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United States Marine Corps
Command and Staff College
Marine Corps University
2076 South Street
Marine Corps Combat Development Command
Quantico, Virginia 22134-5068

MASTER OF MILITARY STUDIES

**TITLE: Countering the Hybrid Threat: A Case for Further Development in Future US
Marine Corps Artillery Programs**

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

AUTHOR:

Major Jeremy J. Colwell, United States Marine Corps

AY 15-16

Mentor and Oral Defense Committee Member: Dr. Francis H. Marlo

Approved: Francis Marlo

Date: 6 April 2016

Oral Defense Committee Member: Dr. Paul D. Gelpi

Approved: [Signature]

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Executive Summary

Title: Countering the Hybrid Threat: A Case for Further Development in Future US Marine Corps Artillery Programs

Author: Major Jeremy J. Colwell, United States Marine Corps

Thesis: If the US Marine Corps wants to continue winning America's battles abroad, it must be able to mitigate future adversaries' integration of hybrid capabilities with indirect fires by increasing developments in indirect fire ammunition, the Extended Range Cannon Assembly (ERCA), and the Ground Combat Element (GCE) specific Unmanned Aerial System (UAS).

Discussion: Hybrid warfare is when an adversary simultaneously and adaptively employs a mix of conventional, irregular, terroristic and criminal means or activities in the operational battle space. Rather than a single entity, a hybrid threat or challenger may be a combination of state and non-state actors. As recently as 2014 with the annexation of Crimea and the invasion of Eastern Ukraine, Russia has adopted hybrid warfare as its primary method of waging war. The US Marine Corps must realize that future adversaries will use the Russian model and incorporate more hybrid techniques into their arsenals, as they are incapable of winning a purely conventional war against the United States. Furthermore, as seen in the Russo-Ukraine conflict, Russia continues to rely heavily upon hybrid capabilities to identify, jam, and target Ukrainian forces subsequently massing indirect cannon and rocket fires, achieving excellent results. The Ukrainians have made attempts to counter the threat but, due to a lack of technology and superior indirect fires assets, they have failed.

The US Marine Corps has multiple programs in development that, if funded appropriately, could provide systems capable of mitigating the effects of future adversaries in a hybrid environment. The Extended Range Cannon Assembly is a program designed to triple the max effective range of the US Marine Corps surface assets. Additionally, the US Marine Corps is conducting research on how to improve upon its precision guided munitions, ensuring their continued use in a GPS denied environment. Lastly, as adversaries continue to have unfettered access to unmanned aerial systems (UAS), the US Marine Corps must increase the availability of UAS at the GCE level and continue the development of anti-UAS systems to protect the GCE from being identified and targeted by enemy UAS.

Conclusion: The US Marine Corps must continue development in artillery programs to ensure its infantry units have the support required to enable battlefield success in a future hybrid environment. As potential adversaries, to include state and non-state actors, understand that fighting conventional wars against the US Marine Corps will ultimately result in failure, their only option is to imitate Russia's hybrid warfare strategy. As the operational environment continues to change, the US Marine Corps must stay flexible, focus on developing programs that will enable success, and further its innovative nature so as not to be surprised by the adversaries of the future.

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Preface

Hybrid warfare is a topic that I knew nothing about until recently. One of my previous regimental commanders, Colonel Stephen Liszewski, who is currently the Commandant of Midshipmen at my alma mater, offered it as a relevant topic that the Marine Corps has yet to develop any substantive conclusions on how to defend against. After reading Phillip Karber's after action from the Russo-Ukraine War, it was apparent that Russia is still using field artillery to their operational benefit, in concert with hybrid warfare. This intrigued me, and has thus focused the basis of my paper.

It has been a goal of mine to fulfill the requirements necessary to obtain a master's degree. The Marine Corps Command and Staff College has allowed me to fulfill this goal and I would like to acknowledge that fact and give my appreciation to the institution first. I would like to thank the folks at Marine Corps Combat Development Command, specifically CWO5 Dave Thomas, as he has been a great help in providing information for inclusion into this paper. Further, I would like to extend my gratitude towards my military faculty adviser, Lieutenant Colonel Mark Liston, as he has been a fantastic motivator, inspiration, and mentor throughout this process. To my civilian mentors, Dr. Linda Di Desidero, Dr. Paul Gelpi, and Dr. Frank Marlo, thank you for your continued support, time, and mentorship throughout this process. Last but certainly not least, I would like to extend my utmost gratitude and thanks to Miranda, Olyvia, Lucas, and Kayla, as you have all been supportive and patient during the long hours and stressful evenings not only preparing this paper, but throughout the school year. You are all the most important things in this life, and I am grateful to have such a wonderful and supportive family!

Introduction

Until recently, the United States has prepared for and fought in mostly conventional wars, meaning either side of the conflict has definitive equipment and uniforms, making it easy to determine who is fighting for what side. The United States has maintained its global dominance as a conventional military superpower – which, in turn, has caused the conduct of war to change, resulting in potential enemies relying upon hybrid warfare in the pursuance of their interests abroad. Hybrid warfare will continue to be a challenge for the United States, specifically for the US Marine Corps, in the twenty-first century. Russia’s genius use of hybrid warfare in conflicts against Crimea and Ukraine represents a threat that the US Department of Defense has yet to encounter. Russia has been able to capitalize on specific methods of exploiting success through the unfettered use of its indirect fires assets. Further, as other nations and non-state actors examine Russia’s use of hybrid warfare, they too will modify their current strategies. If the US Marine Corps wants to continue winning America’s battles abroad, it must be able to mitigate future adversaries’ integration of hybrid capabilities with indirect fires by increasing developments in indirect fire ammunition, the Extended Range Cannon Assembly (ERCA), and the Ground Combat Element (GCE) specific Unmanned Aerial System (UAS).

