, using the Maginot Line as a means to buy time to mobilize its reserves, resulting in the disasters of 1940.[4] Additionally, early US air power theorists touted strategic bombing as a means to lessen the suffering for both sides of a conflict, yet they underestimated the resilience of a nation under bombardment and failed to recognize the need to synchronize efforts between air and ground forces until much later in the war, resulting

in wasted effort.[5] These are but two cautionary tales of innovation. Militaries seeking to innovate for future wars must ensure they incorporate and learn the right lessons as they develop concepts that are concomitant with the principles of war. They must then test their hypothesis via experimentation to constantly improve as the innovation process should be continuous.

The September 2016 version of the *Marine Operating Concept* (MOC) illustrates how the Marine Corps will operate and fight in 2025 and beyond, while setting current conditions to develop the capabilities of the future force.[6] General Robert B. Neller, the Commandant of the Marine Corps, included his own thoughts on the importance of innovation in the MOC when he writes: "We need to change where it makes sense, adapt as quickly as possible, and constantly innovate to stay ahead of our adversaries."[7] Innovation is a key theme throughout the document and as will be sown below, the Marine infantry is a central community to the Marine Corp that must innovate to achieve General Neller's intent.

The MOC states that Marine maneuver forces are "infantry centric"[8] and "superior infantry is a Marine Corps asymmetric advantage."[9] Unfortunately, the MOC does not define "infantry centric" or how "superior" infantry provides this asymmetric advantage. This paper defines the future operating environment as it relates to the Marine infantry and recommend new ways and means for organizing, training, and equipping Marine infantry to fight and win in 2025 and beyond.

For the purposes of this paper, the US infantry community includes Army and Marine Infantry organizations, but will focus on Marine infantry forces. The US infantry community suffered 80 percent of the combat-related deaths in America's conflicts following World War II.[10] During Operation Enduring Freedom, the infantry community suffered 89 percent of America's combat related deaths.[11] When one considers that this community represents less than

four percent of the entire uniformed Department of Defense (DoD), is it clear that the infantry has suffered disproportionate casualty rates.[12] Close combat is one place on the battlefield that provides the enemy the ability to level the playing field, effectively neutralizing America's technological advantage. In close combat, the infantry must assault the enemy without the asymmetric advantages provided by combined arms and other advanced technology. If the MOC is correct and the Marine infantry's ability to close with the enemy is an asymmetric advantage, the Marine Corps must innovate to develop new infantry related capabilities to ensure Marine infantry is prepared to fight and win in the close combat of the future.

The paper begins with an exploration of what the future operating environment holds for Marine infantry. This future operating environment will require Marine infantry forces to engage in close combat with adversaries that have technological parity and increased lethality, which will change the complexity of future conflict, therefore requiring increasingly adaptive Marine forces. Additionally, changes to international norms with respect to armed conflict will provide adversaries with new asymmetric means, as hybrid warfare tactics and gray zone strategies (the zone between war and peace)[13] become more common; subsequently conventional forces will be in higher demand as Special Forces become task saturated. The Marine infantry is not currently organized, trained, or equipped for this future operating environment. To overcome these capability gaps, the Marine infantry must organize and adjust manpower policies to better manage and adapt to the technological complexity of the future, develop organic combined arms capabilities down to the squad level, and adapt training methods to increase the use of simulation and realistic force-on-force training.

The Infantry and the Future Operating Environment

> *War is no pastime; it is no mere joy in daring and winning, no place for irresponsible enthusiasts.*
> *-Carl Von Clausewitz, On War*

The US military is in a transitional period. A cursory look at current journals of the military services indicates that there is much intellectual capital being spent what the future of war will look like. There are books on future war, to include science fiction, on nearly every single professional reading list. The Marine Corps recently launched an innovation challenge to solicit ideas about how to replace tasks that are currently done by Marines that could possibly be done by a robot or autonomous system.[14] Books like *Wired for War* by P.S. Singer and his novel *Ghost Fleet* appear to serve as a prophetic warning: if the military is unable to innovate and adjust to the rapidly changing complexities of future war, then it will be at a distinct disadvantage. The stake are high, if the Marine Corps fails to make the right decisions as it develops innovative capabilities for the future, the price will be paid in American lives and treasure.

For the purposes of this paper, literature used to identify future trends include the MOC, the *Joint Operating Environment 2035*, the *2015 Marine Corps Security Environment Forecast Futures 2030-2045*, the *2016 Update to the 2015-2025 Future Operating Environment – Implications for Marines* from the Marine Corps Intelligence Activity, and *Envisioning 2030: US Strategy for the Coming Technology Revolution* from the Atlantic Council. This paper identified three trends that have the highest probability of influencing the future operating environment that Marine infantry must be prepared to operate in. These trends are: 1. The effects of technological proliferation and parity, 2. Technology's subsequent effect on complexity and the rapid rate of

adaptation required in future war, and 3. The growth of hybrid warfare tactics combined with gray zone strategies by both state and non-state actors.

