Ukraine War OSINT Analysis
A Collaborative Student Report

TECH 4 HUMANITY LAB

Ukraine War OSINT Analysis: A Collaborative Student Report

For the People of Ukraine.

Special Thanks To Our Student Editors

Table of Contents

About this Report:

This report is the final semester research product of 9 undergraduate students from the senior seminar Intelligence Analysis Workshop in Department of Political Science and the International Studies Program at Virginia Tech. In January 2023 students were given instructions to begin developing intelligence analysis products using open-source materials on topics pertaining to the war in Ukraine. Students could choose any relevant topic and present an abstract to the class. If their topic was deemed sufficient, they were then given approval to begin research. For the first half of the semester the students were given detailed instruction on how to write intelligence analysis products including how to address different forms of bias. Concurrently students were given instruction on how to collect various types of OSINT and how to remain secure while doing so. Each student was taught how to maintain their cybersecurity and how to protect their identity in online spaces. During the second half of the semester students read numerous declassified intelligence analysis products from various agencies within the United States Intelligence Community and OSINT products from various organizations. The students regularly met with me as the instructor of record and received feedback and additional source materials. Each of the students turned in a complete draft of their report prior to this final copy. Inclusion in this final report was voluntary. All inclusions also had to be approved by a panel editors elected by members of the class. This report contains no names, titles, or affiliations of the authors. By decision and to protect the future employment prospects of the students all reports are anonymous. If you wish to receive further information on one of the reports, you may reach out to the Tech4Humanity Lab directly. The work below is not perfect and surely contains errors missed by both me as the faculty member and the editorial team. It is the culmination of a semester's worth of learning and work and reflects a progression of learning about a complex and ongoing conflict. The findings are fascinating and highlight many of the complex issues present in the war in Ukraine. If you would like to learn more about the class or the Tech4Humanity Lab please visit our website at Tech4HumanityLab.org.

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Dr. Aaron Brantly
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April 27, 2023

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FSB and GRU Cyber Operations in the Russian-Ukrainian Conflict

BLUF

GRU and FSB cyber operations have not been as publicly successful as initial intelligence predictions in the Russian-Ukrainian conflict thus far.

Abstract

Russia's interpretation of information warfare or 'information confrontation' (*информационное противостояние*)[1] takes an all-encompassing approach to cyber warfare and includes both information-technological and information-psychological operations.[2] Russian technological operations conducted by the GRU and FSB have evolved somewhat throughout the course of the Russian-Ukrainian conflict, ranging from coordinated kinetic and cyber operations during the Viasat satellite attack to spear-phishing attacks against critical infrastructure targets in Ukraine. Based on available evidence, although there is a continuing level of cyber activity occurring in the Russian-Ukrainian conflict, Russia has not been able to gain a significant tactical or strategic advantage from its state-sponsored cyber operations. While there are a few examples of coordination between conventional military operations and cyber operations in the conflict, most GRU and FSB-sponsored cyber operations operate independent to each other and independent to other kinetic warfare attacks.[3] This intelligence report assesses with a high-level of confidence that the lack of coordination between kinetic and cyber attacks, alongside the longevity of the Russian-Ukrainian conflict, the infrequency and conflicting nature of attacks,

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[1] JASPER, SCOTT, and Keith Alexander. "Information Warfare Component." In *Russian Cyber Operations: Coding the Boundaries of Conflict*, 71–92. Georgetown University Press, 2020. https://doi.org/10.2307/j.ctv1169bjk.11.

[2] Akimenko, Valeriy, and Keir Giles. 2020. "Russia's Cyber and Information Warfare." *Asia Policy* 15 (2): 67–75.

[3] Kostyuk, Nadiya, and Erik Gartzke. "Why Cyber Dogs Have Yet to Bark Loudly in Russia's Invasion of Ukraine." *Texas National Security Review* 5, no. 3 (2022): 113–26. https://doi.org/http://dx.doi.org/10.26153/tsw/42073.

and the competition between Russian intelligence agencies for government resources has resulted in Russia not gaining as much public success in their cyber operations compared to initial Western intelligence predictions.[4] Moving forward in the Russian-Ukrainian conflict, this report assesses with a high-level of confidence that the GRU and FSB will continue to use uncoordinated cyber attacks against government, military, civilian, and critical infrastructure targets in Ukraine using previously-used malware and spear-phishing techniques. There are numerous recommendations available to Ukraine to better prepare for and combat Russian state-sponsored cyber attacks, including recommendations from the Cybersecurity and Infrastructure Security Agency (CISA). Based on these recommendations, Ukraine could update its software, enforce Multi-Factor Authentication (MFA), secure and monitor Remote Desktop Protocols (RDP) against exploitation, and provide user awareness and training to all Ukrainian citizens.[5]

Analytic Methodology

Two structured analytic techniques were primarily utilized for this intelligence assessment: Key Assumptions Check and Alternative Futures Analysis. For 'Key Assumptions Check,' this report initially went off of three key assumptions, which were 1) GRU and FSB operations have evolved over time, 2) Russian kinetic and cyber operations are coordinated, and 3) Russia has not been as successful in their cyber operations compared to initial Western intelligence assessments. This report worked to challenge these initial assumptions and looked

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[4] Lewis, James. "Cyber War and Ukraine." Center for Strategic and International Studies, June 16, 2022. https://www.csis.org/analysis/cyber-war-and-ukraine.

[5] "Russian State-Sponsored and Criminal Cyber Threats to Critical Infrastructure." Cybersecurity and Infrastructure Security Agency. National Cyber Awareness System, May 9, 2022. https://www.cisa.gov/uscert/ncas/alerts/aa22-110a.

for corroborating and contradicting evidence for each one, which resulted in a few of these assumptions to be rejected as being inaccurate.

The first key assumption, the assumption that GRU and FSB cyber operations would change throughout the course of the war, was shown to be both correct and incorrect. GRU and FSB cyber operations have changed throughout the conflict as they have decreased over time, therefore changing in frequency. This assumption was incorrect in its theory that the methodology of cyber operations for both the GRU and FSB has changed over time. Based on available evidence, the GRU has not changed their mode of operations for cyber attacks, while the FSB seems more likely to experiment with new types of attacks against Ukrainian targets.

The second key assumption predicted that GRU and FSB cyber attacks were usually coordinated with kinetic attacks from the Russian military. This assumption was shown to be inaccurate, as this report found little evidence to support the notion that kinetic and cyber attacks are coordinated between Russian intelligence agencies and the Russian military, with the only exception being the Viasat satellite attacks.[6] Instead, based on available evidence, this report found that kinetic and cyber attacks usually operate independent of each other, and even when certain attacks seem to be coordinated, as argued by Microsoft, it is usually coincidental.[7] This report further grounded the third assumption that Russian cyber operations have been unsuccessful in the Russian-Ukrainian conflict overall, and found evidence that this is due to a lack of coordination between kinetic and cyber attacks, the unexpected longevity of the Russian-Ukrainian conflict, the infrequency and conflicting nature of attacks, and the competition between Russian intelligence agencies for government resources.

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[6] Willett, Marcus. 2022. "The Cyber Dimension of the Russia-Ukraine War." *Survival* 64 (5): 11–14.

[7] Willett, "The Cyber Dimension of the Russia-Ukraine War," 11–14.

As seen in Figure 1, for the 'Alternative Futures Analysis,' this report generated a futures matrix to predict multiple variations of how Russian cyber operations could progress moving forward in the Russian-Ukrainian conflict. This report found that with more coordination between kinetic and cyber operations, and a more cooperative intelligence apparatus, Russia would have more success in its cyber operations in the Russian-Ukrainian conflict. Russian cyber operations would be conducted more frequently, be larger in scale, produce more damage, and be more varied due to creative cooperation between the GRU and FSB. If Russia continues its current trajectory of uncoordinated cyber and kinetic attacks with a decentralized approach to intelligence, it will continue to have unsuccessful cyber operations in the Russian-Ukrainian conflict.
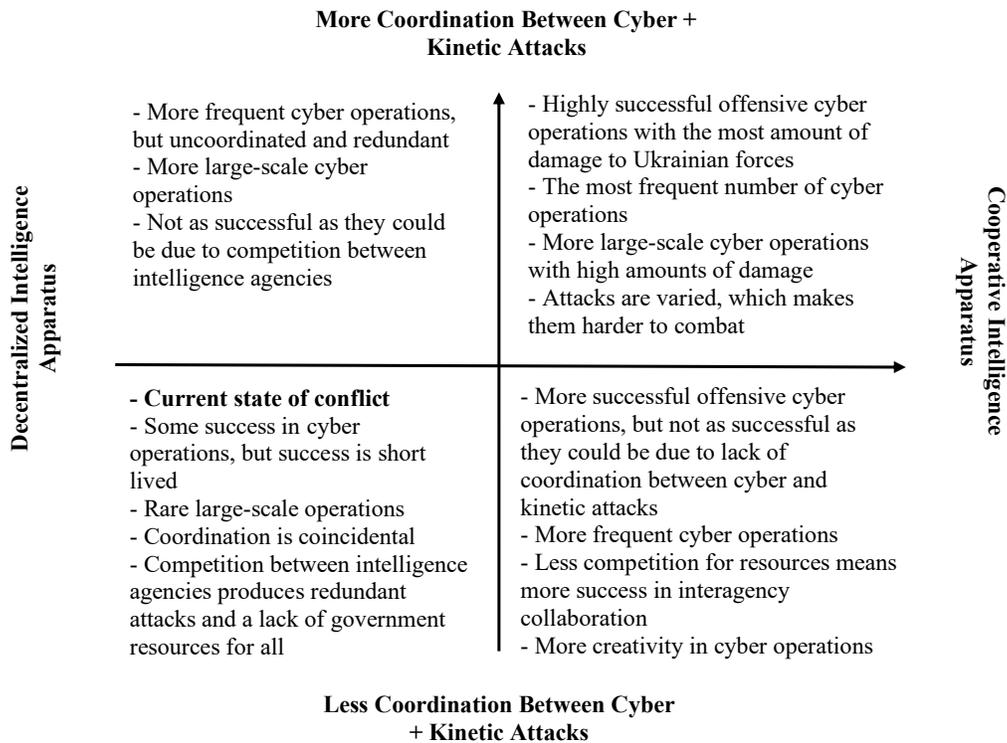
More Coordination Between Cyber + Kinetic Attacks

Upper-left quadrant:
- More frequent cyber operations, but uncoordinated and redundant
- More large-scale cyber operations
- Not as successful as they could be due to competition between intelligence agencies

Upper-right quadrant:
- Highly successful offensive cyber operations with the most amount of damage to Ukrainian forces
- The most frequent number of cyber operations
- More large-scale cyber operations with high amounts of damage
- Attacks are varied, which makes them harder to combat

Decentralized Intelligence Apparatus (left axis)

Cooperative Intelligence Apparatus (right axis)

Lower-left quadrant:
- **Current state of conflict**
- Some success in cyber operations, but success is short lived
- Rare large-scale operations
- Coordination is coincidental
- Competition between intelligence agencies produces redundant attacks and a lack of government resources for all

Lower-right quadrant:
- More successful offensive cyber operations, but not as successful as they could be due to lack of coordination between cyber and kinetic attacks
- More frequent cyber operations
- Less competition for resources means more success in interagency collaboration
- More creativity in cyber operations

Less Coordination Between Cyber + Kinetic Attacks

Figure 1: Alternative Futures Analysis.

Key Judgements

1. **Key Judgement 1: This report assesses with a high-level of confidence that GRU cyber operations have not evolved throughout the course of the conflict, while FSB cyber operations have evolved slightly.** Since the Viasat satellite attack, GRU and FSB cyber operations have devolved from offensive malware attacks to intelligence gathering initiatives, such as spear-phishing campaigns and disinformation campaigns.[8] The GRU will continue to conduct infrequent malware and DDoS attacks, semi-frequent spear-phishing campaigns, and frequent disinformation campaigns. Meanwhile, the FSB will continue to conduct semi-frequent spear-phishing campaigns and implement new cyber techniques against Ukrainian targets. Current GRU and FSB cyber attacks resemble previous attacks conducted by these intelligence agencies from the 2014 annexation of Crimea and the 2008 Russo-Georgian War, which makes it easier for Ukraine to identify and combat these threats.[9] State-sponsored cyber operations from Russia have decreased in general since the beginning of the war and will continue to remain stagnant as the war exceeds initial timeline expectations.[10]

2. **Key Judgement 2: Although there are a few examples of cyber operations coinciding with kinetic warfare attacks against critical infrastructure and government targets in Ukraine, this report assesses with a high-level of confidence that most GRU and FSB cyber operations will continue to operate independently from kinetic attacks.** The Viasat satellite attack on February 24th, 2022 continues to be the best example of a coordinated kinetic and cyber operation conducted by state-sponsored Russian entities in

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[8] Nichols, Shaun. "Russian Cyber Attacks on Ukraine Driven by Government Groups." TechTarget, August 18, 2022. https://www.techtarget.com/searchsecurity/news/252523950/Russian-cyber-attacks-on-Ukraine-driven-by-government-groups.

[9] Willett, "The Cyber Dimension of the Russia-Ukraine War," 10–11.

[10] Nichols, "Russian Cyber Attacks on Ukraine Driven by Government Groups."

the conflict thus far.[11] Microsoft argues that Russian kinetic and cyber operations are coordinated through numerous case studies, however these examples of coordination prove to be inconsequential.[12] This report found a lack of substantial evidence to prove that these examples were coordinated efforts, and instead, found that these examples from Microsoft further demonstrate that kinetic and cyber attacks operate independent of each other.[13] It is also argued that Microsoft purposely exaggerates the threat of Russian cyber attacks for their own corporate gain.[14] As seen in the conflict thus far, Russia utilizes kinetic attacks much more effectively and frequently than cyber attacks against Ukrainian targets.[15]

3. **Key Judgement Three: This report assesses with a high-level of confidence that cyber operations conducted by the GRU and FSB will continue failing to meet initial Western intelligence predictions**. Measurements of successful cyber operations are based on contextualizing the operations through the success of war efforts.[16] Based on available evidence, Russian cyber operations have not assisted Russia in gaining tactical or strategic military advantages over Ukraine in the Russian-Ukrainian conflict.[17] This is due to Russia's lack of coordination between decentralized and competitive intelligence agencies, a lack of coordination between kinetic and cyber military endeavors, and the

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[11] Greenberg, Andy. "Russia's Sandworm Hackers Attempted a Third Blackout in Ukraine." Wired, April 12, 2022. https://www.wired.com/story/sandworm-russia-ukraine-blackout-gru/.

[12] Bateman, Jon. "Russia's Wartime Cyber Operations in Ukraine: Military Impacts, Influences, and Implications." Carnegie Endowment for International Peace, December 16, 2022. https://carnegieendowment.org/2022/12/16/russia-s-wartime-cyber-operations-in-ukraine-military-impacts-influences-and-implications-pub-88657.

[13] Bateman, "Russia's Wartime Cyber Operations in Ukraine: Military Impacts, Influences, and Implications," 2022.

[14] Bateman, "Russia's Wartime Cyber Operations in Ukraine: Military Impacts, Influences, and Implications," 2022.

[15] Bateman, "Russia's Wartime Cyber Operations in Ukraine: Military Impacts, Influences, and Implications," 2022.

[16] Lewis, James. "Cyber War and Ukraine." Center for Strategic and International Studies, June 16, 2022. https://www.csis.org/analysis/cyber-war-and-ukraine.

[17] Lewis, "Cyber War and Ukraine," 2022.

infrequency of large-scale, high-impact cyber operations, which is largely a result of the longevity of the conflict.

<div align="center">Discussion</div>

Key Judgement One

Russian cyber operations in the Russian-Ukrainian conflict take on numerous forms and are conducted by both private and state-sponsored groups. The state-sponsored intelligence agencies with the most successful cyber operations in the conflict thus far are the Main Directorate of the General Staff *(Главное Разведывательное Управление)* or GRU[18] and the Federal Security Service *(Федеральная Служба Безопасности)* or FSB.[19] The GRU is Russia's primer military intelligence agency and divides its information confrontation operations into three primary units: Unit 26165, Unit 74455, and Unit 54777.[20] The FSB is Russia's main domestic intelligence agency and has two centers which focus on information security, the 16th Center and 18th Center, with the 18th Center producing the most successful cyber operations from the FSB in the Russian-Ukrainian conflict thus far.[21]

Although the GRU and FSB overlap in their operational missions, the internal motivations of the two intelligence agencies differ in key areas due to the differences in their foundations. The GRU prioritizes aggressive, risk-taking operations due to their militaristic

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[18] Sherman, Justin. "GRU 26165: The Russian Cyber Unit That Hacks Targets on-Site." Atlantic Council, November 18, 2022. https://www.atlanticcouncil.org/content-series/tech-at-the-leading-edge/the-russian-cyber-unit-that-hacks-targets-on-site/.

[19] Soldatov, Andrei, and Irina Borogan. "Russian Cyberwarfare: Unpacking the Kremlin's Capabilities." CEPA, September 8, 2022. https://cepa.org/comprehensive-reports/russian-cyberwarfare-unpacking-the-kremlins-capabilities/.

[20] Bowen, Andrew S., and Library of Congress. Congressional Research Service. February 2, 2022. Russian Cyber Units. Congressional Research Service. Accessed February 23, 2023. https://crsreports.congress.gov/product/pdf/IF/IF11718#:~:text=The%20Main%20Directorate%20of%20the,two%20primary%20GRU%20cyber%20units.

[21] Bowen, "Russian Cyber Units," 2.

culture[22] while the FSB prioritizes uncovering the 'chekist' mindset through looking for connections between domestic threats and foreign enemies.[23] The internal motivations of the GRU and FSB, alongside their patterns of frequently used cyber attack methods, can be used to help predict future attacks in the Russian-Ukrainian conflict.

After reviewing frequently used cyber operations conducted by the GRU and FSB, this report assesses with a high-level of confidence that the GRU has not changed their cyber operations throughout the Russian-Ukrainian conflict. The GRU will continue to mainly utilize DDoS attacks, spear-phishing campaigns, wiper malware attacks, and disinformation campaigns against government, military, civilian, and critical infrastructure targets in Ukraine. Meanwhile, the FSB has more variety in their cyber operations, and although they will continue to utilize previously used spear-phishing techniques, they have also demonstrated a capacity to develop new malware technologies. In this section, this report will briefly discuss the internal organization of the GRU and FSB, their cyber operations in the Russian-Ukrainian conflict, and predictions for their cyber operations moving forward.

GRU: Military Intelligence

The concept of military intelligence was established in 1918 by Lev Trotsky, who wanted to form a Registration Department for the revolutionary Red Army.[24] Since the days of the Russian Revolution, the GRU has developed into the central body for managing military

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[22] Bowen, Andrew S. November 15, 2021. Russian Military Intelligence. Congressional Research Service. Accessed February 1, 2023. https://purl.fdlp.gov/GPO/gpo154045.

[23] Riehle, Kevin P, and National Intelligence University (U.S.). 2022. *Russian Intelligence : A Case-Based Study of Russian Services and Missions Past and Present*. Bethesda, MD: National Intelligence Press. https://permanent.fdlp.gov/gpo182887/Riehle_Russian-Intelligence.pdf

[24] "Главное Разведывательное Управление Генштаба ВС России. Спавка." РИА Новости. РИА Новости, March 19, 2009. https://ria.ru/20090319/165389424.html.

intelligence for the Russian armed forces.[25] In accordance with the Russian law 'On Foreign Intelligence' (*О внешней разведке*), the GRU conducts political, technical, and economic tasks relating to the Russian military according to state-sponsored Russian news sources.[26]

In regard to the GRU's cyber capabilities, Russia's military doctrine began prioritizing information confrontation and the use of nonviolent tools to gain strategic advantages over their adversaries in the early 2000s due to its shifting interpretation of warfare.[27] There is no difference between 'peacetime' and 'wartime' in Russia's evolving interpretation of warfare, which draws inspiration from Soviet era beliefs, as Russia is always considered to be under attack by internal and external threats to their domestic security.[28] This prioritization of information confrontation is also reflected in the GRU's resource allocation.

The GRU continued to expand its cyber capabilities after the 2014 annexation of Crimea, and has since replaced the FSB as Russia's main state-sponsored organization conducting cyber operations during the Russian-Ukrainian conflict.[29] As a military intelligence agency, the GRU also oversees Russia's *spetsnaz* (*спецназ*) or special forces, which conduct covert actions to gain political advantages for the Russian government.[30] The inclusion of special forces within the ranks of the GRU has impacted its organizational culture, with the GRU awarding aggression and emphasizing high-risk behavior in their cyber operations.[31] This is the main reason why there is more publicly available information on the GRU compared to other Russian intelligence

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[25] "Главное Разведывательное Управление Генштаба ВС России. Спавка."

[26] "Главное Разведывательное Управление Генштаба ВС России. Спавка."

[27] Lilly B, Cheravitch J, and 12th International Conference on Cyber Conflict, CyCon 2020 12 2020 05 26 - 2020 05 29. 2020. "The Past, Present, and Future of Russia's Cyber Strategy and Forces." *International Conference on Cyber Conflict, Cycon* 2020-may: 131–144. https://doi.org/10.23919/CyCon49761.2020.9131723.

[28] Lilly and Cheravitch, "The Past, Present, and Future of Russia's Cyber Strategy and Forces," 131–144.

[29] Lilly and Cheravitch, "The Past, Present, and Future of Russia's Cyber Strategy and Forces"

[30] Riehle, "Russian Intelligence: A Case-Based Study of Russian Services and Missions Past and Present," 199–200.

[31] Bowen, "Russian Military Intelligence," 2–9.

agencies – high-risk activities lead to more publicity and exposure of the GRU's actions.[32] The GRU's aggression and the permeation of its *spetsnaz* culture is further seen through its recruitment strategies for its cyber operation units. Even though most recruits are non-military personnel, employment advertisements aimed at computer science graduates commonly depict images of automatic weapons placed next to computers, thus demonstrating their militaristic culture.[33] The GRU's militaristic culture and increased prioritization of information confrontation strategies have enabled the GRU to conduct aggressive, high-risk cyber operations against Ukraine in the Russian-Ukrainian conflict.

The GRU is overseen by the Ministry of Defense for the Russian Federation, which is led by Sergei Shoigu.[34] The GRU is currently under the leadership of Admiral Igor Kostyukov, and its headquarters is located in the Khoroshevsky District in Moscow.[35] The GRU is organized into 15 directorates, including 4 regional directorates and 11 mission-specific directorates.[36] Within its mission-specific directorates reside the GRU's cyber operation units: Unit 26165, Unit 74455, and Unit 54777. Unit 26165 and Unit 74455 are located within the 6th directorate, which focuses on signals and electronic intelligence, and Unit 54777 is most likely located within the 12th directorate, which focuses on information operations.[37] Each unit is responsible for different cyber operations, with Unit 26165 conducting remote and in-person spear-phishing attacks on government and private sector targets,[38] Unit 74455 conducting aggressive malware attacks on

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[32] Bowen, "Russian Military Intelligence," 2–9.

[33] Lilly and Cheravitch, "The Past, Present, and Future of Russia's Cyber Strategy and Forces" 142.

[34] "Ministry of Defence of the Russian Federation." The Russian Government. The Government of the Russian Federation. Accessed April 10, 2023. https://government.ru/en/department/94/events/.

[35] Bowen, "Russian Military Intelligence," 2–9.

[36] Bowen, "Russian Military Intelligence," 2–9.

[37] Bowen, "Russian Military Intelligence," 2–9.

[38] Sherman,"GRU 26165: The Russian Cyber Unit That Hacks Targets on-Site."

energy and critical infrastructure targets,[39] and Unit 54777 conducting psychological and disinformation operations to influence Western and Ukrainian perceptions of Russia.[40]

Unit 26165, also known as APT28, Sofacy, and Fancy Bear, operates within the 85th Special Service Center and primarily conducts signals intelligence and cryptography for the GRU.[41] Prior to the Russian-Ukrainian conflict, Unit 26165 was best known for their spear-phishing attacks against high profile government targets.[42] Spear-phishing attacks are commonly perpetrated through sending emails, where the sender will try to get the victim to click on an embedded link or image that will unknowingly download malware onto the victim's computer.[43] In 2016, Unit 26165 sent spear-phishing emails to the United States' Democratic National Committee and was able to gain access to their network.[44]

As seen in the Russian-Ukrainian conflict thus far, Unit 26165 still utilizes spear-phishing techniques to manipulate their victims and gain access to their computer systems. For example, in June 2022, Unit 26165 sent emails to Ukrainian victims of the war with an attached malicious document titled 'Nuclear Terrorism A Very Real Threat.rtf,' which played on Ukrainian fears of nuclear weapons being used during the conflict.[45] Using a vulnerability from Microsoft's zero-day, Follina, the document would create a .Net credential stealer if opened to steal usernames, passwords, and URLs from Microsoft Edge and Google Chrome browsers.[46] It is unclear how

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[39] Greenberg, "Russia's Sandworm Hackers Attempted a Third Blackout in Ukraine."

[40] Riehle, "Russian Intelligence: A Case-Based Study of Russian Services and Missions Past and Present," 198.

[41] Hakala J., Melnychuk J., Russia's Strategy in Cyberspace (2021). Riga: NATO Strategic Communications Centre of Excellence. https://stratcomcoe.org/cuploads/pfiles/Nato-Cyber-Report_11-06-2021-4f4ce.pdf

[42] "Everything You Need to Know about the APT, Fancy Bear." Avertium, July 19, 2022. https://www.avertium.com/resources/threat-reports/everything-you-need-to-know-about-the-apt-fancy-bear.

[43] Jasper and Alexander, "Information Warfare Component," 71–92.

[44] "Everything You Need to Know about the APT, Fancy Bear."

[45] "Everything You Need to Know about the APT, Fancy Bear."

[46] "Everything You Need to Know about the APT, Fancy Bear."

many Ukrainians were impacted by this spear-phishing attack, as Ukraine's State Service of Special Communications and Information Protection promptly warned citizens soon after the attack was discovered by the Computer Emergency Response Team of Ukraine.[47] Unit 26165 will most likely continue to conduct spear-phishing attacks against Ukrainian civilian targets, with potential future attacks also targeting government officials based on their prior attacks against U.S. government targets.

Unit 74455, also known as Sandworm, operates within the Main Center of Special Technologies and primarily conducts offensive malware attacks for the GRU.[48] Prior to the current Russian-Ukrainian conflict, Unit 74455 was best known for their aggressive cyber operations against critical infrastructure and government targets in Ukraine.[49] For example, in July 2017, Unit 74455 used popular tax-preparation software to deploy the malware 'NotPetya' against financial, energy, and government targets in Ukraine, which impacted an estimated 10% of all computers in Ukraine based on government reports.[50] The NotPetya malware was a self-replicating worm that Unit 74455 could not control, causing the malware to spread around the world and significantly damage computer systems in 60 additional countries, thus demonstrating how reckless Unit 74455's cyber operations can be.[51] During the current Russian-Ukrainian conflict, Unit 74455 has conducted numerous malware attacks against critical infrastructure and

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[47] Reporter. "Russian State-Backed Hacking Group Fancy Bear Linked to Malware Campaigns in Ukraine." Cyber Security Connect, June 22, 2022. https://www.cybersecurityconnect.com.au/commercial/7953-russian-state-backed-hacking-group-fancy-bear-linked-to-hacking-campaigns-in-ukraine.

[48] "Russian State-Sponsored and Criminal Cyber Threats to Critical Infrastructure." Cybersecurity and Infrastructure Security Agency.

[49] "Russian State-Sponsored and Criminal Cyber Threats to Critical Infrastructure."

[50] Willett, "The Cyber Dimension of the Russia-Ukraine War," 10.

[51] Willett, "The Cyber Dimension of the Russia-Ukraine War," 10.

energy targets in Ukraine (though not on the same scale and without as much success as NotPetya) including WhisperGate, HermeticWiper, CaddyWiper, and Industroyer2.[52]

In January 2022, about a month before Russia invaded Ukraine, Unit 74455 deployed WhisperGate against 70 Ukrainian government websites.[53] WhisperGate successfully defaced 22 websites and damaged six, but Microsoft discovered WhisperGate before it could cause any additional damage.[54] WhisperGate was a 'pseudo-ransomware' that corrupted a system's master boot record and displayed a fake ransomware note to obtain a ransom, but lacked a ransom recovery mechanism.[55] Instead of encrypting the master boot record, as one would see in a ransomware attack, the master boot record and other files on the computer were instead destroyed, thus rendering the targeted websites inoperable.[56] WhisperGate had some similarities to the NotPetya malware as well as AcidRain, which will be discussed in a later section, thus leading experts to believe that Unit 74455 was behind the operation.[57]

On February 23, 2022, hours before the Russian invasion of Ukraine, Unit 74455 deployed HermeticWiper against 300 systems in Ukraine, impacting government agencies, financial institutions, critical infrastructure targets, and agricultural organizations, although it is unclear how many of these systems were rendered inoperable by the attack based on available evidence.[58] The HermeticWiper malware mainly targeted Windows devices and was based on a digital certificate from the company 'Hermetica Digital Ltd,' which allowed the malware to issue

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[52] Antoniuk, Daryna. "A Deeper Look at the Malware Being Used on Ukrainian Targets." The Record from Recorded Future News, April 21, 2022. https://therecord.media/a-deeper-look-at-the-malware-being-used-on-ukrainian-targets/.

[53] Antoniuk, "A Deeper Look at the Malware Being Used on Ukrainian Targets."

[54] Kostyuk and Gartzke, "Why Cyber Dogs Have Yet to Bark Loudly in Russia's Invasion of Ukraine," 119.

[55] Antoniuk, "A Deeper Look at the Malware Being Used on Ukrainian Targets."

[56] Antoniuk, "A Deeper Look at the Malware Being Used on Ukrainian Targets."

[57] Antoniuk, "A Deeper Look at the Malware Being Used on Ukrainian Targets."

[58] Lewis, "Cyber War and Ukraine."

false certificates that bypassed built-in browser protections and other detection capabilities.[59] The malware first distributed a denial-of-service, or DDoS, attack which rendered websites inoperable.[60] Then, the wiper malware HermeticWiper manipulated the master boot record in order to fragment data and overwrite files with random data.[61] After rebooting, Windows was no longer able to work on the targeted systems.[62] HermeticWiper had code similarities to WhisperGate, which is why Unit 74455 is believed to be behind the operation.[63]

Unit 74455 has deployed the malware CaddyWiper in numerous attacks against Ukrainian targets, thus making CaddyWiper its most used malware in the conflict thus far according to publicly available data.[64] In March 2022, the malware was used against a few dozen systems targeting a limited number of Ukrainian organizations, including a bank.[65] In April 2022, CaddyWiper was used against a Ukrainian energy company, and in May and June of 2022, CaddyWiper was used in five additional attacks.[66] Based on available evidence, however, it is unclear to what extent the CaddyWiper malware impacted these Ukrainian entities.

CaddyWiper is a relatively simple, targeted wiper malware that is most likely compiled the same day it is deployed and is commonly deployed through a Windows Group Policy Object, which means Unit 74455 has access to the victim's network before the attacks take place.[67] CaddyWiper causes significant damage to infected machines by erasing user data and splitting

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[59] Antoniuk, "A Deeper Look at the Malware Being Used on Ukrainian Targets."
[60] Antoniuk, "A Deeper Look at the Malware Being Used on Ukrainian Targets."
[61] Antoniuk, "A Deeper Look at the Malware Being Used on Ukrainian Targets."
[62] Antoniuk, "A Deeper Look at the Malware Being Used on Ukrainian Targets."
[63] "Update: Destructive Malware Targeting Organizations in Ukraine." Cybersecurity and Infrastructure Security Agency, April 28, 2022. https://www.cisa.gov/uscert/ncas/alerts/aa22-057a.
[64] Antoniuk, "A Deeper Look at the Malware Being Used on Ukrainian Targets."
[65] Antoniuk, "A Deeper Look at the Malware Being Used on Ukrainian Targets."
[66] Greenburg, "Russia's New Cyberwarfare in Ukraine Is Fast, Dirty, and Relentless."
[67] Antoniuk, "A Deeper Look at the Malware Being Used on Ukrainian Targets."

information from any drives attached to its target.[68] Most recently, CaddyWiper was deployed against the national Ukrainian news agency Ukrinform in January 2023.[69] The malware was deployed through the agency's Group Policy Object, and although Unit 74455 attempted to disrupt Ukrinform's ability to deliver news to Ukrainian citizens, the news agency was not negatively impacted by this attack.[70] CaddyWiper was also used alongside the malware Industroyer2 in another attack, which has established ties to Unit 74455.[71]

Unit 74455 used the malware Industroyer during its infamous attacks against Ukrainian critical infrastructure targets in 2015 and 2016, which successfully disrupted power grids and cut power for many civilians in Ukraine.[72] During the current Russian-Ukrainian conflict, Unit 74455 attempted to cut power in Ukraine again with an updated variation of Industroyer called Industroyer2.[73] Industroyer2 shares code similarities with the original Industroyer, and it is theorized that the new variation was built using the same original code.[74] Just like its predecessor, Industroyer2 communicates with industrial equipment to control its flow of power.[75] In April 2022, Unit 74455 attempted to execute Industroyer2 against high-voltage electrical substations in order to cut power in Ukraine and then executed CaddyWiper on the same systems to destroy any evidence leftover from Industroyer2.[76] Although Unit 74455 was able to gain access to Ukraine's power management system, no power outages occurred and the attacks were

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[68] Antoniuk, "A Deeper Look at the Malware Being Used on Ukrainian Targets."

[69] Gatlan, Sergiu. "Ukraine Links Data-Wiping Attack on News Agency to Russian Hackers." BleepingComputer, January 18, 2023. https://www.bleepingcomputer.com/news/security/ukraine-links-data-wiping-attack-on-news-agency-to-russian-hackers/.

[70] Gatlan, "Ukraine Links Data-Wiping Attack on News Agency to Russian Hackers."

[71] "Industroyer2: Industroyer Reloaded." WeLiveSecurity, April 12, 2022. https://www.welivesecurity.com/2022/04/12/industroyer2-industroyer-reloaded/.

[72] Greenberg, "Russia's Sandworm Hackers Attempted a Third Blackout in Ukraine."

[73] Greenberg, "Russia's Sandworm Hackers Attempted a Third Blackout in Ukraine."

[74] Greenberg, "Russia's Sandworm Hackers Attempted a Third Blackout in Ukraine."

[75] Greenberg, "Russia's Sandworm Hackers Attempted a Third Blackout in Ukraine."

[76] "Industroyer2: Industroyer Reloaded."

successfully thwarted by Ukrainian counter operations.[77] If successful, this attack would have cut off power for roughly two million Ukrainian citizens.[78]

Moving forward in the Russian-Ukrainian conflict, Unit 74455 will continue to use modified versions of the CaddyWiper malware against government, non-government, and critical infrastructure targets in Ukraine. Unit 74455 will prioritize using CaddyWiper instead of the other malware families they have at their disposal due to CaddyWiper's simplicity and ability to be combined with other malware attacks, despite the unclear success rate of CaddyWiper's attacks and their increasing ability to be thwarted by Ukrainian counter operations over time. Unit 74455 has not changed their style of malware attacks throughout the course of the conflict and mainly utilize DDoS attacks and wiping malware attacks against Ukrainian targets. As the conflict continues to surpass initial timeline expectations, Unit 74455 will continue to have less success with using similar families of malware due to the increased success of Ukrainian countermeasures.

Unit 54777 operates within the 72nd Special Service Center and primarily conducts psychological operations and disinformation campaigns for the GRU, although not much is publicly known about Unit 54777 due to the sensitivity of their operations.[79] Unit 54777 is believed to complement GRU cyber operations through their digital disinformation operations and management of various 'front' organizations to further spread pro-Russian information, including the organizations InfoRos and the Institute of the Russian Diaspora.[80] It is also believed that Unit 54777 is likely overseen by Unit 55111 and its Information Operations Troops

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[77] Greenberg, "Russia's Sandworm Hackers Attempted a Third Blackout in Ukraine."

[78] Willett, "The Cyber Dimension of the Russia-Ukraine War," 13.

[79] Bowen, "Russian Military Intelligence," 2–9.

[80] Riehle, "Russian Intelligence: A Case-Based Study of Russian Services and Missions Past and Present," 198.

(*Войска Информационных Операций*), who work to spread disinformation and counterpropaganda narratives against enemy states on behalf of the Russian government.[81]

Prior to the 2022 Russian-Ukrainian conflict, Unit 54777 is believed to have spread covert, pro-Russian disinformation narratives during the 2014 annexation of Crimea.[82] Additionally, letters were sent to Congress in 2015 from 'The Patriots of Ukraine' that claimed Ukraine's military was corrupt and urged Congress to act, however these letters were later believed to have instead originated from Unit 54777.[83] During the current Russian-Ukrainian conflict, Unit 54777 is believed to be spreading disinformation to downplay critical infrastructure attacks against Ukrainian targets and cover up numerous war crimes, including Russia's war crimes in Bucha.[84] Moving forward, Unit 54777 will likely continue to execute disinformation campaigns to complement other GRU cyber operations and spread pro-Russian views to Ukraine and Western targets.

FSB: Domestic and Foreign Intelligence

The FSB is considered the most powerful special service[85] in Russia as the predecessor of the KGB and was officially established in 1995.[86] As Russia's primary domestic security agency, the FSB prioritizes counterintelligence and intelligence collection on both domestic and foreign

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[81] Wilde, Gavin. "Cyber Operations in Ukraine: Russia's Unmet Expectations." Carnegie Endowment for International Peace, December 12, 2022. https://carnegieendowment.org/2022/12/12/cyber-operations-in-ukraine-russia-s-unmet-expectations-pub-88607.

[82] Riehle, "Russian Intelligence: A Case-Based Study of Russian Services and Missions Past and Present," 198.

[83] Riehle, "Russian Intelligence: A Case-Based Study of Russian Services and Missions Past and Present," 198.

[84] Oaks, Mike. "Russia's Military Unit 54777, Disinformation and Psychological Operations Abroad." Insight News Media, January 11, 2023. https://insightnews.media/russias-military-unit-54777-disinformation-and-psychological-operations-abroad/.

[85] Hakala J., Melnychuk J., Russia's Strategy in Cyberspace (2021). Riga: NATO Strategic Communications Centre of Excellence. https://stratcomcoe.org/cuploads/pfiles/Nato-Cyber-Report_11-06-2021-4f4ce.pdf

[86] Riehle, "Russian Intelligence: A Case-Based Study of Russian Services and Missions Past and Present," 60.

targets, with an increased effort on foreign targets over the past decade.[87] Due to its KGB origins, the FSB still prioritizes its subversion of the 'chekist' mindset through its organizational objectives. The 'chekist' mindset originates from the USSR and was used to describe a Soviet state security officer, as well as emphasize the importance of remaining loyal to one's government.[88] In modern times, the 'chekist' mindset is taken to an extreme form and used to describe "the… threat narrative that ties internal dissent to foreign powers."[89] The internal fear of there being a potential connection between domestic threats and foreign powers, alongside the Russian mindset of always being under attack from foreign adversaries, is what drives the FSB in their offensive intelligence operations, efforts to control domestic narratives through propaganda, and cyber operations.[90] The FSB mainly recruits people for their cyber operations through coercing independent Russian hackers to join their agency, as well as cyber criminals who could exchange their FSB service for a reduced legal sentence.[91]

The current Director of the FSB is Alexander Bortnikov.[92] According to the FSB's official website, the basic structure of the FSB is organized into six key areas, including Aviation Divisions (*Авиационные подразделения*), Educational Organizations and Centers (*Образовательные организации, центры*), Special Forces Units (*Подразделения специального назначения*), Scientific Divisions (*Научные подразделения*), Expert and Forensic Expert Divisions (*Экспертные, судебно-экспертные подразделения*), and Military

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[87] Hakala and Melnychuk, "Russia's Strategy in Cyberspace" 17.

[88] Riehle, "Russian Intelligence: A Case-Based Study of Russian Services and Missions Past and Present," 56.

[89] Riehle, "Russian Intelligence: A Case-Based Study of Russian Services and Missions Past and Present," 56.

[90] Riehle, "Russian Intelligence: A Case-Based Study of Russian Services and Missions Past and Present," 56.

[91] Bowen, "Russian Military Intelligence," 2–9.

[92] "Federal Security Service." The Russian Government. The Government of the Russian Federation. Accessed April 10, 2023. https://government.ru/en/department/113/.