Ambiguous, Gray, or Just – Hybrid

In *On War*, Prussian military philosopher Carl von Clausewitz states, “War is more than a true chameleon that slightly adapts its characteristics to the given case.”¹ Further, he explains that “war is a paradoxical trinity” made up of characteristics of violence, probability, and policy, waged by people, militaries, and governments.² Although Clausewitz’s description of warfare as a trinity has remained true since the beginning of history, the twenty-first century has seen the

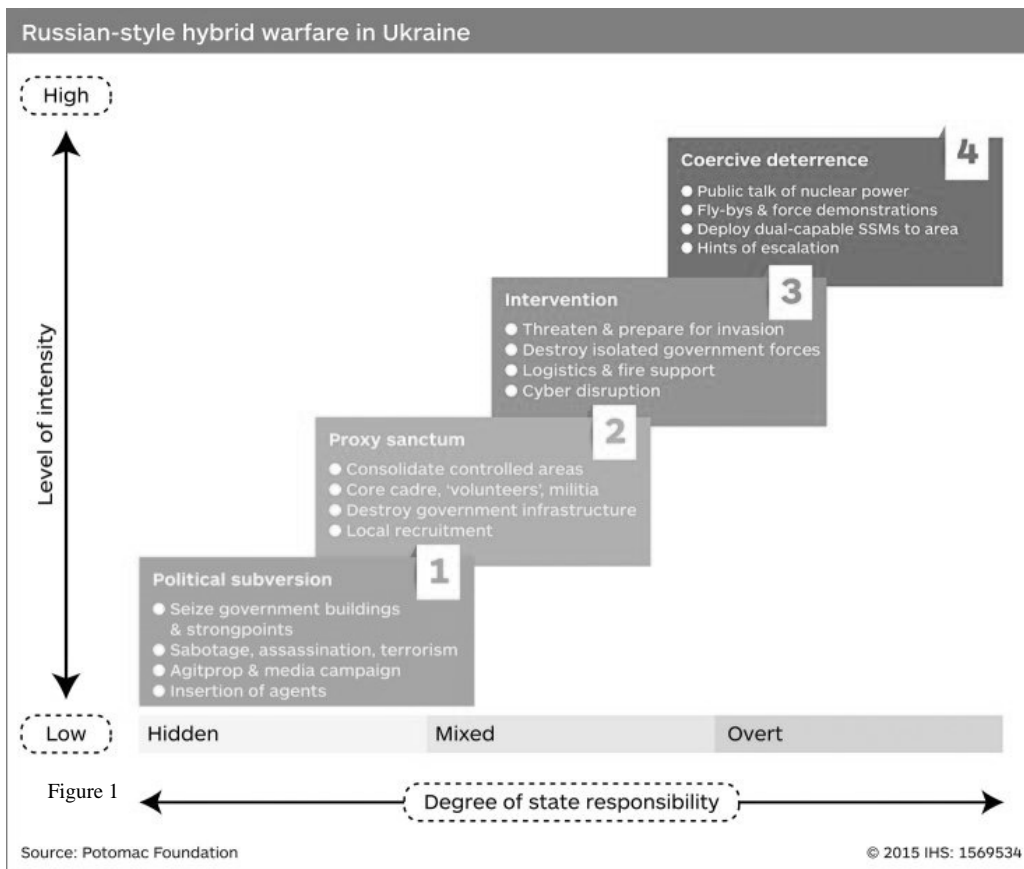
conduct of war adapt into something relatively unfamiliar, where irregular and conventional tactics have been combined. Specifically, the United States has seen security challenges that include terrorism, counterinsurgency conflicts, state-on-state wars, and conventional limited warfare. These examples distort the traditional essence of warfare, bringing about new titles and definitions for the capabilities that adversaries are currently exuding globally to further their strategic aims. The Center for Naval Analysis has characterized Russia's current strategy against Ukraine as "Ambiguous Warfare."³ Additionally, current research by the US Special Operations Command talks of "Gray Zone Challenges," where conflicts that register between total war and normal peacetime activities fall in this ethereal gray area.⁴ Although the arguments presented by both papers are valid, the arguments and definitions of each fall within the realm of hybrid warfare.

In his article "Thinking About Future Conflict," Lieutenant Colonel Frank G. Hoffman, USMCR (Retired) defines hybrid warfare as any conflict against an adversary "that simultaneously and adaptively employs a fused mix of conventional weapons, irregular tactics, catastrophic terrorism, and criminal behavior in the battlespace to obtain desired political objectives."⁵ As the United States continues to remain the global military superpower, state and non-state actors alike will continue to rely upon hybrid warfare as a method to challenge its military superiority. Russia has recently used hybrid warfare to further its political aims, integrating hybrid techniques with its indirect fires assets seamlessly. This paper focuses on that integration, and provides recommendations on where the Marine Corps should continue to development to best mitigate the future use of hybrid techniques by its adversaries. Moreover, the intent of this paper is to suggest a way for the Marine Corps to increase its lethality as a force no matter the threat, as war, hybrid or not, will continue to adapt as it has throughout history.

Russian Strategy

Russia's use of hybrid warfare in two recent conflicts demonstrates mastery of aspects of hybrid warfare that the US Marine Corps has not seen and needs to be prepared to counter. In 2014, during the Russo-Georgian war, Russia demonstrated limited hybrid capabilities; however, six years later Russia launched a full-scale war against Ukraine, inflicting thousands of casualties while keeping larger global powers at bay, with minimal media coverage. Case studies of each of the conflicts will follow, but first it is important to understand Russia's strategy through the mind of its President, Vladimir Putin, and chief of the Russian General Staff, General Valery Gerasimov.

Russia's hybrid strategy has been under development since before its conflict with Georgia, through the most recent war with Ukraine. Prior to the Russo-Georgian War, during the 2004 and 2005 Orange Revolution, Russia incorporated information warfare into its strategy; albeit primitive, Russia identified the importance of integrating information warfare with conventional warfare techniques.⁶ The impending strategy, which Putin adopted and implemented fully against Ukraine, consists of four elements: political subversion, proxy sanctum, intervention, and coercive deterrence. This strategy works best against countries that border the adversary, for information operations and logistical reasons. Figure 1 shows how these elements work in a logical order as tied to intensity and the degree of state responsibility – as the degree of state responsibility rises, so does the level of intensity. Without going into great detail about each element, as they will be referred to during the case studies below, it is important to understand how this strategy works, as it is integrated with Gerasimov's doctrine.