Technology Proliferation

The world is constantly changing, but technology has increased the rate of change. The doubling of computing power every 18 months (Moore's Law) and the ability to transmit data across the world in just a few seconds are just a few of the representative changes seen today.[15] Specifically, the Marine Corps Intelligence Activity's *2015-2025 Future Operating Environment* states that "The complexity of the future operating environment will be fueled by advanced technology. This technology will increase the lethality of non-state actors, third-party organizations, and technology-empowered individuals."[16] Advancements and proliferation of technology, specifically information technology, has and will continue to change the character of war, which will change the environment that the Marine infantry of tomorrow will operate in.

New technology consistently drives the development of innovative concepts. Unfortunately, these concepts often fail to incorporate facets of the unchanging nature of war. For example, the network-centric warfare concept from the 1990s was designed to, "create a high level of shared battlespace awareness that can be exploited via self-synchronization and other network-centric operations to achieve commanders' intent."[17] According to the network centric concept, this shared understanding of the battlespace will be made possible by the technology proliferation, as information technology will provide the infantryman with a near perfect understanding of the operational environment.

However, as discussed in the MOC, US forces will increasingly have to "operate with resilience in a contested-network environment."[18] Our networks will be subject to bandwidth

restrictions. Multiple adversaries (to include non-state actors) will have access to cyber capabilities that can degrade network reliability, resulting in decreased battlefield awareness, subsequently increasing the effects of the fog of war. Additionally, according to a 2016 study conducted by the Office of the Chief of Staff of the Army Strategic Studies Group, there are those that take a more skeptical view of technological advances. This group suggests that further advances in technology may be limited over the next twenty-five years. If true, this will limit US technological innovation, providing adversaries the opportunity to reach technological parity.

Even if the network centric concept was to become a reality, the Marine infantryman is still required to operate in the physical dimension. Overloading him with information and information technology will not enable him to effectively operate simultaneously in the physical, informational, and cognitive dimensions, which is necessary for him to be successful in close combat. Too much information will make it difficult to make decisions in the physical domain. Only the right information, at the right time, via an appropriately secure communications method and via a means that does not overburden his decision making process can enable effective infantry operations in the future. US Army General S.L.A. Marshall, the chief U.S. Army combat historian during World War Two, wrote about the soldiers' load and the physical effects of overloading infantryman in *The Soldiers' Load and the Mobility of a Nation.*[19] Just as an infantryman can be overloaded with too much gear resulting in dramatically decrease capabilities, they also can be overloaded with too much information. The MOC states that information is a weapon. Information can have suppressive effects that can degrade both friendly and enemy combat effectiveness. Looking again at science fiction as a guide, Robert A. Heinlein warned of the effects of technology in *Starship Troopers*: "If you load a mud foot down with a lot of gadgets that he has to watch, somebody a lot more simply equipped—say with a

stone ax—will sneak up and bash his head in while he is trying to read a vernier." Access to information must be balanced with the means for the infantry to effectively manage and employ information and technology in close combat.

Complexity

War has always been complex. The Peloponnesian War, the Napoleonic Wars, and the World Wars were extremely complex where success hinged on sound strategic thinking and tactical innovation. The ability to manage and adapt to the changing complexity of war is often a deciding factor in warfare. One theorist on war, Steven Biddle, argues that warfare has been getting ever more complex over the last century, and those militaries that have been able to manage this complexity have been the most successful on the battlefield.[20] He argues that the US has successfully coped with increased complexity though effective training, use of technology, and professionalism in the ranks. However, Biddle argues that when required to fight a near peer opponent capable of managing the same level of complexity on the battlefield, the inherent US advantages are reduced to parity.

Biddle's assertion that war is becoming more complex is dubious, however, he is correct in that innovations influence the complexity of war. If one views war as a system, the level of complexity in the system is constant. However, when an innovation is successfully introduced into the system, the complexity of the system changes, providing an advantage to those forces that can successfully integrate the innovation. Those who fail or are unable to adapt are at a distinct disadvantage in the new system of war.

The MOC states that advances in technology will drive the complexity associated with the future and will affect the rate of change in the future operating environment.[21] These

technological advancements will provide new means to change the complexity of war. For example, the Islamic State in Iraq (ISIS) used armed drones to attack Iraqi forces in late 2016.[22] On the surface it appears that ISIS has successfully increased the complexity of the system of war. However, the threat from air attack is nothing new (especially for Iraqi forces), but they did have to make tactical adaptations to address the new threat. Warfare's complexity did not increase, it only changed, and the Iraqis were able to adapt to the innovative use of technology.