Medical Divisions (*Военно-медицинские подразделения*).[93] On the contrary, according to open-source information, the FSB is organized into seven services and their cyber operations mainly reside in the Center for Information Security.[94] Its cyber capabilities are divided into two main Centers: the 16th Center and the 18th Center.[95] The 16th Center contains the Center of Electronic Intelligence and Communications, which was inherited from FAPSI, or the Federal Agency for Government Communications and Information.[96] FAPSI was merged into the FSB in 2003, which gave the FSB a strategic advantage in conducting SIGINT operations over other intelligence agencies and advanced the FSB's interest in conducting more foreign intelligence collection operations.[97] The 18th Center is called the Centre for Radio-Electronic Intelligence by Means of Communication (*Центр радиоэлектронной разведки на средствах связи*).[98]

The 18th Center is the most active FSB-sponsored group conducting cyber operations in the Russian-Ukrainian conflict, and their most infamous hacking group is known as Gamaredon (which is an intentional misspelling of the word Armageddon).[99] Gamaredon operates from Sevastopol, Crimea and mainly conducts spear-phishing attacks against government, law enforcement, and critical infrastructure targets in Ukraine.[100] Gamaredon is believed to have begun their spear-phishing campaigns in 2013 a few months before the 2014 annexation of

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[93] "Структура Органов Федеральной Службы Безопасности." Федеральная Служба Безопасности Российской Федерации. Accessed April 10, 2023. www.fsb.ru/fsb/structure.htm.

[94] Bateman, "Russia's Wartime Cyber Operations in Ukraine: Military Impacts, Influences, and Implications."

[95] Riehle, "Russian Intelligence: A Case-Based Study of Russian Services and Missions Past and Present," 68.

[96] "Russia's FSB Malign Activity: Factsheet." GOV.UK. Foreign, Commonwealth, and Development Office, April 5, 2022. https://www.gov.uk/government/publications/russias-fsb-malign-cyber-activity-factsheet/russias-fsb-malign-activity-factsheet.

[97] "Russia's FSB Malign Activity: Factsheet."

[98] "Russia's FSB Malign Activity: Factsheet."

[99] "Groups." MITRE ATT&CK®. MITRE Corporation, 2022. https://attack.mitre.org/groups/.

[100] Antoniuk, Daryna. "Russia-Backed Hacker Group Gamaredon Attacking Ukraine with Info-Stealing Malware." The Record from Recorded Future News, February 1, 2023. https://therecord.media/russia-backed-hacker-group-gamaredon-attacking-ukraine-with-info-stealing-malware/.

Crimea and targeted Ukrainian government organizations to harvest sensitive information.[101]

Prior to the Russian-Ukrainian conflict, Gamaredon was also accused of breaching millions of

Yahoo email accounts in 2017 and was publicly outed by Ukrainian intelligence in 2021 as an

active Russian-sponsored cyber operation group.[102]

During the current Russian-Ukrainian conflict, Gamaredon has used similar spear-

phishing methods as well as new malware technologies to attack government systems and

organizations in Ukraine. In January 2023, Gamaredon used the app Telegram to connect various

Ukrainian-based IP addresses together in order to download malware onto law enforcement and

military computer systems in Ukraine.[103] This attack relies heavily on profiling potential victims

and locating them geographically before initiating the final malware attack.[104] Based on available

evidence, it is unclear how many computer systems were impacted by this attack. The

methodology used to infect the targeted systems, however, was the first of its kind from

Gamaredon, thus demonstrating their capacity for new malware development despite the

longevity of the Russian-Ukrainian conflict.[105]

In February 2023, Gamaredon used additional spear-phishing techniques by sending

emails through 'official' Ukrainian sources, including the supposed Security Service of Ukraine,

in order to gain access to critical information from government targets in Ukraine.[106] Gamaredon

utilized the information-stealing malware GammaLoad and GammaSteel which were used in

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[101] Antoniuk, "Russia-Backed Hacker Group Gamaredon Attacking Ukraine with Info-Stealing Malware."

[102] Bowen, "Russian Cyber Units,"

[103] Lakshmanan, Ravie. "Gamaredon Group Launches Cyberattacks Against Ukraine Using Telegram." The Hacker News, January 21, 2023. https://thehackernews.com/2023/01/gamaredon-group-launches-cyberattacks.html.

[104] "Gamaredon (Ab)Uses Telegram to Target Ukrainian Organizations." BlackBerry. The BlackBerry Research & Intelligence Team, January 19, 2023. https://blogs.blackberry.com/en/2023/01/gamaredon-abuses-telegram-to-target-ukrainian-organizations

[105] "Gamaredon (Ab)Uses Telegram to Target Ukrainian Organizations."

[106] Antoniuk, "Russia-Backed Hacker Group Gamaredon Attacking Ukraine with Info-Stealing Malware."

previous spear-phishing attacks against Ukrainian targets in August 2022.[107] GammaLoad and GammaSteel act as spyware and maintain control over the victim's computer after the victim clicks a malicious link embedded in spear-phishing emails, although it is unclear how many government targets were impacted by this attack based on available evidence.[108] Moving forward, Gamaredon will likely continue to use spear-phishing tactics to gain access to critical government and military information in the Russian-Ukrainian conflict. Gamaredon is also capable of developing new malware technologies, making this cyber group more of an unpredictable threat compared to GRU cyber units, which usually stick to the same malware family groups for their operations.

Future Predictions: GRU and FSB Cyber Operations

Throughout the current Russian-Ukrainian conflict, the GRU and FSB have primarily utilized cyber operations similar to attacks used against Georgia and Ukraine in the 2008 Russo-Georgian conflict and 2014 annexation of Crimea, respectively. In the 2008 Russo-Georgian conflict, the GRU and FSB conducted DDoS attacks and spread pro-Russian propaganda on government websites in Georgia.[109] During the 2014 annexation of Crimea, the GRU's Unit 54477 spread pro-Russian disinformation to influence public perception of the illegal annexation.[110]

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[107] Telychko, Veronika. "Armageddon APT Aka UAC-0010 Uses GammaLoad and GammaSteel Malware in Targeted Cyber-Attacks on Ukraine." SOC Prime, August 12, 2022. https://socprime.com/blog/armageddon-apt-aka-uac-0010-uses-gammaload-and-gammasteel-malware-in-targeted-cyber-attacks-on-ukraine/.

[108] Lakshmanan, Ravie. "New Russian-Backed Gamaredon's Spyware Variants Targeting Ukrainian Authorities." The Hacker News, February 2, 2023. https://thehackernews.com/2023/02/new-russian-backed-gamaredons-spyware.html

[109] Kostyuk and Gartzke, "Why Cyber Dogs Have Yet to Bark Loudly in Russia's Invasion of Ukraine," 116.

[110] Riehle, "Russian Intelligence: A Case-Based Study of Russian Services and Missions Past and Present," 198.

Based on attacks prior to the Russian-Ukrainian conflict, as well as attacks currently taking place, this report assesses with a high-level of confidence that the GRU will continue to utilize DDoS attacks, spear-phishing campaigns, wiper malware attacks, and disinformation campaigns against government, military, civilian, and critical infrastructure targets in Ukraine. Unit 26165 will most likely continue to conduct spear-phishing attacks in order to manipulate Ukrainian civilian targets, with potential future attacks also targeting government officials. Unit 74455 will most likely continue to use modified versions of the CaddyWiper malware against government, non-government, and critical infrastructure targets in Ukraine. Lastly, Unit 54777 will likely continue to conduct disinformation campaigns to complement other GRU cyber operations and spread pro-Russian views to Ukraine and Western sources.

In general, the FSB has more variety in their cyber operations compared to the GRU. Gamaredon will likely continue to use spear-phishing tactics to gain access to Ukrainian government and military information, but Gamaredon is also capable of developing new malware technologies as seen through their recent Telegram attacks. Gamaredon in particular is more of an unpredictable threat compared to the other GRU cyber operation groups, who usually stick to the same malware families and spear-phishing strategies for their offensive cyber operations. GRU's Unit 74455, however, is a more dangerous threat than Gamaredon, as their malware attacks have done significantly more damage to Ukrainian targets than Gamaredon's spear-phishing attacks. Moving forward, Gamaredon could utilize more apps or social media platforms alongside Telegram such as Signal or WhatsApp to reach more critical targets in Ukraine. For both the GRU and FSB, cyber operations will continue to decrease in frequency and scale due to the longevity of the conflict, which will be discussed in more detail in a later section.

Key Judgement Two

Information and cyber operations are still considered to be a recent development in modern warfare. One of the first major instances of cyber operations being utilized in war occurred during the Russo-Georgian War in 2008, where Russia launched multiple offensive cyber operations against Georgia that corresponded with kinetic attacks.[111] Although their military performed poorly during this conflict, it was still a major step forward in the development of coordinated cyber and conventional or kinetic attacks in war.[112] In general, it is argued that joint cyber and kinetic attacks would have the highest levels of success on the battlefield, as disabling critical systems while physically attacking targets would disadvantage the enemy and prevent them from being able to make a proper counteroffensive strike.[113] Although initial reports from Western intelligence agencies predicted that Russia would fully take advantage of their cyber prowess and launch numerous joint kinetic and cyber operations against Ukraine, this has yet to be fully realized in the Russian-Ukrainian conflict.[114]

In fact, it is argued by some scholars that Russia's use of cyber operations has "neither supplanted nor significantly supplemented conventional combat activities" in the conflict.[115] During the Russian-Ukrainian conflict thus far, there have only been a few notable instances of Russia utilizing joint cyber and kinetic operations against a target, the most notable being the Viasat satellite attacks.[116] Evidence suggests that rather than coordination between kinetic and cyber attacks occurring, these attacks instead occur independent of each other.[117] This section

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[111] Bowen, "Russian Cyber Units," 2–9.

[112] Bowen, "Russian Military Intelligence," 2–9.

[113] Lewis, "Cyber War and Ukraine."

[114] Willett, "The Cyber Dimension of the Russia-Ukraine War," 11–17.

[115] Kostyuk and Gartzke, "Why Cyber Dogs Have Yet to Bark Loudly in Russia's Invasion of Ukraine," 114.

[116] Willett, "The Cyber Dimension of the Russia-Ukraine War," 13.

[117] Kostyuk and Gartzke, "Why Cyber Dogs Have Yet to Bark Loudly in Russia's Invasion of Ukraine," 114–115.

will discuss a few examples of coordinated kinetic and cyber attacks, arguments to why kinetic and cyber attacks are not actually coordinated and instead operate independent to each other, and future predictions for the coordination of Russian kinetic and cyber attacks.

Examples of Coordinated Attacks

An hour before Russia invaded Ukraine on February 24th, 2022,[118] GRU Unit 74455 conducted a malware attack on Viasat Inc's KA-SAT satellite network, which disabled internet access to tens of thousands of people across Europe and Ukraine.[119] Approximately 5,800 wind turbines lost remote monitoring access in Germany, 9,000 customers of a satellite internet service provider experienced an outage in France, and several thousand customers were impacted in Ukraine by this attack.[120] Unit 74455 used the wiper malware AcidRain during this attack and conducted targeted DDoS attacks to remotely disable vulnerable modems and routers by overwriting key data in the modem's flash memory, thus rendering the modem inoperable.[121] The malware AcidRain originates from the same family of malware as WhisperGate, thus connecting it to previously used Russian malware attacks from Unit 74455.[122] AcidRain disabled critical telecommunication systems during the beginning of the Russian-Ukrainian conflict, therefore putting Ukraine's forces at an initial strategic disadvantage, although this fact is debated amongst various Ukrainian officials.[123]

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[118] Kostyuk and Gartzke, "Why Cyber Dogs Have Yet to Bark Loudly in Russia's Invasion of Ukraine," 114–115.

[119] "Case Study: Viasat Attack." CyberPeace Institute, July 2022. https://cyberconflicts.cyberpeaceinstitute.org/law-and-policy/cases/viasat.

[120] "Case Study: Viasat Attack."

[121] Antoniuk, "A Deeper Look at the Malware Being Used on Ukrainian Targets."

[122] "Case Study: Viasat Attack."

[123] "Case Study: Viasat Attack."

While the Viasat satellite attack is considered to be the most successful joint cyber and kinetic operation in the Russian-Ukrainian conflict thus far, experts and intelligence analysts disagree on the exact strategic impact this cyber operation had on Ukrainian forces.[124] Some early reports from Ukrainian military officials claim the Viasat satellite attacks produced "a really huge loss in communications in the very beginning of war" for Ukraine's military, while other officials later claimed there was "no information that (it) worsened communications within Ukraine's military."[125] Regardless of the true destructive power of these cyber attacks, Ukraine was able to gain access to the Space Exploration Technologies Corporation's (SpaceX) StarLink orbital information network soon after this attack occurred.[126] The conflicting nature of damage reports, as well as Ukraine being able to adapt their telecommunication systems early in the conflict, produces an unclear picture of how successful this joint kinetic and cyber operation was and how much of a strategic advantage it gave Russia's military when looking at the Russian-Ukrainian conflict as a whole.[127]

As previously mentioned, besides the initial Viasat satellite attack, there are few examples of joint kinetic and cyber operations occurring in the Russian-Ukrainian conflict according to the majority of publicly available reports. In March 2022, Microsoft reported that Russian forces conducted cyber operations against a media organization in Kyiv and also conducted a kinetic missile strike on the organization's TV tower.[128] This attack took place the same day Russian military officials claimed they wanted to destroy disinformation targets in

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[124] Bateman, "Russia's Wartime Cyber Operations in Ukraine: Military Impacts, Influences, and Implications."

[125] Bateman, "Russia's Wartime Cyber Operations in Ukraine: Military Impacts, Influences, and Implications."

[126] Bronk, Christopher, Gabriel Collins, and Dan Wallach. "Cyber and Information Warfare in Ukraine: What Do We Know Seven Months in?" Baker Institute for Public Policy. Rice University, September 6, 2022. https://www.bakerinstitute.org/research/cyber-and-information-warfare-ukraine-what-do-we-know-seven-months.

[127] Bateman, "Russia's Wartime Cyber Operations in Ukraine: Military Impacts, Influences, and Implications."

[128] Willett, "The Cyber Dimension of the Russia-Ukraine War," 13–14.

Ukraine.[129] Also in March 2022, Microsoft reported that Russian forces were able to breach the networks of a Ukrainian power company while simultaneously gaining physical access to the Zaporizhzhia nuclear power station in Ukraine.[130] Similarly, in July 2022, the Ukrainian power company DTEK experienced an unsuccessful cyber attack on their networks, which occurred simultaneously to Russian forces using kinetic missile strikes against DTEK's Kryvorizka thermal power plant in Kryvyi Rih, Ukraine.[131] While there are a few additional examples of Russia conducting seemingly coordinated cyber and kinetic operations in the Russian-Ukrainian conflict, it is important to consider how coordinated these attacks truly were as well as the effectiveness of the coordination in enabling Russia to gain a strategic military advantage.

Arguments Against Coordinated Attacks

The largest reporter of Russia conducting joint cyber and kinetic operations during the conflict has been Microsoft, which has reported numerous instances of wiper attacks damaging critical infrastructure targets in coordination with kinetic missile strikes in Ukraine.[132] Although there is a lack of publicly available information on the exact severity of cyber attacks in the conflict, some experts believe that Microsoft's estimates of the destructive capabilities of Russian cyber operations have been exaggerated due to their own corporate agenda and lack of military expertise.[133] For example, it is argued by experts that Microsoft could be exaggerating the effectiveness of state-sponsored cyber operations because numerous GRU and FSB

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[129] Willett, "The Cyber Dimension of the Russia-Ukraine War," 13–14.

[130] Willett, "The Cyber Dimension of the Russia-Ukraine War," 13–14.

[131] Bateman, "Russia's Wartime Cyber Operations in Ukraine: Military Impacts, Influences, and Implications."

[132] Watts, Clint. "Preparing for a Russian Cyber Offensive against Ukraine This Winter." Microsoft On the Issues. Microsoft, December 3, 2022. https://blogs.microsoft.com/on-the-issues/2022/12/03/preparing-russian-cyber-offensive-ukraine/

[133] Bronk, "Cyber and Information Warfare in Ukraine: What Do We Know Seven Months in?"

operations have utilized Microsoft Office 365® cloud services in their spear-phishing attacks.[134] Microsoft, therefore, would want to exaggerate the threat of GRU and FSB operations in order to prevent their services from looking vulnerable to attacks.[135]

Moreover, Microsoft could be trying to exaggerate their own strategic importance in the conflict by overstating the threat posed by Russian cyber operations and emphasizing Ukraine's success in thwarting attacks, as Microsoft has been giving a lot of cybersecurity support to Ukraine.[136] Microsoft also lacks the contextual expertise to properly measure the military success of GRU and FSB cyber operations in the conflict, as Microsoft is accused of claiming that numerous Russian cyber operations against Ukraine are influential to military history, when this is not the case in reality.[137] With these accusations in mind, and Microsoft's tendency for exaggeration, it is important to situate Microsoft's claims that Russian is conducting sophisticated, coordinated kinetic and cyber attacks against Ukraine in this context.[138] Despite potential skepticism in Microsoft's assessments, the company still reports that Russian cyber operations in the Russian-Ukrainian conflict have not been successful and Russia has inflicted limited operational impacts on Ukrainian targets thus far.[139]

Instead of Russia conducting coordinated cyber and kinetic attacks against Ukraine, these attacks typically operate independent of each other and any evidence of coordination occurs accidentally, with the main exception being the Viasat satellite attacks.[140] For example, in March

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[134] "Russian GRU Conducting Global Brute Force Campaign to Compromise Enterprise and Cloud Environments." National Security Agency, July 2021. https://media.defense.gov/2021/Jul/01/2002753896/-1/-1/1/CSA_GRU_GLOBAL_BRUTE_FORCE_CAMPAIGN_UOO158036-21.PDF.

[135] "Russian GRU Conducting Global Brute Force Campaign to Compromise Enterprise and Cloud Environments."

[136] Bateman, "Russia's Wartime Cyber Operations in Ukraine: Military Impacts, Influences, and Implications."

[137] Bateman, "Russia's Wartime Cyber Operations in Ukraine: Military Impacts, Influences, and Implications."

[138] Bateman, "Russia's Wartime Cyber Operations in Ukraine: Military Impacts, Influences, and Implications."

[139] Bateman, "Russia's Wartime Cyber Operations in Ukraine: Military Impacts, Influences, and Implications."

[140] Kostyuk and Gartzke, "Why Cyber Dogs Have Yet to Bark Loudly in Russia's Invasion of Ukraine," 114.

2022, Microsoft reported that Russian cyber operations were conducted against government targets in Dnipro the same day kinetic missile strikes hit 'government buildings' amongst other public buildings in the city.[141] Microsoft's assessment of this event, however, conflicts with official reports from Ukraine's State Emergency Service, as the State Emergency Service claimed that only civilian targets were hit by missiles during this initial attack.[142] Additionally, Russia could not launch a true offensive attack against Dnipro and instead focused their efforts on targets along Ukraine's Eastern front, thus making cyber attacks against Dnipro government agencies appear fruitless and not strategically advantageous to Russia's military forces.[143] The difference in targets hit by the cyber and kinetic attacks, as well as kinetic attacks not pursuing the city further, disproves a strong coordinated effort between Russian kinetic and cyber attacks.[144] Instead, this example supports the theory that both attacks occurred independent of each other, with a potential argument being made for accidental coordination in the attacks based solely on their geographic proximity in Dnipro, Ukraine.

Another example of reported 'coordination' between Russian cyber and kinetic attacks occurred in October 2022. Microsoft reported that five cyber attacks were conducted on 'critical infrastructure targets' in Ukraine in coordination with missile attacks on energy infrastructure targets based on their temporal and geographic proximity to the missile attacks.[145] None of these cyber attacks, however, targeted energy infrastructure targets in Ukraine, which were the main

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[141] Bateman, "Russia's Wartime Cyber Operations in Ukraine: Military Impacts, Influences, and Implications."

[142] Bateman, "Russia's Wartime Cyber Operations in Ukraine: Military Impacts, Influences, and Implications."

[143] Bateman, "Russia's Wartime Cyber Operations in Ukraine: Military Impacts, Influences, and Implications."

[144] Bateman, "Russia's Wartime Cyber Operations in Ukraine: Military Impacts, Influences, and Implications."

[145] Bateman, "Russia's Wartime Cyber Operations in Ukraine: Military Impacts, Influences, and Implications."

targets of the kinetic missile strikes.[146] This example again shows that claims of coordination are coincidental at best.

Based on limited public information on Russian cyber operations, the few instances of 'coordinated' Russian cyber and kinetic operations do not bring enough evidence to argue that this is a commonly used, viable military strategy against Ukraine.[147] On the contrary, there are even reports that some Russian kinetic attacks destroyed networks that cyber units were attempting to infiltrate and use in later operations, thus making these cyber operations obsolete and further demonstrating the lack of coordination between kinetic and cyber attacks.[148] These numerous examples prove how uncoordinated and poorly planned Russia's cyber operations have been thus far (which will be discussed further in a later section), and how kinetic attacks are utilized more successfully and frequently by the Russian military than cyber operations in the Russian-Ukrainian conflict.

Although cyber operations are more cost effective than kinetic attacks, and cyber units operating inside Russia are cheaper to support logistically than conventional combat units, kinetic attacks are more militarily successful than cyber attacks, as they produce much more unrecoverable damage to the intended target.[149] Additionally, each malware or spear-phishing attack is customized to the specific intended target to minimize collateral damage, unlike kinetic weapons, which are much more multi-purpose in their attacks.[150] During the first four months of the Russian-Ukrainian conflict, Russia conducted 3,654 missile strikes but only 50 destructive

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[146] Bateman, "Russia's Wartime Cyber Operations in Ukraine: Military Impacts, Influences, and Implications."

[147] Bateman, "Russia's Wartime Cyber Operations in Ukraine: Military Impacts, Influences, and Implications."

[148] Willett, "The Cyber Dimension of the Russia-Ukraine War," 13.

[149] Lilly and Cheravitch, "The Past, Present, and Future of Russia's Cyber Strategy and Forces," 117.

[150] Lin, Herbert. "Russian Cyber Operations in the Invasion of Ukraine." *The Cyber Defense Review* 7, no. 4 (2022): 31–46. https://www.jstor.org/stable/48703290.

cyber attacks against Ukrainian targets, which further demonstrates the use of kinetic means over cyber means in the conflict.[151] As described by one analyst, the Russian-Ukrainian conflict is a "heavy metal war," and any evidence of Russia conducting coordinated kinetic and cyber attacks is inconsequential at best, with the exception being their initial Viasat satellite attack.[152]

Future Predictions for the Coordination of Attacks

Moving forward in the Russian-Ukrainian conflict, this report assesses with a high-level of confidence that Russia will continue to operate kinetic and cyber attacks independent of each other, as Russia currently lacks the resources to properly plan out their joint military operations, thus leading to less successful military operations overall. If Russia had the proper resources or better coordinated their operations, Russia could attempt to launch another large-scale, high-impact kinetic and cyber attack similar to the Viasat satellite attack. Based on the state of current GRU and FSB operations, however, this report assesses with a low-level of confidence that this will occur, and instead assesses with a high-level of confidence that the infrequency of cyber attacks will continue into the future.

Key Judgement Three

Most scholars and analysts agree that so far, Russia has been largely unsuccessful in its state-sponsored cyber operations against Ukraine.[153] However, what does conducting a successful cyber operation look like for Russia in the Russian-Ukrainian conflict? To properly gauge whether or not Russia has been successful in its cyber operations, one first needs to define what a successful cyber operation means in the context of warfare. Measurements of successful

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[151] Bateman, "Russia's Wartime Cyber Operations in Ukraine: Military Impacts, Influences, and Implications."
[152] ROVNER, "Sabotage and War in Cyberspace."
[153] Kostyuk and Gartzke. "Why Cyber Dogs Have Yet to Bark Loudly in Russia's Invasion of Ukraine," 113–26.

cyber operations do not solely depend upon whether or not a cyber attack is effective at penetrating networks or disrupting services.[154] Instead, one needs to contextualize Russia's cyber operations through the success of war efforts and analyze whether or not its cyber operations help contribute to the overall mission of the conflict.[155]

In the Russian-Ukrainian conflict, Russia's overall mission is the eventual occupation of Ukraine and replacement of its government. Through this understanding, one can understand why many experts do not believe that Russia has had success in its cyber operations, as Russia is not any closer to achieving victory in the conflict based on the current stagnation in the conflict and the unforeseeable changes of war outcomes in the near future. Although there are many reasons why Russian state-sponsored cyber operations have not been as successful as initial predictions, it is mainly due to a lack of coordination between the GRU and FSB and the infrequency of cyber operations, which is caused by the longevity of the conflict. This section will briefly describe why there is a lack of coordination between the GRU and FSB, as well as the longevity of the Russian-Ukrainian conflict and the complexity of implementing successful cyber operations.

Lack of Coordination between the GRU and FSB

The Russian intelligence apparatus is quite different from the United States' intelligence apparatus. While the United States prioritizes interagency cooperation between the 18 different intelligence agencies, Russia does the exact opposite, as its four primary intelligence agencies are purposely divided against factional and personal lines.[156] According to Kevin Riehle in his

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[154] Lewis, "Cyber War and Ukraine."
[155] Lewis, "Cyber War and Ukraine."
[156] Bowen, "Russian Military Intelligence," 2–9.

book *Russian Intelligence: A Case-Based Study of Russian Services and Missions Past and Present,* Russia's intelligence agencies have three main characteristics or goals: securing the regime, engaging in competitive intelligence and fighting for the Kremlin's favor, and acting as individual entities of decision making and direct action.[157] Based on this overarching organizational structure, the GRU and FSB are internally designed to compete with each other for government resources and political influence, often at the expense of the other.[158] For example, a former FSB cyber officer who was arrested in 2016 for unrelated cybercrimes claimed that the GRU "impertinently, roughly, and brutishly breaks into servers," which is the reason why their cyber operations are much more well known than that of the FSB.[159]

This rivalry and the overlap in their missions, including counterterrorism, covert action, and cyber missions, is actually intentional according to Russia's utilization of competitive intelligence.[160] Due to the nature of competitive intelligence, whichever agency can do the most amount of attacks with the most amount of damage will win the Kremlin's favor, thus prompting both the GRU and FSB to compete with one another to gain more responsibilities and a bigger budget to perform their duties.[161] This unstable rivalry between the GRU and FSB has a negative effect on the ability of each agency to produce quality intelligence operations, which leads the GRU and FSB to accidentally conduct uncoordinated, duplicated intelligence efforts.[162] For example, in 2016, during the previously mentioned GRU spear-phishing attacks against the U.S.

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[157] Riehle, "Russian Intelligence: A Case-Based Study of Russian Services and Missions Past and Present," 50.

[158] Bowen, "Russian Military Intelligence," 2–9.

[159] Lilly and Cheravitch, "The Past, Present, and Future of Russia's Cyber Strategy and Forces," 141.

[160] Riehle, "Russian Intelligence: A Case-Based Study of Russian Services and Missions Past and Present," 75–76.

[161] Bowen, "Russian Military Intelligence," 2–9.

[162] Bowen, "Russian Military Intelligence," 2–9.

Democratic National Committee, it is believed that the FSB also simultaneously conducted a parallel cyber operation to penetrate the Democratic National Committee's networks.[163]

This incident further demonstrates how seemingly unaware the GRU and FSB are of each other's operations, which negatively impacts both agency's ability to conduct successful cyber operations in the Russian-Ukrainian conflict. Russia would have a lot more military success in the Russian-Ukrainian conflict and in its cyber operations if there was a greater organizational focus on cooperation in Russia's intelligence apparatus and less of a focus on using the competitive intelligence model for their operations. If the FSB and GRU cooperated on joint cyber operations, Russian cyber operations in general would be conducted more frequently, be larger in scale and produce more damage, and be more varied due to creative cooperation between the GRU and FSB. This structural change is highly unlikely, however, as the competitive intelligence model has been utilized by Russia since the Soviet Union.

Infrequency of Cyber Operations and the Longevity of the Conflict

Russia initially anticipated that the Russian-Ukrainian conflict would be over in weeks.[164] Weeks turned into months, and over one year later, the war is still raging on. The longevity of the conflict has drastically impacted Russia's ability to sustain its large-scale, high-impact cyber operations, which were seen in the first few weeks of the conflict.[165] The day before the Russian invasion, Microsoft reported that hundreds of cyber attacks were used against various Ukrainian organizations.[166] In the first week of the war, approximately 22 publicly known organizations experienced destructive attacks, and after this initial push, Microsoft reported that about three

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[163] Bowen, "Russian Military Intelligence," 2–9.

[164] Willett, "The Cyber Dimension of the Russia-Ukraine War," 7–26.

[165] Kostyuk and Gartzke, "Why Cyber Dogs Have Yet to Bark Loudly in Russia's Invasion of Ukraine,"113–26.

[166] Bateman, "Russia's Wartime Cyber Operations in Ukraine: Military Impacts, Influences, and Implications."

attacks occurred every week throughout the first five weeks of the conflict.[167] Throughout April into June 2022, the intensity of cyber operations dropped to just one attack per week.[168] Eventually, Microsoft reported little to no cyber operations occurring from August to September, with only a marginal increase in activity occurring in October 2022.[169] This steady decrease of cyber operations throughout the first few months of the war, and the infrequency of large-scale, high-impact attacks, correlates with the longevity of the Russian-Ukrainian conflict. The longevity of the conflict, along with the complex nature of planning and launching cyber operations themselves, has resulted in Russian state-sponsored cyber operations not causing enough significant disruptions to Ukrainian forces based on publicly available information.

Ukraine's internet is decentralized, which makes attacking Ukraine's network connectivity through cyber operations difficult and potentially counterintuitive for Russian forces.[170] Russia's ultimate military goal is to occupy Ukraine, and if they were to succeed, rebuilding communication networks across the country would be extremely costly, which encourages Russian military forces to not attack communication infrastructure through cyber operations.[171] It is also reported that Russia uses Ukraine's decentralized commercial networks for their own battlefield communications, as they were originally equipped with rudimentary GPS capabilities and outdated paper maps for navigation.[172] Additionally, Russian forces have used Ukraine's networks in their counterintelligence operations through spying on Ukraine's military and civilian populations and using their networks to disseminate disinformation.[173]

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[167] Bateman, "Russia's Wartime Cyber Operations in Ukraine: Military Impacts, Influences, and Implications."
[168] Bateman, "Russia's Wartime Cyber Operations in Ukraine: Military Impacts, Influences, and Implications."
[169] Bateman, "Russia's Wartime Cyber Operations in Ukraine: Military Impacts, Influences, and Implications."
[170] Kostyuk and Gartzke, "Why Cyber Dogs Have Yet to Bark Loudly in Russia's Invasion of Ukraine,"113–26.
[171] Kostyuk and Gartzke, "Why Cyber Dogs Have Yet to Bark Loudly in Russia's Invasion of Ukraine,"113–26.
[172] Kostyuk and Gartzke, "Why Cyber Dogs Have Yet to Bark Loudly in Russia's Invasion of Ukraine,"113–26.
[173] Kostyuk and Gartzke, "Why Cyber Dogs Have Yet to Bark Loudly in Russia's Invasion of Ukraine,"113–26.

Using Ukrainian networks has both assisted and hindered Russian forces, as not being able to take down Ukraine's communication infrastructure helps Ukrainian forces just as much as Russian forces and complicates Russia's ability to perform effective cyber operations in the conflict.

Conducting cyber operations in war is not only complex through having to weigh pros and cons in finding appropriate targets, but also in their planning and implementation. Cyber operations, specifically those that involve entering a system or network, are typically executed through several steps, including reconnaissance, preparation, incursion, establishing presence, discovery, capture, and exfiltration.[174] First, the cyber unit has to study the intended target and conduct reconnaissance on its weak links and vulnerabilities.[175] The cyber unit then prepares techniques specific to the intended target that they can use to enter the system or network.[176] Next, the cyber unit finds a point of entry into the intended target through exploiting a zero-day vulnerability, conducting a spear-phishing attack, or entering through a password capturing system.[177] After finding this point of entry, the cyber unit will cover its tracks to prevent the target from knowing where the intrusion is coming from.[178] The cyber unit will then install their malware and have the malware 'call home' to open the gateway for further instructions by establishing its presence.[179] Once inside the intended target's system or network, the cyber unit

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[174] Riehle, "Russian Intelligence: A Case-Based Study of Russian Services and Missions Past and Present," 256–257.

[175] Riehle, "Russian Intelligence: A Case-Based Study of Russian Services and Missions Past and Present," 256–257.

[176] Riehle, "Russian Intelligence: A Case-Based Study of Russian Services and Missions Past and Present," 256–257.

[177] Riehle, "Russian Intelligence: A Case-Based Study of Russian Services and Missions Past and Present," 256–257.

[178] Riehle, "Russian Intelligence: A Case-Based Study of Russian Services and Missions Past and Present," 256–257.

[179] Riehle, "Russian Intelligence: A Case-Based Study of Russian Services and Missions Past and Present," 256–257.

will exploit their insider access to collect data, gain access to other parts of the system, and eventually produce intelligence on their findings.[180] The last step of this process is exfiltration, where the cyber unit will communicate their information out of the intended target's system, thus completing their operation successfully.[181]

As described above, cyber operations involve numerous complicated steps that are unique to each target, take a lot of time and resources to prepare, and are not guaranteed to succeed.[182] Even the most well executed cyber operations will not gain strategic success if they are not properly implemented into a functional war plan, which Russia has not been able to do thus far in the Russian-Ukrainian conflict.[183] Overall, Russia was not prepared in its cyber operations in the Russian-Ukrainian conflict. This is due to their poor planning of cyber operations, inability to undermine Ukrainian targets in the long term, lack of resources, the longevity of the conflict, and the lack of coordination between the FSB and GRU.[184]

Conclusion

In conclusion, Russian state-sponsored cyber operations conducted by the GRU and FSB have not been as successful as initial Western intelligence predictions. Although there are many reasons why Russian state-sponsored cyber operations have not been as successful as initial predictions, it is mainly due to a lack of coordination in kinetic and cyber attacks, a lack of coordination between the GRU and FSB, and the infrequency of cyber operations due to the

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[180] Riehle, "Russian Intelligence: A Case-Based Study of Russian Services and Missions Past and Present," 256–257.

[181] Riehle, "Russian Intelligence: A Case-Based Study of Russian Services and Missions Past and Present," 256–257.

[182] Riehle, "Russian Intelligence: A Case-Based Study of Russian Services and Missions Past and Present," 256–257.

[183] Bateman, "Russia's Wartime Cyber Operations in Ukraine: Military Impacts, Influences, and Implications."

[184] Kostyuk and Gartzke, "Why Cyber Dogs Have Yet to Bark Loudly in Russia's Invasion of Ukraine,"113–26.

longevity of the conflict. During the Russian-Ukrainian conflict thus far, there have only been a few notable instances of Russia utilizing joint cyber and kinetic operations against a target, the most notable being the Viasat satellite attacks.[185] Evidence suggests that rather than coordination between kinetic and cyber attacks occurring, these attacks instead occur independent of each other.[186] There is also a lack of coordination between the GRU and FSB because they partake in competitive intelligence based on the structure of Russia's intelligence apparatus, therefore forcing each agency to compete for government resources rather than work together. This competitive intelligence model produces redundancy in cyber operations. Additionally, Russian state-sponsored cyber operations have been infrequent because the Russian-Ukrainian conflict has surpassed initial timeline estimations, and also because cyber operations take a lot of planning and coordination in order to achieve successful results, which are not always guaranteed.

The GRU has not changed their cyber operations throughout the Russian-Ukrainian conflict and will continue to mainly utilize DDoS attacks, spear-phishing campaigns, wiper malware attacks, and disinformation campaigns against government, military, civilian, and critical infrastructure targets in Ukraine. Meanwhile, the FSB has more variety in their cyber operations, and although they will continue to utilize previously used spear-phishing techniques, they have also demonstrated a capacity to develop new malware technologies. As previously stated, due to the longevity of the Russian-Ukrainian conflict, the GRU and FSB have slowed their cyber attacks over the course of the war and will continue to conduct cyber operations on a semi-frequent basis, decreasing over time depending on Russian resources. These cyber

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[185] Willett, "The Cyber Dimension of the Russia-Ukraine War." 7–26.
[186] Kostyuk and Gartzke, "Why Cyber Dogs Have Yet to Bark Loudly in Russia's Invasion of Ukraine," 113–26.

operations will be based on previously used malware and spear-phishing techniques due to their repetition in the conflict thus far.

With more coordination between kinetic and cyber operations, and a more cooperative intelligence apparatus, Russia would have more success in their cyber operations in the Russian-Ukrainian conflict. Russian cyber operations would be conducted more frequently, be larger in scale and produce more damage, and be more varied due to creative cooperation between the GRU and FSB. If Russia continues its current trajectory of uncoordinated cyber and kinetic attacks with a decentralized approach to intelligence, it will continue to have unsuccessful cyber operations in the Russian-Ukrainian conflict.

Available Recommendations

Based on available evidence, Ukraine has been largely successful at repelling Russian state-sponsored cyber attacks in the conflict thus far. Ukraine's cyber defenses have had considerable assistance from Western entities, particularly from the United States and the United Kingdom, through their close partnerships and information-sharing networks.[187] For example, the UK's Foreign, Commonwealth and Domestic Office (FCDO) has allowed Ukrainian agencies to use the services of numerous commercial cybersecurity companies for their cyber operations.[188] Moreover, a few U.S. intelligence agencies, including the Federal Bureau of Investigation and CISA, have shared classified intelligence with Ukraine to assist with their cybersecurity measures.[189] U.S. Cyber Command has also been instrumental in giving offensive

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[187] Willett, "The Cyber Dimension of the Russia-Ukraine War," 7–26.

[188] Beecroft, Nick. "Evaluating the International Support to Ukrainian Cyber Defense." Evaluating the International Support to Ukrainian Cyber Defense. Carnegie Endowment For International Peace, November 3, 2022. https://carnegieendowment.org/2022/11/03/evaluating-international-support-to-ukrainian-cyber-defense-pub-88322.

[189] Beecroft, Nick. "Evaluating the International Support to Ukrainian Cyber Defense."

and defensive support to Ukrainian forces.[190] Alongside federal support, Ukraine has also

received an abundance of resources from the private sector, including from SpaceX, Microsoft,

and Amazon Web Services, as well as from civilian hacktivists located around the world.[191]

Although some Russian attacks have been successful at penetrating Ukraine's cyber defenses in

the Russian-Ukrainian conflict, Ukraine has been able to quickly recover from intrusions thanks

to prompt reporting from the Computer Emergency Response Team of Ukraine,[192] and overall,

has increased their resilience to cyber attacks since the 2014 annexation of Crimea.[193]

Ukraine has numerous policy options moving forward in the Russian-Ukrainian conflict.

One option is for Ukraine to continue utilizing Western assistance in its offensive and defensive

cyber operations, as this government and private sector assistance has been vital in allowing

Ukraine to keep repelling Russian state-sponsored cyber attacks. Another option is for Ukraine to

study prior Russian malware and spear-phishing attacks to better prepare for the future, as many

of Russia's cyber attacks have utilized modified versions of previously used malware, such is the

case with Russia's CaddyWiper attacks.[194] Additionally, Ukraine can prepare for Russia to attack

critical infrastructure targets using DDoS and malware attacks, and government and civilian

targets using spear-phishing techniques. To combat DDoS attacks, Ukrainians could first identify

where the DDoS attack is coming from and determine whether or not the attack is originating

from a set number of IP addresses.[195] Ukrainians could then block the suspected IPs through

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[190] Healey, Jason. "Ukrainian Cyber War Confirms the Lesson: Cyber Power Requires Soft Power." Council on Foreign Relations. Digital and Cyberspace Policy Program, April 4, 2023. https://www.cfr.org/blog/ukrainian-cyber-war-confirms-lesson-cyber-power-requires-soft-power.

[191] Huber, Nick. "What Ukraine's Cyber Defence Tactics Can Teach Other Nations." Financial Times. Financial Times, November 8, 2022. https://www.ft.com/content/9635c4a0-1f42-44f1-bc9a-503b192f809f.

[192] Beecroft, Nick. "Evaluating the International Support to Ukrainian Cyber Defense."

[193] Willett, "The Cyber Dimension of the Russia-Ukraine War," 7–26.

[194] Greenberg, "Russia's New Cyberwarfare in Ukraine Is Fast, Dirty, and Relentless."