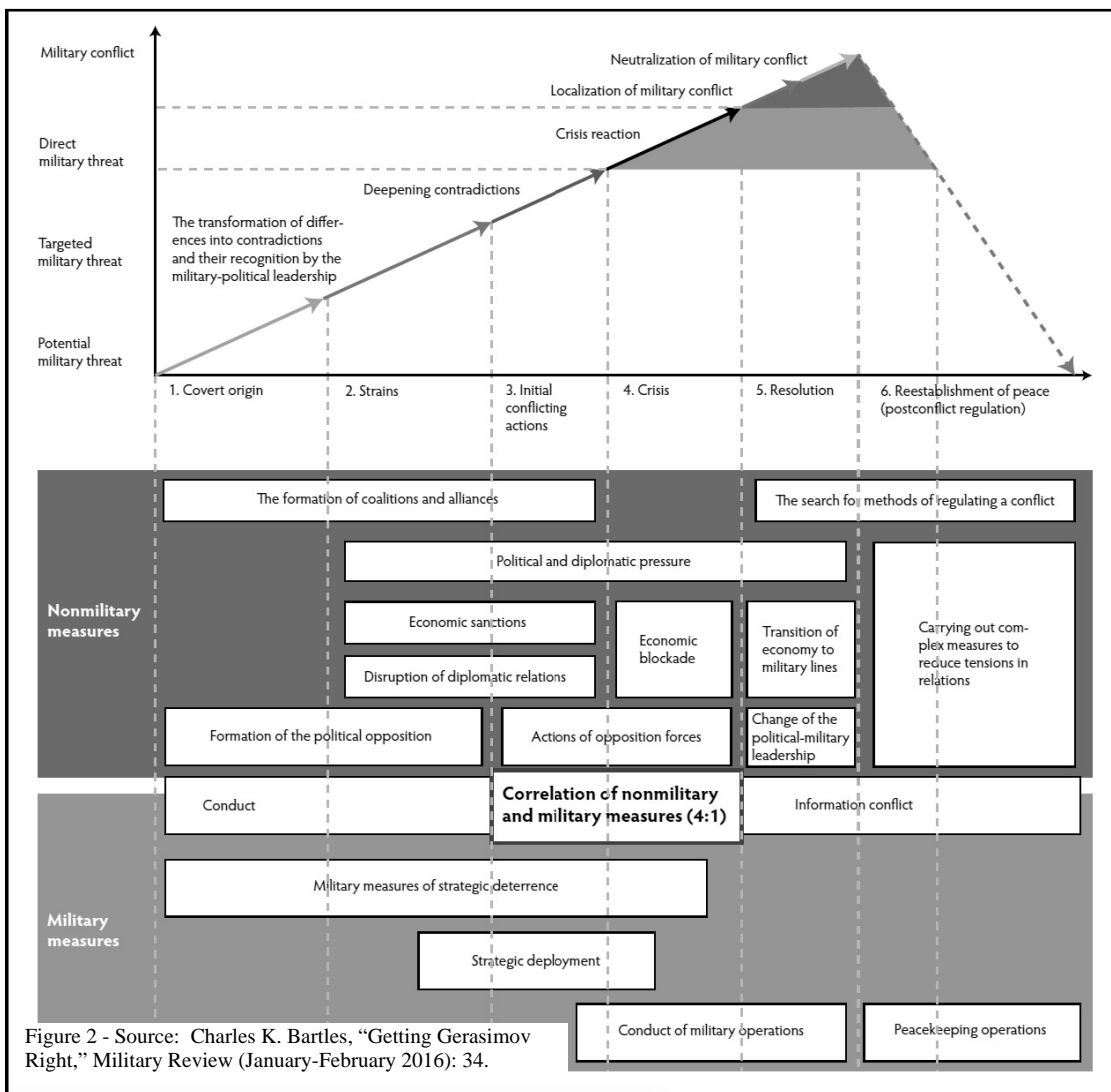


The four elements of Russian-style hybrid warfare break down Russia’s overarching strategy, which is to create conflict within a border country that is large enough to justify Russian intervention. The end result may be Russia occupying territory within that border country or in some form of “ceasefire.” Planting pro-Russian separatists within the target country to create political subversion would create the initial conflict. Fueled by Russian proxies, the conflict would escalate to a point where Russia has no choice but to intervene through the initial deployment of conventional forces on the border. Russia would continue to deploy its forces across the border and – if met by resistance – all engagements are classified as being merely self-defense. Russia demonstrated the use of the above elements of hybrid warfare in Crimea and Eastern Ukraine, setting the example for other nations or non-state actors to

emulate.⁷ General Gerasimov has expounded upon Russia's hybrid warfare strategy, as shown below.

As the chief of the Russian General Staff, Gerasimov is an important player within the Russian military. His position is equivalent to that of the Chairman of the US Joint Chiefs of Staff, with a few caveats. First, the chief of the Russian General Staff has more authority than the Chairman, as he is responsible for long-term planning, oversight of strategic transportation, force doctrinal and capabilities updates, and equipment procurement for all branches of the Ministry of Defense. Second, he maintains daily control of Russia's Main Intelligence Directorate, or GRU, and Russia's strategic reserve, the Russian airborne.⁸ This position, along with the responsibilities outlined above, have allowed Gerasimov to shape Russia's overarching military strategy. On 26 February 2013, Gerasimov published "The Value of Science Is in the Foresight: New Challenges Demand Rethinking the Forms and Methods of Carrying out Combat Operations."⁹ This article articulated Gerasimov's thoughts regarding the past, present, and expected future of warfare. He goes on to forecast how the Russian military views warfare as being more than just a military conflict. What is interesting is how Gerasimov integrates nonmilitary and military functions in an effort to provide a more holistic approach to warfare. Often the United States uses non-military functions from the State Department in an effort to mitigate conflict. Bartles explains that, unlike the United States, Russia is rethinking the integration of nonmilitary measures with military measures as their primary method of waging war.¹⁰ Figure 2 depicts the evolution of conflict through the eyes of Russia. It identifies what non-military and military measures Russia will use to escalate a conflict in order to justify the introduction of conventional forces and then what it will use to quickly de-escalate the conflict upon achieving its goal. Particularly notable is the way Russia integrates non-military and

military measures at a four to one ratio, ultimately escalating to crisis, thus giving Russia a reason to react with conventional military forces. The substantial use of non-military measures to escalate conflicts should resonate with western polities as a strategy opposite theirs, where non-military functions do not de-escalate, but rather escalate the conflict. Although Gerasimov views the integration of non-military and military measures differently from the United States, his views of the future operating environment are similar to those of the US Marine Corps.



