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Learning Lessons from the Ukraine Conflict

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Contents

1. Introduction

In February 2014, after a decade of increasingly destabilizing political confrontations, Ukrainian nationalists ousted the Russian-supported Ukrainian government in what became known as the *Maidan* Revolution. Russian annexation of Crimea and covert support for "Ukrainian Russian Separatists" in the Eastern Oblasts of Ukraine soon followed. Nine months later, the Russian military intervened overtly in support of the Ukrainian Separatist forces. The conflict has settled into a large, complex example of Hybrid (or Russian New Generation) warfare in a context reminiscent of static military operations during World War One.

Interest in mining the lessons emerging from Ukraine has been strong from the conflict's beginning. While some of these efforts are wide ranging, they can generally be clustered in two categories: geo-political and tactical/technical. If, as some have argued, the conflict in Ukraine represents a 21st-century version of the Boer War or the Spanish Civil War—where emerging military technologies and concepts were employed in a nascent form but pointed the way toward a disruptive future—then much more needs to be done to develop lessons in the broad middle. For example, European military observers of the Boer War (1899–1902) noted the effects of machine guns and barbed wire on traditional infantry assault tactics, but these insights were never contextualized for potential war in Europe or war between major powers. The failure to do so clearly contributed to the murderous battlefield conditions of World War One a little more than a decade later.

Learning lessons from these kinds of conflicts requires an integrated approach. Direct lessons applicable to current capabilities are often obscured by the particular economic, political, and social characteristics of the participants. Recent efforts by the Military Services (particularly the US Army) to collect lessons in Ukraine are notable but generally narrow in both subject and application (e.g., the potential for Russian operations in other parts of Europe).

Projecting these lessons into the future and more importantly, into conflicts of a different character from the one being examined, requires a different approach.

2. Lessons Learned Efforts Regarding the Conflict in Ukraine

Following the removal of pro-Russian President Viktor Yanukovych in 2014, Russia intervened militarily in Ukraine, first to annex Crimea and later to support a separatist uprising in a region of eastern Ukraine known as the Donbas. Russia initially denied being directly involved in the conflict in eastern Ukraine, despite the presence of significant Russian paramilitary forces, but abandoned plausible deniability when it overly committed regular Russian military units in August 2014. Fighting between separatists and the Ukrainian military has continued ever since, often with the participation of Russian units and frequently interrupted by temporary ceasefires.

Soon after the conflict in Ukraine began, Western observers began collecting information on its conduct and trying to identify lessons. The purpose of this chapter is to characterize those efforts, to identify existing functional or temporal gaps in the literature, and to identify ways forward to address gaps and best utilize lessons learned efforts.

To best characterize and assess prior work, the study compiled literature from a wide range of military and academic sources to contextualize the breadth of lessons learned efforts. In particular, the study focuses on operationally- and tactically-focused analyses of Russian and Ukrainian efforts in Crimea and the Donbas that were published between 2014 and 2018. For a complete description of the body of literature analyzed for this study, see the Bibliography in Appendix A.

The existing lessons learned literature varies in form and focus by the organization that created it. Two types of institutions have devoted substantial efforts to studying the lessons of the Ukraine conflict: academic institutions and military organizations (especially various elements of the US Army). Academic contributions are largely structured as geopolitical overviews of the conflict or as high-level discussions of the nature of hybrid warfare—and were not central to the research conducted for this paper—but several academic institutions contributed important portions of the available literature.

One such source is the Potomac Foundation and the work of Dr. Phillip Karber, the Potomac Foundation president whose firsthand accounts at the front in Ukraine comprise a large portion of the lessons learned efforts in the conflict's early years. Several prolific authors on the subject—including Major Amos Fox, an Army operations officer who has reported extensively on the conflict—rely heavily upon Karber's work for source material. However, Karber's sourcing should be considered with his particular bias in mind. Karber has long advocated for nonlethal and lethal military aid to Ukraine. He also relied largely upon memory in his recollections of interactions in country, providing no notes and little documentation to confirm his details. Nevertheless, a dearth of other primary sources place Dr. Karber's work centrally among reporting on the early years of the conflict.

Other think tanks and academic institutions have made significant contributions, especially in more recent years. Keir Giles provided useful scholarship on the organization of the Russian military force through his publications with Chatham House and the Carnegie Endowment. Roger McDermott contributed greatly to the lessons learned scholarship by discussing Russia's military power and electronic warfare capabilities in publications from a variety of academic institutions. One such publication, *The Journal of Slavic Military Studies*, was significant among the literature studied, focusing on the nature of future Russian warfare. Other prominent academic institutions in the United States—including RAND and PONARS Eurasia—and among US partners—such as Estonia's International Centre for Defence and Security and Finland's Aleksanteri Papers and the Finnish Institute of International Affairs—produced additional scholarship on hybrid and electronic warfare.

Numerous Army organizations produced literature on Ukraine from 2015–18, including military lessons learned from the Army's Foreign Military Studies office, the Army War College, the Army Command and General Staff College, Army Training and Doctrine Command, and the Modern War Institute. These lessons learned prioritize areas pertinent to the Army: they are primarily tactically or operationally focused and almost exclusively concern land-based capabilities. This is somewhat expanded in other sources within the Department, which include documents from the Joint Forces Staff College and various military journals and quarterly publications. Several recent theses from the Air War College address Russia's hybrid warfare in Ukraine, but the implications on aerial warfare remain largely unexplored in the literature. NATO's literature on the subject mainly characterizes high-level implications of hybrid and non-linear warfare in the European context, leaving a significant space unexplored by a prominent organization with interests in understanding the Ukrainian conflict.

In general, the existing lessons learned efforts offer high-level geopolitical and tactical analyses, implications for the Ukrainian conflict, and focus on the land domain, which in turn reveals significant shortfalls in applying lessons learned to other conflicts. Due to the focus on geopolitical context or tactical and operational levels, few of the non-technical lessons can be applied to potential European conflicts with presumably different contexts or characteristics, nor to contests in other regions that may not bear much resemblance to the Ukraine conflict. These other conflicts will also occur across many domains, extending beyond land and the limited discussion of other domains covered in this body of literature.