[195] "Russian State-Sponsored and Criminal Cyber Threats to Critical Infrastructure." Cybersecurity and Infrastructure Security Agency.

access control lists, enable a firewall to further limit the traffic, and then notify their internet service provider.[196] For spear-phishing attacks, Ukrainians can increase their cyber security training to better prepare themselves on how to detect malicious activity.[197]

In the immediate future, Ukraine could follow recommendations from CISA on how to better prepare for and combat against Russian state-sponsored cyber attacks, which include updating its software, enforcing Multi-Factor Authentication (MFA) to gain access to its computer systems, securing and monitoring Remote Desktop Protocols (RDP) against exploitation, and providing user awareness and training to all Ukrainian citizens.[198] Ukraine can update its software, operating systems, applications, and firmware regularly to prevent DDoS and malware attacks on its systems, and focus specifically on patching critical systems with known vulnerabilities.[199] To better protect these systems, Ukraine can also require MFA on all of its networks and make all users create strong passwords that are not easy to crack.[200] In order to create strong passwords and increase cyber security, the same passwords should not be used on multiple systems and passwords should not be stored somewhere digital.[201] Ukraine could also heavily secure and monitor vulnerable systems that use RDP, as RDP exploitation is one of the most common ways cyber units will conduct malware and ransomware attacks on networks.[202] This can be accomplished by restricting the use of RDPs entirely, using VPNs to better secure private networks, and keeping a detailed record of how the RDP is being accessed.[203] Lastly, all

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[196] "Russian State-Sponsored and Criminal Cyber Threats to Critical Infrastructure."
[197] "Russian State-Sponsored and Criminal Cyber Threats to Critical Infrastructure."
[198] "Russian State-Sponsored and Criminal Cyber Threats to Critical Infrastructure."
[199] "Russian State-Sponsored and Criminal Cyber Threats to Critical Infrastructure."
[200] "Russian State-Sponsored and Criminal Cyber Threats to Critical Infrastructure."
[201] "Russian State-Sponsored and Criminal Cyber Threats to Critical Infrastructure."
[202] "Russian State-Sponsored and Criminal Cyber Threats to Critical Infrastructure."
[203] "Russian State-Sponsored and Criminal Cyber Threats to Critical Infrastructure."

government employees, critical infrastructure employees, and Ukrainian citizens could be trained on how to stay safe online to avoid being targeted by spear-phishing attacks, which is another common way for ransomware attacks to occur.[204] This training could also include how Ukrainian civilians and employees can report possible phishing scams, as early reporting is critical to being able to effectively respond to cyber attacks.[205]

In the long term, Ukraine could implement a strategy known as 'network segmentation' to separate its networks based on their functions.[206] Network segmentation could give Ukraine the ability to better control the flow of traffic between different segments of the network, which would limit cyber units from being able to move through Ukraine's networks as well as limit the spread of ransomware.[207] Ukraine could also maintain physical backups of data, backing up data about every 90 days, and encrypt these data in order to better prepare against Russian wiper malware attacks against its networks.[208] Lastly, Ukraine can restrict where accounts and credentials can be used to prevent Russian actors from accessing its systems from a remote location as they have done previously with the HermeticWiper attack.[209]

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[204] "Russian State-Sponsored and Criminal Cyber Threats to Critical Infrastructure."
[205] "Russian State-Sponsored and Criminal Cyber Threats to Critical Infrastructure."
[206] "Russian State-Sponsored and Criminal Cyber Threats to Critical Infrastructure."
[207] "Russian State-Sponsored and Criminal Cyber Threats to Critical Infrastructure."
[208] "Russian State-Sponsored and Criminal Cyber Threats to Critical Infrastructure."
[209] "Russian State-Sponsored and Criminal Cyber Threats to Critical Infrastructure."

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Council, November 18, 2022. https://www.atlanticcouncil.org/content-series/tech-at-the-leading-edge/the-russian-cyber-unit-that-hacks-targets-on-site/.

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Ukrainian Drone Effectiveness in its Defense Against Russia

BLUF

This estimate suggests drones contributed to Ukraine's success in its defense against Russia. Since the initial invasion on February 24, 2022.

Preface

Ukraine has been severely outnumbered by its Russian adversary in nearly every metric. However, Ukraine has been able to circumvent this disadvantage through the use of drones as a force multiplier. Coupled with artillery, drones have provided Ukrainian forces with valuable offensive capabilities. The ability to strike Russian forces with a remote system offers Ukraine a way to eliminate its adversary while simultaneously preserving its forces. Thanks to foreign aid, Ukraine's drones are easily replaced; the same cannot be said for their soldiers. Drones have also been used to aid in artillery fire by pinpointing fire locations through real-time imagery cross-referenced on a map. ISR capabilities afforded to Ukrainians through the use of drones have also significantly increased the speed and security of their intelligence collection process. The limitations and countermeasures used to combat drones are often unreliable and expensive relative to the cost of the drones used in the conflict, thus making drones an incredibly valuable asset to Ukraine.

Key Judgement 1: UAS offensive capabilities have given Ukraine a cost-effective way to deal with the overwhelming amount of enemy personnel and equipment deployed by the Russians. The cost of the commonly used Ukrainian drones is significantly less expensive than the cost of the Russian equipment they are being tasked to eliminate. For reference, a 2,000 USD DJI Mavic 3 has repeatedly been seen disabling 3 million USD Russian T-72 tanks.

Key Judgement 2: UAS ISR capabilities have enhanced Ukrainian intelligence collection in nearly every category, provided the drones are able to fly without restrictions from factors such as the weather. Speed, security, image quality, and depth of R&S have all been improved due to drones being able to operate more safely behind enemy lines when compared to Ukrainian scout units.

Key Judgement 3: Drone countermeasures, on the Russian side, have been inadequate to deal with Ukraine's drone arsenal. Russia's lack of electronic warfare system employment and air superiority have allowed Ukrainian drones to maneuver more freely than expected. Russia's modern anti-air capabilities have a difficult time shooting down Ukrainian drones forcing them to resort to Soviet-era anti-air guns. Electronic warfare systems are effective, but Russia lacks the numbers to cover the entire front.

Key Judgement 4: Drone limitations do not outweigh the value they bring to the conflict. Ukraine has opened up drone pilot centers to continuously train competent drone pilots capable of flying their systems in adverse conditions. Drones given to Ukraine in foreign aid packages are capable of withstanding the majority of weather conditions experienced in Ukraine.

Key Judgement 5: The psychological impacts of drones on both Russian and Ukrainian forces have had an essential role in the conflict. Drone footage has dramatically contributed to Ukrainian propaganda in an effort to maintain public support and confidence. Russian forces are likely becoming increasingly demoralized by constant footage of their fellow soldiers being killed by drones they never see coming.

Key Judgement 6: A cost-benefit analysis suggests drones are more cost-effective than many fighter jet platforms and ground units[210]. A further breakdown of costs is detailed later in the estimate, but for the time being, it should be noted that all drones given to Ukraine are more cost-efficient per hour of flight than any other aircraft in Ukraine's forces. Additionally, ground troops are more expensive than drones when considering training time, equipment allotted, and potential casualties.

Background

Following the Russian invasion of Ukraine on February 24, 2022, Ukraine has found itself grossly outclassed in the air. Because fighter jets, on both sides, have been ineffective, they have begun to compile several types of drones in an attempt to gain a presence in the skies throughout the conflict[211]. What began as an invasion that was expected to be over in days has turned into a full-scale war of attrition resulting in over 4.6 million Ukrainian civilians being displaced[212]. Due to the nature of the conflict, foreign allies have produced additional aid packages for Ukraine and its comprehensive collection of drones. As the war has wages onward, Ukrainian forces are becoming increasingly competitive with their drone platforms which have contributed significantly to their success in the war. Drones have become a pivotal force multiplier throughout the conflict[213].

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[210] The Conversation. "Drones Are Cheap, Soldiers Are Not: A Cost-Benefit Analysis of War." The Conversation, March 20, 2023. https://theconversation.com/drones-are-cheap-soldiers-are-not-a-cost-benefit-analysis-of-war-27924.

[211] Chadwick, Lauren. "What Are the Pros and Cons of Supplying Fighter Jets to Ukraine?" *Euronews*, 22 Feb. 2023, https://www.euronews.com/my-europe/2023/02/22/ukraine-fighter-jets-what-are-the-pros-and-cons-of-supplying-military-aircraft#:~:text=%E2%80%9CNeither%20Russian%20nor%20Ukrainian%20air,aircraft%20to%20perform%20offensive%20operations.%E2%80%9D.

[212] Lowther, Adam, and Mahbube Siddiki. "Combat Drones in Ukraine - Airuniversity.af.edu." Accessed March 20, 2023.

[213] Ibid

Drones Used by Ukraine:

Name	Wingspan and Weight	Price	Strike Capability
Baykar Bayraktar TB2	12m 650kg	5,000,000 USD	150Kg Max Payload 4 Laser Guided Smart Munitions
Quadcopter Drone	221mm 899g	2,000 USD	RKG-3 Anti-Tank grenades equipped with 3D Printer Tailfins
Quantum Systems Vector	2.8m 7.4kg	48,499 USD	ISR Oriented
Punisher	2.28m 4kg	50,000 USD	2Kg Payload 1-4 high explosive, shrapnel. Or incendiary bombs
Warmate 1	1.6m 5.3kg	12,000 USD	1,400g maximum payload
ScanEagle	3.1m 20kg	100,000 USD	ISR Oriented
Switchblade 300	610mm 2.7kg	6,000 USD	40mm grenade (suicide drone)
Tupolev Tu-141 Strizh	2.88m 5,37kg	Unavailable	Between 500kg and 1,000kg max payload

Ukrainian forces have used a number of drones throughout the conflict. The eight drones used by Ukraine that will be discussed in this estimate include the Bayraktar TB2, Quadcopter Drones, Vector, Punisher, Warmate 1, ScanEagle, Switchblade, and Tupolev Tu-141 Strizh. The primary purpose of these drones is to collect ISR and conduct offensive operations. Below is a description of each UAS.

Bayraktar TB2: The TB2 is the most widely celebrated drone that has been deployed in the conflict. The Turkish-made UAS is a medium-altitude, long-range aerial vehicle capable of carrying four laser-guided bombs that have continuously proved their effectiveness on the battlefield. Baykar Defense built the TB2 as an alternative to the more expensive western products like the US-made MQ-9 Reaper. While the TB2 is not comparable in capabilities to many of the western drones, it makes up for its lack of features through its cost and production time. A TB2 costs 5 million USD to produce, whereas the Reaper costs 32 million USD. The Bayraktar can be controlled remotely or flown autonomously with a flight time of up to 24 hours and a maximum altitude of 25,000 feet[214]. Serving primarily as a force multiplier, the TB2 is 6.5 meters long, 12 meters wide (wingspan), and weighs a maximum of 650kgs at takeoff[215].

Quadcopter Drones: Drones such as the DJI Mavic 3 have become increasingly commonplace in the conflict as a means of both surveillance and offense. Typically costing around 2,000 USD, the DJI Mavic 3 can operate for 46 minutes with a maximum transmission range of 15km[216]. The Quadcopter has become a go-to method for Ukrainian forces when disabling enemy armor. Using 3D printers, Ukrainian forces have created tail fins for old anti-

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[214] Military Today. "Home > Aircraft > Bayraktar TB2." Military Today. Accessed March 20, 2023. http://www.military-today.com/aircraft/bayraktar_tb2.htm.

[215] Ibid

[216] DJI Pro, Timelab, Karl Shakur, 阿岛儿, Jorge de la Torriente, and Jason Charles Hill. "Buy DJI Mavic 3 - DJI Store." Buy DJI Mavic 3 - DJI Store. Accessed March 20, 2023. https://store.dji.com/product/dji-mavic-3?vid=109821.

tank grenades and attached them via remote locking systems. When dropped from overhead, these cheap anti-tank grenades can penetrate most Russian vehicles and kill enemy infantry. The Mavic 3 is 347.5 x 283 x 107.7 mm and weighs in at 895g[217].

Quantum Systems ISR Vector: German-manufactured Vector drones provide valuable ISR capabilities to Ukrainian forces. Quantum systems have announced they will provide Ukraine with an additional 100 Vector drones to go along with the 33 they provided earlier in the conflict. The Vector is fully autonomous, including take-offs and landings. It can fly for 120 minutes with an intelligent cruise mode between 15 and 20 meters per second[218]. The Vector can stream in real-time from up to 25km away. Its range, coupled with its quiet operating system, makes it effective for covert surveillance. Equipped with self-heating batteries, the Vector is capable of handling the harsh weather Ukraine often experiences.

Punisher: The Punisher is a drone made by Ukrainian veterans of the Crimea conflict. It is described as being fast, precise, and lethal. Carrying a maximum payload of 2kg, the drone's simple design makes it effective at crossing enemy lines for a strike. The Punisher has a 45km range and a cruising speed of 43 knots. The most common employment of the Punisher will have it fly at 400m for 90 minutes in an effort to disrupt supply lines. Once it has returned from a mission, the Punisher can be redeployed in less than 10 minutes, making it extremely efficient[219].

Warmate 1: The Polish-produced Warmate 1 is a munition used primarily to disable Russian armor. Commonly referred to as a "suicide drone," the warmate is a single-use munition capable of flying at speeds of 150km/h and can remain in the air for 70 minutes. It functions on a

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[217] Lowther, Adam, and Mahbube Siddiki. "Combat Drones in Ukraine - Airuniversity.af.edu." Accessed March 20, 2023.

[218] Quantum Systems. "Vector - the Ultimate Long-Range ISR SUAS." Quantum, March 2, 2023. https://quantum-systems.com/vector/.

[219] Lowther, Adam, and Mahbube Siddiki. "Combat Drones in Ukraine - Airuniversity.af.edu." Accessed March 20, 2023.

line-of-sight signal limiting its range to 15km. The warmate 1 has a maximum payload of 1.4kg. The primary purposes of this drone are for surveillance and offensive operations[220].

ScanEagle: The US-manufactured ScanEagle is an ISR drone with a 10.2ft wingspan, 3.9ft length, and a weight of 40 lbs. It can reach speeds of 80mph and can fly for 20 + hours[221]. The ScanEagle operates at 16,000 feet and costs less than 100,000 USD for the drone. The aircraft is equipped with a high-resolution day/night camera and a thermal imager[222].

Switchblade: Roughly 700 of the American-made switchblade drones were given to Ukraine under the Biden administration (defense.gov 2023). The Switchblade is a kamikaze drone with two variants. The 300 is meant to take out enemy personnel, and the 600 is meant to deal with enemy armor. The Switchblade can reach a top speed of 185km/h. It is designed to fly 40km in 20 minutes and then loiter for another 20 minutes before striking a nearby target Ukraine[223]. The Switchblade has had repeated battlefield success in Ukraine[224].

Tupolev Tu-141 Strizh: The Tu-141 is a Soviet-era jet-powered drone predominately used as a high-altitude reconnaissance UAS. Following the Russian invasion in 2014, Ukraine overhauled the Tu-141 to modernize the system. Today, it looks more like a cruise missile and is launched from its trailer to travel on a predetermined path at transonic speed. The drone will travel along its flight path collecting intelligence, and then release a parachute to be collected and used again. The Tu-141 weighs 5.37 tons and can be armed with a payload of 500kg[225].

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[220] Ibid

[221] USAF. "Scan Eagle." Air Force. Accessed March 20, 2023. https://www.af.mil/About-Us/Fact-Sheets/Display/Article/104532/scan-eagle/.

[222] Ibid

[223] Ibid

[224] Losey, Stephen. "Switchblade Kamikaze Drone Production to Ramp up Following Ukraine Use." *Defense News*, Defense News, 11 Oct. 2022, https://www.defensenews.com/digital-show-dailies/ausa/2022/10/11/switchblade-kamikaze-drone-production-to-ramp-up-following-ukraine-use/.

[225] Lowther, Adam, and Mahbube Siddiki. "Combat Drones in Ukraine - Airuniversity.af.edu." Accessed March 20, 2023.

Combat Capabilities and Effectiveness

Drones have played a pivotal role as a force multiplier for Ukrainian forces throughout the conflict. They have provided valuable aerial support to ground units and have also served a valuable role in solo operations. Their ability to deal with both mounted and dismounted units has helped Ukraine establish an aerial presence on the battlefield. This section seeks to explain why the combat capabilities of the drones, such as the TB2 and DJI Mavic 3, have likely significantly improved Ukraine's fighting chance in their conflict with Russia.

At the beginning of Russia's invasion of Ukraine, Russia had 4,182 total aircraft, and Ukraine had only 312 total aircraft[226]. As the conflict has progressed, it is estimated that Ukraine has amassed over 6,000 additional aerial units in the form of drones. Granted, many of these are commercial use drones modified for the battlefield that are in no way comparable to many of the Russian fighters, but nonetheless, the sheer number of aerial systems Ukraine has is nothing to scoff at. Drones have quickly become a staple in Ukraine's arsenal largely due to their effectiveness and relative safety for the Ukrainian service members flying them. Ukraine has found itself in a war of attrition in which they are fighting an adversary with significantly more human resources. They have begun to combat this by fighting man with a machine through the deployment of drones.

TB2: Drones such as the TB2 are able to carry four laser-guided missiles capable of destroying Russian infantry, armor, and air defense. In the early days of the conflict, the TB2 successfully destroyed numerous forms of Russian air defense, including the Panstir (~14 million

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[226] Statista Research Department. "Russia vs Ukraine Military Comparison 2023." Statista.com, February 8, 2023.
    https://www.statista.com/statistics/1296573/russia-ukraine-military-
    comparison/#:~:text=Russia's%20military%20capabilities%20outnumbered%20those,16%20times%20larger%20than%20Ukraine's.

USD)[227] and the Tor (~25 million USD)[228]. Needless to say, the 5 million USD TB2 has provided more than enough value for Ukraine to justify its price tag[229]. The most common missiles carried by the TB2 are the MAM-C and the MAM-L, both of which have been designed for light payload drones with maximum effectiveness in mind[230]. Both missiles are laser-guided, making them capable of hitting both stationary and moving targets. The two also have several variants making them highly customizable for specific missions. The MAM-L has a multi-purpose missile and a thermobaric warhead. The MAM-C has a multi-purpose warhead, armor piercing, and high explosive effects. Each TB2 sold comes with 100 MAM-L munitions for a total of 15 million USD. At 150,000 USD a warhead, the cost-benefit analysis of the TB2 attacking Russian armor that costs significantly more would suggest the TB2 and its payload are more than justified[231]. There have been several accounts of the TB2 destroying 8 Russian T-72 tanks in three days which totals to 26.5 million USD[232].

The relative safety for the user of the TB2 should also be noted. In a conflict where Russia has an estimated 1.3 million troops compared to Ukraine's 500 thousand[233], it is crucial to make the most out of each service member. By engaging the enemy with drones, Ukraine is not risking the lives of its troops, thus preserving its living force[234]. Ukraine has received a significant amount of aid from foreign entities in the form of weapons systems, but they have not

[227] Soylu, Ragip. "Turkey's Bayraktar TB2 Drones Proving Effective against Russian Forces in Ukraine." Middle East Eye. Accessed March 20, 2023. https://www.middleeasteye.net/news/russia-ukraine-war-turkey-drones-effective-deadly.

[228] Malyasov, Dylan. "Ukrainian Troops Blow up Russian Tanks with TB2 Drones." Defence Blog, September 5, 2022. https://defence-blog.com/ukrainian-troops-blow-up-russian-tanks-with-tb2-drones/.

[229] Massa, Mark. "The TB2: The Value of a Cheap and 'Good Enough' Drone." Atlantic Council, August 31, 2022. https://www.atlanticcouncil.org/content-series/airpower-after-ukraine/the-tb2-the-value-of-a-cheap-and-good-enough-drone/.

[230] Military Today. "Home > Aircraft > Bayraktar TB2." Military Today. Accessed March 20, 2023. http://www.military-today.com/aircraft/bayraktar_tb2.htm.

[231] Ibid

[232] Saballa, Joe. "Turkish Drones Destroy $26m of Russian Military Assets in Three Days." The Defense Post, September 6, 2022. https://www.thedefensepost.com/2022/09/05/turkish-drones-destroy-russian-assets/.

[233] Statista Research Department. "Russia vs Ukraine Military Comparison 2023." Statista.com, February 8, 2023. https://www.statista.com/statistics/1296573/russia-ukraine-military-comparison/#:~:text=Russia's%20military%20capabilities%20outnumbered%20those,16%20times%20larger%20than%20Ukraine's.

[234] Ibid

been sent a significant number of human resources making their decision to focus on an army of drones one that seeks to preserve their human force. It is likely Ukraine will continue to receive drones, and until Russia can fully counter their capabilities, then drones will likely continue to be used as the force multiplier that have, thus far, proven to be.

It should be noted that the introduction of additional air defense systems, electronic warfare capabilites, and air support on the Russian side has decreased the overall effectiveness of the TB2 since the beginning of the war. While still prominent, its overall use has decreased as it becomes increasingly easy to counter[235].

Quadcopter Drones: Using 3D printers, Ukrainian forces have created tail fins for old anti-tank grenades and attached them via remote locking systems. When dropped from overhead, these cheap anti-tank grenades can penetrate most Russian vehicles and kill enemy infantry[236]. Economically speaking, the $100 grenade and $2000 drone can combine to disable a tank in one shot. The price of a Russian T-72 is currently sitting around 3 million USD. The grenades dropped by the drones are Soviet-era RKG-3 anti-tank grenades capable of penetrating 165mm of rolled homogenous armor (RHA)[237]. The top port hole of the Russian T-72 tank has an RHA thickness of 140mm[238], making the RKG-3, equipped with an impact fuse, capable of piercing the top of a

Figure 1 SteelBeasts.com

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[235] Ibid
[236] Rfe/rl. "How Ukraine Uses Obsolete Soviet Grenades to Destroy Russian Tanks from Above." RadioFreeEurope/RadioLiberty. Radio Free Europe / Radio Liberty, May 5, 2022. https://www.rferl.org/a/ukraine-cheap-grenades-expensive-tanks/31835434.html.
[237] "RKG-3." Weaponsystems.net. Accessed March 20, 2023. https://weaponsystems.net/system/1304-RKG-3.
[238] "72A/M1." Steelbeasts. Accessed March 20, 2023. https://www.steelbeasts.com/sbwiki/index.php?title=T-72A%2FM1.

Russian tank and killing its crew members while simultaneously disabling the tank because the Russian T-72 does not have compartmentalized munitions as many western tanks have. The quadcopter can be equally effective against the superior Russian T-90 tank, as its top port hole only has 140mm of RHA[239]. While the T-90 is better equipped to combat drones, there have been accounts of a $2000[240] quadcopter drone disabling a 4.5 million USD T-90 tank. It is also commonplace for Russian forces to keep the top of their tanks open when not in combat which gives the quadcopter an opening to drop munitions straight into the port hole of the tank. These instances, provided the grenade is accurate, offer a way to disable enemy armor at a beneficial rate as there is no potential for deflection or the grenade being too weak to penetrate the armor due to production error.

The quadcopter drone use has not been limited to strictly armor, but there have also been several instances in which they have been used on Russian infantry[241]. Typically, an artillery section or tank squadron will not use munitions on lone infantrymen because the cost of a shell is worth more than the single soldier. However, the cheap grenades dropped by commercial drones are commonly used on individuals in the open. Because the drones fly at a height that is undetectable by sound, enemy infantrymen that neglect to look up can easily be killed by a grenade they never saw coming. Hundreds of videos have been uploaded online of these exact scenarios, which has led to paranoia among troops on the battlefield. Many of the grenades have been outfitted with impact fuses to detonate the second they hit the ground, making them virtually unavoidable to exposed infantrymen.

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[239] "90s." Steelbeasts 2. Accessed March 20, 2023. http://www.steelbeasts.com/sbwiki/index.php/T-90S.

[240] DJI Pro, Timelab, Karl Shakur, 阿岛儿, Jorge de la Torriente, and Jason Charles Hill. "Buy DJI Mavic 3 - DJI Store." Buy DJI Mavic 3 - DJI Store. Accessed March 20, 2023. https://store.dji.com/product/dji-mavic-3?vid=109821.

[241] Rfe/rl. "How Ukraine Uses Obsolete Soviet Grenades to Destroy Russian Tanks from Above." RadioFreeEurope/RadioLiberty. Radio Free Europe / Radio Liberty, May 5, 2022. https://www.rferl.org/a/ukraine-cheap-grenades-expensive-tanks/31835434.html.

The RKG-3 grenade dropped by Ukrainian quadcopters coupled with artillery fire has created a potent combination to fix and destroy the enemy from range, further proving the value of drones on the battlefield. The quadcopters are able to locate enemy personnel with relative ease. That information can then be automatically relayed to an artillery section via the Ukrainian-made Kropiva software installed on commercial tablets. The software pinpoint's locations in real time and converts them to grid coordinates that artillery sections can use to direct fires. Once the location has been relayed to the artillery section, the quadcopter can drop a grenade on the enemy personnel in an attempt to wound several members of the unit. The goal is to render the enemy combat ineffective and limit their ability to move due to the casualties they have suffered. Once the enemy is fixed, the artillery is called in to further decimate the enemy. Artillery, in this instance, serves as the final blow, but it is the setup by the drone that makes this tactic so effective. Artillery typically misses its target with the first shot because it needs time to zero its weapon. But, with the grid coordinates provided by the quadcopter and its ability to wound enemy personnel, it allows artillery to become increasingly effective and more cost friendly. The coordinates provided by the drone are also transmittable across units which aid in the coordination of fires.

Switchblade 300: This drone platform weighs 5.5 lbs and can be carried in a backpack by infantrymen, making it ideal for ground units. The Switchblade is valuable to Ukrainian forces because it gives them an additional force multiplier in the form of a remotely controlled bunker buster, fuel vehicle destroyer, or dismounted infantry killer[242]. Where line units would typically carry anti-tank weapons such as the AT4 that weigh 14.7lbs or grenade launching

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[242] Yousif, Elias. "Drone Warfare in Ukraine: Understanding the Landscape • Stimson Center." Stimson Center, November 20, 2022. https://www.stimson.org/2022/drone-warfare-in-ukraine-understanding-the-landscape/.

systems like the M320a1that weighs 7lbs plus ammunition[243], the switchblade 300 offers an alternative with the upsides being a reduction in weight and increased maneuverability. The Switchblade has proven effective in the conflict, so much so that other states, such as France, are inquiring about buying their own.

General Capabilities: Drones are not only effective during the daytime, but they also apply pressure on enemy forces at night, as many are equipped with thermal imaging to spot Russian infantry and armor. Russian forces are severely limited in their night vision capabilities, leaving them increasingly vulnerable to drone strikes at night[244]. The climate of Ukraine forces Russian forces to run their vehicle engines at night to stay warm, which radiates a large heat signature that is easy for drones to pick up. Several Ukrainian drones equipped with infrared sensors have been nicknamed "non dormies" (you will not sleep) for how frequently they attack Russian forces at night[245]. These drones are equipped with the same RKG-3 Soviet-era grenades discussed in the section on quadcopters.

In a war of attrition, this tactic can be extremely effective because it progressively fatigues the enemy faster than normal as they lack sleep due to the constant paranoia of an attack from above. Oftentimes militaries such as the United States will employ this tactic with artillery or bombing runs as they did in Vietnam, but Ukraine using cheaper methods to engage the enemy make the strategy more cost-effective. Psychologically, warfare is extremely taxing, but for many soldiers, their only sense of security comes when they can eat and sleep. To have that taken away

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[243] PEO Soldier. "Peo Soldier: Portfolio - PM SL - M320/M320A1 Grenade Launcher Module (GLM)." PEO Soldier | Portfolio - PM SL - M320/M320A1 Grenade Launcher Module (GLM). Accessed March 20, 2023. https://www.peosoldier.army.mil/Equipment/Equipment-Portfolio/Project-Manager-Soldier-Lethality-Portfolio/M320-M320A1-Grenade-Launcher-Module/#:~:text=Weight%3A%205.0%20pounds%20.

[244] The Economist. "Why Russian Forces Can't Match Ukraine's Night-Vision Equipment." The Economist. The Economist Newspaper. Accessed March 20, 2023. https://www.economist.com/the-economist-explains/2022/04/14/why-russian-forces-cant-match-ukraines-night-vision-equipment.

[245] Ibid

by a threat you cannot even see is likely more demoralizing than many other horrors of war. The likelihood of surrender increases when the enemy is continuously uneasy.

Quadcopter drones are not the only ones contributing to artillery capabilities on the Ukrainian side. Most drones with ISR capabilities (primarily the DJI Mavic 3) have the ability to utilize the Kropiva software. This particular application is important because it allows Ukrainian fires to be significantly more accurate than Russian artillery. Ukraine can be significantly more precise with its fires than Russia, which typically employs an artillery tactic in which they bombard an entire grid square, move their artillery pieces into that grid square, and repeat that cycle to meet their objectives. This strategy is incredibly resource-intensive, exhausting Russia's munitions supply. On the other hand, Ukraine can relay coordinates to its artillery pieces instantaneously with precision to ensure the first shot hits its target. As a result, Ukraine's artillery is able to keep pace with Russia's despite the fact that Russia has a much bigger supply of munitions[246].

ISR Capabilities and Value

Intelligence, Surveillance, and Reconnaissance (ISR) drones are quickly transforming ISR collection on the battlefield, making them incredibly beneficial to any force with their capabilities[247]. Drones provide forces with the ability to monitor larger areas for longer periods of time[248]. Because of these abilities, leaders can now maintain better situational awareness, along with more comprehensive target detection and threat assessments. ISR drones also offer

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[246] Defense Express. "How the 'Kropyva' Combat Control System Helps in the Most Difficult ..." Defense Express, July 23, 2022. https://en.defence-ua.com/news/how_the_kropyva_combat_control_system_helps_in_the_most_difficult_situations_fortified_positions_couldnt_save_russian_army-3646.html.

[247] TS2. "The Role of Military Drones in Intelligence, Surveillance, and Reconnaissance (ISR)." TS2 SPACE. Accessed March 20, 2023. https://ts2.space/en/the-role-of-military-drones-in-intelligence-surveillance-and-reconnaissance-isr/.

[248] N, Leigh. "The Role of US ISR in Ukraine." Overt Defense, June 8, 2022. https://www.overtdefense.com/2022/06/09/the-role-of-us-isr-in-ukraine/.

valuable insight into the terrain by mapping potential hazards, choke points, or ambush locations prior to the advancement of troops into that region[249]. The terrain is a factor that can make or break ground combat operations, so being able to view terrain in real-time as opposed to on a map allows leaders to make better decisions when employing their troops, which can ultimately lead to enhanced force preservation. ISR drones are responsible for collecting intelligence on enemy movements, potentially hostile territory, and target identification[250]. Not only are ISR drones providing unprecedented levels of intelligence, but they are also doing so at a faster, cheaper rate than ever before. ISR drones move more quickly than conventional ground forces when collecting data and also reduce the risk of unnecessary casualties as the aircraft are unmanned and controlled remotely[251]. For reference, a US Army cavalry scout platoon comprised of 6 Bradley fighting vehicles costs 26.1 million USD for the Bradley's alone. A ScanEagle ISR drone costs 3.2 million USD for the entire system[252]. When applicable, it is significantly more cost-effective to deploy a few ScanEagle drones as opposed to an entire Scout platoon that would be put in harm's way to produce the same intelligence as the ScanEagle could from 16,000 feet in the air. The deployment of the ScanEagle's is dependent on whether or not terrain needs to be occupied by the scout platoon or if any other measures would deem the scout platoon more favorable. Additionally, the two are capable of working together as the scout platoon can occupy terrain as the drone overhead provides a wider coverage of ISR[253].

ISR drones have been employed on the Ukrainian and Russian front prior to the invasion on February 24, 2022. It is known that US and NATO ISR drones have been providing valuable

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[249] Ibid
[250] Ibid
[251] Ibid
[252] USAF. "Scan Eagle." Air Force. Accessed March 20, 2023. https://www.af.mil/About-Us/Fact-Sheets/Display/Article/104532/scan-eagle/.
[253] TS2. "The Role of Military Drones in Intelligence, Surveillance, and Reconnaissance (ISR)." TS2 SPACE. Accessed March 20, 2023. https://ts2.space/en/the-role-of-military-drones-in-intelligence-surveillance-and-reconnaissance-isr/.

intelligence to Ukrainian forces regarding the Russian troop buildup on the Ukrainian border (Funailoe et al. 2021). The ISR data given to the Ukrainians was meant to help them defend their territory from a vastly superior enemy. The impact of the early warning paid dividends for Ukraine, particularly in the battle for the Hostomel airport[254]. While Russian forces did initially hold the region following multiple air assaults, the Ukrainians swiftly retook the positions as they knew the capabilities and force structure of their attacker (Overt Defense 2022). In addition to border monitoring, ISR drones have also aided in identifying missing persons or locating survivors on the battlefield. Provided Ukrainian forces can retrieve the survivors in time the drone's ability to identify the missing person or group could pay off by keeping allies from falling into enemy hands to either be killed or exploited for intelligence[255].

ISR drones such as the US-made ScanEagle and German-made Vector are two of the primary ISR aircraft provided to Ukraine. What makes these two particular drones especially effective is their range, robustness, and camera technologies. The ScanEagle can fly autonomously for 22 hours but has recorded flights of up to 28 hours[256], and the Vector (a much smaller UAS) can fly for 120 minutes. Relative to its size, the Vector has a respectable range. The ScanEagle can withstand temperatures as low as 14 degrees Fahrenheit, as per the manual[257]. Because the Ukrainian winters can reach temperatures of -4 degrees Fahrenheit, this is where the Vector becomes important. The Vector is listed as being able to operate in temperatures as low as -4 degrees Fahrenheit making it suitable for the winters in Ukraine (Quantum Systems 2023).

[254] Borger, Julian. "The Drone Operators Who Halted Russian Convoy Headed for Kyiv." The Guardian. Guardian News and Media, March 28, 2022. https://www.theguardian.com/world/2022/mar/28/the-drone-operators-who-halted-the-russian-armoured-vehicles-heading-for-kyiv.

[255] Camilleri, Neil, and Liza Kozlenko. "Drone Operator: I Can Save Lives Everyday If the Drones Keep Coming." *Ukrainian World Congress*, https://www.ukrainianworldcongress.org/ukrainian-drone-operator-explains-why-drones-give-ukraine-an-advantage/.

[256] USAF. "Scan Eagle." Air Force. Accessed March 20, 2023. https://www.af.mil/About-Us/Fact-Sheets/Display/Article/104532/scan-eagle/.

[257] US DOHS. "ScanEagle Sop phase20ii Ver1 - UNOLS." ScanEagle Manual. Accessed March 21, 2023. https://www.unols.org/sites/default/files/ScanEagle_SOP_phase20II_ver1.pdf.

Despite the weather, UAS systems like the Vector will allow Ukraine to maintain ISR collection in the coldest months of the year to maintain situational awareness. It should be noted, however, that this data does not account for decreases in temperatures due to altitude gain.

As for the camera technologies, the Vector is equipped with electro-optical and infrared gimbaled sensors to aid in ISR collection during the day or night. The ScanEagle houses electro-optical and infrared sensors, biological and chemical sensors, laser designators, and a magnetometer for the identification and location of magnetic anomalies[258]. In tandem, these drones are capable of collecting nearly any ISR data requested, provided the weather is ideal and the enemy is visible.

Drones offer increased ISR endurance when compared to manned aircraft or ground units, which grants the user the ability to monitor areas for longer periods of time without worrying about shift schedules, human endurance, or the pilot's life. Many drones are autonomous, which means they can loiter for hours on end and send a notification to the pilots should anything be identified. Maintaining constant eyes on your enemy is critical to overall success in combat, which is another reason why drones have been so useful for not only Ukraine but western forces as a whole in monitoring Russian movements and capabilities.

Drone Counter Measures

While drones have become increasingly prominent on the battlefield in Ukraine, they do not go without their critiques. Because they are unmanned systems with highly advanced technology onboard, they are more susceptible to electronic warfare systems such as the

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[258] USAF. "Scan Eagle." Air Force. Accessed March 20, 2023. https://www.af.mil/About-Us/Fact-Sheets/Display/Article/104532/scan-eagle/.

Krasukha-2/4 used by Russia[259]. Additionally, anti-air systems such as lasers produced by Lockheed Martin can render drones ineffective in moments. Flight patterns are also a common way to counter drones, as they often patrol a particular area in hopes of finding their desired target.

Anti-Air Systems: There are many modern anti-air systems used to combat drones, such as laser systems produced by companies like Epirus and Northrop Grumman[260]. These lasers travel at the speed of light and seek to land a non-kinetic kill on enemy aircraft. Essentially, they overheat the internal operating mechanisms to turn the drone into a brick, provided it lacks the necessary equipment to counter the laser[261]. As a more real-world example, Russian forces have commonly used their own drones to combat Ukrainian UAS'. The Shahed-136 is a kamikaze drone equipped with an explosive nose capable of attacking enemy drones for a one-to-one trade. The estimated cost of a Shahed-136 is 20 thousand USD. Additionally, Russia has successfully downed drones with the Harpoon-3 anti-drone gun[262]. However, the Harpoon-3 only has a range of 3.5km rendering it nearly useless against most mid to high-altitude drones.

Russia has also begun to employ Soviet-era S-60 anti-aircraft guns to combat drones. More recent Soviet Flak, such as the ZSU-23-4 Shilka and 2S6 Tunguska, have also been implemented to stop drones on the battlefield. These munitions are preferred as opposed to missiles due to their low engagement cost and availability. These anti-air guns are being used on all drones ranging from quadcopters to the TB2, with varying levels of success. The need to use

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[259] Clark, Bryan. "The Fall and Rise of Russian Electronic Warfare." IEEE Spectrum. IEEE Spectrum, November 22, 2022.
https://spectrum.ieee.org/the-fall-and-rise-of-russian-electronic-warfare.

[260] Thompson, Loren. "Defeating Drones: The Most Promising Weapons Are All Non-Kinetic." *Forbes*, Forbes Magazine, 2 Nov. 2022,
https://www.forbes.com/sites/lorenthompson/2022/11/01/defeating-drones-the-most-promising-weapons-are-all-non-kinetic/?sh=7db5cfe15b8a.

[261] Ibid

[262] TASS. "Russian Troops Successfully Use Harpoon-3 Anti-Drone Guns in Ukraine Operation - Source." TASS. Accessed March 20, 2023.
https://tass.com/politics/1523625.

Soviet-era weapons to combat modern-day drones shows how impactful drones are on the battlefield. The Russian military did not foresee drones being such a large threat, and as a result, they are having to utilize every resource they can in an effort to counter the aircraft.

Jamming and Spoofing: These are common practices used to counter drones largely because it is often easier to jam a drone's signal than it is to down the aircraft. Jamming seeks to disrupt communications between the drone and its user, whereas spoofing aims to send fake GPS signals that mimic legitimate ones[263]. Disruption methods are serious threats to drone implementation on the battlefield because they cover long ranges and can constantly run effectively, keeping drones from operating in particular regions.

A spoofed drone is problematic because it may allow the spoofer to take control of the drone as it emits false coordinates back to the original user to make it appear as if it is on its original flight path. When spoofed, the new user can access flight records, camera footage, and any other features onboard the drone. GPS spoofing is also difficult to defend against because GPS signals are broadcasted by a satellite that you cannot add protection measures to, such as encryption[264].

Enemy Air Superiority: The final countermeasure to drones listed in this estimate is one that has been on display in recent memory. Air superiority is a good way to defend against enemy aircraft, provided one has the proper means to locate the aircraft. A prime example of this would be when the US shot down several balloons in its own airspace in 2023[265]. The main issue with this practice is cost. A Patriot missile like the ones used to shoot down several balloons

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[263] security, 911. "Jammers and Spoofers: Non-Kinetic Counter-Drone Technology." Jammers and Spoofers | Non-Kinetic Counter-Drone Technology. Accessed March 20, 2023. https://www.911security.com/knowledge-hub/counter-drone-technology/jammers-and-spoofers#:~:text=What%20is%20a%20drone%20spoofer,copy%20of%20the%20real%20signal.

[264] Ibid

[265] Wong, Julia Carrie. "Three Objects Shot down after Chinese Spy Balloon May Be Benign, White House Says." The Guardian. Guardian News and Media, February 15, 2023. https://www.theguardian.com/us-news/2023/feb/14/flying-objects-shot-down-balloons-white-house.

costs roughly 3 to 4 million USD each (The Hill 2022). Taking into account the cost of many drones used in Ukraine and it becomes evident that this is not always the best course of action. Maintaining air superiority has almost always been paramount in military campaigns, and the Ukraine war is no different.