This is the normal action, counter-reaction that has always been present in war. The challenge of future operating environment is that advancements in technology will require increasingly adaptive forces. US adversaries will naturally innovate to take advantage of technological proliferation, resulting in a future battlefield that will change more rapidly than it has in the past. The US will not permanently retain technological superiority. The rate of change in the future will continue to change the complexity of the system, only more rapidly in the future. Marine infantry must be organized, trained and equipped to change the complexity of the system to their advantage and recognize where the enemy introduces changes to the system in order to rapidly develop countermeasures. Therefore, Marine infantrymen must not only be conformable in the chaos of combat, but also be comfortable with new technology and finding new ways to gain an advantage. As discussed later, the effect of the rapid changes in war and the resulting complexity will require a change to the Marine Corps organization and manpower policies to develop the right type of Marines for the future.

Hybrid Tactics and a Gray Zone Strategy

> *What has been will be again,*
> *what has been done will be done again;*
> *there is nothing new under the sun.*
> *- Ecclesiastes 1:9*

While the title of this section and the epigraph appear to be at odds with each over, the reverse is much closer to the truth. Future adversaries will continue to employ the tactics and techniques of commonly associated with what has been called hybrid warfare while employing a strategy that allows them to operate in the gray zone, both of which are discussed below. This paper does not propose that hybrid tactics and gray zone strategies are new; they have been employed by adversaries since antiquity. It also does not argue that these concepts are exclusive to future war and that state-on-state violence in the classical sense will never happen. It argues that future US adversaries will increasingly challenge international norms by employing hybrid tactics within a gray zone strategy.[23]

One of hybrid warfare's leading advocates is Frank Hoffman, who defines hybrid threats as any adversary that employs a "tailored mix of conventional weapons, irregular tactics, terrorism, and criminal behavior in the same time and battlespace to obtain their political objectives."[24] According to 2010 Government Accountability Office Report on the use of the term, senior military officials began using "hybrid war" during testimony to Congress from 2008 to 2010 to describe the methods adversaries have employed in Iraq and Afghanistan. These same officials state that the US will see increased use of such tactics in the future.[25] The report further defines hybrid warfare as tactics that "consist of the blending of conventional, unconventional, and irregular approaches to warfare across the full spectrum of conflict."[26] The report states that the DoD does not consider hybrid war to be a new form of warfare and that DoD does not plan to

include it in doctrine.[27] The reason that senior leaders accepted the term is because it better represented the common trends of the operating environment from 2002 onward. US adversaries have identified difficulties that the US had in both Iraq and Afghanistan wars and will seek to employ a mix of conventional, unconventional, and irregular approaches in the future. A Marine force conducting operations against hybrid threats will have to simultaneously be ready to engage against forces employing conventional, unconventional, and irregular approaches as adversaries seek any means of gaining an asymmetric advantage.

The effects of hybrid tactics that are conventional, unconventional, and irregular will be manifested in the so called "gray zone" which has been defined as a strategy of operating on the lower end of the spectrum of conflict, in the area between war and peace.[28] In *Mastering the Gray Zone*, Michael J. Mazarr argues that there are a growing number of revisionist states that are "determined to use tools below the threshold of war to shift international rules, norms, distribution of goods, and patterns of authority to their benefit."[29] These revisionist states view "global rules, institutions, norms, and power balances as insufficient to meet their goals, or unjust, or biased against them."[30] They are unwilling to declare war to achieve their goals, instead adapting a gradual approach[31] where they can and will employ a strategy below a threshold that would elicit an overt conventional response from an adversary.

Actors employing a gray zone strategy employ hybrid tactics and information warfare to achieve their goals. Recent successful Russian operations in the Crimea and Ukraine have been categorized as gray zone conflicts as have the currently situation in Syria, Yemen, and Nigeria.[32] As more state and non-state actors employ gray zone strategies, the need for forces that can operate in the hybrid environment will increase. In recent years the DoD has responded to gray zone conflicts with Special Operating Forces (SOF).[33] However, as more state and non-state

actors assume a gray zone strategy, it is highly likely that SOFs capacity will be strained, and conventional forces will have to fill some of these gaps. The Marine Corps expeditionary character makes it well suited to fill these gaps, if it is organized, trained, and equipped for this environment.

The Marine Corps infantry cannot be just the nation's shock troops or the world's premier counterinsurgent force - it must be both to remain relevant for the future. The next section describes how the Marine infantry must innovate for this future operating environment.

The Military Problem

Marine infantry forces are not currently postured for tactical level of war of the future. As technology continues to proliferate and is increasingly adapted by future adversaries with hybrid capabilities, the Marine infantry as currently organized, trained, and equipped will be unable to locate, close with, and destroy these forces. Technological proliferation will provide adversaries with the ability to rapidly employ lethal capabilities, and the Marine infantry will be unable to gain the tactical initiative. They will have to rely on enterprise solutions, ceding speed and tempo to the enemy, which in turn will provide the enemy tactical advantage. To solve this military problem, this paper proposed three hypotheses encompassing organization, equipping, and training the Marine infantry.