3. Lessons Learned Regarding Russian Military Operations in Eastern Ukraine

While the conflict in Ukraine has remained relatively limited, Russia has nonetheless used some of its best units to conduct modern military operations against a capable opponent. In doing so, Russia has revealed capabilities and concepts that offer important lessons for the United States and NATO as they refine their capabilities, posture, and plans to deter Russian aggression. This chapter highlights key trends in Russian military operations in eastern Ukraine, focusing on force structure and personnel, ground operations, air operations and air and missile defenses, and information operations. It closes with implications for the US military.

A. Force Structure and Personnel

Russia's military activities in Ukraine are consistent with a broader force structure trend: Russian reforms and investments after the 2008 Georgia War prioritized high-readiness, light forces for small-scale interventions around Russia's periphery rather than the heavy, mechanized forces that would be required for a large-scale war with NATO.[1] Russia has upgraded specialized portions of its land forces, including special forces and high-readiness Battalion Tactical Groups (BTGs), and it has relied on them in Ukraine.

1. Special Operations Forces in Crimea

The takeover in Crimea was led by Russian Special Operations Forces (SOF), taking advantage of the presence of Russian forces and facilities on the Crimean peninsula supporting the Black Sea fleet. Russia has various groups within its ground forces that fit under the special operations label—*Spetsnaz* in Russian—but only recently established a dedicated SOF Command to oversee specialized, independent combat units. In contrast to Russian special reconnaissance forces, which typically conduct tactical support missions behind enemy lines, the units in SOF Command conduct direct, independent military operations.[2] These units deployed to Crimea and led the nonviolent takeover, but there is no evidence that they have been involved in the fighting in eastern Ukraine.[3]

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[1] Mikhail Barabanov, "Changing the Force and Moving Forward After Georgia," in Colby Howard and Ruslan Pukhov, eds., *Brothers Armed: Military Aspects of the Crisis in Ukraine*, Second Edition (Minneapolis: East View Press, 2015), 91–123; Charles K. Bartles and Roger N. McDermott, "Russia's Military Operation in Crimea," *Problems of Post-Communism* 61:6 (Nov-Dec 2014): 48.

[2] Alexey Nikolsky, "Little, Green and Polite: The Creation of Russian Special Operations Forces," in Colby Howard and Ruslan Pukhov, eds., *Brothers Armed: Military Aspects of the Crisis in Ukraine*, Second Edition (Minneapolis: East View Press, 2015), 126–27.

[3] Nikolsky, "Little, Green and Polite: The Creation of Russian Special Operations Forces," 129–30.

2. Paramilitaries Supported by Train and Equip Activities

In eastern Ukraine, the fighters collectively included under the umbrella of Ukrainian separatists are made up of a number of groups with differing levels of affiliation with the Russian government. The first category of fighters are pro-Russian Ukrainian separatists that live in Ukraine and oppose the government. In some cases, these may be ethnic Russians that have been turned against the government in Kyiv by Russian propaganda and covert operatives. Agents from both the Main Intelligence Directorate and the Federal Security Service are operating in Ukraine. After the conflict broke out, Russian special forces and intelligence operatives trained, equipped, and organized many separatists.[4] Analyst Roger McDermott notes that, "While much of the commentary on Russian military activities in Ukraine has focused on combat operations, in fact, their primary mission appears to have been to conduct a train and equip program to provide capabilities to the local separatists."[5] Indeed, even after Russian regulars entered eastern Ukraine, most Russian special forces and intelligence operatives have focused on training and equipping separatist forces, not operating in concert with Russian units.[6]

A second category of Russia-affiliated fighters in Ukraine are paramilitary groups, such as the Russian Orthodox Army, Night Wolves, Cossack paramilitaries, and Chetnik Guards. These groups often have members from both Russia and Ukraine, many of whom have military backgrounds or are on leave from the Russian Army. They coordinate with each other and with Moscow.[7] More than half of the Russian nationals who have fought in eastern Ukraine have been non-governmental volunteers recruited by these organizations, not official Russian soldiers.[8]

The primary advantage of separatist and paramilitary units is that they function as a force multiplier. Russia is able to hold territory and frustrate Ukrainian military advances without committing a significant number of troops. It is also able to avoid sending in conscripts who are unreliable and, when significant numbers die, a political liability. While these groups operate quasi-independently, they have been far more effective because of Russian training, equipment, and direction. Paramilitary groups often conduct operations in coordination with regular Russian military units and have benefited from Russian operational and tactical reinforcement at key moments.

Irregular units provide other advantages, including the ability to blend in with the local population. Russian separatists have maintained situational awareness by deploying 3- to 5- person

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4 The US Army Special Operations Command, *"Little Green Men": a primer on Modern Russian Unconventional Warfare, Ukraine 2013-2014,* (Fort Bragg, NC: US Army Special Operations Command, 2015), 43–49.

5 Roger N. McDermott, *Brothers Disunited: Russia's Use of Military Power in Ukraine* (Fort Leavenworth, KS: The Foreign Military Studies Office, 2015), 19.

6 Bret Perry, "Non-Linear Warfare in Ukraine: The Critical Role of Information Operations and Special Operations," *Small Wars Journal*, (2015), smallwarsjournal.com.

7 US Army Special Operations Command, *"Little Green Men,"* 43–44.

8 Paul Robinson, "Explaining the Ukrainian Army's defeat in the Donbass in 2014," in J.L. Black and Michael Johns, eds., *The Return of the Cold War: Ukraine, the West and Russia* (New York: Routledge, 2016), 108–26.

reconnaissance teams dressed in civilian clothes.[9] In other instances, separatist forces have blended in with the civilian population to avoid direct attack or to sabotage Ukrainian ammunition depots.