Additional Applications: Other systems, such as AeroScope, produced by DJI, seek to identify drones in an area. They are also capable of gathering information such as flight paths, status, and communication links to help users make an informed decision on whether or not to respond in real-time. These systems are available on the commercial market with ranges of up to 50km. The limitation to applications such as DJI's AeroScope, however, is that they can only pick up drone signatures from their specific products. AeroScope is unable to identify non-DJI drones in an area[266]. New commercial technologies are being produced to identify a wider array of drones in any given area. The value of these products is their cost and availability when compared to standardized military equipment.

Drone Limitations

Weather: The weather plays a significant role in the employability and overall use of drones. Temperature, clouds, wind, turbulence, icing, visibility, fog, and rain are all serious factors to consider when deploying drones[267]. Hot temperatures are an issue because they can impact lift resulting from changes in atmospheric density. Hot temperatures can also impact the fuel temperature for ignition, which may alter the range or overall capability of the UAS. Cold temperatures, when coupled with increased humidity, can result in icing, which can decrease aerodynamics, freeze internal components, and reduce image quality. Clouds can lead to icing

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[266] "Aeroscope - DJI." DJI Official. Accessed March 20, 2023. https://www.dji.com/aeroscope.
[267] Sauter, Barbara. "DTIC." dtic.mil, March 2007. https://apps.dtic.mil/sti/pdfs/ADA345211.pdf.

due to moisture. Wind and turbulence are similar in that they can alter the course of a drone. Lastly, rain can impact the visibility of the drone, its aerodynamics, and an increased potential for a hard landing[268].

Pilot Experience: While UAS platforms are becoming increasingly autonomous, there are still several frames and applications where a human pilot is necessary, and the experience of said pilot can have a large impact on the effectiveness of the aircraft. The Ukraine war has been a good example of the disparity scene on the battlefield between good and bad drone pilots. On one side, a good pilot is capable of taking a $100 Soviet-era grenade and a $2000 drone to destroy a multimillion-dollar Russian tank. On the other hand, a bad pilot may have their 5 million USD TB2 spoofed and downed in enemy territory, thus compromising the launch site, flight path, and surveillance footage captured before the TB2 could strike its target. A drone is only as effective as its pilot.

Ukraine has begun to combat this need for good drone pilots by creating its first training center for drone pilots. The training center seeks to teach students UAV control in various conditions and an in-depth study of aviation laws, legislation, and international law. The Dronarium has trained roughly 4,500 pilots since the beginning of the invasion[269]. The center further emphasizes the importance of drones to the Ukrainian military as they are willing to allot time and resources to the program to ensure they produce quality pilots. The training center teaches buddy team tactics where one soldier flies the drone, and the other monitors the map to ensure the image relayed from the drone lines up with what is on the map[270]. These two combine to produce imagery for Ukrainian artillery. Ukraine's use of drones will continue to become more

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[268] Ibid

[269] Dronarium. "Академія Dronarium." Українська. Accessed March 20, 2023. https://dronarium.academy/en/.

[270] Melkozerova, Veronika. "Ukraine's Drone Academy Is in Session." POLITICO. POLITICO, February 28, 2023. https://www.politico.eu/article/ukraine-drone-academy-war-russia-kyiv-pilot/.

important as Dronarium continues to churn out trained pilots. Not only are these drones saving the lives of infantrymen on the battlefield, but they also are not pulling from the ranks of the infantry either. The majority of the drone pilots being trained are civilians with prior drone or videogame experience that have volunteered to join the effort[271].

Another training center has been opened to train women drone pilots as well. Female Pilots of Ukraine seeks to train women in all aspects of drone operations which is something women in the Ukrainian military typically do not choose to do. The school gives women a choice to serve in the military following their training, and of which 80% choose to head to the front lines of the conflict[272]. Not only do Female Pilots of Ukraine train the next generation of drone pilots, but it also sends a message to Russian forces that the entirety of Ukraine is willing to resist their invasion, which can be emotionally degrading to Russian forces. The primary issue with the school, however, is its need for more funding. The school costs roughly 3000 USD a month to run and is currently not receiving government funding[273].

Infrastructure: A fairly straightforward way to combat drones is to use cover and concealment. Ground units in urban areas that move underground or through buildings can maneuver around drones undetected. These practices were proven to be effective in the Global War on Terror as terrorist cells would operate in tunnels to avoid detection by US drones. Even trees are a viable way to avoid detection, provided the drone above is not using thermal imagery. The overhead cover is important when combatting drones because if the drone cannot see you, then it likely will not engage a target.

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[271] Dronarium. "Академія Dronarium." Українська. Accessed March 20, 2023. https://dronarium.academy/en/.

[272] Kesteloo, Haye. "Drone School 'Female Pilots of Ukraine' Teaches Women How to Fly Drones to Help Win War." DroneXL.co, December 3, 2022. https://dronexl.co/2022/11/30/drone-school-female-pilots-of-ukraine/.

[273] Ibid

Cost and Resources: As with anything, cost and resources are always a factor. In an ideal world, Ukraine would have an unlimited amount of money and resources to produce an endless supply of drones, but that will not happen. The reality is that Ukraine is able to effectively combat Russian forces due to foreign aid. Had allied nations not been supplying Ukraine with the resources it has received, then the conflict would very likely be over. Overall costs and whether or not drones are worth their often-hefty price tag will be discussed later in the estimate, but for the time being, it is to be noted that the single greatest factor limiting Ukraine's drone arsenal is cost.

Maneuverability: Critics of drones in combat often cite how prominent drones such as the TB2 are slower and less maneuverable than World War 2 fighters which creates the argument as to whether or not they will be effective against modern air defense systems[274]. However, the TB2 has seen great success in Ukraine due to its low speed and unique radar cross-section, making it difficult for Russian air defense to target it. Further examination into the matter suggests that drones such as the TB2 have been able to exploit weaknesses in air defense technologies[275]. While on paper, maneuverability appears to be a weakness for drones in Ukraine, their relative stealth, low speed, lack of effective enemy electronic warfare capabilities, and poor air superiority on the part of Russia have allowed drones such as the TB2 to prosper in the conflict.

<div align="center">

Psychological Impact of Drones

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Drones such as the DJI Mavic 3 have likely had one of the largest impacts on the conflict not just because of their battlefield effectiveness but because of the image they project to external

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[274] Ritter, Joe. "Getting Drones Ready for Conventional War." *War on the Rocks*, June 19, 2022. https://warontherocks.com/2022/06/getting-drones-ready-for-conventional-war/.

[275] Ibid

viewers of the conflict. Countless videos of quadcopter drones dropping munitions on Russian infantry have circulated the internet providing the at-home viewer with insight as to how innovative and cunning Ukrainian forces can be. The use of quadcopters and their surveillance capabilities aid in keeping morale high among Ukrainian forces while simultaneously keeping those around the globe engaged in the conflict by instilling hope and confidence in Ukraine's chances. Additionally, drone footage of Russian forces conducting unjust acts on the battlefield further cements their image of the enemy in the eyes of the west, which, in turn, strengthens the war effort and overall support for Ukraine. Ukrainian drones are also responsible for disrupting Russian operations in that they cause Russian soldiers to feel helpless as they typically have no way to combat the drone constantly monitoring their every move overhead. Drones also demonstrate the technological abilities of Ukraine's forces which can be demoralizing to enemy units that lack the understanding and knowledge to combat such a threat.

Environmental Impact of Drones

A more niche topic that should be covered more in regard to drones in combat is their impact on the environment relative to other equipment employed. Ukraine has found itself fighting a war on its soil, and regardless of the outcome, the land they are fighting on will also be the land they have to live on after the conflict. So, what makes drones a valuable resource to Ukrainian forces is their ability to conduct surgical strikes as opposed to large-scale bombardment commonly seen by artillery. Russian forces have already decimated much of the Ukrainian infrastructure with progressive artillery measures[276], so Ukraine's forces could benefit from finding ways to maximize their effectiveness in combat while also limiting the destruction

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[276] Mednick, Sam. "Ukraine War's Environmental Toll to Take Years to Clean Up." AP NEWS. Associated Press, November 11, 2022.
    https://apnews.com/article/russia-ukraine-kyiv-pollution-europe-business-d2282edd65a0caad45472f2524e5a9be.

to the landscape. Surgical strikes conducted by drones are more than capable of taking out vast numbers of enemy equipment. Furthermore, drones assisting in artillery allow fires to be more accurate, which leads to fewer shells being expended, resulting in less environmental degradation. 41% of Ukraine's exports come from agricultural products such as sunflower oil, meal, and seed totaling to 7.4 billion USD in 2021[277], meaning that for the sake of Ukraine's war recovery, it is imperative they maintain their natural landscape. Ukraine also ranks in the top 10 global exporters of corn, barley, and rapeseed, which accounted for 8.9 billion USD in 2021[278].

Shifting from comparing drones to artillery, the estimate will now examine drones vs. armored vehicles. Tanks, transportation vehicles, and any other armored assets being deployed in Ukraine are responsible for soil compaction, which may reduce crops' ability to grow both during and after the conflict. Additional erosion may occur with larger tracked vehicles such as tanks. Multiple case studies were examined to reach these findings. All of which can be referenced in "Impacts of Military Vehicle Training Activities on Vegetation." Extensive research done at Fort Carson, Colorado, examined the impact of tracked vehicles on a landscape similar to that of Ukraine. Evidently, soil disaggregation and increased bulk density occurred across the landscape. Perennial grass cover decreased, weedy for production increased, and open field bird guilds decreased[279]. In another case study done in Russia, samples were taken from the soil before tracked vehicles drove over them, after four passes of a tracked vehicle, and after 100 passes of a tracked vehicle. The evidence solidified the fact that tracked vehicles disturb micro aggregates in the soil, among other things, after only four passes of a tracked vehicle[280]. While

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[277] USDOA. "Ukraine Agricultural Production and Trade - Foreign Agricultural Service." US Department of Agriculture. Accessed March 20, 2023. https://www.fas.usda.gov/sites/default/files/2022-04/Ukraine-Factsheet-April2022.pdf.

[278] Ibid

[279] Fehmi, Jeffrey S, Tyrone Farmer, and J Andrew Zimmerman. "Impacts of Military Vehicle Training Activities on Vegetation." dtic.mil. Accessed March 21, 2023. https://apps.dtic.mil/sti/pdfs/ADA364024.pdf.

[280] Ibid

these issues may seem irrelevant, they do have impacts on the soil composition of Ukraine which may impact their ability to grow staple crops. The use of drones in place of tracked vehicles greatly reduces the overall soil degradation of the region, making drones effective not only in combat but in environmental preservation as well. These claims, of course, are relative to the alternative methods of combat.

Cost Benefit Analysis

Drones are a cost-effective way to carry out operations in today's day and age. While cost is typically pushed to the wayside in debates over the use of drones on the battlefield in favor of whether or not unmanned aircraft are just, many of the typical objections to drones become secondary when cost benefits are presented. Cost-efficient equipment gives military planners the ability to create increased amounts of hard power.

Relatively speaking, drones are inexpensive. The US-manufactured MQ-9 Reaper has a unit cost of 6.48 million USD and an average operational cost of 3 million USD[281]. However, when broken down into subsections, the Reaper costs an average of 3,250 USD per hour of flight time[282]. The reason is that the drone's system is included in the initial cost. The system includes four Reapers, two pilots, a ground station, and a secure data link. In contrast, the F-35 Fighter costs roughly 5 million USD in annual operations costs and 16,500 USD per hour of flight time. The F-35 costs between 70.2 million USD and 90 million USD, depending on which model is purchased[283].

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[281] The Conversation. "Drones Are Cheap, Soldiers Are Not: A Cost-Benefit Analysis of War." The Conversation, March 20, 2023.
    https://theconversation.com/drones-are-cheap-soldiers-are-not-a-cost-benefit-analysis-of-war-27924.
[282] Ibid
[283] Ibid

When compared to soldiers, it is evident that drones are also more cost-effective. While it is understood that drones will never fully replace soldiers because of their ability to physically occupy land and operate in areas drones cannot reach, there is something to be said about their use in areas they are feasible as an alternative to soldiers. Prior to the rewriting of US military doctrine from Unified Land Operations (ULO) to Multi-Domain Operations (MDO), drones were heavily emphasized in combat due to the nature of threats faced by the US. In the Global War on Terror (GWOT), enemy combatants sought to wage a war of attrition to create low-level civil conflicts. The counter to the enemy's strategy by the US was a focus on specific individuals and a relative disregard for interpersonal relations. The United States' empirical method of eliminating targets proved to be extremely cost-effective when compared to the costs of an attrition war.

Soldiers are not cheap. In 2012, the cost to deploy a soldier was 2.1 million USD, but this is not where the costs end[284]. Advanced medical capabilities increase soldier survivability which leads to increased costs in medical care down the line. For a soldier that has experienced multiple traumatic injuries as a result of war, their estimated annual healthcare cost is 136,000 USD (CBO.Gov 2012). These numbers also do not include the cost of bionics which can come with a price tag of up to 150,000 USD. In the US, veterans also increase social costs as they make up 20% of US suicides[285]. All of these factors together estimate that the total medical costs resulting from the Iraq and Afghanistan operations will be roughly 836.1 billion USD[286].

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[284] Ibid

[285] Kemp, Janet. "Suicide Data Report - 2012 - Veterans Affairs." Edited by Robert Bossarte. VA. Accessed March 20, 2023. https://www.va.gov/opa/docs/Suicide-Data-Report-2012-final.pdf?source=post_page.

[286] Lynda, Blimes. "The Financial Legacy of Iraq and Afghanistan: How Wartime Spending Decisions Will Constrain Future National Security Budgets." Harvard Kennedy School, March 1, 2013. https://www.hks.harvard.edu/publications/financial-legacy-iraq-and-afghanistan-how-wartime-spending-decisions-will-constrain.

The data above suggests that drones provide an effective solution to warfare in an age driven by cost. Efforts to increase military capabilities while also maintaining domestic prosperity are paramount to the success of a nation, and drones offer a solution to both. Choosing "guns over butter" can be dangerous, but drones, among other technologies, offer the ability to maintain balance.

Why This is Relevant to the US

As the United States begins to shift its focus from the GWOT to near-peer threats, changes in doctrine are evident. The US Army recently declared a new form of warfighting doctrine under the acronym Multi Domain Operations (MDO). MDO are centered around the US's ability to fight a near-peer threat like China or Russia. The primary tenants of the newly released MDO doctrine emphasize the Army's ability to fight and win while outnumbered and isolated as well as defeat enemy integrated fires complex[287]. Because its future adversaries will likely outnumber US forces, it is suggested that they operate in multiple domains such as cyber, space, air, land, and sea. Force multipliers such as drones may provide increased value to US forces in their potential conflict with near-peer threats[288]. One of the largest challenges Ukraine faces in supporting its drone fleet is cost, this is a challenge the US does not have as much trouble with as its defense budget is 842 billion USD compared to Ukraine's 10.4 billion USD budget[289]. With an increased budget the US is able to employ cutting edge technologies to combat near-peer threats more effectively than Ukraine has been able to with its rather middle of the road drone platforms.

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[287] FM 3-0 US Army. Army Publishing Directorate – details page. Accessed March 20, 2023.
https://armypubs.army.mil/ProductMaps/PubForm/Details.aspx?PUB_ID=105073.

[288] Hitchens, Theresa. "Mitchell Touts Low-Cost Drones as 'Force Multipliers'." Breaking Defense, November 25, 2020.
https://breakingdefense.com/2020/10/mitchell-touts-low-cost-drones-as-force-multipliers/.

[289] US Congress. "Congress of the United States Congressional Budget Office CBO." Congress. Accessed March 20, 2023.
https://www.cbo.gov/sites/default/files/cbofiles/attachments/02-09-PTSD.pdf.

Force Preservation: Similar to what has been seen in Ukraine, drones may serve as a way to preserve conventional forces[290]. Whether to collect ISR or conduct offensive operations, drones are more efficient and effective than ground troops, provided the conditions are favorable. Being able to fly into enemy territory and provide live video footage without risking the lives of friendly forces could pay dividends on the backend in a war of attrition[291]. Maintaining a strong force posture with ample manpower ensures terrain can be seized and kept from enemy personnel. Drones could afford this ability. As for offensive capabilities, a drone strike is likely less expensive than a joint assault between land and air assets, making it ideal for taking out specific targets or conducting full-scale bombing runs. Provided the terrain does not need to be occupied and the enemy is within the drone's strike capabilities, it can engage enemy personnel in a much safer manner than infantry, armor, or manned aircraft.

Artillery Aid: Looking once again at Ukraine, drones have become attached to many artillery units to increase fires accuracy. The US has recently realized its artillery munitions reserves are far less than what they deem ample for an upcoming conflict. However, drones offer the ability to be more precise, which could make every shell fired increasingly valuable. As the US increases its supply of munitions, increasing its coordination capabilities between artillery sections and drones could create an extremely lethal fire support platform. The increased lethality of artillery through the aid of drones may also aid in freeing up airspace for US fighters and bombers. Increased ISR capabilities afforded to artillery sections could allow them to locate enemy air defense positions and eliminate them with fires. Even in the event that artillery sections are unable to eliminate enemy air defenses, drones can offer an alternative to a fighter

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[290] Hitchens, Theresa. "Mitchell Touts Low-Cost Drones as 'Force Multipliers'." Breaking Defense, November 25, 2020.
    https://breakingdefense.com/2020/10/mitchell-touts-low-cost-drones-as-force-multipliers/.
[291] Ibid

jet at a fraction of the cost, which would reduce the economic losses from the conflict should a jet be shot down by an enemy air defense unit.

Public Perception: Another consideration for the US and its implementation of drones is the public's perception of the force as a whole. One of the common reasons for general mistrust of modern militaries is the idea that war revolves around the rich sending the poor to do their fighting. If a near-peer war breaks out between China and the US, the US will likely need its general populace on its side, and this is where drones may play an important role. Because they can be sent on a vast array of operations, drones potentially offer those in the state's peace of mind that the missions their soldiers are being sent on will be valuable. Perception is reality, and if the general populous believes their troops are fighting a meaningful war, then morale will likely remain in favor of the US.

Recruitment: The US military is also experiencing a recruitment crisis largely because the majority of the civilian population is not fit for military service due to predetermined medical issues, obesity, and a number of other disqualifiers. Drones, acting as a force multiplier, may be capable of picking up some of the slack the US has lost in recent years due to a decrease in overall numbers. Additionally, drone pilots do not need to be in peak physical condition to operate their craft from an air-conditioned trailer making the job more desirable and open to a vast array of people who, otherwise, would have been disqualified from service.

Increased ISR Capabilities: As mentioned earlier, drones may provide forces with superior ISR collection due to their endurance, relative stealth, image quality, and safety. As Ukraine continues to fight a near-peer threat of the US, the States continue to see the value of drones for surveillance of enemy troop movements, composition, and force capabilities. Because the US recently ended a war against a vastly inferior threat, drones may become increasingly

valuable in coming years as the US could use them to collect intelligence on their opponents to better understand how a near-peer threat fights as opposed to a lesser threat. A large portion of the Army's new MDO doctrine focusses on understanding your enemies capabilities before engaging them in combat. The employment of drones could afford the US that ability without needing to risk unnecessary engagements between soldiers.

Support of Allies: One advantage the US has over its common adversaries is that it will never have to fight alone, thanks to a series of treaties and alliances. The data suggests that the use of drones will aid in combined arms operations between nations due to real-time video transmissions and force projection across multiple fronts. Drones can aid in shared understanding among forces, which is paramount to ensure war efforts are being focused in the correct areas and fratricide is avoided as best as possible. A near-peer conflict will require cooperation from all allies and an overall concerted effort to achieve victory. Drones are capable of providing nations with a shared database of footage to determine and document the enemy's weaknesses. These weaknesses can then be exploited to further the US and its allies' chance at victory.

Conclusion

In Conclusion, this estimate assesses with high fidelity that drones have contributed significantly to Ukraine's prolonged success in its defense against Russia. UAS offensive capabilities have provided Ukraine with a cost-effective way to deal with enemy personnel and equipment. Their use in enhancing artillery fire through the Kropiva software has closed the gap in the vast shell disparity between Ukraine and Russia[292]. The software providing instantly actionable grid coordinates for artillery has produced more accurate fires. ISR capabilities have

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[292] Defense Express. "How the 'Kropyva' Combat Control System Helps in the Most Difficult ..." Defense Express, July 23, 2022. https://en.defence-ua.com/news/how_the_kropyva_combat_control_system_helps_in_the_most_difficult_situations_fortified_positions_couldnt_save_russian_army-3646.html.

also increased the intelligence collection and survivability of units that would otherwise be deployed to the field in the absence of drones. Loitering drones can monitor enemy movements and dispositions without risking the lives of Ukrainian soldiers[293]. While these practices do not entirely negate the need for scouts, they decrease the likelihood of scout units engaging in combat, provided the operation is fit for drone use. Additionally, drones can provide overhead cover for scout units already deployed, creating another level of security. The success of offensive and ISR drones has been due, in part, to Russia's lack of electronic warfare systems. While Russia has effective electronic systems, the war's front is so vast that their resources are spread thin, leaving gaps for drones to be effective[294]. As a result, this estimate assesses that drone countermeasures do not outweigh their benefits. Drones supplied through foreign aid can operate in Ukraine's climate, and the introduction of drone pilot schools increases the number of skilled pilots in Ukraine[295]. Another factor that has contributed to Ukraine's success is the psychological impact drones have had on both Russian troops and allied personnel. Footage constantly being released of Ukrainian drones disabling Russian equipment and eliminating enemy infantry has become commonplace to the point where Ukrainian forces have made songs about the drone's effectiveness. Additionally, the footage reassures the external viewer that progress is being made on the war front and Ukraine is having perceived success. Lastly, the cost-benefit analysis suggests that drones are a cost-effective force multiplier as they are cheaper to employ and maintain than most fighter jets and ground units[296].

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[293] TS2. "The Role of Military Drones in Intelligence, Surveillance, and Reconnaissance (ISR)." TS2 SPACE. Accessed March 20, 2023. https://ts2.space/en/the-role-of-military-drones-in-intelligence-surveillance-and-reconnaissance-isr/.

[294] Clark, Bryan. "The Fall and Rise of Russian Electronic Warfare." IEEE Spectrum. IEEE Spectrum, November 22, 2022. https://spectrum.ieee.org/the-fall-and-rise-of-russian-electronic-warfare.

[295] Dronarium. "Академія Dronarium." Українська. Accessed March 20, 2023. https://dronarium.academy/en/.

[296] The Conversation. "Drones Are Cheap, Soldiers Are Not: A Cost-Benefit Analysis of War." The Conversation, March 20, 2023. https://theconversation.com/drones-are-cheap-soldiers-are-not-a-cost-benefit-analysis-of-war-27924.

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    Defense Express, July 23, 2022. https://en.defence-
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Russian Armor In Ukraine

BLUF

Due to heavy losses in tanks, the Russian Ground Forces have lost the capacity to conduct armor-reliant maneuver warfare operations and create major territorial gains through armored attacks, or to exploit breakthroughs made by assault units. New production of tanks since the beginning of the war has been insignificant compared to the scale of the combat losses and is insufficient by itself to restore the Russian Ground Forces' capabilities for conducting maneuver warfare. The vaunted thousands of tanks reported to have been kept in storage have proved to be largely notional and not an effective method of replacing losses. The war has exposed significant vulnerabilities in tank design, as the poor survivability of Russian tanks has contributed to heavy losses among armor personnel. As a result, the Russian Ground Forces will not be able to repeat the major territorial gains that they achieved in the first week of the war, and their further offensive capability has been curtailed by crippling tank losses.

Key Judgements

Key Judgment 1: This report assesses with high confidence that Russia's visually confirmed tank losses exceed 70% of prewar estimated strength. Given that the true number is at least 20% higher, the Russian Ground Forces will be unable to muster the tank strength to exploit breakthroughs or mount a major offensive that aims to repeat the major territorial gains seen in the first week of the full-scale invasion.

Key Judgment 2: This report assesses with high confidence that the scale of losses has also impacted unit cohesion and created a shortage of experienced personnel, especially junior

officers. Because of the long training pipeline for officers, Russia will struggle to replace these losses in a timely manner that impacts the war within the next year.

Key Judgment 3: High personnel and equipment losses in the Russian tank forces have forced a tactical shift reorienting Russian force structures from the complicated battalion-tactical group structure relying on mechanized forces to the more limited assault group focusing on infantry with minimal tank support. This shift also means that Russian armor is no longer capable of exploiting a large-scale breakthrough that gains significant amounts of territory.

Key Judgment 3: This report assesses with high confidence that Russia will be unable to replace its tank losses in a timely manner while relying on stored tanks. The much-publicized thousands of Russian tanks in storage have proven to be of little use in rebuilding capabilities, as the Russian military-industrial complex lacks the skilled labor and means to upgrade obsolete tanks to make them survivable against drones and contemporary anti-tank weapons. T-72s from storage have failed to materialize on the battlefield; instead, much smaller numbers of T-80s have been taken out of storage and sent into combat without effectively impacting the strategic situation. Striking indicators of the desperation of the Russian military-industrial complex are the modernization of obsolete T-62s instead of the thousands of T-72s reportedly in storage before the war, and the transfer of un-upgraded legacy Belarusian T-72s to Russia.

Key Judgment 4: This report assesses with high confidence that Russian tank production will continue to be grossly inadequate in the task of making up for losses. Sanctions have limited new production to T-72B3 and T-90 models, which are being produced in quantities too small to make an effect on the war. The lack of advanced Western-sourced optics and advanced sensors further degrades the effectiveness of these tanks, while the major survivability flaws of Soviet and Russian tank design remain unaddressed, further limiting their combat effectiveness.

Key Judgment 5: This report assesses with high confidence that a significant number of Russian tanks have been captured by the Ukrainian Army, intact or in repairable condition. This shifts the balance of forces in terms of tanks and numerically is still the largest source of tanks for the Ukrainian Army. In the future, continuing Russian attrition with a significant number of captured tanks will weaken Russian armor capabilities even further while strengthening Ukrainian armor capabilities.

Methodology

This report assesses the near-term (one-year) future of the potential usage and capabilities of armor within the Russian Ground Forces during the ongoing war in Ukraine, based on open-source data gathered within the past year of the war. This report uses quantitative research to estimate wartime Russian tank losses and personnel losses. As a baseline for measuring Russian tank losses during the past year of war, this report uses the visually confirmed tank losses compiled by analysts Stjin Mitzer and Jakub Janovsky on the Oryx website. Oryx draws on images and screenshots gleaned from social media, including posts from both sides, to visually confirm individual losses of equipment during the war. This data is prone to undercounting rather than overcounting Russian losses due to the high burden of proof involved in imagery and thus is an accurate baseline for this assessment. A comparison of Oryx's loss data on the T-80U, a type only operated by two specific tank regiments in the Russian Ground Forces and captured Russian documents describing combat losses of these units, revealed that relying on only visually

confirmed losses undercounted actual losses by 20 to 25 percent, indicating that Oryx data is roughly 75 to 80 percent of the actual losses.[297]

Prewar Strength and Organization of Russian Armor

Prior to the war, the Russian Ground Forces were assessed as having a vast array of armored vehicles, with their tank inventory significantly outnumbering that of most NATO countries. The International Institute for Strategic Studies (IISS) think tank estimates from *The Military Balance 2022* can be used to provide an estimate of the equipment available to the Russian Ground Forces before the war. According to prewar 2022 IISS estimates, the Russian Ground Forces had an inventory of 650 T-72B/BA, 850 T-72B3, 530 T-72B3M, 310 T-80BV/U, 170 T-80BVM, 350 T-90A, and 67 T-90M prewar, for a total of 2,927 tanks in active service. IISS estimated that there were 7,000 T-72 variants, 3000 T-80 variants, and 200 T-90s in storage for a total of 13,200 in storage.[298] In addition, the Naval Infantry and Airborne Forces had their own substantial tank inventories and had previously operated with the Ground Forces during the proxy war phase of the War in the Donbas since 2014. The Naval Infantry had an inventory of 50 T-72B, 150 T-72B3, 30 T-72B3M, 50 T-80BV, and 50 T-80BVM for a total of 330 tanks.[299] The Airborne Forces had 160 tanks – 150 T-72B3, 10 T2-B3M.[300] In all, IISS' figures gave a total of 3,417 tanks in active service in the entire Russian Armed Forces in addition to 13,200 more in storage. However, the sheer numbers involved in this seemingly formidable arsenal of tanks masked significant qualitative weaknesses. Of these, only the T-72B3 and T-72B3M upgrades of the T-72, the T-80BVM, and the T-90, altogether only a quarter of Russia's prewar tank fleet,

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[297]"Losses of the 1st Tank Army, 15 March," 16 May 2022.

[298] IISS, "Chapter Five: Russia and Eurasia," *The Military Balance* 122, no. 1 (2022).

[299] Ibid.

[300] Ibid.

could be considered modern due to their advanced fire control systems and night sights.[301] Thus, the prewar Russian Ground Forces fielded only a relatively small number of modern tanks, despite their vast quantitative superiority to Ukraine on paper.

The active Russian tank fleet included massed tank formations in the form of tank divisions and brigades. For infantry support, there were individual tank regiments in some motor rifle divisions and single battalions in most motor rifle brigades. The Russian Ground Forces included two armored divisions with two regiments each and two tank brigades. Regiments and tank brigades both included three tank battalions each. On the eve of the war, the Russian Ground Forces undertook a significant force expansion featuring a reorganization from a brigade-based structure to a divisional structure based on the Soviet model.[302] This reorganization was not fully completed by the beginning of the war, as not all of the brigades had been reorganized as divisions. In addition, not all of the new divisions were more than divisions on paper when the invasion was launched. For example, the 47th Guards Tank Division was reorganized from the 6th Tank Brigade, and committed to the invasion at its beginning.[303] However, only one tank regiment has been identified as being within the division, demonstrating that Russian force generation efforts are unable to find the personnel and equipment resources for them to recreate Soviet-era tank division organizations as more than units that are only divisions on paper.[304] This indicates that the nominal reorganization from brigades to divisions is

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[301] Sergio Miller, "The Graveyard of Russian Tanks
," https://wavellroom.com/2022/09/22/russian-tank-graveyard/.

[302] Anna Maria Dyner, "The Next Reform of Russia's Armed Forces: Is It a New Threat or Just for Appearances?
," *Polish Institute of International Affairs* (2023).

[303] Michael Kofman, "1st Guards Tanks Army Changes. Say Goodbye to 6th Separate Tank Brigade in Mulino. Say Hello to 47th Tank Division Being Stood up on the Basis of the 6th Tank Brigade in Mulino. 1st Gta Is Becoming a Tank Army with Two Tank Divisions.
," ed. KofmanMichael (2022).

[304] "Losses of the 1st Tank Army, 15 March."

often simply a change of name rather than an indication of increased force strength.[305] Each of the nineteen remaining motor rifle brigades included its own tank battalion, but not all the newly formed motor rifle divisions included tank regiments when the war began.[306] Each tank battalion included 31 tanks while some battalions in motor rifle brigades included 41, with ten tanks to each of the three or four companies.[307]

Trends in Russian Tank Losses

Over the course of the war, Russian tank losses have continued at an unsustainable pace of attrition. By mid-March 2023, more than a year after the start of the war, Oryx visually confirmed the loss of 1,845 tanks. 1,018 of these are T-72 variants and 442 T-80 variants, with the balance a mix of T-90s, T-64s, and T-62s.[308] This represented at least 63% of Russia's prewar active tank fleet as estimated by IISS, and, under the assumption that Oryx's data is undercounted by 25%, represents as much as three-fourths of the prewar tank fleet. This is a significant reduction in the armored capabilities of the Russian Ground Forces, and detailed breakdowns by type of tanks lost provide insights into the remaining availability of each type in the Russian arsenal.

For example, the T-72 was the numerically predominant backbone of the Russian tank forces at the beginning of the war. However, the T-72s, even the modernized versions with some explosive reactive armor (ERA), suffered heavy losses to anti-tank missiles in the early days of the invasion, as can be seen from the spike demonstrated by the table in March and April. T-72s

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[305] Tatyana Baklanova, "Военные Тоже Учатся," *Gazeta Znamya*, 10 December 2021.

[306] IISS, "Chapter Five: Russia and Eurasia."

[307] Lester W.; Bartles Grau, Charles K., *The Russian Way of War: Force Structure, Tactics, and Modernization of the Russian Ground Forces* (Fort Leavenworth, Kansas: Foreign Military Studies Office, 2016). p. 224

[308] Oryx, "Attack on Europe: Documenting Russian Equipment Losses During the 2022 Russian Invasion of Ukraine ," https://www.oryxspioenkop.com/2022/02/attack-on-europe-documenting-equipment.html.

continued to predominate in losses relative to T-80s until after the August and September defeats in Kharkiv Oblast. [309] In the following months, it can be observed that the trend of T-80s to T-72s lost becomes roughly equivalent despite the initial numerical predominance of T-72s. From this data, it can be concluded that the Russian stocks of T-72s have been significantly depleted relative to the smaller remaining number of T-80 stocks. This indicates that Russia may face the exhaustion of its T-72 stocks much sooner than expected. [310]

T-72 vs T-80 losses, February 2022 to March 2023
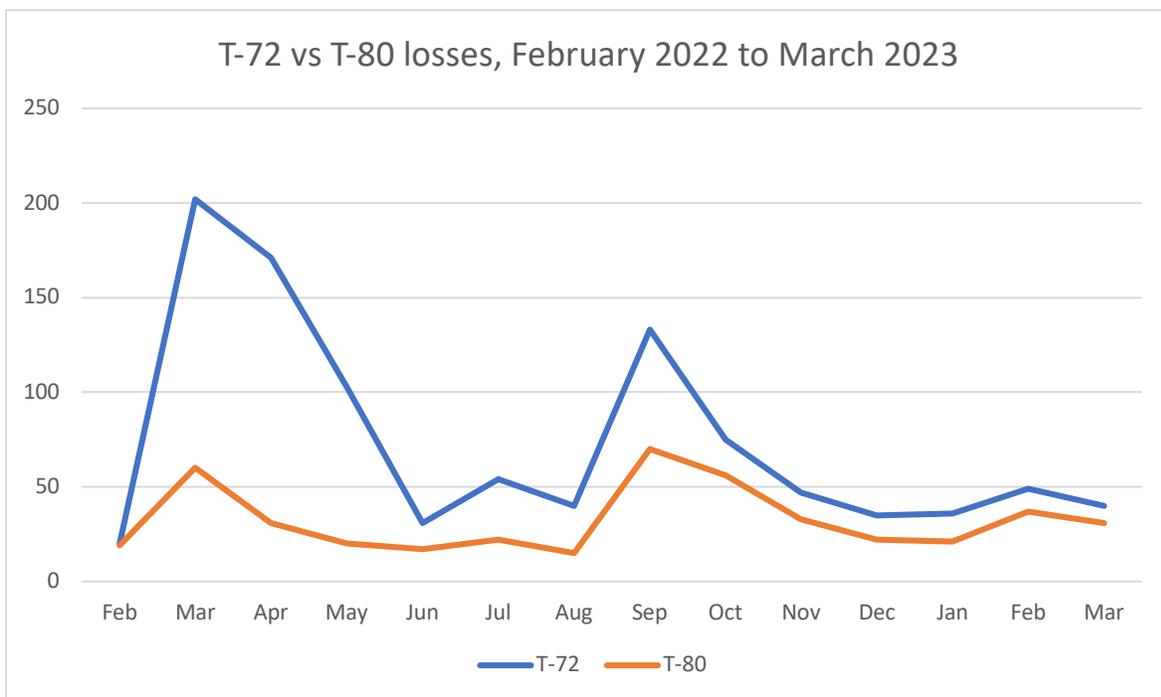
Breaking down the T-72 losses between modernized and unmodernized variants reveals that disproportionate losses have been suffered by the latest modification upgrade of the T-72B3, the 2016 version, which incorporated more Kontakt ERA armor than previous upgrades. Since then, small numbers of a 2022 upgraded version have reached the front, as evidenced by their
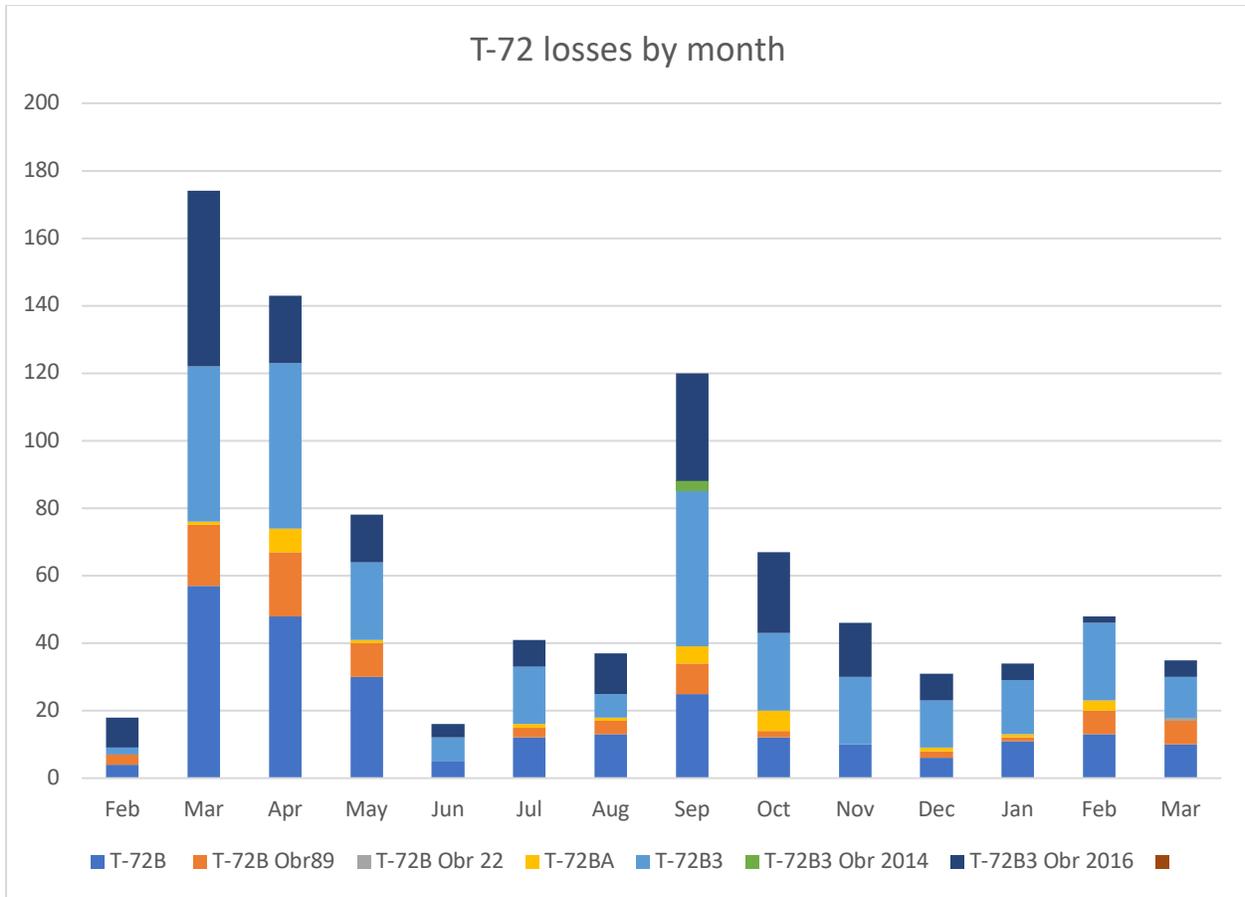
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[309] Ibid.

[310] Ibid.

appearance in the loss statistics. The fact that the losses of T-72B3s of the 2016 version spiked at the beginning of the invasion stems from their usage as one of the workhorse tanks of the Russian units active when the war began. [311] The declining amount of losses of 2016 upgrades of the T-72B3 indicates that their relatively small number has been significantly exhausted by losses over the past year, with the numbers of 2016 T-72B3 upgrades lost declining to almost statistical irrelevance as T-72B3 losses became roughly equal to the smaller number of unupgraded T-72B losses. [312] These trends indicate that Russia is running out of the latest upgrades of the T-72 and relying more on the original 2011 upgrade of the T-72B3 and unupgraded T-72Bs. Given that T-72 variants form the backbone of the Russian tank fleet, the negative trend in T-72 losses of modernized variants demonstrates that the bulk of the most modern T-72 upgrades were lost during the early phase of the war, and now the Russian Ground Forces must increasingly rely on unupgraded T-72Bs. [313]

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[311] Ibid.

[312] Ibid.

[313] Ibid.