The first hypothesis is that the future operating environment will required organizations that are more adaptive and flexible, which can be achieved by adjusting manpower policies and the organization infantry units. The Marine infantry should first age its community by increasing enlistment periods to 6 years, and precluding a Marine from promotion to Corporal without accepting a new enlistment. Additionally, this paper hypotheses that the organization of the

infantry community must adjust to adapt to the rapidly changing complexity of the future. A binary squad is provided as one hypothesis that could improve the infantry's ability to operating with increased tempo in the future.

The second hypothesis is that the Marine infantry must be equipped to with organic combined arms capabilities. The inability of Marine infantry to locate, close with, and destroy threats in the current operating environment without enterprise solutions will only be exacerbated in the future operating environment. To increase tempo on the battlefield, the Marine infantry must be equipped with weapon systems that possess increased lethality, range, and precision. The speed associated with organic employment of lethal, precise arms with increased range will go a long ways towards developing the infantry's "asymmetric advantage" so envisioned by the MOC.

The final hypothesis is that Marine infantry community should improve its training methods to better represent the challenges associated with the future operating environment. Simulation, virtual reality, and Opposing Force Capabilities should be expanded as they will increase the training opportunities available to the infantry while also developing units that will better test the Marine infantry's ability to operate against the threats of the future.

It should be emphasized that these are hypothesis, and they all would have to be tested. It is understood that testing is difficult and costly. The improvements associated with aging the force are difficult to demonstrate empirically, and without such data is will be difficult to demonstrate the advantages. Equipping Marine infantry forces with additional combined arms capabilities will come at a cost of improvements to enterprise solutions, and the advantages of the two possible solutions to the military problem should be rigorously modeled and tested. Cost associated with simulation and standing Opposing Forces must balance the benefits with and

opportunity costs. Only through rigors analytical testing via modeling, experimentation, and simulation will the Marine infantry ensure that is as prepared as possible to deal with the military problems of the future. While testing these hypothesis will be costly, they will not be as costly as failing to innovate for the future.

HOW TO ORGANIZE, EQUIP, AND TRAIN MARINE INFANTRY FOR 2025

> *The ability of Marine infantry to close with the enemy in every type of terrain and environment is an asymmetric advantage.*
> *-Marine Corps Operating Concept: How an Expeditionary Force Operates in the 21st Century*.

Attempting to forecast how Marine infantry should be organized, trained, and equipped to be successful on the battlefield of 2025 will require balance. The balancing act will be to ensure that necessary innovation occurs while simultaneously embracing the hard earned lessons from the past. Change is always difficult in large bureaucracies, and history is full of examples of militaries that did not innovate and subsequently failed against those that had.[34] Using the future trends identified above, Marine infantry must adapt its organization and manning policies, equipment, and training to ensure relevancy in the future operating environment. As discussed above, the MOC states that the Marine infantry's ability to close with the enemy is an asymmetric advantage. This section explains how the Marine infantry should innovate to provide this asymmetric advantage in the future.

Organization and Manning

To be successful in the future operation environment, there are two policies that must be changed with respect to organization and manning the Marine infantry. First, the Marine Corps

must age the infantry's Non-Commissioned Officer Corps by requiring a Marine to re-enlist prior to accepting a promotion to the Non-Commissioned Officer ranks. This would ensure that a Marine is properly physiologically developed as they continue to advance into leadership positions that require complex problem solving techniques. Secondly, the Marine infantry must change their task organization to better be able to adapt to the changing complexity associated with the future operating environment. A squad level model will be discussed, but the concept must expand up to at least the battalion level. Both actions will provide for an infantry force that is capable of adapting to rapidly changing complexity.

The current first term enlistment period for the majority of Marine infantryman is four years. Of this time period, thirteen weeks is spent at boot camp, and then Marines spent additional training time at the School of Infantry before arriving at their fleet units for the remaining term of their enlistment – approximately three and a half years. As of 2015, 51 percent of the Marine Corps fall in the 17-22 age bracket, and 70 percent are 25 or younger.[35] Research done by the Young Adult Development Program at the Massachusetts Institute of Technology indicates that the young adult brain does not reach full maturity until the mid-20s.[36] Their research indicates it is not until later adulthood (25 and older) that adults develop complex problem solving skills, with the ability to deal with problems that have no solutions such as moral dilemmas and develop enhanced leadership capabilities.[37] According to Marine Corps Manpower and Reserve Affairs, the standard promotion tempo to sergeant for all MOS's is 4 years of Time in Service (TIS).[38] Therefore an infantry Marine who enlists at 18 years old and remains on the standard promotion tempo is a sergeant at age 22, and required to lead a squad of thirteen Marines in the rapidly changing future operating environment at an age when research indicates that his brain is still in development.