3. Russian Military Battalion Tactical Groups

The regular Russian Army units that have overtly participated in the conflict in eastern Ukraine have been organized as BTGs. These units have functioned as Russia's primary maneuver element. Generally, they have been held in reserve, then committed to critical engagements to help the separatists take and hold territory.

Russian BTGs are combined arms formations organized around a particular mission. They are usually composed of a tank company, three mechanized infantry companies, an anti-armor company, 2–3 self-propelled artillery batteries, a multiple launch rocket battery, and two air defense batteries. BTGs blend the tactical and operational level of war with organic fires that range as far as 90 km and direct-fire artillery that ranges 6,000 m (exceeding the range of a US Army Brigade Combat Team by 2,500 m).[10] BTGs form the competent core of larger Russian brigades, but can be separated to deploy independently. They are composed almost entirely of contract soldiers.

Table 1. Quantitative Comparison—US Army ABCT and Russian BTG

	US ABCT	Russia BTG	Advantage
Tank Company	4	1	US
Mechanized Infantry Company	3	3	—
Anti-Armor Company	0	1	Russia
Field Artillery Battery	2	2	—
Rocket Battery	0	1	Russia
Air Defense Battery	0	2	Russia
Engineer Companies	2	0	US

MAJ Amos C. Fox, *Hybrid Warfare: The 21st Century Russian Way of Warfare* (Fort Leavenworth, KS: US Army Command and General Staff College, 2017), 55.

[9] SFC John Garcia, CPT Ryan St. Jean, and Kurt Ebaugh, "Ukrainian LL News From The Front," Center for Army Lessons Learned, US Army Combined Arms Center, 10 Nov 2016, 5.

[10] MAJ Amos C. Fox and MAJ Andrew J. Rossow, "Making Sense of Russian Hybrid Warfare: A Brief Assessment of the Russo–Ukrainian War," *The Land Warfare Papers*, No. 112 (Mar 2017), 6.

B. Ground Operations in Ukraine

The Ukraine conflict has been described as "World War I with technology."[11] One aspect that stands out in the Ukraine conflict is the Russian employment of indirect fires. Combining separatist and regular BTGs, Russia has effectively degraded Ukrainian military forces with long-range artillery and rocket fire. Russia's preferred concept of operations has been to keep its fires units at a safe distance, while relying on drones, counter-battery radars, and other intelligence, surveillance, and reconnaissance (ISR) assets to target over the horizon.[12] The observed combination of increased range and precision tracks with a general trend noted worldwide, particularly with multiple rocket launchers. As a result, Russia has on numerous occasions successfully blunted Ukrainian operations while avoiding significant casualties. Ukraine, on the other hand, is estimated to have suffered 80% of its casualties from artillery fire.[13] The increased lethality has required fewer rounds, yet Russia has also demonstrated that it retains the ability to mass large volumes of fires when necessary.

Drones have played a prominent role in Russian operations. Using different types of drones, operating at various altitudes, Russia has enhanced the speed of its targeting for extended-range indirect fires. The SAIC Strategic Analysis & Assessments group, drawing on on-the-ground reporting by Dr. Karber, describes the process that Russia has demonstrated in Ukraine:

> The most notable aspect of Russia's use of drones in the Donbas is not the mix of vehicles themselves or even their unique characteristics but the ability of Russian units to integrate multiple sensing platforms into a real-time targeting system. There are three critical components to the Russian method: the sensor platforms that are often used at multiple altitudes over the same target with complimentary imaging; a command-and-control system that nets their input and delivers a strike order; and an on-call ground-based strike capability that can execute an attack on short order. By emphasizing overhead surveillance at tactical and operational ranges, Russia has been able to identify Ukrainian positions, combine multiple sensor inputs, and promptly deliver high-lethality indirect fires via artillery and rockets. Then, once Ukrainian units have been weakened, Russia at times has followed with direct armor and sniper engagements.[14]

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[11] Col. Liam Collins, "A New Eastern Front: What the U.S. Army Must Learn from the War in Ukraine," Association of the United States Army, 16 Apr 2018, www.ausa.org.

[12] US Army Asymmetric Warfare Group, *Russian New Generation Warfare Handbook*, Version 2 (Fort Meade, MD: Asymmetric Warfare Group, Jan 2017), 12–13; SAIC Strategic Analysis & Assessments, *Adapting to Operational Dissonance: Lessons Learned from the Ongoing Ukraine Conflict* (Arlington, VA: SAIC, Sept 2017), 6–10.

[13] Phillip A. Karber, *Russia's "New Generation Warfare": Implications of Ukraine for US & Allies*, Briefing for 1st Special Operations Command, US Army, Ft. Bragg, NC (1 May 2015), 18.

[14] SAIC Strategic Analysis & Assessments, *Adapting to Operational Dissonance*, 23.

This approach is consistent with the Soviet reconnaissance-strike model, which led with artillery strikes followed by infantry advancements. The United States, by contrast, often attempts to synchronize artillery strikes and infantry maneuver.[15]

A defining feature of Russian fires has been their speed. Ukrainian units report that once a Russian unmanned aerial vehicle (UAV) is spotted they may receive artillery strikes within minutes.[16] Three factors have enabled Russia to conduct indirect fires with ruthless efficiency.[17] First, the fires units are organic to each BTG. Second, only Russian Army units are operating in eastern Ukraine, which makes it easier to plan and conduct strikes quickly without joint coordination or worry about fratricide. Third, Russia is not as concerned with collateral damage as the United States would be, which reduces the information required for strike planning.

Part of Russia's success can also be attributed to the lethality of the munitions used. Russia has been willing to conduct area fires using Multiple Launch Rocket Systems and has increased effectiveness by relying on Dual-Purpose Improved Conventional Munitions, sensor-fused weapons, scatterable mines, top-attack munitions, and thermobaric warheads, many of which the United States does not field.