As the US Marine Corps prepares to conduct operations and mitigate hybrid threats, understanding how future adversaries view the future operating environment is critical. Charles Bartles explains: “[Gerasimov] envisions less large-scale warfare; increased use of network command-and-control systems, robotics, and high-precision weaponry; greater importance placed on interagency cooperation; more operations in urban terrain; a melding of offense and defense; and a general decrease in the differences between military activities at the strategic, operational, and tactical levels.”¹¹ Bartles goes on to talk about how Russia has increased its reliance and investments in conventional capabilities and kept its special operations forces (SOF) numbers the same, while relying on its conventional forces to execute SOF functions when necessary.¹² Gerasimov’s Doctrine preceded the annexation of Crimea and the Russo-Ukrainian War. The points in his article are very telling, as each of these conflicts unfolded as presented in his article, with a heavier Russian reliance upon mixing asymmetric and conventional warfare.

Russia’s Hybrid Wars – Crimea and Ukraine

Within the last two years, Russia has implemented the hybrid warfare strategy twice against Ukraine. Political unrest began, followed by conventional intervention by Russian ground forces. The following section will discuss the details surrounding Russia’s annexation of Crimea and the subsequent intervention in Ukraine, explain Russia’s use of hybrid warfare, specifically its use of hybrid techniques to capitalize on its use of indirect fires, and conclude with Ukrainian lessons learned.

Yanukovich’s Burden

The recent conflict between Russia and Ukraine that led to the annexation of Crimea and eventual committal of ground troops into Ukraine was largely the result of poor leadership by

Viktor Yanukovich, the previous Ukrainian president. He became President of Ukraine in 2010, and fled to Russia in 2014. The details surrounding his abrupt exit to Russia are unknown, as only speculation exists. Regardless of the reason for his departure, the outcome from Yanukovich's last two years in office is what led to Russia's annexation of Crimea and the eventual conventional war that ensued on Eastern Ukrainian soil.

Yanukovich's initial two years in office were relatively uneventful. The Orange Revolution in 2004 had caused the Ukrainians to be generally disenchanted by the political system; therefore, public dissatisfaction with Yanukovich's policies did not result in mass protests, as it had in the past with other presidents. Paranoid about the upcoming elections, Yanukovich used nepotism to solidify his power. He appointed much of his family to key political positions, ensured his interest groups controlled local media outlets, and placed loyalists in charge of law enforcement, the security apparatus, and financial flows. Due to the 2008 financial crisis, Ukraine's economy took a massive hit, with its GDP falling 15 percent.¹³ Yanukovich's economic policies did not help matters, as throughout his tenure Ukraine amassed approximately 15 billion dollars in debt. Despite his concern about reelection and the added stress of a failing economy, Yanukovich refused to align Ukraine either with the European Union (EU) or with Russia through the Eurasian Customs Unit (CU), settling instead on a 15-billion-dollar loan from Russia.¹⁴

Yanukovich had a decision to make: become a member of the EU and align with Western Europe or align with Russia and become a member of the CU. Russia envisioned Ukraine's membership in the CU as a geopolitical counterweight to the EU. Not wanting to join the CU, but unable to directly state that to Russia, Yanukovich decided to work slowly with the EU as talks with the EU gave him a reason to maintain friendly negotiations with Russia.¹⁵ In

November 2013, Yanukovich rejected the Ukrainian Association Agreement (AA), the economic deal with the European Union (EU). News of the possibility of accepting this economic deal gave the Ukrainian people hope of a more productive and modern economy, one more aligned with the West. Although this deal would have been mutually beneficial for the EU and Ukraine, Yanukovich decided that membership with the EU or CU was not the right decision for Ukraine. He did not want to relinquish any of his authority and was concerned that joining one of these organizations would result in him having to appease someone other than himself. Instead, negotiations with Russia led to a 15-billion-dollar aid package from Russia, money that Yanukovich desperately needed due to his current financial troubles. With the announcement of not only the abrupt dismissal of AA but also the Russian aid package, huge protests erupted throughout Kiev, with the people calling for Yanukovich to reinstate the EU deal. As the protests continued to escalate, Yanukovich approved the use of draconian measures such as riot police and snipers in an attempt to quell the violence. Hundreds of deaths resulted and Yanukovich lost support from his parliament and the people, forcing his departure to Russia. Prior to fleeing the country, Yanukovich tried to compromise with his people by negotiating a different deal with the EU, but it was apparent to the Ukrainians that he was more concerned about himself; therefore, the compromise was too late and any solution involving Yanukovich was not going to be good enough for the Ukrainian people.¹⁶ The swift departure of Yanukovich and the increasing political instability throughout Ukraine created an opportunity for Russia to annex Crimea and prepare for possible intervention in Eastern Ukraine.