This is not to argue that there are not individuals who are capable of leading at this young age, as many Marines have demonstrated in the past. MITs research indicates there is a variance associated with brain development.[39] However, to truly develop leaders who are ready for the operational environment, requiring Marines to accept an additional enlistment prior to accepting a promotion to NCOs would set the stage for the Marine Infantry community to: 1. Choose and retain the best and most qualified in leadership positions and 2. Develop an Enlisted NCOs Corps whom has had time to develop into the leaders needed for the future operating environment. This reenlisted would leadership approval before the Marine is allowed to serve in billets such as fire team and squad leader. This policy of simply requiring a Marine who desires to be an NCO to re-enlist would require Marines to demonstrate added commitment to the profession of arms and provide young Marines the time needed to develop for the rapidly changing complexity associated with the future operating environment.

The current Marine Corps infantry squad is triangular in nature in that it consists of three fire teams, with four Marines assigned. This structure was originally incorporated into the Marine Corps by Maj Evans S. Carlson after he spent time with Chinese communist guerillas in the 1930s.[40] The assumption that the rule of three must be maintained at the platoon and squad level is the first convention that should be challenged to ensure the Marine infantry has organic combined arms capabilities. The inherent capabilities of a unit is affected by its organization, and the triangular organization of the Marine rifle squad inhibits the development of organic combined arms capabilities as capabilities must be spread among three fire teams. A binary squad of two fire teams with six men each would dramatically increase the squad's ability to adapt, employ organic combined arms, and execute the tasks required of it in the future.

It is unclear exactly the capabilities the Marine rifle squad will need in the future, but it is doubtful that the number of requirements on the squad will decrease. Systems such as Unmanned Aerial Vehicles (UAVs), man portable precision guided weapons, and robotic capabilities will most certainly be employed no matter where an operation falls on the range of military operations. The solution in the past has always been to attach "enablers" to the infantry squads, platoons, or companies to provide them with niche capabilities. These enablers, however, are normally high demand, low density Marines, in other words, there are not enough of them to meet the demands of the all of the infantry units, therefore employment decisions had to be made by higher headquarters and some units had to operate without these vital capabilities. Examples from previous wars include Joint Terminal Attack Controllers, electronic warfare/signals intelligence teams, and Explosive Ordinance, Disposal (EOD) capabilities. The rifle squad has also been required to use organic force structure to create needed capabilities, however, these capabilities detracted from the overall combat effectiveness of the squad. During the wars in Iraq and Afghanistan, the addition of designated riflemen, dog handlers, and UAV operators all had to come from the organic structure of the rifle squads. While these capabilities were necessary and provided for additional warfighting capabilities, there was a cost. For example, a Marine dog handler had to not only accomplish the tasks associated with the employment of his dog, he was also required to conducts his primary task of serving as a rifleman, reducing the overall capability of the fire team. The bottom line is that there was barely enough manpower to manage the complexities of the last wars given the squads triangular organization. Assuming that the rate of change and complexity will increase in the future, a change is necessary to the rifle squads' organization.

The ability to manage rapidly changing complexity can be corrected with a binary squad. The overall size of the squad should remain constant at thirteen Marines, however adjusting the rifle squad's structure to fire teams with six Marines assigned each will improve their ability to manage the rapidly changing complexity associated with the future operating environment. This organization will provide the fire team leader with more organic capability to his team and increase the overall capabilities of the squad. As mentioned above, forecasting the requirements is always difficult and we will not know exactly what capabilities the rifle squad will need in the next war. Few in the late 1990s forecasted the requirement for rifle squads to carry sophisticated electronic jamming systems on dismounted patrols to defeat remote controlled Improvised Explosive Devices, however, just a few years later, a squad could not go on a combat patrol without one. The addition of two extra men to the fire team will ensure that no matter what the changing nature of war brings to the battlefields of 2025 and beyond, the Marine rifle squad will be organized to handle it.

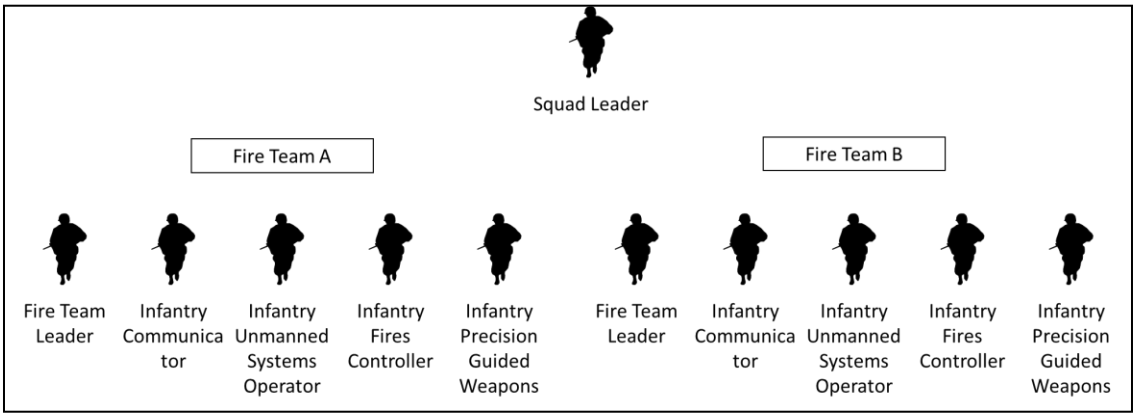

Figure 1 - Notional Binary Squad Task Organization

The downside of reducing the rifle squad from three to two fire teams is that three fire teams provide the squad an additional fire team that can maneuver to a position of advantage on the battlefield. For example, Marine tactics in urban operations are normally task organized in a triangular task organization – assault, support, and security teams, and those who would argue