With increased precision and specialized warheads such as Dual-Purpose Improved Conventional Munitions and sensor-fused weapons, the threat to lightly armored vehicles has increased. To conserve weight, most light armored vehicles have minimal top armor and are generally designed only to withstand shrapnel from airbursts. Improvised explosive device attacks in Iraq and Afghanistan have understandably focused attention on the vulnerable underside of vehicles, resulting in many vehicles being modified with increased under-vehicle and side armor and v-shaped hulls, but the Ukraine conflict has highlighted the vulnerability to top attack as well. Ukrainian units operating light-armored vehicles, in particular, have suffered significant, at times catastrophic, losses.[18] Indeed, Ukrainian infantry units have taken to riding on top of light-armored vehicles and conducting dismounted assaults to avoid being trapped inside burning vehicles.[19] Another response by Ukraine has been to increase reliance on prepared defenses.[20]

Russian targeting and maneuver have been supported by advanced electronic warfare (EW) and cyber capabilities. Russia has used jammers to disrupt communications and data links and to

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15 Fox and Rossow, "Making Sense of Russian Hybrid Warfare," 10.

16 Philip A. Karber, *"Lessons Learned" from the Russo-Ukrainian War: Personal Observations*, Prepared for Historical Lessons Learned Workshop, Johns Hopkins Applied Physics Laboratory and US Army Capabilities Center (6 July 2015), 11–12.

17 MAJ Amos C. Fox, "Battle of Debal'tseve: the Conventional Line of Effort in Russia's Hybrid War in Ukraine," *Armor* 128:4 (Winter 2017): 45–52.

18 SAIC Strategic Analysis & Assessments, *Adapting to Operational Dissonance*, 16–18.

19 Karber, *"Lessons Learned" from the Russo-Ukrainian War*, 27.

20 SAIC Strategic Analysis & Assessments, *Adapting to Operational Dissonance: Lessons*, 20.

conceal its maneuver units and advanced emission sensors to detect Ukrainian headquarters, operations centers, and maneuver units.[21] Russian units have jammed and downed Ukrainian drones by disrupting their Global Positioning System links.[22] They have also shown an ability to use their EW and cyber assets to detect electromagnetic emissions, geo-locate cellular phones, and generate targeting information for artillery strikes.[23] As a result, Ukrainian units now view nearly all emissions as targetable and have been forced to operate with significantly reduced communications and coordination.

Russia's BTGs have also employed modern heavy tanks—primarily T-72B3s, T-80s, and T-90s featuring reactive armor—to conduct effective assaults against Ukrainian positions already softened by artillery fire.[24] The Ukraine war has reinforced the difference between US and Russian concepts of armor. According to analyst Keir Giles,

> Unlike Western tank designs, which are optimized for defending a series of positions while falling back in the face of superior numbers, Russian tanks have traditionally emphasized features that allow speed, transportability, low observability, and, more recently, armor enhancements and defensive aids to further minimize losses while assaulting defended positions.[25]

At the start of the war, Ukrainian armor units were poorly trained, operating outdated and poorly maintained equipment, giving Russia a significant advantage. But even as Ukrainian tank proficiency has grown and Ukrainian infantry units have acquired modern anti-tank guided missiles, Russian armor has posed a significant challenge to Ukrainian forces.

C. Air Operations and Air and Missile Defenses

Another notable aspect of the conflict in eastern Ukraine has been the near absence of air power on both sides. For Russia, air forces have been kept in reserve for two reasons. First, Russia's need to maintain plausible, and later implausible, deniability meant that it could not conduct

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[21] US Army Asymmetric Warfare Group, *Russian New Generation Warfare Handbook*, 17–18; Yuriy Radkovets, "Lessons of Russia's 'Hybrid War' against Ukraine," *Geostrategic Pulse*, No. 225, (13 Oct 2016). http://bintel.com.ua/en/article/10-13-lessons/

[22] Karber, *"Lessons Learned" from the Russo-Ukrainian War*, 15.

[23] Roger N. McDermott, *Russia's Electronic Warfare Capabilities to 2025: Challenging NATO in the Electromagnetic Spectrum* (Tallinn, Estonia: International Centre for Defence and Security, 2017), 5, 16, 25; Stephanie J. Seward, "Cyberwarfare in the Tactical Battlespace: An Intelligence Officer's Perspective," *Infantry* (Apr-Jun 2018): 12.

[24] Maj. Amos Fox, "The Battle of Debal'tseve, the Conventional Line of Effort in Russia's Hybrid War in Ukraine," *Armor* (Winter 2017): 47–50; Serhii Sobko, "The U.S. Armored Brigade Combat Team versus Current Hybrid Threat: How Should the U.S. ABCT Be Organized and Equipped to Address the Current Hybrid Threat," (Ft. Leavenworth: US Army Command and General Staff College, 2017), 91.

[25] Keir Giles, "Assessing Russia's Reorganized and Rearmed Military," Carnegie Endowment for International Peace, 2017, 8.

overt air operations, and instead had to supply air defense systems covertly to separatists.[26] Carrying out extensive air operations might have motivated the United States or Europe to respond more forcefully to Russia's involvement. Second, Russian integrated air defense has been extremely effective, which has significantly reduced the need for counter-air operations. On the Ukraine side, air operations have not been viable for operational reasons. In 2014, Ukrainian aviation units had old platforms and were poorly trained, which made both fixed-wing aircraft and helicopters exceptionally vulnerable to Russian defenses. After suffering significant early losses, the Ukrainian military quickly all but abandoned close air support.[27]

Russia's air and missile defense system consists of an integrated, overlapping network of operational- and tactical-level capabilities. Particularly when operating close to Russian territory, Russian and separatist units in Ukraine are protected by extremely capable surface-to-air missile systems, such as the S-400. Those operational capabilities are supplemented by tactical surface-to-air missile systems and man-portable air-defense systems that deploy with Russian and separatist BTGs.[28] Many tactical systems are netted together with each other and operational-level defenses.