Russia Takes the Initiative

As political instability increased within Ukraine, Russia's purported concern with its future stability prompted it to intervene. Russia began staging military forces along its border

with Ukraine and inserting Russian troops into Crimea. These troops aided in isolating Crimea and securing key pieces of infrastructure throughout the peninsula. The mostly Russian leadership within Crimea began organizing a referendum on secession from Ukraine, a violation of the Ukrainian constitution, which states that “Alterations to the territory of Ukraine shall be resolved exclusively through the All-Ukraine referendum.”¹⁷ The leadership of Crimea used the political instability within Kiev and the dismissal of President Yanukovich to quickly organize the referendum and put it to vote. With the new arrival of Russian troops, militiamen, and paramilitary forces throughout Crimea, the referendum passed, arguably without giving the people the alternate choices of becoming completely independent or remaining loyal to Ukraine.¹⁸ The formal annexation of Crimea is an example of Russia pressing its influence in the region. Subsequent actions by Russia in Eastern Ukraine demonstrate Russia’s hunger for reestablishing itself as a global power.

As the annexation of Crimea was ongoing, Russia was building up forces on its border with Ukraine, publically on the grounds that it needed to prepare to intervene if the political situation within Kiev did not mend itself. Although this assertion was the narrative coming out of Moscow, Russia did not want Kiev to stabilize; it wanted political instability to thrive, giving it an excuse to intervene and further its influence into the region.¹⁹ Two months after the annexation of Crimea, a pro-Russian insurgency began in the Donbass coal-mining region in South-Eastern Ukraine and quickly expanded. “Foreign volunteers, paid mercenaries, radical Russian nationalists, local mobsters, and former members of the disbanded Ukrainian ‘Berkut’ special police” secured key pieces of infrastructure and government institutions.²⁰ Russian officials gave many of the orders to these factions to spread the political instability towards Eastern Ukraine. Furthermore, the “insurgents” on the ground looked and operated exactly like

the same operatives that had been in Crimea, leading international observers to believe Russia was responsible for the insurgency.²¹ Almost simultaneously, on the Eastern Ukraine border, the Russian Army, with approximately 40,000 troops, was massed and ready to invade Ukraine. A combined arms offensive commenced unlike anything that had been seen between the Ukrainian and Russian armies since World War II. The Ukrainian army was able to conduct the largest counter-mobilization effort of any European army since the end of World War II, deploying fifteen brigades to counter the Russian threat. Over the next eight months, Russia deployed its army across the Ukrainian border utilizing fire support, unmanned aerial systems (UAS), and maneuver warfare to gain control of much of Eastern Ukraine. The tenets of Russian-style hybrid warfare were prevalent during the Ukrainian conflict, specifically, Russia's heavy use of indirect fires in conjunction with hybrid techniques.

Russian-Style Hybrid Warfare as Applied to the Ukrainian Conflict

The Russian style of hybrid warfare is broken into four distinct elements: political subversion, proxy sanctum, intervention, and coercive deterrence. When applied to the conflict surrounding the war in Eastern Ukraine, one is able to identify the military and non-military actions that escalated the conflict to war, enabling Russia to achieve its goals. Parts of the operations fall within each element of Russian hybrid warfare and show that this model is capable of being globally leveraged.²²

In the lead up to the war with Ukraine from March to May 2014, Russia applied the first two elements of Russia's hybrid warfare model, political subversion and proxy sanctum. Russia instituted a covert political subversion campaign, increasing protests, seizures, and violence throughout Eastern Ukraine aimed at undermining the political system. Early on, Russia

heavily relied upon an agitation and propaganda (agitprop) campaign, developed and distributed through digital and print media, aimed at separating the populace from the existing political structure. Next, Russia used proxy sanctum, in which separatists and Russian volunteers conducted terrorist activities, including abductions, assassinations, and destruction of political leaders and political offices. Russian inserted and tasked its Spetznaz forces with seizing key political infrastructure throughout Eastern Ukraine. Terrorism reached its high point near the end of May 2014: examples include the seizure of police stations, airports, and military depots; destruction of ingress transportation infrastructure; and conduct of cyber attacks to compromise communications. These actions led to Russia's intervention under the guise of humanitarian and military assistance.

The last two elements within the Russian-style hybrid warfare model, intervention and coercive deterrence, took place from June 2014 to February 2015. As Eastern Ukraine was falling apart politically and had proven to already be weak economically, Russia showed concern by massing its conventional military army along the border with Ukraine and conducting military exercises. Furthermore, Russia used convoys camouflaged as humanitarian relief vehicles to move people, resources, and equipment across the border undetected. It built logistics camps along the border and in August 2014, Russia was prepared to cross the line-of-departure. For the purposes of this paper, intervention will be the final element discussed within the Russian-style hybrid warfare model, as this is where the Marine Corps can best improve to ensure future success.

Russia's intervention into Eastern Ukraine consisted of deploying 26 Battalion Tactical Groups (BTG), 10 of which were proxy and an additional 24 staged on the Ukrainian border in reserve. These BTGs were reinforced by tanks, heavy artillery, self-propelled artillery, and

multiple launch rocket systems (MLRS). The Russians also leveraged combat aircraft, attack helicopters, and UAS. Eighty-five percent of Ukrainian casualties were the result of cannon and rocket artillery barrages. Both sides used UAS, but the Russians predominately employed the system to not only collect intelligence, but to call for and spot indirect fires. Moreover, Russia employed UAS at different altitudes, nesting capabilities to best cover the battle space and provide real time intelligence, target acquisition, and target engagement, often times achieving effects on target in less than fifteen minutes. Russia also demonstrated use of electronic warfare to acquire incoming artillery strikes, jam communications, and guard against exploitation from Ukrainian UAS.

Russian Integration of Artillery and Hybrid Warfare

Dr. Phillip Karber, president of the Potomac Foundation, witnessed the lethality of Russia's indirect fires firsthand, as he was present on the ground in Ukraine for many of the strikes. He explains that the Ukrainians received a volume of indirect fire comparable to rates of fire witnessed during World War II, as units were expending as many as 300 to 400 rounds per tube, per day.²³ Moreover, the Russians are heavily reliant upon their MLRS; whether counterbattery fires or conventional strikes, MLRS was Russia's weapon of choice. Karber notes that, after "a combined MLRS fire strike that lasted no more than three minutes, two Ukrainian mechanized battalions were virtually wiped out with the combined effects of top-attack munitions and thermobaric warheads."²⁴ When comparing the ammunition fired by the Russians, combinations of high explosive and dual-purpose improved conventional munitions (DPICM) were shot rapidly. The United States developed DPICM for use against mechanized and armor units, relying upon it heavily in the past, as other adversaries did not have this capability. As the Russians demonstrate that they too have this capability and are willing to use

it, the United States no longer has the advantage in an era where it is willingly denouncing the employment of DPICM.