against the binary squad would cite this as one reason not to innovate. However, one could also argue that the true strength of the thirteen man squad is not due to the number of fire teams, it is the mass it provides. The urban environment is often so chaotic that it causes larger units to break down into small teams that impose their will on the enemy using commander's intent as a guide. The binary squad will not reduce the Marine infantry's hard earned capabilities in urban combat, it will increase their capabilities and provide them the asymmetric advantage needed to win in this complex environment. Experimentation would be required to prove that binary squad would increase the flexibility and adaptability of the Marine rifle squad, but as stated above, those that innovate must experiment to test their hypotheses.

Equipment

Getting the right equipment into the hands of the infantry is a very heated subject. Arguably, this is the area that the infantryman cares the most about as he must rely on the gear provided when operating in the caldron of combat. As more adversaries employ hybrid tactics that reduce the traditional US combined arms advantages, the Marine Corps must equip all infantry units with the capabilities needed to conduct organic combined arms.

The Marine Corps' seminal doctrine – *Marine Corps Doctrinal Pamphlet-1, Warfighting* clearly aspires to achieve combined arms effects at the *fire team* level: "An example of the concept of combined arms at the very lowest level is the complementary use of the automatic weapon and grenade launcher within a fire team. We pin an enemy down with the high-volume, direct fire of the automatic weapon, making him a vulnerable target for the grenade launcher. If he moves to escape the impact of the grenades, we engage him with the automatic weapon."[41] The Marine Corps has made improvements to optics and sensors, including night vision goggles

and infrared pointers, but increases combined arms capabilities as encapsulated in *Warfighting* are needed. The Marine Corps must procure equipment that increases the combined arms capabilities and precision of the infantry as this will enable them to provide the asymmetric advantage envisioned by the MOC.

The proliferation of unmanned vehicles (both aerial and ground based) is expected to be one technology that will have a large impact on both civilian and military applications.[42] Previous attempts to integrate this capability at the infantry company level and below have been met with limited success because of shortfalls in UAV capability (poor resolution and on-station time) and the members of the unit were assigned as operators, forcing commanders to make trade off decision on capabilities. Today's advanced Commercial off the Shelve (COTS) UAVs (commonly referred to as drones) have HD camera capabilities, flight times of up to 30 minutes per battery, and weigh approximately fifteen pounds. The procurement of unmanned systems that can be employed at the fire team and squad level should be a top priority of infantry acquisitions as they will expand their organic combined arms capabilities. There are systems in development such as the man-portable Switchblade UAS which not only provides infantrymen the ability to conduct visual surveillance, but also can serve as a means of precision strike, providing the Marine rifle squad an organic combined arms capability.[43]

Figure 2 – AeroVironment's Switchblade UAS
Source: https://www.avinc.com/media_center/unmanned-aircraft-systems/switchblade

The additions of the "Unmanned System Operator" will support the addition of these and other unmanned systems to the infantry. The MOC discusses the importance of the unmanned systems when it states, "mastering the man-machine interface offers a revolution in military operations"[44] and the addition of an infantry Military Occupational Specialty (MOS) whose primary task would be to provide the fire team or squad with unmanned capabilities with the secondary task of serving as an additional rifleman would set the conditions for the Marine infantry to take advantage of this revolution and allow for both COTS and formal acquisition programs to have a target to place their developed capabilities. The unmanned systems operator MOS would be then able to employ both aerial and ground based unmanned systems. The development of digital links between the unmanned systems and all members of the rifle squad would provide for increased situational awareness. These platforms could then conduct tactical reconnaissance in support of the rifle squad, identify targets, and increase their lethality, all of which will increase the rifle squads' adaptability and flexibility in the future operating environment.

Another acquisition priority of the infantry community should be development of laser guided precision weapon systems. A man portable rocket or missile with a range of over 1,000

meters and precision mortars that are capable of being both laser and GPS guided would increase the lethality, adaptability, and flexibility of the Marine infantry. These capabilities would counter the enemy's ability to engage with tactics that rely on camouflage and reduced signatures as the infantry would be able to rapidly engage with combined arms as soon as the firefight is initiated. The use of lasers provides numerous advantages in that they work in a degraded signature environment and provide a high degree of precision. A family of munitions could be developed to provide different weaponeering effects depending on the operational environment. This could be in both the form of laser guided rockets, mortars, and grenades that increase the lethality of the infantry and realize small unit combined arms as envisioned in *Warfighting*.