[26] McDermott, *Brothers Disunited*, 33.

[27] Anton Lavrov, "Aircraft, Tanks and Artillery in the Donbass," in Colby Howard and Ruslan Pukhov, eds., *Brothers Armed: Military Aspects of the Crisis in Ukraine,* Second Edition (Minneapolis: East View Press, 2015), 228–35.

[28] SAIC Strategic Analysis & Assessments, *Adapting to Operational Dissonance: Lessons*, 26–28.

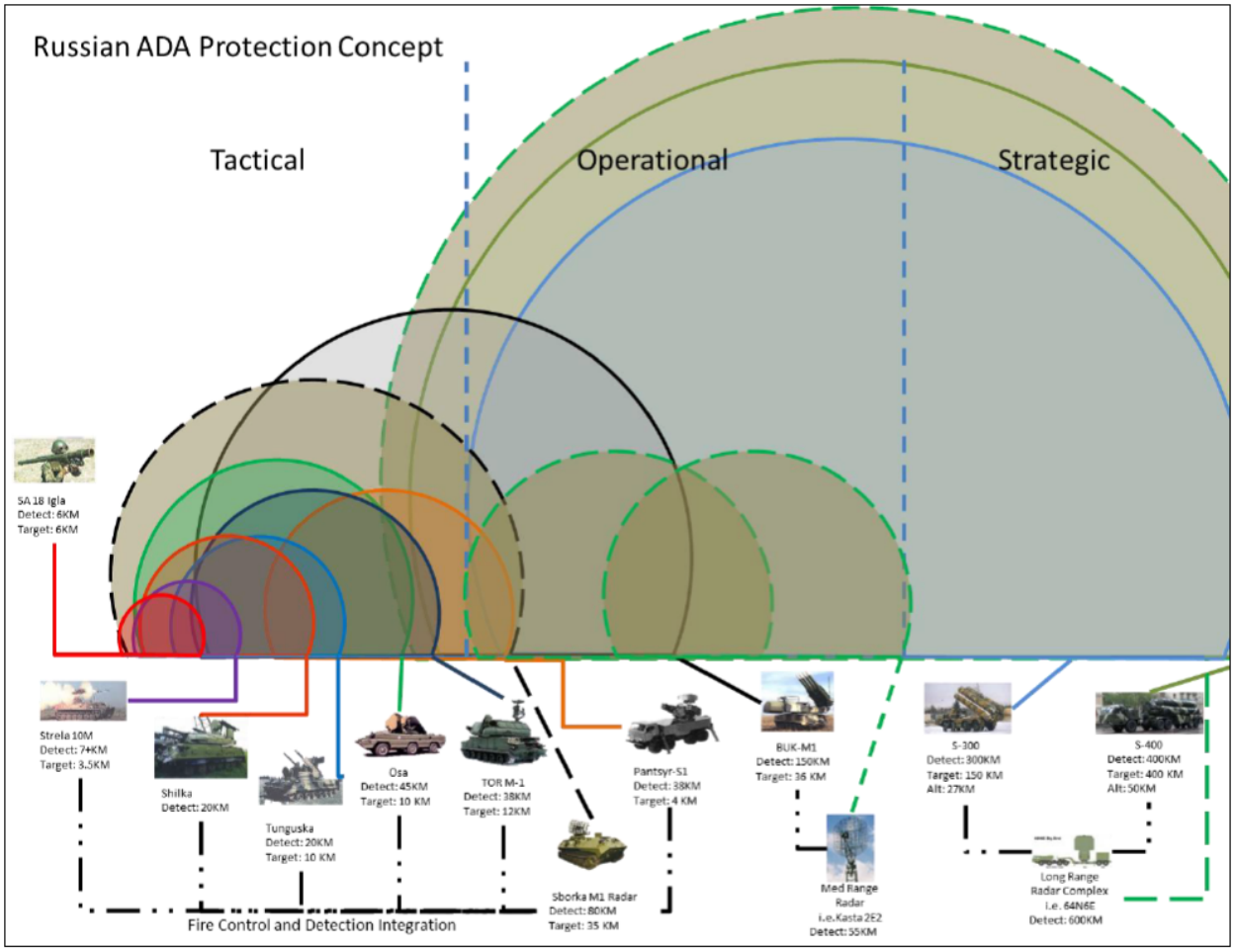

Figure 1. Russia's Air Defense Artillery Protection Concept[29]

D. Information Operations

A final important aspect of Russian military operations in Ukraine has been the use of information operations. Russia has noted the importance of public opinion in Russia, Ukraine, and other countries—notably European powers and the United States—and aligned its message and operations to achieve desired outcomes. Moscow has had a consistent justification for its involvement in Ukraine for all three audiences: Russia is intervening to protect ethnic-Russians under assault from an illegitimate government in Kyiv. Even before the conflict, Russian propaganda arms were used to delegitimize the government in Kyiv and generate support for Moscow among the Russian-speaking population in eastern Ukraine. During the conflict, Russia continues to sell its story to this audience and others to improve its chances of operational success.

Russia has also been cognizant of limiting its operations to avoid provoking a backlash. As noted above, Russia has shunned air operations to make its involvement appear more limited. For

[29] US Army Asymmetric Warfare Group, *Russian New Generation Warfare Handbook*, 8.

similar reasons, Russia has shown a preference for siege warfare in order to slowly achieve political gains. If, instead, Russia had achieved quick decisive gains by pummeling the Ukrainian military, the resulting casualties might have set off an international reaction.[30] At the same time, Russia has attempted to demoralize Ukrainian troops and the Ukrainian population. Using its EW and cyber capabilities, Russia's military has hacked into cell networks and sent targeted messaged to Ukrainian troops and their families. It has also aggressively conducted cyber operations to disrupt Ukrainian government and business activity and to intimidate Ukrainians and those who might support or do business in Ukraine.[31]

In various ways, Russia has taken steps to ensure that its message dominates. Moscow has made a concerted effort to build up its media presence in Russian-speaking areas along its periphery. Moreover, in both Crimea and eastern Ukraine, Russia made a point of taking over media outlets so it could control what message was disseminated to whom.