The Russian style of hybrid warfare is a model that state and non-state actors alike could adapt to thwart the technological advantages of the United States, specifically the US Marine Corps, in a future conflict. Unfortunately, as Russia demonstrates, the technological advantage that the US Marine Corps has had in the past will no longer be enough to mitigate the emerging technology of future adversaries. As the technological advantage that the US Marine Corps has wanes, and the Russian hybrid model becomes more popular, what would have been an inferior enemy to the US Marine Corps, will become a near peer competitor. The US Marine Corps is currently developing and fielding new technologies within the artillery community that will help to mitigate many of the capability gaps outlined above. What must happen next is the continual development of these programs to ensure future success.

Continuing Developments

Within the recent decade, the US Marine Corps has found itself fighting counter-insurgency operations in urban terrain where the concern of collateral damage has resulted in the overreliance on precision guided munitions (PGM). The Russo-Ukrainian war is a perfect example of why the Marine Corps must not forget about the importance of massing unguided artillery projectiles. While the Marine Corps has debated the importance of artillery and relied upon artillerymen to execute many missions other than their mission occupational specialty (MOS), Russia has built upon its indirect fires capacity, increasing the lethality of their artillerymen.²⁵ The US Marine Corps has begun investing in field artillery programs and experimenting with new equipment that will bring added capabilities to its Marines. The issue

rests within an increasingly restricted economic environment, as funding has become limited and sequestration continues to constrain the Department of Defense's spending. Therefore, the Marine Corps Combat Development Command may modify or even cut programs such as field artillery modernization. Doing so would severely hamper the Marine Corps's ability to mitigate future hybrid wars. The programs below are essential in giving the US Marine Corps the necessary advantage on the battlefield against adversaries that will utilize Russian-style hybrid warfare models. The Marine Corps must improve artillery ammunition, develop a cannon capable of ranging targets at three times the current maximum effective range, and equip the GCE with an organic UAS capability.

The Future of Artillery Ammunition

The US Marine Corps continues to modernize artillery ammunition through the use of new technologies that will benefit the future of the Marine Corps in its fight against hybrid actors for years to come. As adversaries increase their jamming capabilities, current precision-guided rounds will become ineffective. One of the hallmarks of hybrid warfare is the use of technology to deny the opponents use of global positioning systems (GPS), as demonstrated by Russia in the Russo-Ukraine War.²⁶ GPS has become ubiquitous throughout the modern Marine Corps and is included as the premier guidance system on a majority of its PGMs, therefore anti-jamming technology is extremely important in hybrid warfare. Additionally, hybrid actors like Russia, will continue to develop ways to incorporate indirect fires into their schemes of maneuver, as artillery is an effective method to attrite high volumes of forces quickly. The incorporation of anti-jamming technology into its PGMs, development of new cluster and extended range munitions will all benefit the Marine Corps in its fight against hybrid warfare.

The Marine Corps is currently developing methods to mitigate the effects of GPS jamming in a hybrid environment. The Marine Corps has identified this issue and is working with civilian companies in the development and manufacturing of new satellites capable of emitting a GPS signal called Military Code (M-Code). M-Code has been designed to fulfill the needs of a twenty-first century military by improving upon the anti-jamming and secure access of military GPS signals. The M-Code signals will greatly increase the effectiveness of PGMs in a GPS-denied environment. Further, the Marine Corps is looking into the feasibility of using ground based satellites called pseudolites to increase the reliability of PGMs in a hybrid environment. The most recent upgrade to the US Marine Corps artillery arsenal was the incorporation of the Precision Guidance Kit (PGK) onto unguided artillery rounds. The PGK is significantly cheaper than the Excalibur round (a GPS guided round,) but is still susceptible to jamming. With the incorporation of M-Code into new satellites and development of ground based satellites, the PGK will be upgraded to incorporate counter-jamming into the fuse. This new technology will allow the PGK fuse to counter up to three jammers. In the advent of hybrid warfare, these new technologies are the way of the future and must continue to be funded and further invested in by the US Marine Corps.

Recently the international community has expressed concern over the widespread use of DPICM as this projectile tends to bring with it a high unexploded ordinance (UXO) rate. UXO rates are important because this is the percentage by which some of the grenades will not function correctly, leaving them on the battlefield where they could hurt civilians or friendly forces transiting the area. The current advertised DPICM UXO rate is anywhere from two to fifteen percent, depending on the terrain fired upon.²⁷ The United States and the international community have expressed this to be unacceptable; specifically, the United States has agreed to

ban the use of its current stockpile of cluster munitions after 2018, and is working to develop a projectile that has a UXO rate of less than one percent. Unfortunately for the US Marine Corps, its adversaries are not concerned with high UXO rates as a byproduct from the indiscriminate use of DPICM and, like Russia, will use whatever means available to win. Therefore, in the interim, the Marine Corps should continue to maintain DPICM in its arsenal so that it is able to support the maneuver commander if the appropriate conditions surface, with a few caveats. The use of DPICM must be deliberate and its effects mitigated. Infantry units should therefore decide to not shoot it in the urban environment or if shot elsewhere, place an UXO Area around where DPICM functioned to deconflict friendly maneuver and civilians from that area. Furthermore, once a suitable replacement has been accepted by the Department of Defense, the immediate transition from old to new must occur. DPICM has proven to be the most effective munition against enemy armor, therefore while the development of an alternate weapon continues, DPICM should be kept in the inventory as a precautionary, last resort munition. If a conventional war erupts and battle is once again fought against a near peer, the maneuver commander will need DPICM as a method to quickly attrite high volumes of armor, if necessary.