T-72 losses by month

Legend: T-72B, T-72B Obr89, T-72B Obr 22, T-72BA, T-72B3, T-72B3 Obr 2014, T-72B3 Obr 2016

The overall trend of Russian tank losses has reflected the intensity and character of fighting, with losses spiking during major defeats. The spike in tank losses during March and April coincides with the retreat from Kyiv oblast and the general intense fighting that occurred in multiple sectors during that period. The losses during September and October coincide with Russia's retreat from Kherson and Kharkiv Oblasts and the large-scale abandonment of equipment. Since then, losses markedly increased in February, with the renewed attacks towards Vuhledar and the increased allocation of resources towards Bakhmut. [314] As of mid-March, losses are on track to match or surpass those of February. This indicates that Russia is unable to sustain

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[314] Ibid.

its attacks for a long period without simply running out of tanks, even with attacks mostly focused on the limited area of Bakhmut.

Monthly Russian tank losses, all types

Personnel Losses and Unit Cohesion

The heavy losses of Russian tanks have also meant that there are correspondingly high levels of casualties among Russian tankers. The high personnel losses are a consequence of the poor survivability of Russian tanks when penetrated, with catastrophic ammunition detonations dooming their crews.

An analysis of a captured loss report of the 1st Guards Tank Army from mid-March 2022 indicates that, when the 12th and 13th Guards Tank Regiments of the 4th Guards Tank Division

lost 62 T-80U and T-80UE tanks, personnel losses included 7 killed, 40 wounded, 8 captured and 8 missing for a total of 63 casualties. The 1st Guards Tank Regiment of the 2nd Guards Motor Rifle Division lost 45 T-72B3 Obr. 2016 tanks – nearly half of its total strength - in the same period while losing six killed, nine wounded, two missing, and 33 captured for a total of 48 casualties.[315] These casualty statistics indicate that at least one crew member became a casualty for each tank lost, as a baseline. The high number of prisoners of war from the 1st Guards Tank Regiment indicates that several crews must have ended up in a tactically disastrous situation given the evidence of a mass surrender, indicative of poor leadership.

The ranks of the casualties listed in the report also offer insights on the impacts of tank losses on the command structure. A standard Russian tank platoon is commanded by a lieutenant in the command tank and the other two tanks are commanded by sergeants. The gunner and drivers of the three tanks are typically corporals or privates, more inexperienced recent conscripts. The typical tank company is commanded by a captain.[316] For the 1st Guards Tank Regiment, it is possible to identify the exact positions of the regiment's casualties by matching names to their entries in the regimental roster, also captured by Ukrainian intelligence. Of the casualties in the tank units of the regiment within the first three weeks of the war, three out of nine tank company commanders were lost in addition to six out of 27 platoon commanders killed or captured.[317] Nearly a quarter of the tank platoon leaders and a third of tank company commanders became casualties, a rate that has surely worsened as the war progressed. This indicates that Russian junior officers in tank units have suffered significant casualties that reduce

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[315] "Losses of the 1st Tank Army, 15 March."

[316] GUR, "War Criminals - Servicemen of the 1st Tank Regiment Participating in the Invasion of Ukraine," https://gur.gov.ua/content/voennosluzhashchye-1-tankovoho-polka.html.

[317] Ibid.

the quality of leadership within tank units, as trained junior officers are a scarce commodity in the Russian Ground Forces, given that one can estimate that there were under 900 tank platoon commanders and under 300 tank company commanders in active service when the war began from the number of tanks in service.

Similarly, there would have been under 1,600 non-commissioned officer (NCO) tank commanders in the entire Russian Ground Forces, judging by the estimated pre-war tank strength, and a similar number of gunners and drivers. In the case of the 1st Guards Tank Regiment, six tank commanders were lost, as well as twenty gunners and drivers, indicating a roughly 10 percent casualty rate among enlisted personnel in tank units. While gunners and drivers with relatively short time in service could be more easily replaced, the NCO experience of a tank commander is much harder to replace, given that these NCOs, judging by the ages of those in the 1st Guards Tank Regiment, were generally 23-24 years old, compared to the 19-20 year-olds who formed the gunners and drivers. [318] These losses together could render individual subunits combat ineffective, such as one platoon in which the platoon commander and his tank crew were lost with another tank commander becoming a casualty – such a platoon would have effectively ceased to exist if only one tank remained with a full crew. [319]

Given the heavy officer losses of the first weeks of the war, a shortage of junior officers at the company level is inevitable a year later. Judging by the amount of tanks lost, the Russian Ground Forces, even estimating conservatively that the 25 percent attrition rate of platoon leaders continued from the opening weeks of the war and did not increase, ran out of their prewar platoon leaders within four months of intense fighting. If ten percent of tank commanders

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[318] Ibid.
[319] Ibid.

became casualties, based on the experience of this regiment, over half the prewar tank commanders were lost in a year of war. A lack of experienced personnel is demonstrated by the Russian tactical shift from employing tanks in larger numbers to using small groups of 2-3 tanks to support infantry assaults.[320] This indicates that the Russian Ground Forces may no longer have the necessary junior officers to coordinate larger tank maneuvers. Such a shortage is exacerbated by the relatively long training pipeline of troops in the armored forces relative to infantry.

The tank troops' training pipeline for officers is lengthy, similar to the American equivalent. There is only one officer training school in Russia that prepares future platoon leaders, the Kazan Higher Tank Command School (KVTKU). Moreover, KVTKU's admissions standards require higher mathematics exam scores than the pilot schools of the Russian Air Force. Students at the school spend four years studying and training and at the end of this period are given the rank of lieutenant and then sent to serve as platoon leaders. By comparison, the armor basic officer leaders course in the US Army prepares officers in nineteen weeks or almost five months, after they complete four years in Army ROTC.

As an indication of the number of junior officers entering the army, the KVTKU's latest annual graduating class produced 111 lieutenants in July 2022, unchanged from the 2021 class.[321] Since each graduation is a public event that is open to the media, any acceleration of the training course for platoon leaders would be noticeable, and there has been no indication of another graduation since the July 2022 class.[322] Given the lack of any changes in graduation patterns at

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[320] Sergio Miller, "Anatomy of a Russian Army Village Assault
," https://wavellroom.com/2023/02/01/anatomy-of-a-russian-army-village-assault/.
[321] Arseny Karimov, "Kazan Tank School Graduated 110 Officers," *TatarInform*, 30 July 2021.
[322] "Kazan Tank School Graduates 111 Young Lieutenants," *Tatarstan-24*, 29 July 2022.

KVTKU or efforts to increase the training of platoon leaders, it can be assumed that platoon leader training will remain grossly inadequate relative to losses experienced.

As the Red Army did during World War II, it is highly likely that the course of instruction at KVTKU could be shortened. However, modern Russian tanks are more technologically advanced and therefore more complex than their World War II equivalents, even the historical six-month course that most Red Army tank commanders underwent would be grossly inadequate. In any case, this course was criticized by veterans of that war for not even teaching its graduates map reading, and being reduced to the bare minimum of basics such as maneuvering in a column.[323] Given the demands of 21st-century warfare it is unlikely that the Russian Ground Forces can restore their armor capabilities simply by producing inadequately trained tank platoon leaders.

Instead, since KVTKU does not produce enough junior officers to compensate for losses, the Russian Ground Forces have begun using officers trained at the Omsk Armored Engineering Institute (OABII), which trains tank repair platoon leaders on a five-year program. Such graduates are considered specialists and typically perform the duties of a repair platoon leader or deputy company commander for technical support, which involve overseeing the logistics of tank operations rather than combat leadership.[324] One example of this practice was a 2021 OABII graduate pressed into service as a tank platoon commander whose biography reveals that he commanded the platoon from the beginning of the war to his death in combat in September. However, OABII's graduation classes number about the same as those from KVTKU, indicating that pressing OABII alumni into service as tank platoon leaders is not a sustainable solution to

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[323] Robert Forczyk, *Tank Warfare on the Eastern Front 1943-1945: Red Steamroller* (Pen & Sword, 2016).
[324] "Омский Автобронетанковый Инженерный Институт," Учебные заведения
, https://www.uchsib.ru/uz/vuz/2062.

the junior officer shortage.[325] At the same time, such substitutions also serve to strip logistics elements of tank units of qualified leadership in a war in which poor logistics management has hampered Russian offensive efforts. The losses of junior officers that cannot be easily replaced are thus a key factor in the ineffectiveness of Russian armor on the battlefield, and a problem that will likely not be solved in the next year given the lack of indication of efforts to train larger numbers of platoon leaders.

Similarly, the Russian enlisted training pipeline for tank crewmen is not adapted to quickly replace wartime losses. Russian tank crewmen receive training at military district training centers after contract signing. Training centers combine several distinct enlisted training specialties such as infantry and BMP crewmen, known as junior specialists. Both gunners and drivers are trained at training centers, of which there are five, one for each military district. Training consists of three months and roughly 2,000 from all specialties were included in each training class prewar. On paper, the training process consists of gunnery, driving, and tactical maneuver training on training grounds adjacent to the training centers, and incorporates electronic simulators.[326] However, it is evident that wartime requirements have diluted the quality of even tank training, as mobilized personnel who are barely trained have been entrusted with operating tanks. An indication of the lack of training of even mobilized personnel slated to serve as tank crews in formerly elite units such as the 1st Guards Tank Regiment is revealed by a video recorded by a mobilized serviceman in late September 2022. The serviceman in question

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[325] "Выпускнику Филиала Ва Мто В Г. Омске Николаю Данильченко Присвоено Высокое Звание Героя Российской Федерации
," 23 December 2022.
[326] "Около 2 Тысяч Курсантов Окружного Учебного Центра Вво Приняли Военную Присягу
," 31 January 2022.

revealed that they had been sent to the front without any gunnery practice, "nothing."[327] This indicates that the normal training process for tank crewmen has been omitted in the rush to get mobilized personnel to the front, and that the problems that affect mobilized infantry have extended to those mobilized to rebuild tank units. Sending untrained tank crewmen into the frontline cannot improve the effectiveness of Russian armor and if anything can only waste valuable tanks when untrained tank crewmen prove unable to operate tanks effectively in combat situations. As can be seen from the lack of significant Russian territorial gains in the last several months, the rebuilding of tank units with mobilized personnel has failed to restore their combat effectiveness, as can be seen by the ineffective commitment of conventional units from the 3rd and 144th Motor Rifle Divisions to attacks in the Kreminna sector in late February.[328] The lack of effectiveness of Russian conventional forces in the past three months demonstrates that unit cohesion problems within armored forces arising from high losses of junior officers have not been resolved, and if this trend continues Russia will not be able to provide effective armor support to future offensives if there is any capability in terms of equipment remaining.
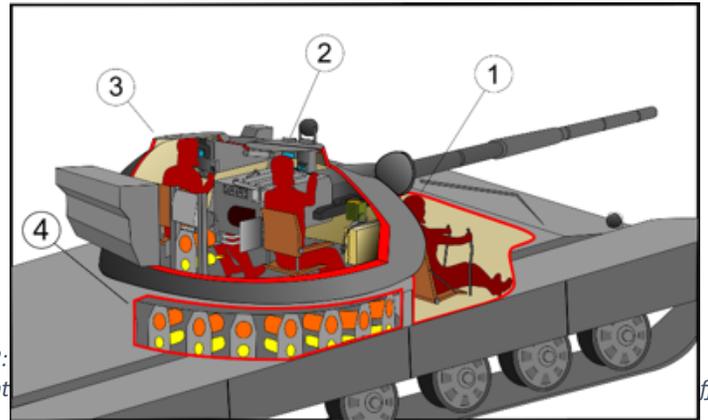

Tank Survivability

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[327] "Мобилизованный Из Первого Танкового Полка Рассказал, Что Их Отправляют В Херсон Без Учений ," *MediaZona*, 27 September 2022.

[328] Karolina and Kagan Hird, Frederick W., "Russian Offensive Campaign Assessment, February 19, 2023."

The massive losses of Russian tanks over the past year highlight the fundamental design flaw and Achilles heel of Soviet tank design – the ammunition storage. The T-64 and subsequent tank designs relied on using carousel autoloaders positioned under the turret to store ammunition so that tanks could be lighter, faster, and cheaper than their NATO counterparts. Because the carousel autoloader is based on a conveyor system, it cannot be compartmentalized. [329] As a result, the bags that

2: ht ... ff/

3: T-72 Turret cross-section, driver (1), gunner (2), and commander (3), ammunition (4) Source: https://commons.wikimedia.org/wiki/File:T72_crew.svg

contain the volatile propellant charges for the tank shells are stored under the loader's feet. This lack of compartmentalization has proven a fatal vulnerability for Soviet and Russian tank design, because even a seemingly minor penetration by even a shell fragment into the turret can ignite the charge bag.[330] The resulting chain reaction explosion of the tank's ammunition results in the signature "turret toss," in which the turret explosively separates for the chassis of the tank,

killing the crew. The "turret toss" occurred with roughly half of Russian tank losses and was not limited to the oldest tanks, as both the original unupgraded T-72 and newly upgraded T-72B3 Obr 2016 tanks suffered from similar rates of the "turret toss" occurring. The lack of improved survivability in newer upgrades of the T-72 demonstrates that the new version of Kontakt 5

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[329] Miller, "The Graveyard of Russian Tanks ".

[330] Ibid.

reactive armor does not offer significant performance benefits over the original Kontakt 1

reactive armor, brutally demonstrating that Russian tank design has failed to advance the

survivability of its tanks since the Cold War. [331] The failure of the Kontakt explosive reactive

armor (ERA) stems from a fundamental problem with its purpose: Soviet ERA was designed to

reduce weapons penetration of the tank, but not eliminate it entirely. This leaves tank

ammunition storage uniquely vulnerable to any penetration, whether from Stugna, NLAW,

Javelin anti-tank guided missiles, fire from other   tanks, and shell splinters from 152 mm

and 155 mm guns. [332]

The lack of survivability inherent in Soviet tank design continues to the present day as

the T-90 shares the same ammunition storage placement as the T-72. Without an unlikely

fundamental shift in tank design, which is likely impossible due to the inertia of the Russian

military-industrial complex system, Russian tanks will continue to remain deadly to their

crews.[333] The consequence of this lack of survivability is that the ratio of destroyed to damaged

Russian tanks visually confirmed is almost 12:1.[334] This indicates that Russian tank crews are

more likely to be killed when their tanks are destroyed, leading to a casualty ratio that is

unsustainably high, as discussed above, especially for company level officers. Such a casualty

ratio indicates that Russia has a shortage of   experienced tankers, which damages unit

cohesion and the ability of Russian armor to interact with infantry and conduct combined arms

operations. In fact, recent reports of individual Russian attacks indicate that tank operations are

not coordinated with infantry attacks, even when tanks only have a supporting role. Russian

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[331] Ibid.

[332] Ibid.

[333] Ibid.

[334] Oryx, "Attack on Europe: Documenting Russian Equipment Losses During the 2022 Russian Invasion of Ukraine
".

tankers tend to attack in columns rather than maneuvering in dispersed formations, increasing their vulnerability to ATGMs. They often do not use installed countermeasures systems and fail to camouflage their tanks. [335] These tactical failures indicate that the lack of experienced tankers caused by high casualties is beginning to reduce the combat effectiveness of Russian armor, to the point where Russia's once-vaunted armored force is offensively irrelevant.

Tactical Shift to Reduced Role of Tanks on the Offensive

Historically, Soviet doctrine relied on the idea of creating the "deep battle," a decisive penetration of enemy lines allowing offensive spearheads to strike deep into enemy rear areas. The Soviet doctrine of deep battle relied on breaking the enemy defensive line with massed artillery fires superiority and then exploiting the resulting penetration into the enemy rear with fast-moving armored forces. [336] The armored forces would then be able to target critical enemy logistics and supply nodes, and disrupt the defensive through creating chaos in the rear.[337] However, since the collapse of the Soviet Union, Russia lacked the resources for effective deep battle in terms of massed forces, and as a result the Serdyukov reforms of 2009 prioritized maneuver warfare by making the brigade the primary maneuver unit instead of the old Soviet-style division. As a result, there was a shift in the early 2010s to the idea of the battalion-tactical group, similar to a NATO style task force in which tank, motor rifle and artillery units were integrated into one battalion to create an organic combined arms force. In theory, the battalion-tactical group functioned as an effective and mobile maneuver force within a concept of non-

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[335] Miller, "The Graveyard of Russian Tanks
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[336] Lester W. Grau, "Russian Deep Operational Maneuver: From the Omg to the Modern Maneuver Brigade," *Infantry*, no. 8 (2017).

[337] Ibid.

linear warfare, but in reality its logistical weaknesses were concealed by its main combat test being an unprepared and outmatched Ukrainian Army in the 2014 Donbas war.[338]

However, the Serdyukov reforms proved unpopular within the Armed Forces, and were reversed under the administration of Defense Minister Sergey Shoigu. In regards to armored forces, there was a renewed shift from brigades back to Soviet-style division structures beginning in 2016, rhetorically justified by a desire to counter NATO threats and presaging a return to emphasizing large-scale conventional warfare operations favored by Cold War doctrine rather than the hybrid warfare concept tested in the annexation of Crimea.[339] Armored forces played a key role in the initial stages of the Russian invasion of Ukraine, forming the bulk of the northern and eastern strike groups, but their logistical vulnerabilities were exposed by the much-publicized traffic jam on the road to Kyiv.[340] Ultimately, Russian tank units proved inflexible and unable to effectively counter Ukrainian usage of ATGMs and drones, further hampered by the vulnerability of their tanks.[341] The tank battalion tactical groups were hampered by a lack of infantry, as Russian units in the initial stage of the invasion suffered from a shortage of riflemen who could dismount and thus proved helpless in urban combat. The infantry shortage significantly reduced the actual size of the tank BTGs from their paper equivalent, as units such as the 1st Guards Tank Regiment went into action with only one 70-man infantry company rather

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[338] Grau, *The Russian Way of War: Force Structure, Tactics, and Modernization of the Russian Ground Forces*.

[339] Catherine Harris; Frederick W. Kagan, "Russia's Military Posture: Ground Forces Order of Battle," (Institute for the Study of War, 2018).

[340] Per and Listou Skoglund, Tore, and Ekstrom, Thomas, "Russian Logistics in the Ukrainian War: Can Operational Failures Be Attributed to Logistics?
," *Scandinavian Journal of Military Studies* (2022).

[341] Dyner, "The Next Reform of Russia's Armed Forces: Is It a New Threat or Just for Appearances?
."

than the assigned motor rifle battalion, which proved to be grossly inadequate to security requirements.[342]

As a result of heavy losses in both personnel and equipment that have proven difficult to replace, Russia has shifted away from tactics emphasizing the role of tanks on the battlefield. Most notably, Shoigu's announced force expansion plan of December 2022 called for a dozen new divisions of infantry, but did not mention a single armored division.[343] This demonstrates a high-level conceptual shift away from tanks at the top echelon of Russian military planning, clearly a reaction to the heavy armor losses of the previous year which cannot be replaced in the near future.

Since the battlefield defeats of mid-2022, the Russian Ground Forces have abandoned the concept of the battalion tactical group in favor of the assault detachment, as revealed by a captured Russian tactical manual. [344] The assault detachment abandons the battalion tactical group's requirement for at least a tank company of ten tanks in BTGs drawn from motor rifle brigades or a 31-tank battalion in tank divisions and brigades. Instead, the assault detachment consists of a tank group with three tanks and 2-3 assault companies with one to four tanks each. This indicates that an assault detachment could be supported by as few as six tanks, a drastic reduction in tank support compared to the ten provided to a motor rifle BTG or the 31-strong tank battalions.[345]

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[342] Michael and Lee Kofman, Rob, "Not Built for Purpose: The Russian Military's Ill-Fated Force Design," (2022), https://warontherocks.com/2022/06/not-built-for-purpose-the-russian-militarys-ill-fated-force-design/.

[343] Dyner, "The Next Reform of Russia's Armed Forces: Is It a New Threat or Just for Appearances? ."

[344] Tatarigami_UA, in *Russian forces are revamping their assault tactics after experiencing failures with their current structure. The Battalion Tactical Groups (BTGs) are getting replaced with a new unit called the "Assault Unit" or "Assault Detachment", which I will discuss in this thread.*, ed. Tatarigami_UA (2023).

[345] Dyner, "The Next Reform of Russia's Armed Forces: Is It a New Threat or Just for Appearances?

Instead of tank support, the assault detachment relies on artillery to support infantry in attacks on Ukrainian defensive positions. The assault detachment is also less mechanized than the BTG as each company only has 4 BMPs to provide mobility, indicating that Russia is shifting towards prioritizing small-scale gains in attritional warfare of the type seen in the fighting for Bakhmut rather than attempting to achieve large territorial gains as they did in the first weeks of the war.[346] This tactical shift indicates that Russia hopes to play the "long game" in the war and grind down Ukrainian forces in order to prevent a decisive Russian defeat.

Examples of assault detachment tactics as exercised by conventional Russian Ground Forces (not Wagner) can be analyzed from reports of two different attacks in late 2022 and early 2023. The first, a 15 August 2022 attack by a company-sized airborne element from the 108th Guards Air Assault Regiment of the 7th Guards Air Assault Division on the village of Blahodatne in Kherson Oblast, was supported by three T-72B3 tanks of the organic divisional tank battalion, as explained by captured orders. [347] By this point in the war, the divisional tank battalion was down to five tanks out of the 31 that it began the war with, another indicator of the scale of tank losses. The assault group, attacking with the objective of capturing parts of the village, consisted of the three tanks and a platoon of 40 paratroopers riding 7 BMD-2s. In the attack, the T-72B3s were unable to communicate with the paratroopers securely due to radio incompatibility. The attack was launched as a frontal assault preceded by a weak artillery bombardment and did not make significant gains, exemplifying the futility of frontal assaults without combined arms coordination, even while deploying the once elite Airborne troops.[348]

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[346] Tatarigami_UA.

[347] Miller, "Anatomy of a Russian Army Village Assault

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[348] Ibid.

A second example of assault group tactics was a January 2023 attack by elements of the 11th Separate Motor Rifle Regiment on the village of Vodoyane southwest of Avdiivka in Donetsk Oblast. Although the 11th Regiment was formerly a unit of the separatist militias, these units have been formally integrated into the Russian Ground Forces and should be included as a component of the Russian force structure, although their combat effectiveness is low even by Russian standards. The attack began in earnest with the advance of 8 BMP-2s carrying infantry over open terrain, which were repulsed by Ukrainian artillery and UAVs with heavy losses. Only after the infantry had been forced to retreat did two separatist T-72Bs approach Vodoyane, although they used the same route as the infantry, with predictable vulnerability to Ukrainian fire. One tank was destroyed by a Stugna ATGM and the second disabled by drone-dropped grenades. The attacks demonstrated a lack of basic coordination and fire support among the separatist forces as there was no artillery involved on the Russian side, in addition to the communications issues inherent in using old tanks with potentially broken radios. The assault also demonstrates the vulnerability of unsupported tanks to drones and ATGMs, a problem evidently still dogging Russian forces.[349]

These attacks indicate that assault detachment tactics have limited effectiveness without using prisoners as cannon fodder like Wagner in Bakhmut. The failure of these attacks demonstrates that the Russian Ground Forces have not measurably improved their effectiveness with the switch to assault detachments, although this may be all the Russian Ground Forces remain capable of given crippling equipment losses. Although assault detachments seem more flexible on paper than BTGs, it is evident that the Russian Ground Forces continue to face

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[349] Sergio Miller, "May the Farce Be with You: The Assault on Vodyane Village ," *Wavell Room* (2023).

problems in translating doctrine from manuals into tactics that can be effectively implemented to accomplish tactical objectives.

Stored Tanks: An Illusory Force

Before the war, Russian state media reported the presence of thousands of tanks mothballed in storage bases east of the Urals, and these reports were credited by institutions such as IISS that published inflated estimates of Russia's overall tank strength through the inclusion of tanks in storage. The IISS 2022 Military Balance estimate of Russian tank strength assumed that there were 7,000 T-72 variants, 3000 T-80 variants, and 200 T-90s in storage for a total of 13,200 tanks in storage.[350] Because many of these storage base have tanks outside in the open air, they are visible on satellite imagery. One such storage base at

4: Arsenyev, 2021 (Google Earth)

Arsenyev, Primorsky Krai, has in fact changed since the invasion, but the only difference is that turretless tanks waiting for disposal have been moved from neat rows into what appears to be a scrap heap. Judging by satellite imagery of storage bases, most of the tanks in outside storage are likely not recoverable, and Russian tank strength should not be exaggerated by incorporating turretless hulls into this number.

Russia has been confirmed to have removed tanks from storage and sent them to the frontline. As early as March, Ukrainian intelligence reported Russian attempts to reactivate

5: In June 2022 (Google Earth)

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[350] IISS, "Chapter Five: Russia and Eurasia."

obsolete T-62M tanks from storage.[351] The T-62Ms were photographed on railcars en route to Ukraine and were deployed to Kherson and Zaporozhia sectors where many were abandoned as Ukrainian forces recaptured Kherson in November.[352] By May, T-80BV tanks had also been pulled out of storage, with 100 reported to have been taken out of a storage base in the Central Military District in late April.[353] The infusion of T-80BV tanks from storage into the Russian Ground Forces explains the spike in T-80BV visually confirmed losses starting from September 2022 and continuing into March 2023. [354]

However, the amount of Russian tanks in storage is not limitless and is not an efficient method of rebuilding Russian tank strength. A Ukrainian analysis of tanks visible from satellite imagery in mid-2022 counted 2,075 combat ready tanks stored under cover, including 886 preserved by dry air, the most combat ready tanks in storage. However, only those preserved by dry air could be immediately ready and of these many are obsolete T-62s. The tanks stored under cover but not preserved by dry air still take time to take out of storage and to be prepared for service. There were also 1,304 tanks in outdoor storage, but these have to be refurbished at tank repair plants in order to make them fit for service and often suffer damage from the elements and parts theft. This satellite imagery analysis indicates that Russian tank storage stockpiles are much smaller than previously believed, and often of doubtful usefulness.[355] Even this number is an

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[351] "Орда Т-62м Часів Хрущова: Чи Дійсно Кремль Може Відправити В Україну "Раритетні" Танки Та Навіщо
," *Defense Express*, 24 March 2022.
[352] Oryx, "Attack on Europe: Documenting Russian Equipment Losses During the 2022 Russian Invasion of Ukraine
".
[353] "Russia Removing T-80bv from Storage, the Echelon Spotted near Moscow
," *Defense Express*, May 27 2022.
[354] Oryx, "Attack on Europe: Documenting Russian Equipment Losses During the 2022 Russian Invasion of Ukraine
".
[355] Ihor Myhaylenko, "Аналіз Запасів Танків Рф На Базах Зберігання За Уралом
," *mil.in.ua* 2022.

overestimate of what Russian industry is capable of restoring, as if the Russian Ground Forces could effectively leverage the amount of tank hulls at their disposal, they would be making more of an impact on the battlefield with the sheer amount of tanks in storage.

Inadequate Production and Optics Supply

Although Russia possesses considerable amounts of tanks in storage, the Russian military-industrial complex is no longer capable of restoring the amount of tanks necessary to replace the losses of the past year in a timely manner. Russia has only one factory left capable of producing tanks, Uralvagonzavod (UVZ) in Nizhny Tagil. This situation resulted from the closure of factories that were unable to cater to the tank export market, leaving UVZ the last survivor of the once-sprawling Soviet military industrial complex of tank factories. Because Russian defense contracts do not operate on a competitive bid system like Western contracts, there is no incentive for companies to innovate in defense with new weaponry. Instead, companies are incentivized to maximize their profits by slow-rolling production since Russian Ministry of Defense (MO) contracts are relatively unprofitable compared to exports. After the war began, the MO ordered 400 tanks, but UVZ production lines were unprepared to meet the demand.[356]

As a result, UVZ production has been grossly inadequate in replacing the losses suffered in the first year of the war. While production capacity is as high as 200-250 tanks per year, new tanks are being assembled by hand due to a lack of equipment necessary to turn out tanks in the quantities that Soviet industry was able to. A lack of skilled labor prevented UVZ as of late 2022 from setting up new production lines to quicken the pace, which has left T-72B3M tanks being

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[356] Georgy Aleksandrov, "The Barren Barrels," *Novaya Gazeta Europe* (2022).

produced in only small batches of five or ten. Calculations by Telegram channel Volya estimate that Russian industry can make up to 250 new tanks and modernize 600 a year. Using this figure as a baseline, that would come out to 850 new and modernized tanks in the first year of the war to replace over 1,800 losses, leaving the Russian Ground Forces still a thousand short or more in returning to their prewar strength. An anonymous source from Rostec, parent company of UVZ, aptly summarized the situation: "The T-62 is a tank that is easy to use and simple to operate for a mobilized person. If Russia runs out of those, the T-34 can be taken from pedestals…"[357] As for the much-vaunted T-90M, Russia's most modern tank, UVZ has only been able to deliver less than 40 in 2022, and the tank has not proven itself a "wonder weapon" as several have been captured or destroyed by Ukrainian forces.[358]

While UVZ focuses on production of the T-72B3M and T-90M, the 103rd Tank Repair Plant near Chita is tasked with modernizing the T-62M tanks in storage. The plant was contracted to restore and modernize 800 T-62s from storage in October 2022. The timeframe for the contract was three years, resulting in the plant having to modernize at least 22 a month to meet demand. Even this timeline, which would not result in timely rebuilding of Russian armor with the obsolete T-62, proved too ambitious. Duma MP Andrey Gurulev revealed that by March, only 35 tanks had been delivered. This indicates that only seven tanks, three times less than requested, were being delivered per month. Furthermore, the T-62 modernization remains inadequate to the demands of modern warfare as the T-62's lack of an autoloader due to its age is not efficiently

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[357] Ibid.

[358] Sergio Miller, "T-90ms Are Appearing on the Eastern Front – What Is the Threat?
," Wavell Room, https://wavellroom.com/2023/03/10/t90m-are-appearing-on-the-eastern-front/.

correctable, and Russia has run out of Sosna-U sights and instead has installed the Cold War era

1PN-96MT-02 sight on modernized tanks instead, due to the impact of sanctions.[359]

A final indicator of Russian desperation is the removal of T-54/55 tanks more obsolete

than the T-62 from storage. The first imagery of T-55 tanks on railcars was discovered by the

Conflict Intelligence Team open-source intelligence

group in late March, and satellite imagery revealed the

absence of at least one battalion of T-55s that had been

stored outdoors at storage bases. The footage revealed

that the T-54/55 tanks on the railcars were unmodernized

and remained visibly in the original obsolete

configuration.[360] This transfer began between late February and mid-March.[361] These did not

take long to reach the war zone, as in mid-April pro-war Russian telegram channels posted

images of a T-55 from the Zaporizhia front, showing

6: An unmodified T-55 in Zaporizhia Oblast, April 2023. Source: Conflict Intelligence Team via Telegram, https://t.me/cit_backup/1438

similar markings to those seen on the railcars. The T-55

in the image was not modified with ERA blocks, suggesting that little effort was made to

improve the protection of the obsolete tanks when delivered to the front.[362] Given that the T-55

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[359] "У Рф Розкрили Реальні Темпи Відновлення Т-62, Які Хаотично Модернізуються З Відставанням Від Графіка
," *Defense Express* (2023).
[360] Conflict Intelligence Team, "From Hibernation to Humiliation? Russia Brings T-54 Tanks out of Retirement
," 21 March 2023.
[361] Konrad Muzyka, "Satellite Imagery Confirms the Withdrawal of a Battalion (29) Worth of T-55s from the 1295th Central Tank Storage and Repair Base in Arsenyev in Primorsky Krai between Mid-Feb and Mid-March
," ed. konrad_muzyka (Twitter, 2023).
[362] Conflict Intelligence Team, "Sitrep for Apr. 14-15 (as of 09:30 A.M.)
," April 15 2023.

lacks an autoloader, has only rudimentary stabilization, and has a different gun caliber than other Russian tanks, resorting to T-55s cannot restore the effectiveness of Russian armor. [363]

With the lack of substantial tank production and continued impacts of sanctions, it is highly probable that Russia faces a crisis-level shortage of tanks by 2024. This will be exacerbated by the fact that T-55s and T-62s will not be a solution to battlefield issues due to their extreme obsolescence, especially as Ukraine continues to receive relatively modern NATO tanks.

Captured Tanks: Accidental Lend-Lease

A significant factor in shifting the balance of tanks towards Ukraine is that hundreds of Russian tank losses add to Ukraine's tank strength through captures of tanks relatively intact. As of March 2023, Oryx visually confirmed 550 tanks captured by Ukraine. These include some of the most modern Russian tanks such as 84 T-72B3, 102 T-72B3 Obr. 2016, 12 T-90A, and 45 T-80U.[364] This is an amount significantly greater than the amount of tanks received through Western assistance. In fact, the Ukrainian tank strength has actually increased over the first year of the war as losses have been offset by captured Russian tanks, from 858 to 953.[365] Furthermore, Ukrainian engineers have been innovating with obsolete equipment, such as captured T-62s, which have been repurposed as armored recovery vehicles with turrets removed.

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[363] "From Hibernation to Humiliation? Russia Brings T-54 Tanks out of Retirement
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[364] Oryx, "Attack on Europe: Documenting Russian Equipment Losses During the 2022 Russian Invasion of Ukraine
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[365] Dan Sabbagh, "Russian Army Has Lost up to Half of Key Battle Tanks, Analysts Estimate
," *The Guardian*, 15 February 2023.

It is important to note that the effort to repair captured equipment is largely crowd-funded because the state is occupied repairing Ukrainian tanks.[366]

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[366] Daniel Boffey, "The Ukraine Repair Shop: Where Russian Tanks Go to Change Sides
," ibid., 3 February.

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, edited by Tatarigami_UA, 2023.

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The Russian Federation's Violations of Humanitarian Law in Kupyansk and Kupyansk-Vuzlovyi, Ukraine

BLUF

Violations of international humanitarian laws committed by the Russian Federation in Kupyansk and Kupyansk-Vuzlovyi can be attributed to poor training practices and a culture of brutality within the Russian military.

Preface

This estimate assesses the scale and nature of the war crimes committed by the Russian Federation in the cities of Kupyansk and Kupyansk-Vuzlovyi. It describes the relevant international humanitarian laws and norms that the Russian Federation has incorporated into its legal system and publicly supported. It details documented violations of humanitarian laws and norms within the cities of Kupyansk and Kupyansk-Vuzlovyi during and after the Russian Federation's occupation of both cities. It evaluates if there is in fact a systemic nature to the Russian Federation's violations of international humanitarian laws and norms or if it can be attributed to individual rogue actors at play. This estimate evaluates the likelihood that the Russian Federation will continue to violate international and national humanitarian laws and norms in the cities of Kupyansk and Kupyansk-Vuzlovyi; as well has the likelihood that the Russian Federation will continue to violate these laws in the broader Ukrainian conflict. The options available to the United States concerning policy and capabilities in relations to these violations are presented within this estimate.

Analytical Methodology

This estimate uses pattern analysis to identify and connect trends in the Russians Federation's actions. It looks at historical trends in public statements made by government officials and government policy and legislation. Additionally, it looks at trends of actions taken by the Russian Federation in historical conflicts. Considering historical trends, it then analysis the current conflict in Ukraine and the continuation of such trends. Additionally, it considers the connections and trends within the Russian militaries training structure is seen to carry over into Russian actions in the war in Ukraine.

Key Judgements

The Russian Federation suffers from systemic failures that have led to widespread violations of international humanitarian law throughout the war in Ukraine, across all functions and ranks of their armed forces. The public stance of the Russian Federation has historically and currently remains in opposition towards violations of human rights in conflict situations and beyond. They maintain a political posture of support towards the protection of human rights in conflict and seek the punishment of individuals and nations who do not adhere to international standards and norms. However, in practice the Russian Federation violates human rights in favor of national objectives. The Russian Federation has denied all responsibility and/or existence of violations in relation to their own actions and from individuals within their own ranks. Their denial of responsibility is also a denial of the necessity to prosecute responsible parties for violations. Therefore, this report assesses with low confidence that the Russian Federation will

take any steps towards preventing further violations of international humanitarian laws and norms at any level of the war effort in Ukraine.

The Russian Federation has proven that their continued humanitarian law violations are systemic through the nature of crimes committed in Ukraine. Poor training and education of newly recruited soldiers is not the sole cause of the war crimes committed in Ukraine. The use of missiles and bombs to target civilian infrastructure and populations in Kupyansk and Kupyansk-Vuzlovyi substantiates this claim. The strategy, planning, and execution of bombing campaigns are developed and set into motion at command levels far above the pay grade of newly employed soldiers. More explicitly they are programmed by a group within the Main Computation Centre of the General Staff (GVC) of the Russian Armed Forces. Hence, their paths are determined and carried out by members of the Russian Armed Forces who have received far more training, education, and combat experience than those who have been conscripted and positioned on the frontlines in the expedited fashion now being employed by the Russian Federation. This indicates three possibilities as to what is causing the widespread brutality carried out by Russian forces:

- The Russian Government established in 2007 a legislated requirement that commanding officers in the Russian Armed Forces must educate their subordinates on international humanitarian laws and inform them of their responsibility to adhere to such laws. This practice has either not been universally implemented in military training structures or has not been implemented at all.

- Despite implementation of such education structures, the cultural norms pervasive in the Russian Federation Armed Forces perpetuate the implementation of tactics that violate established international humanitarian laws.

- The decree issued by President Vladimir Putin establishing the Internal Service Regulations of the Armed Forces of the Russian Federation in 2007, which establishes the education requirement, was done without the sincere intensions of implementation.

This report assesses with a high confidence level that there is in fact no education of humanitarian laws provided to new soldiers in the Russian Forces. This in conjuncture with the culture of brutality pervasive in the Russian military are the root causes of the continued violations of human rights and executions of war crimes. The Russian military has a deep rooted and brutal tradition of hazing called dedovshchina (дедовщина). The tradition has created severe mental trauma for those serving in the Russian Armed Forces. It has created an organization of individuals who have a strong desire for revenge and power after being subjected to grotesque hazing practices. Young men put on the battlefield find themselves in a position of power. After taking over cities such as in Kupyansk and Kupyansk-Vuzlovyi the young soldiers are enthusiastic to exert their power over any individual they can. It is this extreme cycle of abuse combined with a lack of education and culture of respect, morality, and legality that has led to the extensive violations of humanitarian laws across Ukraine by Russian forces.

The standards for the treatment of all individuals are laid out by international laws. The Russian Federation was a party to the creation of international humanitarian laws. The international laws form the foundation of the established Russian legal structure regarding humanitarian law. The legal framework and standards established for the Russian Armed Forces are done so through the Military Doctrine of the Russian Federation and the Regulations on the Application of International Humanitarian Law by the Armed Forces of the Russian Federation. The actions taken by the Russian Federation and its representatives in the cities of Kupyansk and

Kupyansk-Vuzlovyi repeatedly violate the established laws. The clear instances of civilian torture and murder, as well as the illegal torture and murder of individuals believed to be combatants, and the targeting of civilian infrastructure and medical establishments are all examples of violations of humanitarian law committed by the Russian Federation in Kupyansk and Kupyansk-Vuzlovyi. Violations of humanitarian law by the Russian Federation in Ukraine are in no way isolated and extend far beyond the cities of Kupyansk and Kupyansk-Vuzlovyi that are at present being evaluated. The war crimes committed by the Russian Federation in other localities across Ukraine are extensive.

Probable courses of action available to the United States include:

- Provide Ukrainian domestic government, official national organizations, and international organizations with the economic and operational support to build their capacity to document and prosecute those responsible for the war crimes committed within their country. These groups include but are not limited to: European Digital Rights (EDRI), the Atrocity Crimes Advisory Group (ACA), the Ukrainian Office of the Prosecutor General (OPG), the National Police of Ukraine (NPU) and the State Border Guard Service (SBGS). Building a US partnership with some or all of these entities to provide financial support, mentorship, and training to further their capabilities.

- Coordinate with the international community to launch a full-scale investigation to identify those responsible to the war crimes committed in Ukraine and prosecute them in the United States, International Court of Justice, and elsewhere.

-   Impose sanctions on the Russian government with clear statements as to what actions prompted such sanctions. Ensuring that sanctions are only lifted at the termination of all illegal activity.

-   Improve the capabilities, effectiveness, and range of international accountability mechanisms.