E. Implications for the US Military

In drawing implications from the Ukraine conflict for the US military, caution is warranted. From Russia's perspective, the Ukraine conflict has been limited. Rather than seek to invade and conquer Ukraine, Russia has instead supported local separatists in the Donbas in an attempt to create a frozen conflict in pro-Russian areas of Ukraine. With this limited objective, Russia has used limited means, relying primarily on paramilitaries to do its fighting. Even when Russia has employed regular units against Ukrainian forces, its full capabilities have not been required. Ukraine's military, while modern in many respects, does not approach the capability of a US-led NATO force.

How would the Russian military fight against the United States? It is possible, and even likely, that Russia would employ different concepts of operation in a more serious engagement with a better trained and equipped US-led force. But there are also aspects of Russian operations in Ukraine that are likely to carry over to plausibly future conflicts with NATO.

1. BTGs

Perhaps the most important question for US analysts is the extent to which Russia is likely to continue to rely on BTGs. Russian BTGs have proven extremely successful in Ukraine: their combination of tactical mobility and operational-range intelligence, surveillance and reconnaissance (ISR) and fires has posed a significant problem for the Ukrainian military. There are indications that Russia plans to substantially increase the number of BTGs in its force structure. In September 2016, the Chief of the General Staff of the Armed Forces of Russia announced that the number of

[30] MAJ Amos C. Fox, "The Russian–Ukrainian War: Understanding the Dust Clouds on the Battlefield," *Modern War Institute*, 17 Jan 2017. https://mwi.usma.edu/russian-ukrainian-war-understanding-dust-clouds-battlefield/

[31] Andy Greenberg, "The Untold Story of NotPetya, the Most Devastating Cyberattack in History," *Wired*, 22 Aug 2018. www.wired.com/story/notpetya-cyberattack-ukraine-russia-code-crashed-the-world/

BTGs in the Russian Army would increase from 66 to 125 by 2018.[32] On the other hand, some Russian military analysts have argued that BTGs are not suited for a large-scale war with NATO.[33] Russian BTGs have not fought more than 100 miles from the Russian border, where they enjoy fire and air defense support from Russian territory and can be easily resupplied.[34] In this regard, there are signs that the Russian military is preparing for future conflict by reverting to a divisional model that emphasizes larger, heavier formations. For example, Russia has moved significant heavy forces from east to west by rail in recent military exercises.

If Russia did emphasize BTGs in a conflict with NATO, these units would have a number of clear advantages and disadvantages. The main advantage of BTGs is the speed with which they can maneuver and conduct long-range fires. With organic air defense and ISR, units conducting tactical and operational fires each have their own capability to locate, target, and strike while providing for their own defense. BTGs posed a problem for Ukrainian forces because a standard Ukrainian mechanized brigade was often outgunned. The United States, therefore, might require more than one organic field artillery battalion in an Army BCT in order to match Russian BTGs.[35]

Yet, the strength of BTGs is also a weakness. Russia gains speed in their indirect fires cycle by delegating to maneuver units with significant organic capability. But while these tactical units have operational-range fires, they are not well coordinated with still longer-range indirect fire capabilities that are controlled at the operational level and higher. BTG commanders do not have control over operational-level fire support assets, which can limit their operational effectiveness. According to the US Army Asymmetric Warfare Group,

> Troops have to wait for a bombardment to stop and advance after volleys have ended or assets have completed their mission. This indicates a low proficiency in battle tracking which results from the Post-Soviet mission command style.[36]

In essence, this is the general dilemma of mission command: giving lower-level units greater autonomy buys speed and flexibility at the expense of coordination and efficiency.

2. Operating Under Threat of Surveillance and Targeting

Electronic warfare will be a significant part of any future contest with Russia. In Iraq and Afghanistan, the US military has enjoyed near-constant control of the air and the electronic spectrum. This has enabled frequent communication between tactical- and operational-level command-

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[32] Fox, "The Russian–Ukrainian War: Understanding the Dust Clouds on the Battlefield."

[33] SAIC Strategic Analysis & Assessments, *Adapting to Operational Dissonance: Lessons*, 33.

[34] Fox and Rossow, "Making Sense of Russian Hybrid Warfare," 12–13.

[35] LTC Serhii Sobko (Ukrainian Army), *The U.S. Armored Brigade Combat Team Versus Current Hybrid Threat: How Should the U.S. ABCT Be Organized and Equipped to Address the Current Hybrid Threat* (Fort Leavenworth, KS: US Army Command and General Staff College, 2017), 127.

[36] US Army Asymmetric Warfare Group, *Russian New Generation Warfare Handbook*, 31.

ers and across components with little to no risk of enemy targeting. Russia, by contrast, has demonstrated that it can efficiently integrate multiple sources of ISR—overhead surveillance, electronic detect, spotters, and other means—into its targeting cycle.

US units need to be prepared to maneuver quickly while taking active steps to limit their electronic footprint and deny Russian ISR. A particular vulnerability is US tactical operations centers, which can be easily detected by EW or overhead ISR. Operations centers need to limit communications, reduce or conceal the physical footprint of their antennas, and enhance their ability to relocate during an ongoing engagement.[37] Another example of US vulnerability is drone operations. The US concept of operations for drones is to launch and recover at a location that remains static during the course of a flight operation; against Russia, this location is likely to be targeted by long-range fires. To be effective, US drone operations will need to more closely resemble artillery: shoot and scoot.[38]

Maneuver units must also be able to operate with a limited electronic and physical signature. The US military requires secure, jam-resistant, low-probability-of-detection means of horizontal (battalion-to-battalion) and vertical (company-to-battalion) communication. In this regard, the Army is emphasizing high frequency radios for the former and frequency modulation (FM) radios for the latter.[39] But there will be a constant competition between means of communication and adversary electronic detection and jamming capabilities.