The Marine Corps has always relied upon the extended range of its cannon munitions to have an effect on the adversary, enabling infantry commanders to attrite enemy formations before meeting them at a place of their choosing. As observed during the Russo-Ukraine War, the adversaries of today are able to outrange their opponents through the use of MLRS. Not being able to range the enemy is a significant problem, one that the US Marine Corps is currently trying to rectify through ammunition development.

There are two types of extended range artillery munitions currently under development, the XM1128 insensitive munition, high explosive, base burn projectile, and the XM1113

Extended Range Artillery projectile. They both are essentially high explosive projectiles, but each function differently as the mechanics behind why they are able to travel further is based on one having a rocket on the back and the other having a combination of a consistent propulsion system in concert with a short duration rocket that propels it further. Regardless of how each of these projectiles function, the important part is that an infantry commander will be able to affect an adversary at greater ranges within the hybrid fight. These new projectiles, along with the extended range cannon assembly (ERCA), will triple the current employment range of the Marine Corps' cannon artillery.

Extended Range Cannon Assembly

Throughout the war with Ukraine, the Russians introduced the deployment of a long range cannon capable of firing a rocket assisted projectile out to seventy kilometers, more than twice the current range of Marine Corps cannon artillery. Furthermore, the Russians paired their long-range artillery systems with extremely capable counterbattery radar assets enabling them to prosecute long range targets. The ultimate goal of a counterbattery mission is to make the adversary's artillery displace, creating an opportunity for the acquisition and subsequent destruction of the target. Long range artillery is critical when facing an enemy that has a large stockpile of indirect fires assets. Additionally, counterbattery radar assets that are able to acquire targets at significant ranges are crucial to protecting friendly artillery assets. The Marine Corps lacks sufficient long range artillery systems as it is currently reliant upon its only asset, the high mobility artillery rocket system (HIMARS). Moreover, the Marine Corps is also vulnerable to counterbattery fire as its counterbattery radar can only acquire targets out to 24 kilometers. In a long-range artillery fight, this is inadequate. The Russians currently have these capabilities, and

future adversaries will be able to procure and potentially capitalize on these systems in a war against the United States.

The Marine Corps is attempting to develop a system that will be able to transform the current howitzer. The ERCA is a modification to the current M777A2 where the tube is approximately ten feet longer and the breech mechanism is reinforced to allow for the use of more propellant. This modification, along with the advances in ammunition technology, will extend the Marine Corps current maximum range for cannon artillery to between sixty and seventy kilometers, on par with the current ranges the Russians are reaching.²⁸

Unmanned Aerial System

UAS was a ubiquitous platform during the war between Russia and Ukraine. The Russians utilized a plethora of different platforms that all operated together at different altitudes enabling intelligence gathering, target acquisition, indirect fires spotting and control, and battle damage assessment (BDA). The United States has led the world in UAS technology and in the use of UAS in military operations. During the war between Russia and Ukraine, Russia demonstrated the employment of at least fourteen different UAS designs – thirteen fixed wing and one quad-copter in the execution of the missions stated above.²⁹ Although the procurement of these systems is not surprising, the ability of the Russians to employ these systems at tactical and operational ranges, leverage different sensors, acquire targets, and mass indirect fires in real time is impressive, as the United States has yet to see this from an adversary. Karber personally witnessed “a fire-strike east of Mariupol in September 2014 in which an overflying drone identified a Ukrainian position, and destroyed it with a ‘GRAD’ BM-21 MLRS within 15 minutes of the initial over-flight and then returned shortly after to do an immediate bomb-

damage assessment.”³⁰ The ability of the Russians to leverage UAS in this capacity is unlike anything seen to date; furthermore, to take advantage of destroying targets at the range that UAS is able to acquire, the Russians have made great strides in increasing the range of their indirect fires as witnessed during the war with Ukraine.

The Marine Corps has been incorporating UAS into its operations since 1987 with the activation of the first remotely piloted vehicle company as part of 7th Marine Amphibious Brigade.³¹ The Marine Corps UAS systems all reside with the Marine Aircraft Wing (MAW) in a unit called the Unmanned Aerial Vehicle Squadron (VMU), even though the system supports the GCE of the Marine Air Ground Task Force (MAGTF). Furthermore, the personnel trained to fly UAS are not pilots, but Marines from any mission occupation specialty specifically trained to fly these systems. The issue with keeping UAS solely at the MAW is that training suffers for the Marines within the GCE. As hybrid warfare becomes an increasingly viable threat to the Marine Corps, the GCE needs to have an organic UAS capability. Due to the nature of the MAGTF, training happens between each element of the MAGTF, but cross-training does not happen until the months before a deployment. Waiting to cross-train until the months before a deployment is an issue, and to fix this issue would mean providing UAS to the GCE so it can build upon certain tactics, techniques, and procedures, making the use of this system more lethal and building the capacity of the unit before it is needed in combat.

Conclusion

Hybrid warfare is when an adversary simultaneously and adaptively employs a mix of conventional, irregular, terroristic and criminal means or activities in the operational battle space. Rather than a single entity, a hybrid threat or challenger may be a combination of state and non-

state actors. As recently as 2014 with the annexation of Crimea and the invasion of Eastern Ukraine, Russia has adopted hybrid warfare as its primary method of waging war. The US Marine Corps must realize that future adversaries will use the Russian model and incorporate more hybrid techniques into their arsenals, as they are incapable of winning a purely conventional war against the United States. Furthermore, as seen in the Russo-Ukraine conflict, Russia continues to rely heavily upon hybrid capabilities to identify, jam, and target Ukrainian forces subsequently massing indirect cannon and rocket fires, achieving excellent results. The Ukrainians have made attempts to counter the threat but, due to a lack of technology and superior indirect fires assets, they have failed.