Discussion

Russian Military Codes and Training

Most nations' militaries operate under established rules of engagement (ROE). These are rules issued by military leadership and typically outline the circumstances under which soldiers can act and what they are and are not permitted to do under such circumstances. Russia ROEs are general rules and are not designed to control conflict.[367] Russia also follows international humanitarian laws and has established legislation and guidelines within its national government that align with international humanitarian laws. However, soldiers are currently receiving little to no training before being placed on the frontlines. In this short training, they are not being educated about the humanitarian laws that their country has pledged that they will follow. It is very common that Russian Armed Forces break international humanitarian laws. Russia's public support of humanitarian laws is not new, nor are the laws enacted within Russia entirely new documents. However, the Russian Federation has a long history of establishing an international definition of morality in their legal code but not following it in practice.

Russia issued an updated version of its military doctrine in 2014 and an updated version of its military strategy in 2021. Russia's military doctrine claims that Russia will

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[367] Skaridov, Alexander. "The Russian Approach to Roe." Marine Policy 28, no. 1 (2004/01/01/ 2004): 19-23. https://doi.org/https://doi.org/10.1016/j.marpol.2003.10.007. https://www.sciencedirect.com/science/article/pii/S0308597X03001234.

maintain a defensive posture and will not take military action unless necessary.[368] The document establishes what the Russian Federation views as external military threats. These include but are not limited to; North Atlantic Trade Union (NATO) expansion that would move it closer to the Russian border, the establishment of regimes that threaten the interest of the Russian Federation in neighboring countries, the deployment and buildup of weapons by non-allied nations, and territorial claims against the Russian Federation. The document established an updated version of their military policy, in which they aim to contain and prevent military conflict and maintain global stability. Additionally, they aim to neutralize potential military dangers and threats by non-military, political, and diplomatic measures. Russia intends to maintain a degree of readiness of their armed forces and economy in case of conflict.[369] The military doctrine establishes that Russia considers it lawful to use Armed Forces to repel aggression and they intend to act in alignment with the United Nations (UN) Security Council decisions and follow the principles and norms of international law. The use of armed forces during peacetime is a decision reserved for the President of the Russian Federation. The President also has the power to decide whether or not to use nuclear weapons. The Russian Federation establishes that they reserve the right to employ nuclear weapons if necessary and if nuclear weapons are used against them.[370] The military strategy that was released in 2021 presents the concept of an active defense.[371] Like the military doctrine, it emphasizes preventative and deterrence measures. However, it envisions their active defense strategy as demonstrations or limited use of force. The document also lays out the strategies for defense that Russia will utilize if a conflict does ensue.[372]

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[368] *Military Doctrine of the Russian Federation*. President of Russia, 2014.

[369] Ibid

[370] Ibid

[371] Kofman, Michael, Anya Fink, Dmitry Gorenburg, Mary Chesnut, Jeffrey Edmonds, and Julian Waller. 2021. "Russian Military Strategy: Core Tenets and Operational Concepts." The Center for Naval Analyses. https://www.cna.org/reports/2021/10/russian-military-strategy-core-tenets-and-concepts.

[372] Ibid

Russia issued the Regulations on the Application of International Humanitarian Law by the Armed Forces of the Russian Federation in 2001. The document replaced the Instructions on the Application of the Rules of International Humanitarian Law by the Armed Forces of the USSR (1990). The Regulations on the Application of International Humanitarian Law by the Armed Forces of the Russian Federations prohibits the attack of civilian populations and individuals, and this rule is in line with the international laws. Terrorizing civilian populations is prohibited, including threats of violence with the primary purpose of inciting terror. The document defines civilians as all persons not participating in an armed conflict[373]. Combatants are defined as members of armed forces that are participating in an armed conflict, but this does not include military medical or military religious personnel[374]. Additionally, humanitarian relief personnel are not legitimate targets. If there is doubt as to whether they are a civilian or not they are to be considered a civilian until determined otherwise.[375] The regulation states that civilians will be provided general protection against military operations. When planning and conducting operations, commanding officers must consider the principles of legality, distinction, proportionality, humanity, and military necessity. An attack on civilian infrastructure is prohibited unless it is of military necessity. The regulation prohibits indiscriminate attacks acknowledging that such attack can cause excessive loss of life, injury to civilians, or damage to civilian infrastructure.[376]

Hospitals and safety zones that are established to protect and aid the sick and wounded are not legitimate military targets. The regulation states that pillaging a place or town is

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[373] Federation, Russian. 2001. Regulations on the Application of International Humanitarian Law by the Armed Forces of the Russian Federation. edited by Ministry of Defense of the Russian Federation. Moscow.

[374] Ibid

[375] Federation, Russian. 2001. Regulations on the Application of International Humanitarian Law by the Armed Forces of the Russian Federation. edited by Ministry of Defense of the Russian Federation. Moscow.

[376] Ibid

a prohibited method of warfare. Torture aimed at obtaining information is prohibited. Murder, mutilation, cruel treatment, and torment (or the threat of any such thing) is prohibited. Prisoners of war are no exception. They are to be questioned in a language they understand, and no other pressures may be used. Civilians are protected from all forms and threats of corporal punishment under this regulation. The personal belongings, not including weaponry, cannot be taken from civilians or prisoners of war.[377]

Military commanding officers are obligated to ensure that their subordinates are informed of international humanitarian law, and respect it during an armed conflict. If subordinates do in fact violate international law officers are obligated to report such violations to their superiors and repress all further violations. According to the Internal Service Regulations of the Armed Forces of the Russian Federation that was approved in November of 2007, commanding officers are required to provide education to their subordinates during the course of combat training about the established domestic and international humanitarian laws applicable to them during combat. During combat, if those laws are breached, commanding officers are required to carry out disciplinary action.[378]

Training and Conditions for Russian Soldiers

The Russian military has lost over 150,000 soldiers in the invasion of Ukraine so far. They were ill prepared to be met with such a resistance force and did not expect to lose men in the numbers they have. The Russian Federation was expecting a swift and easy victory of Ukraine. In response to what has become a manpower crisis, the Russian Federation has hastily

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[377] Ibid

[378] Federation, Russian. 2007. Internal Service Regulations of the Armed Forces of the Russian Federation. In Decree No. 1495, edited by President of the Russian Federation.

attempted to recruit and draft individuals. Additionally, because of time constraints and the intensified need for men on the ground, they are resorted to skipping steps in the training and recruitment process. The Russian military has historically and continues to be a mix of contract soldiers and conscripts. Russian soldiers are being recruited or drafted and almost immediately being sent to the front lines. Medical and religious exemptions are often being denied to those who are drafted. Most are not receiving any medical exam prior to conscription. Most soldiers are now at the front lines within two weeks of joining the Russian Army.[379] The Russian Defense Ministry claims that an intense 240-hour, four-week combined arms and survival training is essential for anyone who joins the Army[380]. Additionally, under Russian law conscripts cannot be sent to the frontlines unless they have received a minimum of four months of training. Some soldiers have reported receiving as little as 2-5 days of training, and while they claim it is a very intense training it is not sufficient.[381] With such little training time, soldiers are ill equipped to deal with the situations they face on the battlefield. The lack of training creates a lack of confidence within new recruits and among fellow soldiers who cannot rely on the person next to them to be capable of acting on the battlefield. This has greatly diminished the cohesion and morale of the Russian military.[382] The Kremlin has created a narrative that is repeated within the armed forces and in the media. They say that Ukrainians are fascists, neo-Nazis, and ultra-nationalists in an effort to dehumanize the Ukrainians.[383] This creates justification for the actions

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[379] Tenisheva, Anastasia. 2022. "Russia Sends Army Recruits to Fight in Ukraine After Just Days of Training." The Moscow Times. https://www.themoscowtimes.com/2022/07/20/russia-sends-army-recruits-to-fight-in-ukraine-after-just-days-of-training-a78314.

[380] Ibid

[381] Thomas, Jake. 2022. "Mobilized Russians Sent to War After Two Days of Training: Rights Group." News Week. https://www.newsweek.com/mobilized-russians-sent-war-after-two-days-training-rights-group-1747336.

[382] Ibid

[383] Rosenberg, Steve. 2023. "Russian army officer admits: 'Our troops tortured Ukrainians'." BBC. https://www.bbc.com/news/world-europe-64470092.

taken within the country. Additionally, this dehumanization of all Ukrainians has allowed Russian soldiers to carry out the war crimes they have committed.

Brutality is ingrained in the Russian military way of life. The military practices an informal system of hazing called dedovshchina (дедовщина), meaning "the rule of the grandfathers." The tradition encourages senior conscripts to beat, brutalize, or even rape younger conscripts.[384] The tradition of dedovshchina began around the 1960's after the fall of the Soviet Union. Prior to this, systematic hazing still occurred but it was typically done through more formal structures. The Russian Army averages about 45 suicides per 100,000 soldiers and have on average 10,000 deserters.[385] For comparison, the United States suicide rate averages 17 per 100,000 soldiers.[386] There are many cases of the brutality of dedovshchina causing mental breaks in individuals that directly lead them to commit acts of violence, including cases of men killing comrades or going AWOL and murdering innocent people. New recruits in the Russian Army are called dukhi (духи) ("ghosts"). Dedovshchina is split into four stages, separating the two years of required service into six-month segments.[387] It is a hierarchical structure and the dedy (деды) ("grandfathers") are at the top. [388] Young men usually begin their service in the Russian Army at 17-18 years old and are dedy by 19-20. [389] In two years, the young men that come in become the aggressive perpetrators of ghastly hazing methods. By the time soldiers reach their last six months they are often very ready to be the perpetrator rather than the recipient of abuse. However, if an individual looks to end the cycle and refrain from participating in the abuse of

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[384] Hodge, Nathan. 2022. "In Russia's military, a culture of brutality runs deep." CNN. cnn.com/2022/04/04/europe/russia-military-culture-brutality-intl/index.html.

[385] Rudnitsky, Jake. 2006. "Full Metal Torture." Vice. https://www.vice.com/en/article/gqdx44/full-v13n4.

[386] Ibid

[387] Ibid

[388] Ibid

[389] Ibid

younger members, they are forced to beat their comrades. And if they are not harsh enough, they can be demoted back to dukhi. Dedy use brutal hazing tactics such as sleep deprivations, forced labor, starvation, beatings, and rape.[390] The hazing tactics used by the dedy violate international human rights laws. Joining the Russian Armed Forces is not a choice for these young men but a requirement by their government. If they do not complete their compulsory service, they will face legal punishment. Historically, men of higher class have been able to buy their way out of service. Therefore, those who do end up being conscripted are usually from poor families. If a dukhi failed to have a clean-shaven face, dedy would rub off their beard with a cloth which would create serious burn or they would burn off their beard with a lighter.[391] Listed below are a few examples of hazing tactics that have been given names and have been repeated methods over the years:[392]

> *-The Confiscation:* When dukhi's relatives would bring/send them food or supplies the dedy would confiscate it. The dedy would also order the dukhi to have their family bring them certain things, and if their requests were unfulfilled, they would subjugate the dukhi to abuse.[393]
>
> *-The Elephant:* The dukhi is forced to put on a gas mask. Then, the air way on the gas mask is closed off at the end of the long tubes hanging off the front of the mask that resemble elephant trunks. The dukhi are then forced to do tasks until they pass out, such as singing patriotic songs or running around.[394]

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[390] Ibid
[391] Ibid
[392] Ibid
[393] Ibid
[394] Ibid

-*The Batman:* The dukhi are forced to wrap their arms and legs around the frame of a top bunk bed and hang underneath. The Batman is typically done as a competition and the last to drop and is spared from further punishment.[395]

-*The Crazy Deer:* The dukhi are told to cross their hand over their forehead and then bang their own head against a wall. This typically results in concussions.[396]

-*The Television:* The dukhi are told to sit on a stool and then they are handed another stool with a cup of water balanced on it. The stool the dukhi is sitting on is pulled from under him and if the cup of water spills, the dukhi receives a serious beating.[397]

-*The Bicycle:* The dedy places paper between the toes of the sleeping dukhi and lights them on fire. It gets the name because once awake the movements made by the dukhi attempting to put out the fire typically look like someone furiously peddling a bicycle.[398]

-*The Dried Crocodile:* The dukhi suspends themselves face down between two bunk beds and a Kalashnikov rifle with a bayonet affixed to it is placed under them, pointing upward. The dukhi hangs there until the dedy takes away the rifle. Often, the exhausted dukhi is hit with pillows by the dedy.[399]

-*The Birdie:* The dedy wraps a wire from a wind-up telephone around the dukhi's big toe and cranks the telephone which sends intense electric shocks to the dukhi.[400]

-*Billiards:* The dukhi is forced to hold a pool ball in their mouth while the dedy hits the ball with a cue. It may end there or may progress to the dukhi being raped with the cue.[401]

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[395] Ibid
[396] Ibid
[397] Ibid
[398] Ibid
[399] Ibid
[400] Ibid
[401] Ibid

-*The Pheasant:* It is the dukhi's rite of passage, if they complete the event, they are no longer a dukhi. The dukhi is entirely naked and crouches on the legs of an upside-down bench. The dedy line up and whip the dukhi with the metal buckle of a belt. This usually ends up being about 100 blows, and if the dukhi falls off the bench, the process starts over.[402]

The cycle of abuse manifests itself far beyond the ranks of the Russian army. Young soldiers are looking for the nearest opportunity to take power over anything, POWs and citizens of occupied cities are perfect targets. This level of abuse impairs a person's ability to sympathize or have compassion and respect towards other humans- it dehumanizes them. The detriment this causes is long lasting. Additionally, it is likely to influence decision making on all levels of the Russian military. The abuses perpetrated during dedovshchina have led to permanent physical injuries or deaths of countless soldiers far away from the battlefield. In 2006, Andrei Sychyov was tied to a chair and beaten for hours by his superiors. The doctor who examined him said he was fine but a few days later he developed gangrene in the most injured areas of his body. The young man had to have both legs and genitalia amputated in order to save his life.[403] In 2018, Private Artyom Pakhotin had a profanity carved into his forehead with a razor blade as punishment for smoking a cigarette in the barracks. Two weeks later he committed suicide using an AK-47.[404] In 2019, a 20-year-old young man named Ramil Shamsutdinov killed eight fellow

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[402] Ibid

[403] Ibid

[404] Craw, Victoria. 2022. "Russia tried to convince the West its brutal military hazing culture had changed – it hadn't." I News. https://inews.co.uk/news/world/russia-brutal-military-hazing-culture-changed-convince-west-hadnt-1677162.

soldiers. He stated in a letter he wrote, that was circulated by his lawyer, that he "had no other way out…[he] couldn't take any more mistreatment."[405]

Some men have chosen to join the Russian Armed Forces during the Ukrainian conflict as they are promised a salary that is up to four times higher than local averages. However, due to corruption they are often not receiving the money they were promised.[406] A former British Ambassador to Moscow, Sir Rodric Braithwaite, explained that "We believed that when this war started the Russian army was this new, efficient, well-trained, professional army, but it turned out not to be. What we have [invading] Ukraine is the old-fashioned Soviet Army, which is large numbers of barely trained or poorly trained young men from poor and underprivileged and deprived backgrounds."[407] Conditions for soldiers in the military are poor, as they are ill equipped and ill trained. Many have protested conscription; individuals have lit enlistment offices and other administrative buildings on fire. Tens of thousands of young men have fled Russia to avoid being conscripted.[408] Russia does enforce compulsory military service for all men for two years. However, there are reports coming out that many of the individuals being drafted are without any military experience. Even those who have served likely do not have combat training or experience. Minorities and the poor are also being drafted at a much higher rate than their European Russian counterparts. Many have reported spending their personal money on equipment and necessities. Some private campaigns have been started to help

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[405] Ibid

[406] Tenisheva, Anastasia. 2022. "Russia Sends Army Recruits to Fight in Ukraine After Just Days of Training." The Moscow Times. https://www.themoscowtimes.com/2022/07/20/russia-sends-army-recruits-to-fight-in-ukraine-after-just-days-of-training-a78314.

[407] Craw, Victoria. 2022. "Russia tried to convince the West its brutal military hazing culture had changed – it hadn't." I News. https://inews.co.uk/news/world/russia-brutal-military-hazing-culture-changed-convince-west-hadnt-1677162.

[408] Press, The Associated. 2022. "Rusted Guns, No Food, and Filthy Beds: Russian Soldiers Paint a Bleak Picture of the World's Second Greatest Military Power." Fortune. https://fortune.com/2022/10/26/russian-soldiers-complain-military-preparedness-ukraine-training-equipment/.

supply soldiers with necessities.[409] Additionally, there are reports that injured Russian soldiers are being forced to return to the battlefield before receiving proper medical care.[410]

Brief History of Russia in Relation to War Crimes

Russia has made claims on the international level that they condemn war crimes of all types. In 1990, Russia's Order on the Publication of the Geneva Convention and Protocols contains a provision for the teaching of international humanitarian laws and norms during studies and education.[411] In 1993, at the International Conference on the Protection of War Victims, Russia declared that incendiary weapons should be completely banned.[412] However, in Ukraine there is evidence that they have used white phosphorus bombs, which are classified as an incendiary weapon. White phosphorus is not considered illegal at this time as long as they are used properly, however, in 1993 Russia expressed their belief that they were in fact immoral. In 1995, at a UN Security Council debate about the situation in Yugoslavia, the Russian representative stated that "the continuing large-scale violations of the rights of the Serbian population in the former Sectors West, North and South – including… the looting of homes… are causing serious concern."[413] In 1999, Russia in conjunction with the Netherlands presented a report to the UN General Assembly at a conference entitled "Centennial of the Russian Initiative: from the First Peace Conference, 1899 – to the Third, 1999" in which they concluded that measures of education and training designed to ensure that the principles of international humanitarian law are necessary as they are widely understood and to create a "culture of

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[409] Ibid

[410] "Wounded Russian Soldiers Returned to Front Without Proper Treatment – Agentstvo." 2023. The Moscow Times https://www.themoscowtimes.com/2023/01/12/first-president-of-russias-bashkortostan-murtaza-rakhimov-dies-at-88-a79930.

[411] Henckaerts, Jean-Mariee, and Louise Doswald-Beck. 2005. Customary International Humanitarian Law. Vol. II. Cambridge University Press.

[412] Ibid

[413] Russia. 1995. "UN Doc S/PV. 3591." UN Security Council.

compliance" with international law.[414] In 2009, a representative of the Russian Federation stated before the UN Security Council that they were "deeply concerned about the escalation of the crisis in Gaza as a result of Israel's military operation… [and] the destruction of infrastructure, including United Nations schools… from Israeli fire. Those action are absolutely inappropriate and are flagrant violations of international law."[415] These are a few among many of the public statements and initiatives led by Russia to combat war crimes. However, the country has repeatedly perpetrated war crimes and has violated international humanitarian laws and then outwardly denied such violations.

The Russian historical conflict in Chechnya displays numerous accounts of Russian failure to adhere to international humanitarian laws. In 1995, in the Parliamentary Assembly of the Council of Europe on the situation in Chechnya, a representative of the Committee on Legal Affairs and Human Rights criticized the action of Russia in Chechnya, claiming they failed to respect and protect civilian populations. The representative referred to their use of blanket bombing techniques and use of heavy weapons against civilian populations.[416] In April of 1995, at least 100 civilians were massacred by Russian soldiers in the Chechen village of Samashki.[417] Additionally, the soldiers looted civilian homes and stole television sets, cattle, and other private property. The Russian government denied the allegations from the international community regarding their validity.[418] Today, there is extensive evidence of the rape, torture, and killing of civilians across Ukraine. Yet, the Russian Federation has employed a propaganda scheme in order to perpetuate a denial of responsibility for their actions. State run media and social media

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[414] Henckaerts, Jean-Mariee, and Louise Doswald-Beck. 2005. Customary International Humanitarian Law. Vol. II. Cambridge University Press.

[415] ---. 2009. "UN Security Council Meeting On The Protection of Civilians in Armed Conflict." UN Security Council Meeting On The Protection of Civilians in Armed Conflict.

[416] Germany, Member from. 1995. "Official Report of Debates." Council of Europe Parliamentary Assembly.

[417] Spector, Michael. 1995. "Russian's Killing of 100 Civilian In a Chechen Town Stirs Outrage." The New York Times, 1995. https://www.nytimes.com/1995/05/08/world/russians-killing-of-100-civilians-in-a-chechen-town-stirs-outrage.html.

[418] Henckaerts, Jean-Mariee, and Louise Doswald-Beck. 2005. Customary International Humanitarian Law. Vol. II. Cambridge University Press.

accounts run by Russian officials repeat statements insinuating that the photos and videos coming out of Ukraine are not real. They suggest that Ukraine is using actors to manufacture these videos and photos as part of campaign to discredit the Russian government.[419]

In the Ukrainian city of Bucha, photos have emerged of mass graves, and the local Mayor Anatoly Fedoruk has confirmed that about 270 residents have been buried in two mass graves. Again, Russia claims that Ukraine and western media have staged the images. "The other day, another fake attack was launched in the city of Bucha," Foreign Minister Sergei Lavrov said in televised remarks. "After the Russian military personnel left from there in accordance with plans and agreements, a few days later they staged this fake, which is being dispersed through all channels and social networks by Ukrainian representatives and their Western patrons."[420] This same sentiment was repeated by Konstantin Kosachev, the deputy speaker of the upper house of Russia's parliament and Dmitry Peskov, the Press Secretary for President Vladimir Putin. Peskov stated during a briefing, "From what we have seen- the video materials- in many ways they cannot be trusted, because our specialists from the Ministry of Defense have revealed signs of video fraud and various fakes."[421] The Russian Federation has also attempted to censor and shape media sites to further their propaganda goals. The leading source of news for Russian citizens is Yandex. Following the emergence of images from Bucha the leading headlines were those quoting officials calling the images a fake. A search on Yandex for Bucha, would only bring up images of the city from before the invasion.[422]

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[419] Whalen, Jeanne, Robyn Dixon, and Mry Ilyushina. 2022. "Russia denies and deflects in reaction to Bucha atrocities." The Washington Post. washingtonpost.com/world/2022/04/04/russia-bucha-atrocities-war-crimes/.

[420] Ibid

[421] Ibid

[422] Ibid

Russia has bragged about the "surgical precision" of its cruise missiles.[423] They claim that these missiles are only hitting military targets, however, this is not the case as described later in the estimate. It is highly likely that a secretive group of dozens of military engineers with educational backgrounds are programing the missiles. The group works within the Main Computation Centre of the General Staff (GVC) of the Russian Armed Forces. The group works out of two locations: the Ministry of Defense headquarters in Moscow and the Admiralty headquarters in St. Petersburg.[424]

War Crimes Kupyansk and Kupyansk-Vuzlovyi

Human rights organization have attributed thousands of civilian deaths, the displacement of people, and other abuses in Ukraine to Russian Armed Forces.[425] Russia has violated international human rights law around the country and continues to do so as the conflict persists. Here we will look specifically at the violations in Kupyansk and Kupyansk-Vuzloyvi, which are very close in proximity along the Oskil River. Kupyansk and Kupyansk-Vuzloyvi are in the Kharkiv Oblast (region) and Kupyansk spans both banks of the Oskil River.[426] The city of Kupyansk had roughly 27,000 residents and Kupiansk-Vuzlovyi had about 8,500 residents.[427] The Kupiansk is a railroad hub on the way to the key Russian held outpost of Izium.[428] In February 2022, Russian troops overtook the city of Kharkiv and began moving towards

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[423] Grozev, Christo. 2022. "The Remote Control Killers Behind Russia's Cruise Missile Strikes on Ukraine." Bellingcat. Last Modified 2/22. https://www.bellingcat.com/news/uk-and-europe/2022/10/24/the-remote-control-killers-behind-russias-cruise-missile-strikes-on-ukraine/.

[424] Ibid

[425] 2021 Country Reports on Human Rights Practices Russia. 2021. edited by Human Rights Bureau of Democracy, and Labor: U.S. Department of State.

[426] Foy, Henry, Sam Joiner, Sam Learner, and Caroline Nevitt. 2022. "The 90 KM Journey That Changed The Course Of The War In Ukraine." Financial Times. https://ig.ft.com/ukraine-counteroffensive/.

[427] Phinney, David. 2022. "This Ukrainian Mayor Made A Deal With The Devil And Lost." Los Angeles Times. https://www.latimes.com/world-nation/story/2022-12-12/ukraine-most-hated-mayor-surrendered-russians.

[428] Balmforth, Tom. 2022. "Analysis: Ukraine Blindsides Russia With Northeastern Thrust At Supply Hub." https://www.reuters.com/world/europe/ukraine-blindsides-russia-with-northeastern-thrust-supply-hub-2022-09-09/.

Kupyansk which is located 70 miles southeast of Kharkiv and is a smaller city. To slow the movement of Russian troops, the Ukrainian forces demolished a railroads bridge on Russian troops path to the city. However, there are reports that the Kupyansk Mayor Gennadiy Matsehora provided the Russian troops with an alternate route to the city. There is evidence that Mayor Matsehora has historically been politically friendly with Russia.[429] As Russian forces advanced towards the Kupyansk, Mayor Matsehora received a phone call from a Russian commander on February 27, 2022. In the course of the conversation Mayor Matsehora surrendered the city of Kupyansk to Russian forces. Mayor Matsehora argued that the Ukrainian Armed Forces were already stretched thin and would be unable to effectively defend the city. Additionally, after watching the devastating bombardment of Kharkiv, he believed that surrendering before the fight began would hopefully save the city from extreme losses. Mayor Marsehora was immediately charged with treason by the Ukrainian government. During the occupation by Russian forces, some citizens of the city attempted to protest by carrying signs and Ukrainian flags but were met with gunfire and tear gas.[430] The city was eventually liberated by Ukrainian forces in on September 9, 2022. Following the liberation, the retreating Russian forces fired its artillery upon the city, destroying the city and its infrastructure. Russia continues to fire missiles in an indiscriminate manner, destroying many purely residential areas, and destroying critical infrastructure. FAB-500 parachuted concrete-piercing air bombs lay unexploded in purely residential areas. FAB-500 bombs are two meters in length and weigh up to half a ton.[431] The shelling of Kupyansk and Kupyansk-Vuzloyvi remains a regular occurrence. Instances of war

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[429] Phinney, David. 2022. "This Ukrainian Mayor Made A Deal With The Devil And Lost." Los Angeles Times. https://www.latimes.com/world-nation/story/2022-12-12/ukraine-most-hated-mayor-surrendered-russians.

[430] Ibid

[431] "This is what genocide looks like: Russian torture chambers in Kharkiv Oblast." 2022. Euromaidan Press. https://euromaidanpress.com/2022/10/25/this-is-what-genocide-looks-like-russian-torture-chambers-in-kharkiv-oblast/.

crimes have been reported and documented within the city and continue to emerge as the war persists. Russian soldiers in Kupyansk documented their own war crimes through videos and photos which law enforcement were able to get a hold off after taking phones from Russian soldiers during the process of liberating the city.[432] Under the procedural leadership of the Kupyansk, Chuguyiv, and Bogodukhiv district prosecutor's offices of the Kharkiv region, pre-trial investigations have been launched into violations of the laws and customs of war.[433] The next few sections will detail accounts of the Russian Federations violations of humanitarian laws in Kupyansk and Kupyansk-Vuzloyvi.

Kupyansk Prison

For most of the occupation of Kupyansk, Russians illegally held civilians in a jail that was originally used by the regional police department. The jail was designed to hold 140 people, however the Russian military held over 400 people at one time, typically holding eight people in cells designed for two.[434] They held the locals who refused to collaborate with Russian forces. During the occupations, Russian soldiers forced local people to give up the names of people who had previously served in the Ukrainian army or who held pro-Ukrainian sentiments. After getting this information, Russian soldiers rounded those individuals up and detained them.[435] They beat and threatened to kill civilians and their families to convince them to turn on their neighbors.[436] The prison was so overcrowded that some prisoners reported having to sleep standing up.

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[432] Dovgan, Konstantin. 2022. "The place of the crime is Kupyansk: Russia will not be able to avoid responsibility for the execution of civilians." 24 Channel. https://24tv.ua/vbivstvo-mirnih-lyudey-kupyansku-yak-rosiya-namagalas-prihovati_n2181672.

[433] --- (pgo_gov_us). 2023. "Prosecutors and police investigators documented the consequences of regular enemy shelling of Kharkiv Oblast." https://t.me/s/pgo_gov_ua.

[434] "Ukrainian prisoners in Kupyansk tortured with electric current, burned - SBU." 2022. LB.ua. https://en.lb.ua/news/2022/09/17/16960_ukrainian_prisoners_kupyansk.html.

[435] Phinney, David. 2022. "This Ukrainian Mayor Made A Deal With The Devil And Lost." Los Angeles Times. https://www.latimes.com/world-nation/story/2022-12-12/ukraine-most-hated-mayor-surrendered-russians.

[436] "Ukrainian prisoners in Kupyansk tortured with electric current, burned - SBU." 2022. LB.ua. https://en.lb.ua/news/2022/09/17/16960_ukrainian_prisoners_kupyansk.html

Individuals held in the prison were interrogated. One former prisoner claims that interrogators would use an old wind-up telephone to shock him during interrogations. The same individual states that he was also shot with "some kind of pistol" in his chest and leg. The individual was once in the Ukrainian army as a cook but claims now to be a civilian.[437] Dr. Yeugeniy Sinko was the head of the medicine at the Kupyansk hospital and was detained after refusing to turn over the hospital to Russian forces.[438] Dr. Sinko states that "they would make people sing Ukrainian songs and then beat them… then they would beat them more until they sang Russian songs." Additionally, he claimed that they would use an eight-inch carpenter's wood file to file prisoners' teeth. Dr. Sinko said that he was regularly beaten with clubs and pipes when he refused to help produce propaganda YouTube videos for Russia.[439] When Ukrainian police entered the prison following the liberation, they found further evidence of torture including a gas mask that had been modified for torture. The filter had been detached and wooden disks covered the eyes, which were marked with the letter Z. The mouthpiece would be attached to a hose and held over a smoking fire or a hot hair dryer. Another victim of torture in the Kupyansk prison stated that "At the first interrogation, they electrocuted me for 40 minutes, shot me with a pneumatic or gas gun, I don't know - I was in a sack... They beat me with bats or iron pipes."[440] He said that he was interrogated by an individual with the call sign "Kot."[441] Some of the prisoners had crosses burned onto their backs with blowtorches. Many of the

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[437] Gallón, Natalie, Nick Paton Walsh, Kostyantin Gak, and Brice Lâiné. "Liberation Has Finally Come to Ukraine's Kharkiv. but Scars of Russia's Brutal Occupation Remain." CNN. Cable News Network, September 20, 2022. https://www.cnn.com/2022/09/19/europe/kupiansk-ukraine-liberated-russia-intl-cmd/index.html.

[438] Ordonez, Franco. 2022. "Another casualty of Russia's war: Some Ukrainians no longer trust their neighbors." NPR. https://www.nprillinois.org/2022-10-26/another-casualty-of-russias-war-some-ukrainians-no-longer-trust-their-neighbors.

[439] Phinney, David. 2022. "This Ukrainian Mayor Made A Deal With The Devil And Lost." Los Angeles Times. https://www.latimes.com/world-nation/story/2022-12-12/ukraine-most-hated-mayor-surrendered-russians.

[440] "Ukrainian prisoners in Kupyansk tortured with electric current, burned - SBU." 2022. LB.ua. https://en.lb.ua/news/2022/09/17/16960_ukrainian_prisoners_kupyansk.html

[441] "This is what genocide looks like: Russian torture chambers in Kharkiv Oblast." 2022. Euromaidan Press. https://euromaidanpress.com/2022/10/25/this-is-what-genocide-looks-like-russian-torture-chambers-in-kharkiv-oblast/.

methods of torture used resemble methods of hazing used in dedovshchina, including the use of gas masks and the use of wind-up telephones for electrocution. A network of 18 Russian torture chambers were found in the liberated Kharkiv Oblast.[442]

Prison Testimony 1

Vadym Kutsenko was held in the Kupyansk prison for 110 days. He had served in the Ukrainian Armed Forces but was discharged for health reasons before the Russian invasion of Ukraine. He came to Kupyansk to replace his expired ID and register at the labor exchange. However, Kutsenko was quickly got caught up in the invasion. He was staying at his former fathers-in-law's country cabin and remained there until Russian soldiers came for him in May. Two vehicles marked with the letter Z appeared at the cabin. When the Russian soldiers approached, they immediately hit Kutsenko over the head with the butt of a rifle and his hands were tied so tightly behind his back that it took over a month for his wrists to heal. A bag was put over his head and he was put in one of the cars. He was brought along while the Russians stopped at two more addresses.

When they got to the Kupyansk prison, he was put in cell number 10. The Russian soldiers then proceeded to beat him with a metal-plastic heating pipe that was a little over a meter long and a belt with a metal buckle. The following day, Kutsenko was subjected to electro-shock. He states that they attached clamps to his ear and below his stomach. Kutsenko claims that some prisoners were hung on a pull-up bar in one of the cells with their hands tied behind their back and some would lose consciousness during the process. He states that two of the guards' names were Zhenya and Vitaliy and they were from Luhansk, Ukraine. At times he saw

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[442] Ibid

guards dragging out the bodies of prisoners who had died. Kutsenko describes that they were provided with very poor medical care. He regularly took medication and had a very difficult time getting access to it. Yura Zhivitsa was detained with him, who was a retired lieutenant colonel and had graduated from Kozhedub University of the Air Force in Kharkiv. He retired in from the Ukrainian Air Force in 2005, yet he was detained for 55 days and badly beaten. The prison was eventually abandoned by its Russian guards when Ukrainian forces reentered the city, and the prisoners were able to Escape. The prisoners set the prison building on fire hoping to destroy any weapons that were left and any documents containing their names, fearing further subjugation. However, the prisoners were unaware at this time that the Ukrainian forces had launched an offensive.[443]

Prisoner Testimony 2

A 30-year-old resident of Kupyansk, Dmytro Hrechanyi, took photos of Russia troop movement from the window of his apartment building on the outskirts of the city. He sent those photographs to his friends that were working for the Security Service of Ukraine (SBU) and then deleted them. Russian soldiers knocked on his apartment door at the end of June. They forcefully searched his apartment and interrogated him, his girlfriend, and the friend they had over at the time. At the time, they found nothing and left the apartment. Hrechanyi and his girlfriend chose to stay with his mother when Russian patrols in their neighborhood increased. On July 31, a Russian soldier approached his mother and told her they needed to talk to her son. He went to the police station and two investigators spoke to him. Their names were Sasha Kot and Dmytro Eduardovych (call sign Dozor 7.1). They asked for his laptop, and after going through it, called

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him back to the police station to pick it up. They had, however, found the photos he had taken of the Russian military. They beat him over the head with a briefcase when he would not confess anything. They then called his girlfriend into question. She also refused to cooperate, and both were imprisoned. Hrechanyi says that prisoners were fed twice a day. They were fed pasta, some kind of porridge, and occasionally stew. Hrechanyi is a diabetic, and after suffering from a diabetic attack that caused him to collapse, he was brought to the hospital but remained guarded in a room with another prisoner, Roman, who was beaten so badly by guards that he had to be hospitalized. Roman had suffered seven broken ribs, pierced lungs, and his kidneys and liver were damaged. When Hrechanyi got there, Roman had already been in the hospital for two months. On September 7, the Russians evacuated the hospital and took with them their wounded from the military hospital on the third floor. After that, Hrechanyi's mother came to the hospital and took him home.[444]

Hrechanyi's girlfriend remained in the prison for the entire time. She was held in a cell with 10-11 other women and they had no mattresses or blankets. She was threatened at gun point but never tortured. She states, however, that there were numerous occasions that her cell mates were tortured, and at times, she could hear the screams of other prisoners who she believed were being tortured. Some of them were subjected to solitary confinement, beaten with metal poles, left without food for long periods of time, and shocked with electricity. On September 7, 2021, around 3:00pm-4:00pm all the guards left the police station. By that evening, some of the men managed to break the bars on the window and get out into the street. They broke down the

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[444] Kochmarskyy, Serhiy. 2022. "Dmytro and Olena from Kupyansk imprisoned for sending SBU pictures of Russian equipment: Couple tells how they waited for town liberation in captivity." ZMINA. https://zmina.info/en/articles-en/dmytro-and-olena-from-kupyansk-imprisoned-for-sending-sbu-pictures-of-russian-equipment-couple-tells-how-they-waited-for-town-liberation-in-captivity/.

entrance door and found the keys to the cells. By two o'clock in the morning, everyone had been released.[445]

March 1, 2022

The Deputy head of the Kupyansk City Council, Mykola Mykolayovych Masliy was called aside by the Russian forces during a rally on March 1, 2022, and was allegedly abducted.[446] Masliy had organized the protest and encouraged and organized protests after the surrender of the city.[447] Witnesses reported seeing Russian forces through smoke bombs and hearing gun shots at the time of the abduction but the smoke obstructed their view of the Councilman, and no one has claimed to have seen what exactly happened to him. His whereabouts are still unknown, and his official Facebook page has not been updated since his alleged abduction.[448]

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[445] Ibid

[446] Power, Samantha (PowerUSAID). 2022. "Mykola Masliy, councilman from Kharkiv, was at a March 1 rally when Russian forces called him aside." https://twitter.com/PowerUSAID/status/1510984810449227780

[447] "War Crimes Watch Ukraine." 2023. Associated Press, Frontline, PBS. https://www.pbs.org/wgbh/frontline/interactive/ap-russia-war-crimes-ukraine/?facets=%7CDirect+Attack+on+Civilians%7CCivilian+Deaths.

[448] ZMINA. 2023. "ZMINA joined the OSCE SHDM pre-event "Russia's War in Ukraine: Accountability for War Crimes and Serious Human Rights Violations"." ZMINA. https://zmina.ua/en/event-en/zmina-held-the-osce-shdm-pre-event-russias-war-in-ukraine-accountability-for-war-crimes-and-serious-human-rights-violation/.

September 25, 2022

A civilian convoy was shelled by Russian forces in a grey zone, killing at least 24 people, including a pregnant woman and 13 children.[449] Seven cars were driving in the convoy containing 48 people, including a minibus that displayed a sign on the back and read "children." The act was carried out by a Russian sabotage and intelligence group according to the Security Services of Ukraine (SBU).[450] The convoy was leaving Kupyansk and was hit in the Eastern Kharkiv region. This was the group's second attempt to flee the city, as the first attempt, they were stopped by Russian soldiers and brought back. The convoy was organized by a local and reportedly costs up to 6,000 Ukrainian hryvnias. Investigation confirmed that the shell fragments are the same as those use by heavy guns mounted on Russian armored vehicles. Two of the cars were completely scorched with children and their parents inside. The survivors crawled to a tree line and hid before retreating to where they came from. They had to hide from

Figure 7: https://t.me/SBUkr/5258

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[449] "24 Killed After Ukraine Evacuation Convoy Shelled: Governor." 2022. Al Jazeera. https://www.aljazeera.com/news/2022/10/1/ukraine-says-russians-shell-evacuation-convoy-killing-20.

[450] Ukraine, Security Service of (SBUkr). 2022. "A new atrocity of the occupiers in Kharkiv Oblast: Rashists shot a column of civilians with children, at least 20 dead." https://t.me/SBUkr/5258.

Russian vehicles along the way. Seven of the individuals made it back to Kupyansk on their own. Other survivors were found still alive by a Ukrainian man who came around the convoy hours later. He brought the survivors that he could fit in his car to the hospital.[451] This is not the only civilian convoy that was targeted, at least one in the Zaporizhzhia region was also targeted.[452] The Kharkiv Regional Prosecutor's Office is investigating this war crime under Part 2 of Article 438 of the Criminal Code of Ukraine, violations of the laws and customs of war, combined with intentional murder.[453]

Figure 8: https://t.me/s/truexanewsua

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[451] Vlasenko, Anna. 2022. "On Ukraine Backroad, Children's Bodies And Wreckage of Civilian Convoy Shelled by Russians." Global News. https://globalnews.ca/news/9258518/ukraine-bodies-wreckage-civilian-convoy-shelled-russian-troops/.

[452] "Russian Attack Kills 30 In Civilian Convoy in Ukraine: Kyiv." 2022. Al Jazeera. https://www.aljazeera.com/news/2022/9/30/russian-attack-kills-23-in-civilian-convoy-in-ukraine-governor.

[453] Ukraine, Security Service of (SBUkr). 2022. "A new atrocity of the occupiers in Kharkiv Oblast: Rashists shot a column of civilians with children, at least 20 dead." https://t.me/SBUkr/5258.