In addition, the US Army must also reemphasize camouflage, concealment, and deception techniques. Operating in the Donbas, Ukrainian mechanized units that come to a temporary stop quickly camouflage with netting so that they look like vegetation clusters to overhead surveillance.[40] NATO mechanized units, by contrast, generally rely on speed and maneuver, not camouflage, for survivability. On the modern battlefield with shorter targeting cycles for artillery and rocket fires, this approach may not be viable.

Finally, US maneuver units must be better prepared to disrupt enemy ISR and fires. Tactical ground units need organic, cost-effective UAV defenses—EW and kinetic—and improved counter-battery capabilities and training.

3. Operating Without Air Superiority

The Ukraine conflict demonstrates that the US military will not be able to rely on uncontested air superiority in future high-end conflicts. The US relies almost exclusively on airborne ISR, but in plausible Baltic conflict scenarios, Russian integrated air and missile defenses will cover some if not all of the battlefield.

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[37] Phillip Karber and Lt. Col. Joshua Thibeault, "Russia's New-Generation Warfare," *Army* (June 2016): 61.

[38] Lt. Col. Benjamin A. Bennett, "Enabling Brigade Combat Team Success in Europe," *Military Review* (Nov-Dec 2017): 76–77.

[39] Bennett, "Enabling Brigade Combat Team Success in Europe," 76.

[40] Collins, "A New Eastern Front."

Vulnerable ISR and close-air-support platforms will be required to maintain significant stand-off distances. For the Air Force, this requires renewed emphasis on suppression of enemy air defense, offensive counter-air, and defensive counter-air against high-end surface-to-air missiles and fourth and fifth generation fighters. Army, Marine, and Air Force aviation units all need to prepare to provide close air support in a heavily contested environment.

The Army and Marine Corps must be prepared to engage the enemy in high-intensity conflict without consistent, on-call ISR, close air support, or medical evacuations. Both services should consider pushing more organic capability to maneuver units, including counter-battery, air defense, and electronic warfare capabilities, so they are able to disrupt enemy fires without air support. They might also need to explore new tactics, such as deemphasizing helicopters, using difference concepts of operation for medical evacuations, or conducing suppression of enemy air defense operations with ground forces.

4. Logistics

At the theater-strategic level, the Ukraine conflict has demonstrated that Russia can rapidly move and concentrate forces from across the country. In a future conflict in Eastern Europe, the United States and NATO will not necessarily have a long period of warning provided by the build-up of Russian forces, which in turn may limit the period available to reinforce US forces in Europe.

In the area of sustainment, both sides in the conflict have reportedly experienced high expenditures of ammunition for indirect fire weapons. In a future conflict, the speed of Russian operations may be constrained by the supply of indirect fire munitions near the front. In Ukraine, Russia has often negotiated cease-fires, which were likely partially motivated by the need to re-supply artillery units. In this regard, a future conflict with Russia may be characterized by short periods of intense fires, followed by hours or even days of resupply, then a resumption of high-tempo operations.

5. Responding to Hybrid Warfare

At the strategic level, Russia's activities in eastern Ukraine provide a blueprint for future hybrid warfare in the Baltics. A key aspect of the Russian approach and strategy is to capitalize on the presence of significant numbers of ethnic Russians living in the target country or area. These persons provide both the pretext for Russian intervention and the basis for the formation of indigenous resistance forces.

US and NATO forces, therefore, must be prepared to operate against a force consisting of paramilitaries and regular Russian units that are coordinating their activities. Paramilitaries will be a force multiplier for Russia in conventional operations, while also serving as an irregular warfare asset. As they have in Ukraine, paramilitaries may conduct reconnaissance or sabotage operations while blending in with civilian populations. Having to worry about high-end fires and insurgency tactics simultaneously will be a difficult challenge for US and allied units.

The Ukraine conflict has also demonstrated that Russia will attempt to control the flow of information about the situation and craft a story to cast the opposing government in the worst possible light. Incidents between U.S. forces and local citizens, whether real or fabricated, will be exploited to undermine the confidence of the target country's populace and foment animosity toward US and NATO forces. The United States and its allies, therefore, must be prepared to counter Russian information warfare by effectively disseminating their own narrative lest they lose local popular support.

4. Implications of the Ukraine Conflict for Future Warfare

Significant attention has been paid to the tactical and technical lessons from Ukraine for potential future conflicts with Russia. However, far less inquiry has been devoted to analyzing whether those observations are unique or might apply outside the specific context of the current conflict. Are there implications for future warfare in other theaters, against other opponents? Does the conflict portend changes to military operations beyond the land domain? Are there early signs of technological advancements that are likely to have disruptive implications for future warfare? This chapter endeavors to facilitate that discussion by proposing a number of hypotheses about the future of warfare drawn from lessons learned in Ukraine.

A. Militaries will have to balance the benefits of greater connectivity against the risk that their opponents will exploit or disrupt those connections

Although superior information has always been important in warfare, the development and proliferation of information technologies has enabled more coordinated collection from a broader range of sources, better integration, expanded opportunities for collaboration, and more rapid and efficient dissemination of information. Forces in the field no longer have to wait for information to flow up and decisions to move down the chain of command. Instead, they are able to act more rapidly because information can be shared widely across the network and decision-making can be pushed down to lower-level units. Greater band-width communications and more numerous sensors have increased the connectivity and situational awareness of ground forces, thereby facilitating the conduct of more dispersed operations. Highly accurate position, navigation, and timing satellites enable precision strike forces. Today's expanded communication networks and information sharing capabilities influence and shape many aspects of military operations, from situational awareness to command and control.

Militaries around the world have recognized the potential benefits of greater connectivity and developed new doctrine to take advantage of them. Whether it is called Multi-Domain Battle, New Generation Warfare, or Informatized Warfare, the emerging doctrine envisions extensive networks with data and information constantly flowing among entities on the battlefield.