The US Marine Corps must be able to mitigate future adversaries' integration of hybrid capabilities with indirect fires by increasing developments in multiple artillery programs. Specifically, the US Marine Corps must be able to counter the increasingly lethal electronic warfare capabilities that will hinder its ability to operate and bring fires upon its enemies. Developing and integrating counter-jamming technologies within its artillery ammunition is one method, but also continuing to stress the importance of training in the use of manual, non-digital methods will ultimately save lives and maintain momentum during operations. Increasing the range by which the Marine Corps is able to affect its enemies with massed, indirect fires will promote protection of the force and enable the Marine Corps to achieve surprise against future hybrid adversaries. Lastly, by providing the GCE with organic UAS necessary training will prevail and innovation will continue as the systems are tested during training and real-world operations.

Hybrid warfare is a very real threat to the US Marine Corps as the United States "911" force. If the Marine Corps is required to take the initiative, operate in a distributed manner, and

gain a foothold for other services to continue the fight, it must be equipped correctly for hybrid warfare. Recently, the Marine Corps has begun changing its tactics, operations, and strategy to fit the equipment it procures. Instead, the Marine Corps should be studying history, learning from the past, paying attention to current adversaries, and developing equipment that will enable it to be successful, no matter the threat, for decades to come. The Marine Corps will benefit from continuing to invest in artillery programs as history has proven: the side with the best artillery always prevails.

¹ Carl von Clausewitz, *On War*, ed. Michael Howard and Peter Paret, trans. Michael Howard and Peter Paret (Princeton, NJ: Princeton University Press, 1984), 88.

² Clausewitz, *On War*, 88.

³ Mary Ellen Connell and Ryan Evans, *Russia's "Ambiguous Warfare" and Implications for the U.S. Marine Corps* (Washington, DC: Center for Naval Analysis, 2015).

⁴ Philip Kapusta, "The Gray Zone" (draft paper, United States Special Operations Command, 2015), 1.

⁵ Frank G. Hoffman, "Thinking about Future Conflict," *Marine Corps Gazette* (November 2014), 11.

⁶ Michael Kofman and Matthew Rojansky, "A Closer look at Russia's 'Hybrid War'." *Kennan Cable*, no. 7 (April 2015): 5, <https://www.wilsoncenter.org/sites/default/files/7-KENNAN%20CABLE-ROJANSKY%20KOFMAN.pdf>.

⁷ Philip A. Karber, "Lessons Learned from the Russo-Ukrainian War: Personal Observations," (draft, The Potomac Foundation, 2015), Section III - Strategy.

⁸ Charles K. Bartles, "Getting Gerasimov Right," *Military Review* (January-February 2016): 30.

⁹ Bartles, "Getting Gerasimov Right," 30.

¹⁰ Bartles, "Getting Gerasimov Right," 34.

¹¹ Bartles, "Getting Gerasimov Right," 36.

¹² Bartles, "Getting Gerasimov Right," 37.

¹³ C.W. "Why is Ukraine's Economy Such a Mess." *The Economist*, March 5, 2014, <http://www.http://www.economist.com/blogs/freeexchange/2014/03/ukraine-and-russia>.

¹⁴ Rajan Menon and Eugene Rumer, *Conflict in Ukraine: The Unwinding of the Post-Cold War Order* (Cambridge, MA: The MIT Press, 2015), 53-77.

¹⁵ Menon and Rumer, *Conflict in Ukraine: The Unwinding of the Post-Cold War Order*, 53-77.

¹⁶ Menon and Rumer, *Conflict in Ukraine: The Unwinding of the Post-Cold War Order*, ix-xv, and John Curran. "Russian-Ukrainian Conflict Explained." *Huffington Post*, March 6, 2014, updated, March 11, 2015, http://www.huffingtonpost.com/john-curran2/russian-ukrainian-conflict-explained_b_4909192.html.

¹⁷ Constitutional Court of Ukraine, *Constitution of Ukraine*, as amended by the Law of Ukraine in 2004, <http://legislationline.org/documents/action/popup/id/16258/preview>.

¹⁸ Ian Birrell. "Crimea's referendum was a sham display of diplomacy." *theguardian*, March 17, 2014, <http://www.theguardian.com/commentisfree/2014/mar/17/crimea-referendum-sham-display-democracy-ukraine>.

¹⁹ Menon and Rumer, *Conflict in Ukraine: The Unwinding of the Post-Cold War Order*, 83.

²⁰ Mary Ellen Connell and Ryan Evans, *Russia's "Ambiguous Warfare" and Implications for the U.S. Marine Corps* (Washington, DC: Center for Naval Analysis, 2015), 10.

²¹ Menon and Rumer, *Conflict in Ukraine: The Unwinding of the Post-Cold War Order*, x-xi.

²² Karber, "Lessons Learned from the Russo-Ukrainian War: Personal Observations," Section III – Strategy.

²³ Karber, "Lessons Learned from the Russo-Ukrainian War: Personal Observations,"

²⁴ Karber, "Lessons Learned from the Russo-Ukrainian War: Personal Observations," Section II - Operations.

²⁵ Karber, "Lessons Learned from the Russo-Ukrainian War: Personal Observations," Section I – Technology and Tactics.

²⁶ Joe Gould, "Electronic Warfare: What US Army Can Learn from Ukraine," *Defense News*, August 4, 2015, <http://www.defensenews.com/story/defense/policy-budget/warfare/2015/08/02/us-army-ukraine-russia-electronic-warfare/30913397/>

²⁷ Headquarters US Marine Corps. *Fire Support Coordination in the Ground Combat Element*, MCWP 3-16 (Washington DC: US Marine Corps, November 28, 2001), 5-34.

²⁸ Todd McCarthy, "Artillery Operational Advisory Group Conference Minutes." (unpublished manuscript, October 26, 2015), Portable Document Format file.

²⁹ Karber, "Lessons Learned from the Russo-Ukrainian War: Personal Observations," Section I – Technology and Tactics.

³⁰ Karber, "Lessons Learned from the Russo-Ukrainian War: Personal Observations," Section I – Technology and Tactics.

³¹ "Marine Unmanned Aerial Vehicle Squadron – 1," Global Security, accessed March 14, 2016, <http://www.globalsecurity.org/military/agency/usmc/vmu-1.htm>.

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