September 27, 2022

Five people were injured by a rocket fired at Kupyansk by Russian forces. "As a result of the shelling, a church school, an outbuilding and a shop are on fire. There were no military facilities nearby," said Kirill Timoshenko, Deputy Head of the Office of the President.[454]
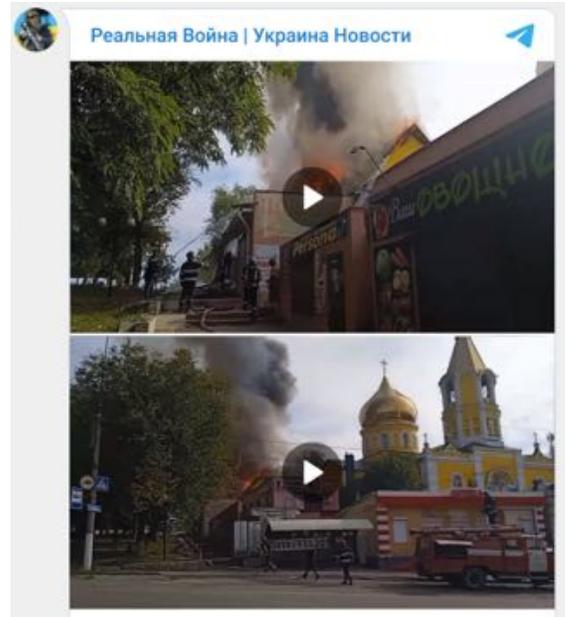

Figure 9: https://t.me/s/voynareal

October 3, 2022

A hospital in Kupyansk was hit by a Russian missile, on October 3, 2022, killing an anesthesiologist and injuring a nurse. According to the Head of the Kharkiv Regional State Administration, Oleg Sinegubov, the hospital is almost destroyed.[455]

Figure 10: https://t.me/s/synegubov

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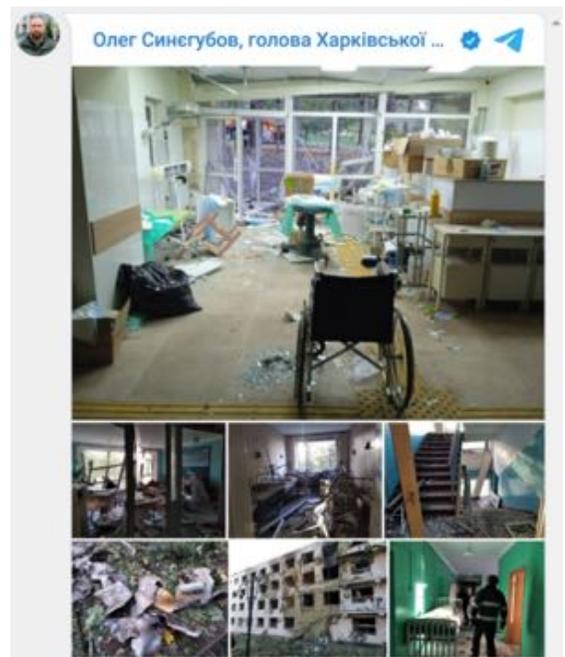
[454] News, Real War | Ukraine (voynareal). 2022. "Russia fired rockets at the recently liberated Kupyansk - 5 people were injured." Telegram, 4:25.

[455] Oleg Sinegubov, Head of the Kharkiv Regional State Administration. 2022a. Telegram. https://t.me/synegubov.

October 6, 2022

The bodies of two men reported to be tortured and killed were recovered at the Kup'yans'k-Vuzlovyi brick factory after Ukrainian forces retook control over the area.[456] The men were found in civilian clothes with their hands tied behind their backs and appeared to show signs of possible torture. One man had extensive bruising on his neck and chest. The other had a fractured skull and bullet wounds in his chest and groin.[457] Both of the men appeared to be between 30-35 years old.[458]

Figure 11: https://t.me/s/prokuratura_kharkiv

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[456] Team, Bellingcat Investigation. 2023. "Civilian Harm In Ukraine." Bellingcat. https://ukraine.bellingcat.com/?range=2021-09-05&range=2023-03-17.

[457] "War Crimes Watch Ukraine." 2023. Associated Press, Frontline, PBS. https://www.pbs.org/wgbh/frontline/interactive/ap-russia-war-crimes-ukraine/?facets=%7CDirect+Attack+on+Civilians%7CCivilian+Deaths.

[458] Desk, The Kyiv Independent New. 2022. "2 bodies of tortured men found in liberated Kupiansk-Vuzlovyi, Kharkiv Oblast." https://kyivindependent.com/news-feed/two-bodies-of-tortured-men-found-in-liberated-kupiansk-vuzlovyi-kharkiv-oblast.

October 8, 2022

The bodies of four civilians were discovered by locals in the basement of a home in Kupyansk-Vuzlovyi. According to the Ukrainian security service and local prosecutors, they were killed by Russian soldiers. All four civilians were shot in the chest and head. Three of the victims were women and one was a man.[459] One of the victims was the owner of the house in which they were killed, and was 73-years-old. The other three victims were of a neighboring family; a 71-year-old women, her 27-year-old grandson and her 49-year-old daughter-in-law.[460] Local citizens buried the bodies in two graves on the property. Officials discovered the graves on October 8, 2022, and opened an investigation. Casings from a Kalashnikov assault rifle were found in the basement.[461]

Figure 12: https://t.me/s/prokuratura_kharkiv

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[459] Desk, The Kyiv Independent New. 2022b. "Prosecutors find 4 bodies of civilians executed by Russia in Kharkiv Oblast." https://kyivindependent.com/uncategorized/prosecutors-find-4-bodies-of-civilians-executed-by-russia-in-kharkiv-oblast.

[460] "War Crimes Watch Ukraine." 2023. Associated Press, Frontline, PBS. https://www.pbs.org/wgbh/frontline/interactive/ap-russia-war-crimes-ukraine/?facets=%7CDirect+Attack+on+Civilians%7CCivilian+Deaths.

[461] "In the village of Kupyansk-Vuzlovy, the bodies of four civilians were found, who were shot by the Russians in a cellar." 2022. ZMINA. https://zmina.info/news/u-selyshhi-kupyansk-vuzlovyj-vyyavyly-tila-chotyroh-czyvilnyh-yakyh-rosiyany-rozstrilyaly-u-pogrebi/.

October 13, 2022

The bodies of three individuals were found buried in Kupyansk-Vuzloyvi by the Kupyansk District Prosecutor's Office of the Kharkiv region and local police detectives. One of the bodies had been buried by a friend after Russian forces shot the man in the head on September 21, 2022. He was shot because he had been helping the Ukrainian Army by reporting the location of Russian forces. The other two bodies were a male and a female that died in a mortar strike.[462]

Figure 13: https://t.me/s/prokuratura_kharkiv

October 28, 2022

Russian forces launched a rocket attack on Kupyansk at night. The rocket landed near a residential building, breaking windows. The S-300 missile created a crater that was about seven meters deep and 10 meters wide.[463]

Figure 14: https://t.me/s/prokuratura_kharkiv

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[462] General, Office of the Prosecutor (pgo_gov_ua). 2022a. "Prosecutors continue recording war crimes in the de-occupied territories — three more bodies of civilians were discovered in the Kupyan district." https://t.me/pgo_gov_ua/6703.

[463] General, Office of the Prosecutor (pgo_gov_ua). 2022b. "Russian soldiers shelled Kupyansk in the Kharkiv region - prosecutors recorded another crime of the Russian Federation." https://www.gp.gov.ua/ua/posts/rosiiski-viiskovi-obstrilyali-kupyansk-na-xarkivshhini-prokurori-zafiksuvali-cergovii-zlocin-rf.

November 14, 2022

In the village of Kupyansk-Vuzlovy, law enforcement exhumed the body of a 45-year-old man. There is evidence that the man was tortured, and two stab wounds were found on his back. Additionally, the body of a 37-year-old man was exhumed, and investigators determined that he died from artillery fire.[464]

In Kupyansk, the bodies of a 70-year-old man and 40-year-old women were exhumed. Investigators determined that he died from artillery fire.[465]

Figure 15: https://t.me/s/prokuratura_kharkiv

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[464] Office, Kharkiv Regional Prosecutor's (prokuratura_kharkiv). 2022h. "Prosecutors exhumed the corpses of four civilians: one of them was tortured by Russian soldiers" https://t.me/s/prokuratura_kharkiv

[465] Ibid

November 16, 2022

Investigators exhumed the body of a women killed by artillery fire on September 15, 2022. During the investigation on November 16, the house was hit by further artillery fire and the 76-year-old owner of the home was killed, her head was torn off by the artillery fire.[466]

Figure 16: https://t.me/s/prokuratura_kharkiv

November 23, 2022

Two civilians were reported to be killed by the shelling of the residential area in Kupyansk, Kharkiv Oblast. Shelling war carried out by Russian armed forces and took place at 7:40 am. A nine-story residential building and a medical clinic were damaged. A 55-year-old-women died and a 68-year-old man. One man was hospitalized, another individual was injured but was treated at the scene. Later in the day, several private homes and
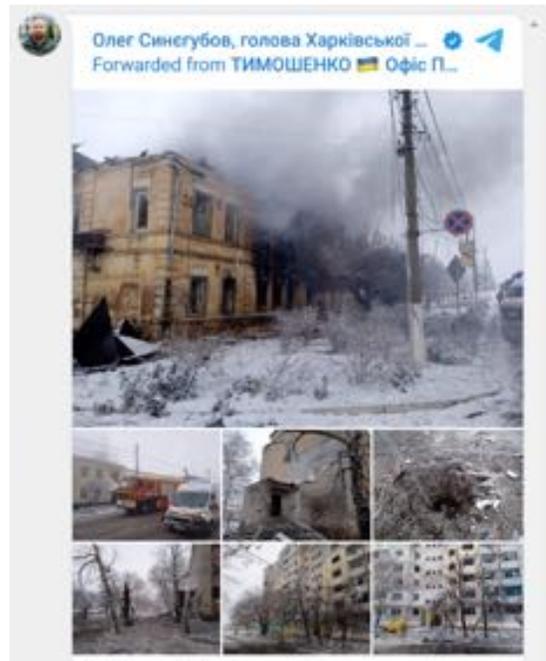

Figure 17: https://t.me/s/synegubov

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[466] Office, Kharkiv Regional Prosecutor's (prokuratura_kharkiv). 2022g. "In the city of Kupyansk, during the exhumation, the occupiers opened fire on the city: a woman was killed, a law enforcement officer was wounded" https://t.me/s/prokuratura_kharkiv

outbuildings were destroyed by further shelling and

no casualties or injuries were reported.[467]

Figure 18: https://t.me/s/prokuratura_kharkiv

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[467] Oleg Sinegubov, Head of the Kharkiv Regional State Administration. 2022b. https://t.me/s/synegubov.

November 28, 2022

Around 5:00pm, the Russian military fired artillery at the residential sector of Kupyansk damaging cars, high-rising buildings, private homes, and a school.[468]

Figure 19: https://t.me/s/prokuratura_kharkiv

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[468] Office, Kharkiv Regional Prosecutor's (prokuratura_kharkiv). 2022f. "The occupiers once again shelled the residential sector of Kupyansk: law enforcement officers record the consequences" https://t.me/s/prokuratura_kharkiv

November 30, 2022

Around 7:00am, the Russian military fired artillery at Kupyansk, damaging a cultural center and a private house.[469]

Figure 20: https://t.me/s/prokuratura_kharkiv

December 6, 2022

Around 9:25am, the Russian Federation fired artillery at the city of Kupyansk, injuring a 67-year-old women. Additonally, residential buildings and commercial buildings were damaged.[470]

Figure 21: https://t.me/s/prokuratura_kharkiv

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[469] Office, Kharkiv Regional Prosecutor's (prokuratura_kharkiv). 2022e. "The prosecutor's office documents the consequences of the armed aggression of the Russian Federation: in the morning, the occupiers shelled Kupyansk" https://t.me/s/prokuratura_kharkiv

[470] Office, Kharkiv Regional Prosecutor's (prokuratura_kharkiv). 2022d. "The military of the aggressor countries once again shelled the Kharkiv region: two people were killed, two more were wounded" https://t.me/s/prokuratura_kharkiv

December 16, 2022

Around 7:00am, artillery fire from the Russian

Federation damaged a hospital and pharmacy.[471]

Figure 22: https://t.me/s/prokuratura_kharkiv

December 26, 2022

Around 2:00pm, artillery fire from the Russian

Federation damaged a four-story apartment

building.[472]

Figure 23: https://t.me/s/prokuratura_kharkiv

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[471] Office, Kharkiv Regional Prosecutor's (prokuratura_kharkiv). 2022c. "Life saved in indomitable Kupyansk: law enforcement officers retrieved a dog from under the rubble, which was injured by a rocket attack by the occupiers" https://t.me/s/prokuratura_kharkiv

[472] Office, Kharkiv Regional Prosecutor's (prokuratura_kharkiv). 2022c. "The Russian military once again shelled Kupyansk - law enforcement officers are documenting the consequences" https://t.me/s/prokuratura_kharkiv

December 29, 2022

Around 1:00pm, artillery was fired at the city of Kupyansk hitting the residential sector and killing a 59-year-old resident.[473]

Figure 24: https://t.me/s/prokuratura_kharkiv

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[473] Office, Kharkiv Regional Prosecutor's (prokuratura_kharkiv). 2022b. "As a result of enemy shelling in Kharkiv Oblast, there are dead and injured - law enforcement officers recorded another criminal act of the Russian army" https://t.me/s/prokuratura_kharkiv

January 1, 2023

Around 7:00am, the Russian Federation fired artillery at Kupyansk, injuring a 77-year-old and damaging private home.[474]

Figure 25: https://t.me/s/prokuratura_kharkiv

January 12, 2023

Around 1:30pm, the Russian Federation fired artillery at a residential district in the city of Kupyansk, injuring a 76-year-old man.[475]

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[474] Office, Kharkiv Regional Prosecutor's (prokuratura_kharkiv). 2023l. "The occupiers once again shelled the residential sectors of the Kupyan region — law enforcement officers recorded the consequences" https://t.me/s/prokuratura_kharkiv

[475] Office, Kharkiv Regional Prosecutor's (prokuratura_kharkiv). 2023k. "As a result of enemy shelling in Kupyan Oblast, two civilians were wounded - prosecutors and police investigators document the consequences" https://t.me/s/prokuratura_kharkiv

January 17, 2023

Extreme damage to a college was caused by Russian rockets on January 17th around 2:20pm. Additionally, later that night, another rocket attack caused damaged to a building the housed a medical facility.[476]

Figure 26: https://t.me/s/prokuratura_kharkiv

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[476] Office, Kharkiv Regional Prosecutor's (prokuratura_kharkiv). 2022. https://t.me/s/prokuratura_kharkiv.

January 19, 2023

As a result of a Russian rocket attack at around 10:00pm on January 19, 2023, a boarding school in Kupyansk was destroyed. It is believed that the missile that hit was an S-300 type from the Belgorod region of the Russian Federation.[477]

Figure 27: https://t.me/s/prokuratura_kharkiv

January 24, 2023

Five people were injured in the shelling of a residential house in Kupyansk.[478]

Figure 28: https://t.me/s/huyovy_kharkiv

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[477] General, Office of the Prosecutor (pgo_gov_us). 2023. "Prosecutors and police investigators documented the consequences of regular enemy shelling of Kharkiv Oblast." https://t.me/s/pgo_gov_ua.

[478] Kharkiv, XC (h_saltovka). 2023a. "In Kharkiv Oblast, five were injured as a result of enemy shelling." https://t.me/s/h_saltovka.

January 25, 2023

At 7:00 am, Russians shelled the city of Kupyansk, setting a private home and a store on fire. There were no reports of casualties. Additionally, in Kupyansk-Vuzlovy, two private homes, farm buildings, and a gas pipeline were damaged from Russian shelling.[479]
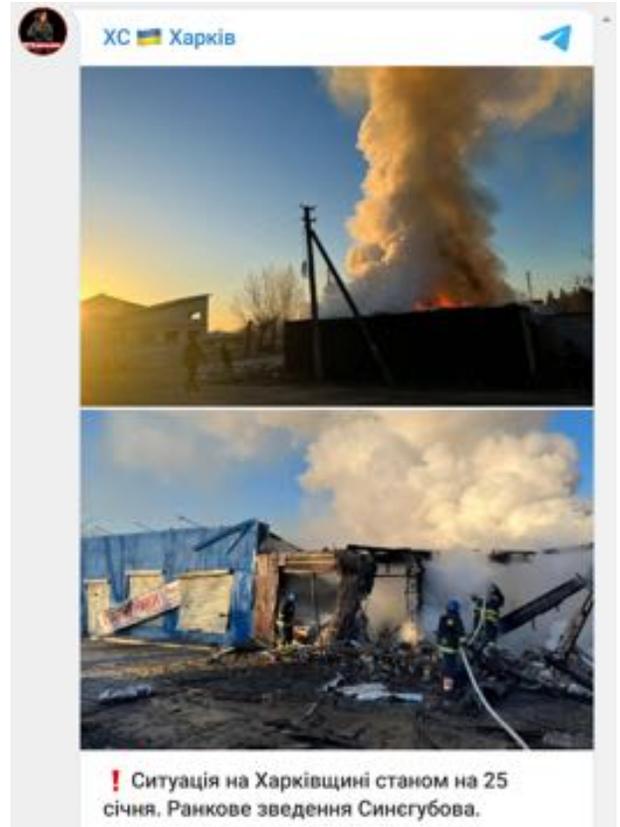

Figure 29: https://t.me/s/h_saltovka

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[479] Kharkiv, XC (h_saltovka). 2023b. "The situation in Kharkiv Oblast as of January 25. Synegubov's morning briefing.". https://t.me/s/h_saltovka.

February 13, 2023

The Russian military fired artillery at Kupyansk, damaging a two-story apartment building and private homes.[480]

Figure 30: https://t.me/s/prokuratura_kharkiv

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[480] Office, Kharkiv Regional Prosecutor's (prokuratura_kharkiv). 2023j. "Military personnel of the Armed Forces of the Russian Federation once again shelled residential sectors of the Kharkiv region - law enforcement officers work at the sites of shelling" https://t.me/s/prokuratura_kharkiv

February 15, 2023

Around 7:00am, the Russian Federation fired artillery at Kupyansk, damaging private homes and commercial buildings.[481]

Figure 31: https://t.me/s/prokuratura_kharkiv

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[481] Office, Kharkiv Regional Prosecutor's (prokuratura_kharkiv). 2023i. "The enemy does not stop shelling Kupyansk: prosecutors have documented the consequences" https://t.me/s/prokuratura_kharkiv

February 17, 2023

Around 12:30am, the Russian Federation fired artillery at Kupyansk, damaging private homes.[482]

Figure 32: https://t.me/s/prokuratura_kharkiv

February 21, 2023

Russian rocket fire damaged a football field and tribute stadium, a kindergarten building, and a five-story residential building. One civilian was reported to be injured and hospitalized.[483]

Figure 33: https://t.me/s/synegubov.

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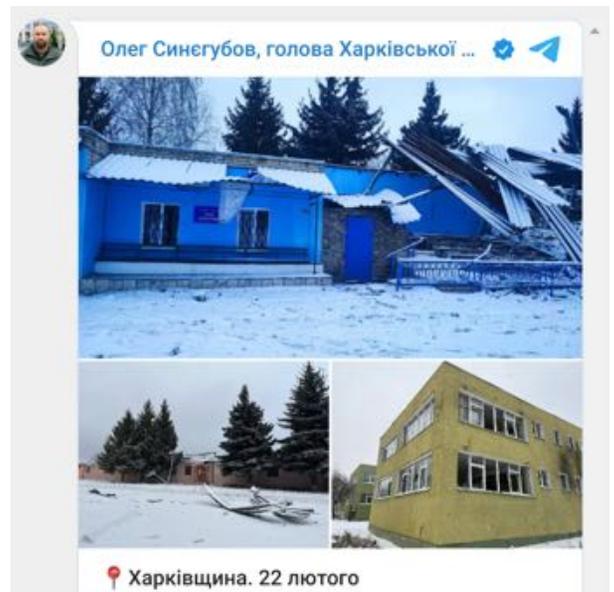
[482] Office, Kharkiv Regional Prosecutor's (prokuratura_kharkiv). 2023h. "The enemy does not stop shelling Kupyansk - law enforcement officers have documented the consequences" https://t.me/s/prokuratura_kharkiv

[483] Oleg Sinegubov, Head of the Kharkiv Regional State Administration. 2023. "Kharkiv region. February 22." https://t.me/s/synegubov.

February 23-24, 2023

Russian Federation MLRS and S-300 missiles were fired at Kupyansk overnight, damaging private homes, parking lots, and garages.[484]

Figure 34: https://t.me/s/prokuratura_kharkiv

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[484] Office, Kharkiv Regional Prosecutor's (prokuratura_kharkiv). 2023g. " Occupiers continue to strike Kupyansk — law enforcement officers documented another crime of the aggressor state" https://t.me/s/prokuratura_kharkiv

February 28, 2023

The Russian Federation fired artillery at the city of Kupyansk around 10:30am, killing a 63-year-old man. Residential buildings, a kindergarten, and local recreational park were damaged.[485]

Figure 35: https://t.me/s/prokuratura_kharkiv

March 3, 2023

The Russian Federation fired artillery at Kupyansk around 6:00pm, which resulted in damage to private homes and apartment buildings.[486]
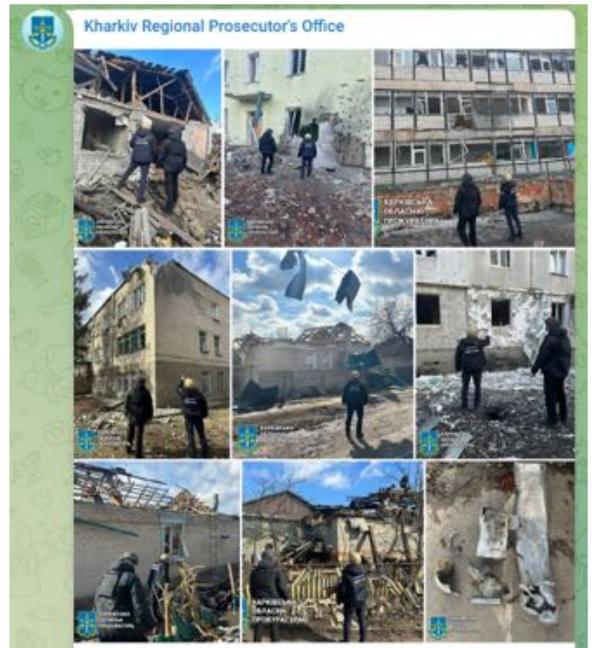
Figure 36: https://t.me/s/prokuratura_kharkiv

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[485] Office, Kharkiv Regional Prosecutor's (prokuratura_kharkiv). 2023f. " The Russian army once again shelled Kupyansk, there is a dead person - the investigative and prosecutorial group recorded the consequences" https://t.me/s/prokuratura_kharkiv

[486] Office, Kharkiv Regional Prosecutor's (prokuratura_kharkiv). 2023e. "The occupiers shelled Kupyansk again - the investigative-prosecutor group collected material evidence" https://t.me/s/prokuratura_kharkiv

March 4, 2023

The Russian military fired on the residential sector of Kupiansk at 11:00pm. A 64-year-old man was killed, and private houses were damaged.[487]

Figure 37: https://t.me/s/prokuratura_kharkiv

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[487] Office, Kharkiv Regional Prosecutor's (prokuratura_kharkiv). 2023d. "Law enforcement officers are documenting the consequences of another enemy attack on Kupyansk: there is a dead person" https://t.me/s/prokuratura_kharkiv

March 21, 2023

Russian military fired artillery at the city of Kupyansk. At around 7:00pm, a fire and rescue building was damaged, and at about 11:00pm, a residential building was damaged.[488]

Figure 38: https://t.me/s/prokuratura_kharkiv

March 26, 2023

Russian Federation artillery shelling damaged a five-story residential building and several private homes. No casualties were reported.[489]

Figure 39: https://t.me/s/prokuratura_kharkiv

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[488] Office, Kharkiv Regional Prosecutor's (prokuratura_kharkiv). 2023c. "The occupiers took turns shelling the civilian infrastructure of Kupyansk - law enforcement officers documented the consequences" https://t.me/s/prokuratura_kharkiv

[489] The Kyiv Independent News Desk. "Russia Strikes Residential Area in Kupiansk in Kharkiv Oblast." Kyiv Independent. Kyiv Independent, March 26, 2023. https://kyivindependent.com/russia-strikes-residential-area-in-kupiansk-in-kharkiv-oblast/.

April 2, 2023

Russian Federation fired artillery at Kupyansk at 5:30 pm with multiple rocket launchers. A 65-year-old women was injured, and a private house was damaged.[490]

Figure 40: https://t.me/s/prokuratura_kharkiv

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[490] Office, Kharkiv Regional Prosecutor's (prokuratura_kharkiv). 2023b "Military Personnel of the Armed Forces of the Russian Federation Once Again Shelled the Kharkiv Region - One Is Wounded." https://t.me/s/prokuratura_kharkiv.

April 4, 2023

The Russian Federation shelled the city of Kupyansk at 4:40 am, damaging farm buildings and houses. No injuries were reported.[491]

Figure 41: https://t.me/s/prokuratura_kharki

Conclusion

The Russian Federation's failure to properly train and educated their soldiers has led to violations of humanitarian laws in the cities of Kupyansk and Kupyansk-Vuzlovyi. Humanitarian law violation is not isolated to these two cities but extend across Ukraine. This analysis provides only a small snapshot of what has occurred throughout this war. Reports of rape, torture, civilian targeting, and murder are common. The methods used in the Russian military's tradition of dedovshchina are repeated in the methods of torture committed by Russian soldiers in Ukraine. Methods such as electric shock, extreme beatings, and rape are all commonly seen throughout

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[491] Office, Kharkiv Regional Prosecutor's. (prokuratura_kharkiv). 2023. "Under the Procedural Guidance of the Kupyan District Prosecutor's Office of the Kharkiv Region…." https://t.me/s/prokuratura_kharkiv.

the war in Ukraine, and are methods historically used in dedovshchina. The Russian Federation has cultivated a culture of brutality, distrust, and inhumanity within their military. While the Russian Federation may make political statements on the international scale claiming their commitment to uphold international humanitarian laws, it is clear these are false commitments. Additionally, the Russian Federation's repetitive denial that they have violated international humanitarian law is disproven through the extensive evidence laid out in this analysis and evidence that has and continues to come out from across Ukraine.

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Assessment of Ukrainian Government Claims of Crimes Against Humanity During the Invasion of Mariupol

BLUF

The Ukrainian government's claim that Russian forces committed crimes against humanity during the invasion of Mariupol is accurate.

Preface and Methodology

This report assesses the accuracy of the Ukrainian government's claims that Russian forces committed crimes against humanity in Mariupol, Ukraine. The report seeks to assess the accuracy of the Ukrainian government's accusations by confirming or denying two specific instances of claimed human rights abuses and by evaluating Ukrainian civilian death toll reports from multiple levels of government.

This assessment uses open-source intelligence analysis to evaluate videos posted to social media and determine their authenticity. Publicly available satellite imagery is used to verify the location and date of the social media posts. Additionally, pattern analysis is used to determine whether consistent themes can be seen in the behavior of Russian military forces across multiple conflicts. Furthermore, this assessment evaluates statements from Ukrainian officials at the local and national level in addition to United Nations statements to support any judgments made.

Key Judgements

Russian forces engaged in strikes against civilian occupied structures in Mariupol during in the early phases of their assault on Ukraine. There is ambiguity surrounding specific death counts as a result of difficulties faced when accounting for casualties in Russian controlled

territory. There is also ambiguity regarding the presence of Ukrainian forces in the vicinity of civilian deaths that occurred due the lack of data related to specific troop positions.

The Ukrainian government's claim that 2,500 civilians were killed in the invasion of Mariupol is an accurate approximation of the real death toll and lines up with U.N. estimates. The mayor or Mariupol's claim that between 10,000 and 20,000 civilians were killed during the invasion of Mariupol is not likely to be accurate due to a lack of evidence to support the claim. Additionally, this estimate confirms the occurrence of Russian strikes on a hospital and a theater in Mariupol, each of which housed civilians at the time of the strike. The assessment matrix below summaries assessments of claims made by the Ukrainian government.

Assessment Matrix

Party	Claim	Assessment	Confidence level
Ukrainian Government	Russian Forces committed crimes against humanity during their invasion of Mariupol.	This is an accurate claim.	High
Ukrainian Government	2,500 civilians were killed in the invasion of Mariupol.	This is a functional approximation of the real death toll that may fluctuate.	Medium
Mariupol City Officials	10,000 to 20,000 civilians were killed in the invasion of Mariupol.	This is not an accurate claim.	Low
Ukrainian Government	Russian forces bombed a theater containing civilians in Mariupol.	This is an accurate claim.	High
Ukrainian Government	Russian forces bombed a maternity hospital containing civilians in Mariupol.	This is an accurate claim.	High

Background

Defining Crimes Against Humanity

This analysis uses the International Criminal Court (ICC) definition of crimes against humanity. Though multiple definitions of crimes against humanity exist the ICC provides a well-established definition that is widely accepted in the international community. Additionally, the ICC definition is often used in cases that gain international involvement.[492] This analysis makes no judgment about the quality of this definition. Instead, this definition is used due to its relevance in the international community. The ICC definition comes from Article 7 of the Rome Statute of the International Criminal Court (ICC) and reads as follows:

> *"For the purpose of this Statute, 'crime against humanity 'means any of the following acts when committed as part of a widespread or systematic attack directed against any civilian population, with knowledge of the attack:*
> - *Murder;*
> - *Extermination;*
> - *Enslavement;*
> - *Deportation or forcible transfer of population;*
> - *Imprisonment or other severe deprivation of physical liberty in violation of fundamental rules of international law;*
> - *Torture;*
> - *Rape, sexual slavery, enforced prostitution, forced pregnancy, enforced sterilization, or any other form of sexual violence of comparable gravity;*
> - *Persecution against any identifiable group or collectivity on political, racial, national, ethnic, cultural, religious, gender as defined in paragraph 3, or other grounds that are universally recognized as impermissible under international law, in connection with any act referred to in this paragraph or any crime within the jurisdiction of the Court;*
> - *Enforced disappearance of persons;*
> - *The crime of apartheid;*
> - *Other inhumane acts of a similar character intentionally causing great suffering, or serious injury to body or to mental or physical health."*

This definition is the basis for all future references to crimes against humanity (CAH) in the analysis and is used to assess alleged instances of CAH. Alleged instances of CAH will be

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[492]" Rome Statute of the International Criminal Court." OHCHR, July 17, 1998

compared against this definition to determine whether they meet the criteria presented by the International Criminal Court.

Russian History of Crimes Against Humanity

It is important to consider context when discussing crimes against humanity. Based on this, consideration must be given to Russia's history in relation to crimes against humanity. We will confine this analysis of Russian history to the post-Soviet era to give a more current picture of Russia's military actions.

The Russian Federation has been involved in four conflicts since the fall of the Soviet Union that have been saturated with claims of human rights violations and CAH.[2] Assessing two of these conflicts gives a baseline for evaluating the record of Russian tactics.[493] The First and Second Chechen wars can be looked to determine whether any alleged Russian CAH in Ukraine are consistent with those which were documented in the past. Consistency in terms of both the occurrence of CAH and their nature across multiple wars would give weight to current claims of Russian CAH. Conversely, no record of Russian CAH would make current claims of CAH less viable.

First Chechen War

Russia's response to the Chechen declaration of independence has been criticized by human rights groups due to reports of CAH carried out by Russian forces.[494] Particularly, the Russian armed forces were criticized for their use of cluster bombs, not taking adequate measures to avoid civilian casualties and overtly attacking civilian targets with little strategic value.[495] Such organizations as Human Rights Watch reported heavy civilian casualties as a

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[493] International, Amnesty. *Annual Report 2001*
[494] Haque, Mozammel. *Genocide in Chechnya and the World Community,* 15–29
[495] Secretary-General of the United Nations. "The Situation of Human Rights in the Republic of Chechnya of the Russian Federation." UN Commission on human rights

result of Russia's strategy in Chechnya. Human Rights Watch reported that over 300,000 refugees were created as a result of the conflict.[496]

Russia's bombardment strategy as used on the city of Grozny was partially responsible for these human rights reports. To prepare Grozny for infantry units, the Russian armed forces shelled Grozny using carpet bombing, cluster bombs, artillery, and rockets.[497] These low precision tactics resulted in the previously mentioned heavy civilian casualties.[4] While falling short of indicating intent, the use of these strategies demonstrated a disregard for civilian lives. In a dense urban environment, these tactics are incompatible with mitigating for civilian casualties due to their broad target area.[3; 4] Russian forces heavily relied on the use of unguided multiple launch rocket systems (MLRS), such as the BM-22, to place Grozny under siege.[498] The unguided nature of Russian MLRS likely made a significant contribution to civilian casualties.

Russia's involvement in CAH during the First Chechen War was not limited to civilian deaths resulting from the use of ineffective strategies. Similar to Russian strategy in Grozny, the Russian military engaged in what has come to be known as the Samashki Massacre, in which MLRS were used in civilian populated areas and Russian forces engaged in the overt shooting of civilians.[8] According to U.N. reporting based on 128 eye-witness accounts, over 100 people were deliberately killed over a two day period through various means including the aforementioned MLRS.[8] Other methods included shooting civilians in their houses and burning them with flame throwers. Additionally, eyewitnesses stated that Russian troops threw grenades into basements where civilians were seeking shelter from the bombardment.[8]

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[496] " War Crimes in Chechnya and the Response of the West." Human Rights Watch,
[497] " Urban Warfare Communications: A Contemporary Russian View." Red Thrust Star. FOREIGN MILITARY STUDIES OFFICE.
[498] " Urban Warfare Communications: A Contemporary Russian View." Red Thrust Star. FOREIGN MILITARY STUDIES OFFICE.

Beyond overt acts of violence towards civilians, human rights organizations have also reported that Russia failed to provide escape routes for residents to properly mitigate for civilian casualties.[499] Residents of Grozny found themselves in harm's way, largely surrounded by Russian forces with no safe corridors to allow their escape the from the crossfire. Human Rights Watch also reported multiple occasions during the First Chechen War in which refugee convoys came under fire from Russian forces.[9]

These Russian activities in Chechnya violate Article 7 of the Rome Statute as written by the ICC.[500] Russian knowledge of civilians in their area of operation paired with neglecting to account for them in their battle plan, caused significant civilian death and constitutes *"widespread or systematic attack directed against any civilian population, with knowledge of the attack".[10]* Based on this, Russia's activity in the First Chechen War sets a precedent for Russian engagement in CAH. The examples of Grozny and Samashki show that Russian military strategy and the individual choices of Russian soldiers resulted in crimes against humanity during the First Chechen War.

Second Chechen War

The Second Chechen War exhibited crimes against humanity similar to the first. Russia continued its use of tactics that fail to account for civilian presence. In addition to tactics that resulted in the incidental killing of civilians, the Russian Armed Forces participated in the purposeful targeting of civilians.[501]

The Chechen capital of Grozny was one once again subjected to attacks that resulted in significant civilian casualties. A 1999 missile attack resulted in over 118 civilian deaths and

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[499] " War Crimes in Chechnya and the Response of the West." Human Rights Watch
[500] " Rome Statute of the International Criminal Court." OHCHR, July 17, 1998
[501] International, Amnesty. "Annual Report 2001"

many more injuries.[502] The intended targets of the missile strike remain unclear, however, the missiles struck the only maternity hospital in Grozny in addition to a mosque and a market.[12] Multiple other instances of Russian disregard for Article 7 were reported by human rights groups.[10] These included multiple massacres, rapes, murder of civilians, and Russian attacks on civilians attempting to evacuate.[503] By the end of the second Chechen war, Amnesty International estimated that 25,000 civilians had died as a result of Russian forces.[504]

These example of Russian crimes against humanity have no impact on any claims related to the war in Ukraine except to set a precedent for Russian military behavior when operating in civilian-rich areas. While this Russian precedent cannot act as evidence of war crimes, it demonstrates potential flaws in Russia's military doctrine and training.

The Strategic Value of Mariupol

Prior to understanding Russian attacks on Mariupol, the motivation behind these attacks must be understood. There are likely three primary reasons that Mariupol was targeted in the first phase of the Russian invasion, in no specific order: 1) Its production capacity, 2) It's provision of a warm water port, and 3) Its ability to assist in the creation of a land bridge connecting Russia to Ukraine.

Steel Production

The first reason that Russian battle planners likely chose Mariupol as one of their early objectives is its significant steel production capacity. The city is home to two major steel production plants.[505] [506] The first plant, called Azovstal Steel and Iron works, has a production capacity of 5.7 million tons of iron per year, 6.2 million tons of steel per year, and 4,700,000 tons

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[502] " Evidence of War Crimes in Chechnya." Human Rights Watch, November 2, 1999
[503] International, Amnesty. "Annual Report 2001"
[504] " What Justice for Chechnya's Disappeared? - Executive Summary." amnesty.org. Amnesty International,
[505] " Azovstal Today." METINVEST. Accessed March 20, 2023
[506] " ILYICH IRON AND STEEL WORKS - Work Today." METINVEST. Accessed March 20, 2023.

of finished rolled steel products according to their website.[15] The steel factory also has a significant capacity for producing railroad tracks.[15] Their website claims that the company is capable of making components vital for gas pipelines, shipbuilding, and offshore oil structures.[15]

Each of these attributes made the plant a logical strategic objective for Russia. Capturing this steel plant enabled Russia to significantly reduce Ukraine's ability to produce steel components that could be either directly or indirectly used for the war effort. This facility would likely be vital in supplying replacement rails for any sections of the Ukrainian rail system that were destroyed in Russian strikes. The inability of Ukraine to quickly replace tracks could have a significant impact on their military's logistical capability.

The second reason that this steel plant is a logical objective is that capturing the facility would enable Russia to use the plant for its own purposes. So long as sufficient portions of the plant survived the attacks, Russia could use this plant as a production facility that is closer to the location where steel components are needed (the front line), therefore reducing shipping time. Additionally, if advancing Russian forces need to repair the Ukrainian rail system to move assets deeper into the country, it would be strategic to have a steel factory closer to the site of such repairs.

The second major steel production plant is called Ilych Iron and Steel Works.[16] This facility produces steel for a wider variety of applications and then the Astoval plant. It specializes in producing steel for pipelines, shipbuilding, large structures, such as bridges, and steel used for stamped components.[507] The plant's website claims that it is one of the largest producers of steel in Ukraine, and that its products are exported 80 countries nationwide, giving it both domestic and international impact.[17]

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[507]" ILYICH IRON AND STEEL WORKS - Work Today." METINVEST. Accessed March 20, 2023.

In addition to its ability to help rebuild destroyed structures, Ilych Iron and Steel Works' capacity to produce stamped steel components put it in a position to make significant contributions to Ukraine's production of military equipment. There are many components important to combat that are made of stamped steel. For example, many gun components are derived from stamped steel pieces, including many soviet era weapons.[508] Capturing this factory would enable Russia to significantly reduce Ukraine's wartime production capacity.

Both plants contributed to making Mariupol a target for attack. These facilities increase Ukraine's capacity to rebuild structures as they get destroyed in airstrikes and other combat related events. Without access to such plants, Ukraine's rebuilding efforts are hindered, justifying the Russian identification of Mariupol as a target.

The Port of Mariupol

The second likely reason for selecting Mariupol as a target is that its capture provided Russia with an additional warm water port, that can be used both for stationing naval vessels and shipping. The Russian Navy has a deficit of warm water ports compared to navies of comparable size.[509] This is problematic for the nation as one of the world's major naval powers. For this reason, warm water ports are vital to Russia's national interests.[19] Many of Russia's ports are frequently frozen during the winter, presenting a problem for Russia's Navy, as a goal of any Navy is mobility.[19] While icebreakers help solve this problem for Russia, it has a significant desire for additional ports that are ice-free year-round.[510]

Some analysts view this Russian desire for warm water ports as part of the motivation for the 2014 Russian invasion of Crimea.[20] Russia's capture of Crimea provided the Russian Navy

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[508] Small Arms Identification and Operation Guide--Eurasian Communist Countries, 75–75. Washington: Defense Intelligence Agency

[509] Chauhan, Tanvi. "Why Are Warm-Water Ports Important to Russian Security? - Air University, USAF

[510] Small Arms Identification and Operation Guide--Eurasian Communist Countries, 75–75. Washington: Defense Intelligence Agency

with greater direct access to the Black Sea and increased the nation's access to warm water ports. The capture of Mariupol gave Russia access to the Black Sea-connected Sea of Azov, allowing Russia, to increase its naval presence in the Black Sea, and ultimately the Mediterranean Sea.