There are, however, drawbacks to greater connectivity. The constant transmissions required to reap the benefits of connectivity also provide excellent opportunities for detection and engagement by an adversary. A clear implication for ground forces is that if one can be "seen" one can be engaged and, if engaged, one can be killed. Future forces will need to be able to monitor, manage, and minimize their signatures across the visual, infrared, thermal, electronic and even audible

spectrums to limit detection. A necessary first step in emissions control is understanding the signature one's units are generating. The Ukrainians, for example, use UAVs to monitor the signatures of their positions. Once the signature one's units are presenting is understood, one can take steps to manage and minimize it. The Ukrainians bury electronic cables and operate radios and electronic equipment remotely in order to avoid revealing their locations.

Second, protection from indirect fires will need to be increasingly emphasized. This may involve some combination of improved camouflage and deception techniques, increasing the armor protection on the top of vehicles, improved types of armor, electronic warfare capabilities to disrupt fusing or accuracy of munitions, vehicle protection systems capable of engaging indirect fire as well as anti-tank weapons, and weapons systems capable of intercepting indirect fire rounds in flight. Based on combat lessons learned, the Ukrainians and Russians, as well as the Israelis, are developing or have developed heavy armored personnel carriers based on main battle tank chassis' to provide improved protection for infantry.

This trend is likely to extend to the air and sea domains as well. In both domains, improved ISR and long-range strike capabilities are making even capable, stealthy platforms more vulnerable. There are a number of possible implications. First, power projection may become even more challenging as countries are able to erect detection networks in the home region and rely on long-range fires from their territory. As a result, future conflicts between major competitors may quickly devolve into standoffs in which there are large swathes of mutually denied territory, seas, and airspace. Second, militaries may have to reconsider their approaches for avoiding detection. With more numerous and capable sensors operating across the electronic spectrum, concealment strategies that emphasize providing false positives through decoys may be more effective than attempts to hide signatures from every conceivable means of detection.

Even in cases where connectivity does not enable an opponent to locate and target one's forces, it still poses the twin dangers of dependency and disruption. Russian operations in the Ukraine have reinforced that modern conflict will occur in a highly contested electromagnetic environment, an aspect which has been absent from the limited conflicts in Iraq and Afghanistan. The Ukrainians have learned to adapt to operating against a sophisticated electronic warfare threat, in many cases by adopting legacy solutions. They no longer trust GPS information, for example, because the Russians spoof it so frequently, and rely instead on maps and compasses. One clear implication is that training must address what to do if advanced communications and information systems are not available. The US Navy regularly trains to operate in an electronically denied environment where command and control has been heavily impacted; ground (and air) forces need to do likewise. This has particular implications for Joint coordination, such as ground-to-air, where new tactics, techniques, procedures and capabilities may need to be developed. Conversely, some reversion to legacy solutions may be the most practical and effective.

B. Militaries will be required to conduct operations in support of ground maneuver in contested air environments

The Ukraine conflict suggests that future conflicts are likely to take place in a highly contested air environment. The Russian integrated air defenses have kept the Ukrainian Air Force grounded because Ukraine lacks the aircraft and electronic warfare capabilities to challenge them. Even more advanced air forces, however, are unlikely to achieve the level of air superiority enjoyed by US forces in recent conflicts in the future.

The viability of helicopters in such future air defense environments is questionable. To avoid radar detection, the Ukrainians have had to fly their helicopters at low altitudes where they are vulnerable to man-portable air-defense systems and small-arms fire. As a result, the Ukrainians have suffered significant helicopter losses and are no longer able to fly their helicopters within 30 km of the front lines.

In the contested air environments likely to characterize future conflicts, militaries may still need to be able to find, fix, track, and target mobile entities deep in denied airspace. This is not only vital for the counter-long-range fires battle but also to suppress or destroy electronic warfare and air defense systems. Although airborne assets may be optimal, as the Russians have demonstrated, ground-based signals intelligence systems and weapon-locating radars can play an essential role as well.

Having found and targeted high-value assets, militaries will require weapons with the range, responsiveness, and accuracy to engage those targets at extended ranges (100 km or greater). While precision will be essential, militaries will also benefit from more lethal munitions. Particularly against mobile targets, militaries may have narrow targeting windows and will be far more effective if they can degrade or destroy targets with high confidence in a limited number of strikes.

Ground units will also have to protect themselves against aerial attack. Particular attention will need to be paid to countering UAV systems, which will likely require both kinetic and electronic warfare solutions. Although not present in Ukraine, militaries will also be forced to deal with armed UAVs and UAV swarms.

C. Militaries will be forced to balance the gains in coordination and capability from fielding larger, more capable units against the advantages in flexibility and survivability from relying on smaller, more dispersed units

The Ukraine conflict has demonstrated that the massing of effects, if not forces, will still be necessary to exercise military power in the future. The Russians have been able to deliver devastating volumes of long-range fires and to deny large swaths of territory. Meanwhile, Russian heavy forces, although not used often since 2014, have proven decisive when employed.

If, as noted earlier, the Russians are considering returning to a divisional organization, it may be because they believe that larger, more capable units will enjoy several advantages in future warfare. Larger units will have access to a greater range and volume of capabilities than smaller ones. They are also easier to command and control and require less decision-making at lower levels.

Yet the Ukraine conflict has also demonstrated that concentrated forces are extremely vulnerable. Smaller units that can disperse on the battlefield have proven more survivable. If those lighter units have significant organic capabilities, they may also be more flexible than larger units. Although there has not been a significant naval component to the Ukraine conflict, the same observations are likely to be true at sea. Large combatants, while providing considerable combat power, are likely to be vulnerable. Coordinating the actions of numerous small units in a contested electromagnetic environment while minimizing the signatures of those units, however, will be challenging. Militaries will therefore need to develop organizational structures, operational concepts, and technologies that enable the rapid massing and demassing of military effects in contested electromagnetic and air environments.

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