The Javelin missile system has been employed in an antipersonnel method in Iraq and Afghanistan; however, it was originally designed as an anti-tank weapon system. The addition of a Multipurpose Warhead (MPWH) for engaging anti-personnel targets (which is currently in development)[45] is a step in the right direction to increase the infantry's combined arms capability, but the system would also require an upgrade to its targeting system as the thermal signature of a human is much different from that of a tank or motorized weapon system. The capabilities provided by the MPWH Javelin will provide the infantry with increase adaptability and flexibility, and additional precision like capabilities should be pursued.

Another possible systems that would provide organic combined arms capabilities to the infantry is the Raytheon's Pike munition, a semi-active laser-guided precision weapon that can be fired from a handheld grenade launcher.[46] With a range of one and a half miles and the ability to strike within five yards of a target[47] the Pike is the type of precision capability needed to increase both the lethality and precision needed by the infantry of the future. Instead of having wait for artillery or aerial delivered fires, the infantry could rapidly and precisely engage and

destroy enemy targets employing hybrid tactics that today's environment require aerial or artillery fires. The ability to rapidly and precisely engage will increase the tempo of tactical operations, as combined arms lethality is now organic to the unit in close combat, and will allow them to rapidly adapt to any tactical scenario.

Figure 3 - Raytheon's Pike Precision Munition
Source: http://www.raytheon.com/capabilities/products/pike/.

While neither the Javelin or the Pike are perfect solutions, these are the type of weapon systems that should drive infantry acquisitions to push more combined arms capabilities down to small units. These material solutions are steps in the right direction towards developing the "superior infantry" envisioned by the MOC as small units will have increased lethality, precision, and "Enable small unit leaders to achieve greater effects" on the battlefield.[48] When the Marine infantry is engaged in close combat, these and other small unit organic combined arms capabilities will provide the infantry the tools needed to enhance their flexibility and adaptability.

Training

…only in opposed, free-play exercises can we practice the art of war.
Marine Corps Doctrinal Publication 1 - Warfighting

The Marine Corps believes tough, realistic training as one of the key ingredients to success in combat. While the live-fire exercises at the Marine Corps Air Ground Combat Center during the Integrated Training Exercises must always be a part of this training regimen, simulation and free play exercises must be integrated into the Marine infantry training programs. This free play and simulation will provide more training opportunities and increases the friction in training events to more accurately reflect reality. There are communities in the Marine Corps that already do this to great affect that the Marine infantry should work to emulate.

The F-35 simulator allows pilots to complete approximately 70 percent of their qualifications virtually.[49] The cost of the Full Mission Simulator is included into the costs of the aircraft, of which the Department of the Navy spent approximately $180 million per aircraft in Fiscal Year 2016.[50] While the costs and benefits of the aircraft itself can be debated, the life of the pilot is at risk when in flight, therefore few can argue against the costs and benefits of simulation. However, the same emphasis on simulation is not shared by the Marine ground community, and most certainly the foot mobile Marine infantry because of the difficulties in creating a realistic virtual environment.

There have been a few attempts at simulation for the infantry. The Infantry Immersion Trainer (IIT) is an excellent example of a simulated training environment that provides infantry Marines with simulation opportunities similar to those that pilots receive. The IIT is a training facility that provides an augmented reality training experience where trainees exercise practical application of tactical decision making skills and decision making in an immersive, scenario-based training environment. This augmented reality training environment can be tailored to provide culturally realistic, dynamic, synthetic entities that allow realistic interaction for the

training force.[51] The IIT is an outstanding start, however, current limitations such as throughput, size, and cost limit its employment. Further investment is needed to expand the capabilities provided by the IIT.

Augmented reality provides excellent opportunities for quick decision making shoot/don't shoot scenarios and should be further developed. However, realistic scenarios that require interaction with civilians on the battlefield in the form of key leader engagements, large refugee populations, or the local populace are require live actors, which can be cost prohibitive. It is unlikely that any future conflict, no matter where it falls on the spectrum of conflict, will not have the complexity that civilians add to the battlefield. The Marine Corps must invest in simulation to provide leaders with more realistic opportunities to deal with this complexity.

To create the opposed, free-play exercises were the Marine Corps can practice the art of war as described in *Warfighting*, there is a need for force-on-force training that allow Marines to operate against a thinking actor. To truly be free play exercises, the opposing force needs to be organized, trained, and equipped to employ capabilities that challenge Marine infantry units. To do this, the Marine Corps must create dedicated Opposing Forces (OpFor) that employ hybrid tactics at each major training location. This OpFor would consist of a cadre of Marines that operate as hybrid forces to challenge to Marine infantry. This would provide Marine infantry units the ability to train against Marines who are paid to think and fight differently. The US Army used this approach to great success at the National Training Center during the Cold War by the creation of OpFor that were organized, trained, and equipped as Soviet forces. The Marine infantry needs a cadre of OpFor that represent the hybrid threats that will be seen in the future operating environment in force-on-force environments to train for regular, irregular, and unconventional adversaries.

Force-on-force training will provide Marine infantry forces the ability to train against the hybrid threats of the future operating environment, yet live fire training must not become an anachronism. Only during live fire training do Marine infantry forces gain confidence in both their abilities and the capabilities of their weapon systems. Live fire ranges must be developed so that the tasks associated with the range is not limited to only an assault on the objective, but to increase the number of decisions that are required on the range. The decisions on most live fire ranges are restricted to the shifting and ceasing of supporting fires (normally indirect fire and machine guns). While the decision making process surrounding combined arms employment is vital, it will not reflect all of the combined arms decisions that will need to be made in the assault of the future. Signals will be jammed, unmanned systems employment, and information warfare capabilities will need to be integrated into the decision making at the tactical level to ensure the success of future infantry assaults. If Marine live fire training ranges are not improved to incorporate these additional layers of complexity, the Marine infantry will be at disadvantage in the future operating environment because the supporting establishment failed to innovate to support the infantry.

There will be significate challenges that the Marine infantry must overcome as signature management is incorporated into both live fire and force-on-force training in the future. Marine infantry forces must learn to operate without emitting electronic signatures that will be much easier to detect and target as technology continues to proliferate. Training ranges and scenarios must be developed that reward Marine infantry units with the ability to responsibly manage their signatures, while simultaneously punishing those units that cannot. Additionally, all training events, but especially live fire events, must be structured to ensure that Marine infantry units are capable of exploiting enemy electronic signatures. For example, the evolution from a

communications Marine to an infantry Marine trained as an electronic warfare specialist permanently assigned at the fire team level will provide the level of expertise required to provide Marine infantry forces the adaptability needed in the future operating environment.

Additionally, those units who can take advantage of cyber capabilities, especially social media, will be able to exploit gaps in the future operating environment. The Marine Corps must develop training exercises that test its ability to synchronize and disseminate information gathered from operational or strategic level cyber capabilities with tactical units. Exploitation of adversary operational security gaps in terms of both cyber and social media exploitation is but one example. Marine infantry forces are unlikely to be the ones to employ these combined arms capabilities, but they will be in the position to take advantage of these capabilities. An adversary's mistake on social media can provide opportunities for infantry forces to out maneuver the enemy.[52]

All of this additional training comes at a cost. Increased use of simulation, creation of standing hybrid Marine OpFors, and inclusion of signature management in training will require force reductions in other areas to save costs. Additional analysis would be required to determine the right places to cut forces, but increased automation in administration, reductions to supporting establishment commands, or wholesale cuts to the Marine reserves may be necessary to pay for the training needed to prepared Marine infantry forces for future operating environment.

CONCLUSION - MARINE INFANTRY IN 2025 AND BEYOND

This paper is an attempt to answer some of the statements surrounding the central problem as stated in the 2015 Marine Corps Operating Concept with a specific focus on the

Marine infantry community. The way Marine infantry forces are currently organized, trained, and equipped must evolve to meet the demands of war in 2025 and beyond. The challenge must be to ensure that the Marine infantry properly incorporates lessons from the past with the capabilities needed in 2025 and beyond. Carl Von Clausewitz reminds us that, "War is more than a true chameleon that slightly adapts it characteristics to the given case."[53] More plainly stated, the nature of war does not change, only its character. Maneuver warfare will continue to serve the Marine Corps well into the future. There are those that believe the Marine Corps has failed to institutionalize Maneuver Warfare principles and remains a force of attrition.[54] This assertion is simply not true, the Marine Corps has demonstrated the ability to apply maneuver warfare throughout the last decade and a half of war from high intensity conflict to counterinsurgency operations. The difficulty in the future will be to find ways to ensure Marine infantry can expand the application of maneuver warfare and combined arms to maintain a tactical edge on the battlefields of 2025 and beyond.

Admittedly, there are numerous acquisition programs required to provide Marine infantry units a technological edge in 2025. However, there are steps that can be taken today. Personnel policies and task organizations can be changed. There are acquisition programs that can be fast tracked and placed in the hands of the Marine infantry. Opposing forces with hybrid threat capabilities can integrated into force-on-force exercises today. Simulation capabilities for the Marine infantry must become a spending priority. As discussed above, many of the concepts in this paper are hypotheses which must be tested in experimentation. Each small step forward will begin the process of innovating the Marine infantry for the future operating environment.

The future operating environment is full of challenges. Technology proliferation, rapidly changing complexity, and the expansion of hybrid tactics combined with a gray zone strategy

will challenge international norms and the US interests overseas. The Marine infantry must be ready to operate in this environment during both crisis response and major combat operations. Adjusting manpower policies, equipping for organic combined arms, and developing simulation and force-on-force training capabilities will prepare the Marine infantry for the future operating environment. The Marine Corps has demonstrated that is has made dramatic innovations for past conflicts, it is time to invest in innovation for the future.

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