This new port also gave Russia an increased ability to transfer cargo from freight trains to cargo ships and vice versa as approximately 2550 ships are processed through the port annually.[511] Additionally, approximately 17,000,000 tons of cargo go through the port on an annual basis, making the port the largest on the Sea of Azov.[512] Furthermore, the port of Mariupol hosts Ukraine's largest coal loading facility, which has the capacity to handle 5,000,000 tons of coal annually.[513] This is significant as Ukraine exports large amounts of coal on an annual basis, contributing to its GDP.[514]

This desire for an additional warm water port gives Russia a significant incentive to target Mariupol for attack. Furthermore, it gave reason for Russian battle planners to prioritize the capture of the city early in the conflict, to increase the pace at which military equipment and troops could flow into Ukraine. This was thanks to the robust transportation system that already existed in Mariupol, as a result of its port.

Russian Land Bridge

The third reason why Russia likely prioritized capturing Mariupol relates to Russian incentives to connect Crimea to the Russian mainland and secure avenues of transportation. Creating a direct connection between Russia and the Crimean Peninsula enables Russia to both increase the legitimacy of the land captured in 2014 and increase the logistical capacity of

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[511] Joshi, Rishab. "5 Major Ports of Ukraine." Marine Insight, June 20, 2022
"Sea Ports of Ukraine UA - SeaRates." Sea Rates. Accessed March 21, 2023
[513]" Port of Mariupol." World Port Source. Accessed March 20, 2023
[514] "Добыча Коксующихся Углей в Украине Снизилась До Минимума За Время Независимости." Информационное агентство. Accessed March 20, 2023.

Crimea's various ports that are under Russian control. This increased logistical capability could be used for both military and civilian purposes. Taking Mariupol helped them achieve this goal in two ways.

First, geographically, Mariupol falls directly between Crimea and the Russian border.[515] It is approximately 30 miles from Ukraine's border with the Russian mainland, and approximately 160 miles from Crimea.[25] If Russia wanted to connect Crimea to the mainland of Russia through a land bridge, Mariupol would naturally fall in its path.

This connection to Russia would increase the likelihood that other nations would recognize Crimea as a legitimate part of Russia by allowing it to function as a part of Russia. The road and rail connections to Crimea would let Russia export shipments directly from Crimea. Additionally, being connected to the mainland of Russia could change the way in which other nations view Crimea's relationship with Russia, forcing them to accept that Crimea is controlled by Russia. Furthermore, it would add another node to the Russian navy's shipping network, giving it greater mobility in areas near the Black Sea and the Mediterranean Sea.

The second way that the capture of Mariupol would assist Russia in the connection of Crimea to Russia is by giving Russia additional points of entry to Ukraine's road and rail networks which could be used to penetrate deeper into the center of Ukraine. By utilizing existing Ukrainian railways Russia could increase its ability to resupply its troops as they advance deeper into Ukraine.

Invasion of Mariupol

On February 24, 2022, Russia's invasion of Mariupol began along with the invasion of the other parts of the nation.[516] This started with heavy artillery strikes across the city to prepare

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515 Google maps. Google. Accessed March 20, 2023
516 Hunder, Max. "Timeline: Russia's Siege of the Ukrainian City of Mariupol." Reuters

the way for Russian ground forces. Russian ground forces advanced towards Mariupol from the east and met Ukrainian resistance.[26] Concurrently, Russian forces began an amphibious assault from the Sea of Azov (west of the city) in an effort to surround the city according to U.S. defense officials.[517] By February 28, the city of Mariupol was mostly surrounded by Russian forces as the shelling continued.[26] According to the mayor of Mariupol, the city no longer had access to water at this point.[518] In addition, the mayor stated that the Russian military was not allowing civilians to exit, creating a significant risk of civilian death.[28] The shelling of Mariupol continued for several days. Over the course of this shelling, Russia utilized low accuracy, weapons, such as Soviet era MLRSs that are often criticized for their lack of precision.

From March 5 to March 8, the Ukrainian government attempted multiple evacuations from the city geared at getting civilians out of harm's way. Both sides agreed upon a cease-fire, however, the cease fire would end up falling through, preventing civilians from departing the city.[519]

Russia's use of imprecise munitions resulted in significant collateral damage to civilian structures. Damage to buildings such as houses, restaurants, apartment, buildings, and hospitals. Can be seen in satellite imagery.[520] The vast number of destroyed houses resulted in displaced civilians who did not have any ability to leave the city due to failed cease-fire attempts.[521] This left civilians looking for places to hide from the shelling. The inability of civilians to depart the city resulted in hundreds of civilians, taking refuge within the city's Donetsk Regional Drama Theater.[522] In addition, hospitals began moving patients into basements as a safety measure. This

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[517] Woodyatt, Amy, Rob Picheta, Ed Upright, Adam Renton, and Melissa Macaya. '"Amphibious Assault 'Underway"

[518] Prentice, Alessandra, Natalia Zinets, and John Stonestreet. "Mariupol Mayor Reports Mass Casualties" Reuters

[519] Hunder, Max. "Timeline: Russia's Siege of the Ukrainian City of Mariupol." Reuters

[520] ArcGIS Living Atlas of the World. "World Imagery Wayback."

[521] Prentice, Alessandra, Natalia Zinets, and John Stonestreet. "Mariupol Mayor Reports Mass Casualties from Nonstop Russian Attack." Reuters

[522] Qena, Nebi. "Ukraine Reports 300 Dead in Airstrike on Mariupol Theater." AP NEWS. Associated Press

included a children's and maternity hospital in the center of the city, just blocks from the theater.[523]

Ukrainian Claims of Russian CAH

This analysis seeks to assess the accuracy of claims made by the Ukrainian Government in the wake of Russian attacks on Mariupol and focuses on three claims made by the Ukrainian Government during the invasion. The first claim is that Russia bombed a theater containing civilians that had the word "kids" written outside in text large enough to be seen from aircraft.[524] The second claim is that Russia bombed a maternity clinic unit of a hospital during their attack.[525] The final claim relates to various estimates of civilian death tolls that were produced by the government of Ukraine and the government of Mariupol.[526]

In order to assess the accuracy of these claims, this analysis utilizes satellite imagery to determine whether there is evidence of these attacks. Satellite imagery is also used to verify the location of photos that allegedly show the war crimes of which the Ukrainian government speaks. Additionally, this analysis uses reports from agencies other than those associated with the Ukrainian government as a means of cross-referencing the Ukrainian Government's claims. This analysis refers to reports from Amnesty international, Human Rights, Watch, the United Nations, and statements released by the United States Government. This analysis has used Russia's history in relation to crimes against humanity to assess whether a precedent exists for these kinds of incidents. Similarly, this report has also evaluated the strategic value of Mariupol to better understand the mindset with which Russian forces entered the conflict.

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[523] Chernov, Mstyslav. "Ukrainian Maternity Ward Moves to Basement for Shelter." AP NEWS

[524] Зеленський, Володимир. "A Year Ago, Russia Deliberately Dropped a Bomb on the Drama Theater in Mariupol." Twitter. Twitter, March 16, 2023

[525] Зеленський, Володимир. "Mariupol. Direct Strike of Russian Troops at the Maternity Hospital." Twitter. Twitter, March 9, 2022

[526] Yuras Karmanau, Adam Schreck. "Mariupol Mayor Says Siege Has Killed More than 10K Civilians." AP NEWS. Associated Press

Theater Bombing

The previously mentioned theater in which civilians sought shelter was allegedly bombed by Russian forces on 16 March, 2022.[527] The Ukrainian government claims that 1,300 people were sheltering inside of the theater and that 300 of them died in the attack.[528] The Ukrainian government also claimed that a high proportion of the victims of this attack were children.[529] Ukraine officials stated that the word "дети" (meaning "children") was written in Russian outside of the theater in letters large enough to be visible from the sky at the time of the attack.[530] This claim is supported by satellite imagery from both before, and after the bombing occurred as seen in Figures 5 and 6.[531]

Satellite imagery sourced from arcGIS supports the claim that some type of strike took place on the theater at the heart of Mariupol [40] However, this satellite imagery is insufficient to assign a specific date to the damage that can be seen. This is because the imagery provided by arcGIS does not have frequent enough pictures to provide a precise date. Considering the shortcomings of the satellite imagery available to this analysis, videos posted to social media were used to verify the timing of this event. This was achieved by confirming the location of two separate videos that were posted to social media.

The first video that was geolocated to the site of the theater showed a man taking a camera person on a tour of the theater prior to the attack, showing civilians who were seeking shelter in the interior of the theater (See Annex A).[532] Midway through the video, the man exits

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[527] Зеленський, Володимир. "A Year Ago, Russia Deliberately Dropped a Bomb on the Drama Theater in Mariupol." Twitter. Twitter, March 16, 2023

[528] Qena, Nebi. "Ukraine Reports 300 Dead in Airstrike on Mariupol Theater." AP NEWS. Associated Press

[529] Qena, Nebi. "Ukraine Reports 300 Dead in Airstrike on Mariupol Theater." AP NEWS. Associated Press

[530] Зеленський, Володимир. "A Year Ago, Russia Deliberately Dropped a Bomb on the Drama Theater in Mariupol." Twitter. Twitter, March 16, 2023

[531] ArcGIS Living Atlas of the World. "World Imagery Wayback." Redirect. Accessed March 20, 2023.

[532] Новинарня. "Блокадний Маріуполь - Драмтеатр Як Бомбосховище Для Тисячі Людей." YouTube. Новинарня, March 10, 2022

the building and walks around the outside, giving an opportunity to identify his location based on physical markers in his surroundings as seen in Annex A. This video was posted to social media on March 10, six days before the alleged theater bombing. Based on the date and location of this video, it appears to confirm the claim made by the Ukrainian government that the theater was occupied by civilians seeking refuge from the Russian bombardment.[533] [534] The interior of the building shows no signs of being a valid military target. There is no evidence of Ukrainian troops using the building as a defensive position as some Russian sources claimed.[42]

The second video that was used to confirm that this event occurred was posted to social media on March 16, the day of the alleged attack. The video depicts the same theater in ruins, presumably as a result of a Russian strike.[535] The geographic markers seen in both the satellite imagery and the first video are consistent with one another, indicating that each of the videos took place in the same location at the heart of Mariupol (47.09603° N, 37.54871° E). This video corroborates the claim made by the Ukrainian government that some type of explosion occurred at the site of this theater. However, this video alone is insufficient evidence to confirm the origin of this explosion as it simply shows a building in ruin. Based on this video alone, it is unclear what caused the building to partially collapse.

In contrast to claims made by the Ukrainian government, Russian state owned media agency, TASS, made the claim that Ukraine's own Azov battalion rigged to the building with explosives, after holding Ukrainian civilians hostage there.[536] In the same article, Russian state owned media claimed that Russia could not be responsible for the bombing of this theater,

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[533] Зеленський, Володимир. "A Year Ago, Russia Deliberately Dropped a Bomb on the Drama Theater in Mariupol." Twitter. Twitter, March 16, 2023

[534] Новинарня. "Блокадний Маріуполь - Драмтеатр Як Бомбосховище Для Тисячі Людей." YouTube. Новинарня, March 10, 2022

[535] Lori Hinnant, Mstyslav Chernov. "AP Evidence Points to 600 Dead in Mariupol Theater Airstrike." AP NEWS. Associated Press

[536]" Azov Battalion Militants Blow up Mariupol Theater Building - Defense Ministry." TASS, March 16, 2022

because Russia did not engage in any airstrikes on March 16 involving targets in Mariupol.[537]

The article continued to state that in light of the potential danger of killing civilians the theater

building was never considered as a strike target.[46]

Based on the video and satellite evidence described above in addition to the context of

the event, this analysis finds it likely that Russia was responsible for striking the theater.

Considering that the city had been under Russian bombardment for 21 days at the time of the

attack it is more likely that the explosion which occurred at the theater in Mariupol was the result

of Russian strikes than it was a covert operation, carried out by the Azov Regiment, as claimed

by Russia.

Circumstantial evidence does not support the claim that the Azov regiment carried out

this attack, because this claim lacks a plausible motive. There are two potential motives that

would explain such a strike carried out by the Azov Regiment and each has confounding factors.

The first is that if the Azov regiment was interested in attacking civilians with no objective in

mind it is not logical that they would have waited for a Russian invasion to do so. It is more

likely that they would have had a track record of committing CAH prior to the Russian invasion.

Furthermore, carrying out such an attack would be counterproductive to their goal of defending

Mariupol from Russia.

The second potential motive that Ukrainian forces could have to attack their own theater

is to gain western support by exaggerating the humanitarian disaster created by Russia. This

second motive is also unlikely as widespread strikes on civilians occurred across the entirety of

Ukraine during the initial stages of the invasion. Given the risk associated with such an

operation, it does not make sense that Ukraine would conduct a false flag attack on its own

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[537]" Azov Battalion Militants Blow up Mariupol Theater Building - Defense Ministry." TASS, March 16, 2022

citizens, in order to gain western support when the alternative would be to simply use actual occurrences that the Russians do not deny.

Hospital Bombing

At 10:23 AM On March 9th Ukrainian president, Vladimir Zelenskyy posted a tweet to Twitter, claiming that Russian forces executed a strike on a maternity hospital in the center of Mariupol.[538] He stated that children were under the wreckage that was caused by the attack and asked how much longer the world would be an accomplice to Russia by ignoring such incident.[47] In his tweet, he then made a plea for the nations of the world to create a no-fly zone over Ukraine in order to prevent such events in the future.[47] Along with this message, he posted a video showing what appeared to be a destroyed hospital. The video shows people entering the building, presumably to search for survivors in the rubble. The video provides both interior and exterior angles of the building. The images that appeared in President Zelenskyy's post are consistent with satellite images of the hospital, indicating that the location shown in it the video is the same location at which satellite imagery shows evidence of an attack as seen in Annex B.[47][539] The location of this video was verified by stitching together various screenshots of the video posted by Zelenskyy to create a panorama of the site of the attack. Once this was accomplished, physical markers were used to verify the location.

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[538] Зеленський, Володимир. "Mariupol. Direct Strike of Russian Troops at the Maternity Hospital." Twitter. Twitter, March 9, 2022

[539] ArcGIS Living Atlas of the World. "World Imagery Wayback." Redirect. Accessed March 20, 2023

On March 10, In response to President Zelenskyy's accusation, Russian defense, ministry spokesperson Igor Konashenkov stated that no targets were struck by the Russian military in the area of Mariupol according to Russian news agency Interfax.[540] He continued that the alleged strike was staged by the Ukrainian government in order to maintain anti-Russian sentiment, and create public outcry among Westerners.[49] He said that the reports of Russian airstrikes on the hospital on March 9 were *"an information provocation staged by the Kyiv regime"*.[49] The defense minister provided no evidence to support the claim that Russia had no involvement. Also, on March 10, the Russian embassy in the United Kingdom, made the claim through a Twitter post that the attack was staged by the Ukrainian government.[541]

The day after the strike, Russian foreign minister, Sergey Lavrov made a statement at the United Nations security council concerning the bombing of the Children's Hospital in Mariupol.[542] He claimed that the hospital was purposefully targeted by the Russian military, contradicting the claims of the Russian defense ministry.[51] However, he stated that the hospital was targeted because it

Figure 1

Figure 2

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[540] Russian Troops Don't Hit Hospital in Mariupol, It's Kyiv's Information Provocation - Russian Defense Ministry." Interfax.
[541] Sardarizadeh, James Clayton & Shayan. "Twitter Blocks Russian Claims on Hospital Attack." BBC News.
[542] Polglase, Katie, Gianluca Mezzofiore, and Livvy Doherty. "Anatomy of a Hospital Attack." CNN

contained members of the Azov battalion, arguing that all civilians had been evacuated from the hospital days prior to their strike and that the hospital was now being used as a position by Ukrainian forces.[51] In addition to being inconsistent with the claims of the Defense Ministry, photo evidence from the days leading up to the attack indicate that the building was, in fact, being used by civilians as a hospital as seen in figures 1 and 2.[543] [544] [545] However, this analysis cannot confirm, or deny the presence of Ukrainian forces at the hospital at the time of the attack.

The inconsistency between messaging among Russian officials, may suggest that the Russian government is attempting to cover up the specific nature of a strike on this location. The willingness of the Russian foreign minister to admit Russia was involved in this strike paired with photographic evidence is sufficient evidence to confirm that this strike occurred. Additionally, while this report cannot rule out the possibility that Ukrainian troops were present at the hospital at the time of the attack, this claim is unlikely as on the days leading up to the attack Russian forces and battle lines were still on the outskirts of the city.[546] [547] This means that if the Ukrainian forces did use the hospital as a firing position, they risked taking forces away from the front lines in order to stay in a position where they had no clear shot at the enemy and therefore held little strategic value. It is unlikely that Ukrainian forces would choose to create a firing position of a little utility in the face of an invasion force significantly larger than their own. Based on this, it is more likely that Ukrainian forces would have been closer to the perimeter of

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[543] Tapper, Jake. "Ap Photo: Serhii, Father of Teenager Iliya, Cries on His Son's Lifeless Body Lying on a Stretcher at a Maternity Hospital Converted into a Medical Ward in Mariupol, Ukraine, Wednesday, March 2, 2022

[544] Chernov, Mstyslav. "Ukrainian Maternity Ward Moves to Basement for Shelter." AP NEWS. Associated Press, March 2, 2022.

[545] Regensburg, Marcel. "Ambulance Paramedics Move an Injured Man on a Stretcher, Wounded by Shelling in a Residential Area, at a Maternity Hospital Converted into a Medical Ward and Used as a Bomb Shelter in Mariupol, Ukraine, Tuesday, March 1, 2022.

[546]" Day of News on Live Map - March, 09 2022." Ukraine Interactive map - Ukraine Latest news on live map - liveuamap.com, March 9, 2022

[547] Project Owl OSINT. "Ukraine Control Map." Google my maps. Google. Accessed March 20

the city at this point in the invasion. Given that the hospital is at the heart of Mariupol, this analysis finds that Russian claims of the hospital being used as a firing position are unlikely.

Based on the findings above, Zelenskyy's initial claim that Russia struck a maternity hospital are confirmed with high confidence. However, claims about the presence or absence of Ukrainian troops at the hospital cannot be made with even low confidence. Photographs of the maternity hospital, neither confirm nor deny the presence of Ukrainian troops. Based on this, Russian claims about the nature of the attack remain ambiguous. The high probability of civilian deaths when striking a hospital, regardless of any potential presence of Ukrainian troops, suggests that this strike by Russia, constitutes a crime against humanity, as defined by the international criminal court as discussed earlier in this assessment.

Civilian Death Toll

According to a report, published by the United Nations office of the High Commissioner for Human Rights, the UN has confirmed that 6,322 civilians have died as a direct result of the war.[548] This report includes casualties that occurred between 24 February 2022, and 5 March 2023 across the entire nation.[57] The report states that this number may be a significant underestimate due in part to the difficulty of confirming deaths in active combat zones and areas controlled by Russian forces.[57] Given that Mariupol is now a Russian controlled area, it falls into the category of regions that the U.N. admits to having difficulties tracking.

These limitations on United Nations data related to cities such as Mariupol confound the ability to draw specific conclusions from UN statements. Due to the self-reported insufficiencies of their data in Russian controlled areas, the United Nations' civilian casualty data cannot be used to definitively confirm or deny the death toll numbers presented by the Ukrainian

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[548]" Ukraine: Civilian Casualty Update 6 March 2023." OHCHR, March 6, 2023.

Government. However, the United Nations data can be used to present a picture of civilian casualties in cities that remain under Ukrainian control, and experienced sieges similar to that which occurred in Mariupol.

Comparing the death tolls from these cities with Ukrainian government reports provides a sense of the accuracy of the Ukrainian government's reports. Considering that the United Nations has confirmed 6,322 civilian casualties across all cities, including those which faced Russian siege and are now under the control of Ukraine, this number can be used as a litmus test with which the casualty claims of the Ukrainian government can be assessed.[549] In the event that officials claim that more civilian deaths have occurred in their city than the United Nations has confirmed in the entire country, it will decrease our confidence in the claim of those officials.

A portion of the confirmed 6,322 civilian deaths occurred in the city of Mariupol.[58] On June 16, 2022, the Office of the High Commissioner on Human Rights released a statement that the office had verified 1,347 civilian deaths in Mariupol.[550] The report stated that most of these deaths were caused by artillery shelling, tanks, airstrikes, and small, arms fire. The report also states that the actual civilian death toll Is likely thousands higher than the previously mentioned 1,347 deaths due to difficulties in accounting for all civilian deaths.[59]

3.3.1 - Government of Ukraine Death Toll Reports

Civilian casualty assessments from the Ukrainian Government vary at different levels of government. On 14 March 2022, Oleksiy Arestovych, one of the Ukrainian president's top advisors said that more than 2,500 residents of Mariupol had died in the process of Russia taking the city.[551] This figure represents the official figure put forth by the Ukrainian National

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[549] " Ukraine: Civilian Casualty Update 6 March 2023." OHCHR, March 6, 2023.

[550] " High Commissioner Updates the Human Rights Council on Mariupol, Ukraine." OHCHR, June 16, 2022.

[551] Macaya, Melissa, Amy Woodyatt, Ben Church, Ed Upright, Maureen Chowdhury, and Jason Kurtz. "Ukraine Puts Death Toll in Mariupol Bombardment at More than 2,500." CNN.

government. While the government of Ukraine does not release its methodology for coming to such numbers, the verification process for such statistics is likely more rigorous on the national level than the local level. This presents a potential bias in the direction of this number being an underestimate due to the time that it takes to rigorously verify each death. However, pressure for the Ukrainian government to release death toll figures quickly also exists as a result of both general pressure from the civilian population and pressure to demonstrate to Ukraine's Western allies, the severity of the situation. Fully expressing the severity of their situation requires the Ukrainian government must produce death toll estimates in a timely fashion. These countervailing timeframe-related interests may or may not balance each other out in their overall effect on the accuracy of the government's death toll numbers. Based on this ambiguity, assessing the accuracy of the Ukrainian government reports based on timeframe-related biases does not appear to be a viable method.

Government of Mariupol Death Toll Reports

While national estimates of the civilian casualties resulting from the fighting in Mariupol appear to be somewhat accurate, claims made about the civilian death toll are neither consistent with each other nor consistent with the estimate put out by the United Nations. According to the Mayor of Mariupol, more than 10,000 civilians died during the siege as of April 11, 2022.[552] He continued to state that the death toll could surpass 20,000 in the weeks to come.[61] These statements were made by Mayor Vadym Boychenko in a phone interview with the associated press.[61]

These figures are drastically different from those coming from the United Nations. The United Nations claimed 6,322 deaths in the entire country, including several cities that were

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[552] Yuras Karmanau, Adam Schreck. "Mariupol Mayor Says Siege Has Killed More than 10K Civilians." AP NEWS.

subject to a similar form of siege by Russian forces as Mariupol.[553] The death toll stated by Mariupol's Mayor is also a departure from the claims of the Ukrainian national government, which places the civilian death toll in Mariupol at 2,500.[554]

For the mayor of Mariupol to be correct, both the United Nations and the Ukrainian federal government would have to be wrong in their estimates by several multiples. It is unlikely that the United Nations is drastically wrong in its estimates due to its track record for reporting on human rights, abuses, and civilian casualties resulting from the war as the United Nations is the premier international body that studies crimes against humanity. The mayor of Mariupol's claim of 10,000 to 20,000 deaths suggests that he believes more deaths have occurred in Mariupol alone than the United Nations says has occurred in the whole country. Such a huge discrepancy is cause for revaluation.

Given that the United Nations' research standard is consistent over time. To suggest that the UN is incorrect by several orders of magnitude is to reject the United Nations' research methods altogether. Based on this, a rejection of their verification methods would call into question several decades of established United Nations research. While the siege of Mariupol resulted in substantial civilian casualties, the methods used by the Russian military were similar to those used in several other cities in the early stages of the war in Ukraine. Based on this it is unlikely that one city would have substantially higher casualty rates than other cities that were subjected to similar bombardment.

It is similarly unlikely that the mayor of Mariupol has more accurate civilian, death toll estimates than the national government of Ukraine. As previously discussed, the Government of

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[553] "Ukraine: Civilian Casualty Update 6 March 2023." OHCHR, March 6, 2023.
[554] Macaya, Melissa, Amy Woodyatt, Ben Church, Ed Upright, Maureen Chowdhury, and Jason Kurtz. "Ukraine Puts Death Toll in Mariupol Bombardment at More than 2,500." CNN. Cable News Network, March 15,

Ukraine has a significant interest in demonstrating the severity of its situation to justify its requests for western assistance in the form of both sanctions on Russia and the supply of weapons. Based on this significant incentive, it is unlikely that the federal government of Ukraine would underestimate their claims of Russian aggression on their civilian population. Providing western nations with underestimated death tolls would decrease the likelihood that Ukraine receives the support it desires from western nations.

United Nations Death Toll Reports

The findings of the office of the High Commissioner on Human Rights are consistent with the claims of the Ukrainian government and provide a level of independent verification to the claims of the government of Ukraine. The Ukrainian government's estimate of 2,500 civilian deaths falls within the range of 1,347 (plus thousands of unknown) deaths as detailed by the United Nations.[555] [556] This independent verification increases the likelihood that the Ukrainian government has been accurate in its reporting of civilian death estimates. This analysis estimates with moderate confidence that the death toll figures offered by the Ukrainian government are accurate with the United Nations, figure of 1,347 deaths acting as a minimum bound.

Destruction of Civilian Buildings

Another Ukrainian claim of Russian war crimes is rooted in the general destruction of civilian buildings in Mariupol. These claims accuse Russia of striking civilian structures of various kinds. The structures include workplaces, houses, hospitals, and apartment buildings. These claims can be assessed by assessing satellite images taken both before and after Russia's invasion of Mariupol.

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[555] Macaya, Melissa, Amy Woodyatt, Ben Church, Ed Upright, Maureen Chowdhury, and Jason Kurtz. "Ukraine Puts Death Toll in Mariupol Bombardment at More than 2,500." CNN. Cable News Network, March 15
[556]" High Commissioner Updates the Human Rights Council on Mariupol, Ukraine." OHCHR, June 16, 2022.

Looking at the satellite images a pattern becomes clear. Russian strikes in Mariupol show no evidence of being limited to specific strategic targets within the city.[557] If the Russian strategy was to target strategic locations within the city, you would expect to see destruction focused on those locations. The accompanying satellite imagery shows a drastically different story. In these satellite images taken of multiple different parts of the city, we can see that there is widespread destruction across-the-board. Furthermore, using satellite imagery taken on multiple dates, we can see that this destruction only became present after the beginning of the Russian invasion of Ukraine. These satellite images are significant evidence that the Russian military is responsible for the destruction of civilian targets.[66] When Google Maps data is overlayed on top of imagery that was taken after the invasion, the wide variety of civilian structures that were destroyed is made clear. This Google Maps overlay was not included in this assessment due to copyright issues. [66, 558]

Strike on Shopping Mall

Using satellite imagery, a shopping mall called Port City Mall can be seen destroyed amid the Russian invasion. Is important to note the presence of residential buildings immediately next to the destroyed shopping mall.[66] At the site of these residential structures, similar types of damage to the mall can be seen. It is unclear whether these buildings were occupied at the time of the strike. If these buildings were occupied, civilian casualties would be likely.

The destruction of this mall represents not only the human impact of these strikes, but also the economic impact. The port city mall is likely responsible for a small portion of the city's economic output, in terms of GDP, relative to the steel plants. However, it likely supported many business owners and their employees. The business owners who operated out of this mall no

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[557] ArcGIS Living Atlas of the World. "World Imagery Wayback." Redirect. Accessed March 20, 2023.
[558] Google maps. Google. Accessed March 20, 2023

longer have a means of supporting themselves even once the war ends. This is true of the mall and the countless other businesses that were destroyed. The recovery from the existing humanitarian crisis will likely take longer than it would otherwise because of this. An extended recovery would bolster the Ukrainian Government's claims of CAH.

Apartment Buildings

In satellite imagery we can see significant evidence of explosions and fire at the sight of buildings that combine both residential and retail spaces.[559] This damage is not consistent with that of a precision strike and is more in line with what you would expect from a general bombardment.

To determine who is responsible for this destruction, it is relevant to ask whether these buildings were being used as positions by one side or another in this conflict. Due to the lack of precise troop position data that this analysis has access to, it is unclear whether any troops occupied these buildings at the time they were fired upon, and if they did which side the troops were from. However, a combination of Russian military doctrine and historical precedent can be used to assess the likelihood that these acts were committed by one side or the other.

These attacks appear to be consistent with Russian military doctrine. In the past, as described above, it has been a tactic of the Russian military, to surround the city, and bombard it with munitions to enable ground forces to move in to capture strategic points within a city. This was described above in the discussion about the first and second Chechen wars. This strategy is also enabled using affordable weapons to which Russia has significant access. Russia would likely be judicious with its use of more precise, weapons such as cruise missiles due to their

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[559] Google maps. Google. Accessed March 20, 2023

expense. Based on this, it follows that Russian forces would heavily rely on imprecise munitions, such as multiple-launch rocket systems that have a large kill zone.

The large kill-zone of these multiple-launch rocket systems is consistent with the damage that we see in the satellite imagery. In many of these images, we see craters or evidence of explosions of a similar size spread across a large area. Multiple launch rocket systems typically fire rockets of equal size within a given system. Based on this, the satellite images can be viewed as evidence for the use of multiple launch rocket systems in Ukraine, and in the attack on the city of Mariupol. It is likely that Ukrainian claims of widespread Russian strikes on civilian locations are accurate based on this evidence.

Final Findings

This estimate assesses with high confidence that the Ukrainian Government's claim that war crimes have been committed in Mariupol is accurate. This conclusion is based on evidence including photographic, video, satellite imagery and is consistent with the findings of the U.S. State Department.[560] This report presents examples of multiple photos and videos that are confirmed to show the destruction of civilian targets in Mariupol. These images and videos are confirmed to have occurred in the city of Mariupol using geolocation techniques. Furthermore, the claim of the Ukrainian government that war crimes have been committed in Mariupol is supported by satellite imagery showing hundreds of destroyed civilian buildings.

These claims are also supported by Russia's history of crimes against humanity from both the First and Second Chechen Wars. The tactics used in each of these wars are consistent with those which appear to have been used in the city of Mariupol. In both Chechen wars, the Russian military heavily relied on the use of low-accuracy munitions such as multiple-launch

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[560]" War Crimes by Russia's Forces in Ukraine - United States Department of State." U.S. Department of State. U.S. Department of State

rocket systems. These tactics are consistent with those seen in the siege on Mariupol. Russia has set a precedent for committing crimes against humanity and showing little regard for civilian targets. This increases the likelihood that claims of Russian war crimes in Ukraine are accurate.

The final factor that supports this claim is the significant strategic incentives that Russian forces had to capture the city of Mariupol. These strategic incentives likely encouraged an expedient attack on the city that allowed for little mitigation of civilian casualties. The Russian military likely recognized the importance of decreasing Ukraine's production capability, therefore weakening the capability of their force. Additionally, the value of connecting Crimea to the mainland of Russia gave Russia an additional incentive to capture the city of Mariupol in the earliest stages of the war, as it would provide them with a logistical connection to enable advances from the south of the nation. Finally, the Russian need for warm water ports gave Russian battle planners an additional incentive to capture the city of Mariupol as quickly as possible.

This estimate assesses with medium confidence that the Ukrainian Government's claim that 2,500 civilians were killed in the invasion of Mariupol is a functional approximation of the real death toll. Using the United Nations civilian death estimates data as a baseline, as described previously, we conclude that the figures presented by the government of Ukraine are within the realm of possibility. This claim, however, can only be made with medium confidence due to the inability to have investigators from the Ukrainian government on the ground, to confirm or deny deaths due to the Russian occupation. Satellite imagery of the city supports the claim that significant civilian deaths occurred. However, it cannot be used to verify the specific number of civilian deaths that have occurred. This limitation of satellite imagery comes from the inability of satellite imagery to confirm the number of occupants in a building.

Future analysis could assign occupancy estimates to destroyed buildings to estimate the number of civilian casualties per building. However, this method would likely lead to significant inaccuracy due to the inability to control for a sufficient number of variables and the necessity to rely on many assumptions.

This estimate states with medium confidence that the civilian death estimates of city officials in Mariupol are not accurate. The claims made by the mayor of Mariupol that between 10,000 and 20,000 civilians have died in the city represent a significant deviation from the numbers presented by the United Nations. It is unlikely that more civilians died in the attacks on Mariupol and then died in the attacks across the entire country of Ukraine according to the United Nations. Additionally, this estimate finds that the timeline that the mayor of Mariupol had to confirm each of these civilian deaths is not feasible. These claims were made by the mayor in April 2022, just over a month after the initial invasion began. It is unlikely that the mayor could confirm each of these deaths in just over a month. To confirm a single civilian death, the government would have to prove that an individual is a civilian, in addition to proving that they died as a result of a Russian strike. Because of this, it is unlikely that a local government could have the organizational capacity to confirm the deaths of 20,000 civilians in just over a month.

The confidence level of the conclusion that local government civilian casualty claims are inaccurate remains medium due to the lack of a method to falsify the claim. While it is unlikely that the mayor of Mariupol was able to verify his claims so quickly, the inability of this analysis, to definitively prove that he is right or wrong prevents this claim from being made with high confidence.

Annex A

Verifying the location of video taken at theater:

Civilians taking shelter within the theater.

3 of the 6 spires of the Church of the Intercession of the Mother of God.

Small white building with slopped roof

Church of the Intercession of the Mother of God.

Small white building with slopped roof

Camera is in this zone

Annex B

Stitched together screenshots from the video posted by Zelenskyy were used to create a panoramic view of the hospital's courtyard to be used for geolocation.

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Use of Russian Disinformation to Dissuade International Support of Ukraine

BLUF

The Russian Federation is conducting disinformation campaigns to erode international support for Ukraine.

Abstract

The Russian Federation continues to use disinformation campaigns throughout the Ukrainian War to undermine international support for Ukraine. The Kremlin has an established history of utilizing disinformation tactics tracing back to the imperial Tsars and to the Soviet Union KGB. Today's disinformation operations are conducted by Kremlin intelligence agencies and non-state actors that manipulate media through new networks, social media, and online news sources. These state agencies and non-state actors, all sanctioned by Vladimir Putin, adopt disinformation practices and campaigns to sabotage global support for Ukraine and alter the perception of Russia and Vladimir Putin around the globe. Beginning with the annexation of Crimea in 2014 and the surrounding misinformation to cover up Russian actions, the Russian Federation continues to endorse similar disinformation operations leading up to its invasion of Ukraine in 2022. Russian disinformation surrounding the ongoing invasion of Ukraine indicates a strong persistence to dissuade international support for Ukraine. Moving forward from 2022 and into the second year of the invasion, this paper assesses with high confidence that the Kremlin's propaganda tactics will only further drive a wedge into Ukraine's base of international support.

Analytical Methods

This analysis examines the intricacies of Russian disinformation and how it ultimately affects international support for Ukraine. This report uses three key judgments which are 1) the Russian Federation has a vast tradition and precise approaches to conduct disinformation campaigns, 2) the Kremlin is actively using disinformation tactics in its current war with Ukraine, and 3) the disinformation campaigns of the Russian Federation are undermining global support for Ukraine. Using a qualitative research approach, this analysis looks at historical and current cases of Russian disinformation and evaluates how the Kremlin utilizes propaganda to distract and subvert viewers' perceptions about the war in Ukraine. Based on these cases of misinformation, a level of confidence, i.e., high, medium, or low was assigned as to the likelihood of whether Russia is spreading disinformation against Ukraine during the war and if this disinformation factors into global support for Ukraine. Using satellite imagery, Botometer (which is a learner algorithm that assesses the probability of a Twitter account created by a human or by a bot based on factors such as linguistics, friend networks, activity patterns, etc.)[561], social media platforms, and online journal articles and reports, this analysis breaks down these cases of Russian disinformation and confirms them as falsehoods designed to erode international support for Ukraine. Initially, it was challenging to pick apart and reveal how these cases were fabrications spread by Russia and the Kremlin and then correlate that with declining support for Ukraine in other countries. Through examination across numerous sources and platforms, and by collecting smaller pieces of information to build a bigger picture, it became clear how the

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[561] Mohsen Sayyadiharikandeh et al., "Detection of Novel Social Bots by Ensembles of Specialized Classifiers," in *Proceedings of the 29th ACM International Conference on Information & Knowledge Management*, 2020, 2725–32, https://doi.org/10.1145/3340531.3412698, 2725.

Kremlin uses precise techniques to distract, deny, and spread deception that negatively affects the international community's outlook on the Russian-Ukrainian War.

Key Judgements

Key Judgement One: The Russian Federation has an institutional legacy of creating and spreading disinformation around the globe utilizing various propaganda tactics. From imperial Russia ruled by Tsars, the Cold War and the KGB, and finally the Kremlin today ruled by Vladimir Putin, the Russian government employed and continues to employ propaganda tactics against its enemies. The secret police of the Russian Empire used misinformation tactics against revolutionary and communist forces to quell rebellion against the Tsars.[562] Post World-War II, the Soviet Union conducted operations domestically and internationally to ensure the security of the Russian State and undercut American influence.[563] After years of refining their tactics, the Russian Federation leverages propaganda tactics against their enemies today, especially in Ukraine beginning in 2013, using various frameworks and platforms carried out by state and non-state actors.[564]

Key Judgement Two: This report assesses with high confidence that Russia is using disinformation tactics to distract and divert attention in its war with Ukraine. Looking at the examples of grain stealing, fraudulent posts by fake accounts on Twitter, claims of infectious

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[562] Iain Lauchlan, "Security Policing in Late Imperial Russia," in *Late Imperial Russia: Problems and Prospects. Essays in Honour of R. B. McKean* (Manchester: Manchester University Press, 2005), 44–63, https://core.ac.uk/display/9049957?utm_source=pdf&utm_medium=banner&utm_campaign=pdf-decoration-v1, 3.

[563] Andrzej Krzak, "Operational Disinformation of Soviet Counterintelligence during the Cold War," *International Journal of Intelligence and CounterIntelligence* 35, no. 2 (April 3, 2022): 265–78, https://doi.org/10.1080/08850607.2021.2014280, 266.

[564] "Disinformation and Russia's War of Aggression against Ukraine," OECD, accessed March 20, 2023, https://www.oecd.org/ukraine-hub/policy-responses/disinformation-and-russia-s-war-of-aggression-against-ukraine-37186bde/.

outbreaks caused by Ukrainian labs, and the Kremlin denying strikes against Ukrainian

residential areas, it indicates that the Russian Federation actively conducts disinformation

operations. Using varying methods of propaganda across different platforms, the Russian

Federation is devoted to distracting the world from its actions and denying allegations made

against them.

Key Judgement Three: This report assesses with high confidence that these disinformation

campaigns undermine global support for Ukraine. As the Russian Federation conducts

disinformation operations inside of Ukraine and on online platforms with global audiences, the

Kremlin skews the perception about the war. Since Russia has spread disinformation about the

events in Ukraine, there has been an uptick in support for Russia spread by African and Latin

American countries across online platforms.[565] Additionally, with increased support for Russia

by these nations, the Kremlin has found a way to evade the sanctions placed by the West by

using these pro-Russian countries to supply them with the resources they need.[566]

Discussion

Key Judgement One:

A Brief History of Russian Propaganda

Employing deception in military strategy is not a new concept. In the *Art of War* by Sun

Tzu, he discusses the importance of deception when fighting against an enemy. Russia has an

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[565]Aloysius Uche Ordu and Mary Blankenship, "Russia's Narratives about Its Invasion of Ukraine Are Lingering in Africa," *Brookings* (blog), June 27, 2022, https://www.brookings.edu/blog/africa-in-focus/2022/06/27/russias-narratives-about-its-invasion-of-ukraine-are-lingering-in-africa/..
[566]Ibid.

institutional legacy of disinformation that begins with the Tsar's secret intelligence police and evolves into 21st century social media "internet trolls" (Russians paid by the government "to use fake identities to establish hundreds of accounts on Facebook, Instagram, Twitter, and other social media. Within time, those accounts gain followers and became more influential"[567]). This historical legacy underpins the creativity and devotion of the Russian Federation to undermine its enemies. Beginning with the Okhrana forces, they conducted intelligence activities to seek out revolutionaries in the Russian Empire and protect the Tsar.[568] After the Okhrana came the Cheka, later named the GPU (State Political Directorate) in 1922, worked to promote communism and suppress support for the Tsars after the communist revolution overthrew them.[569] The Cheka were tasked with consolidating power for their new government by using disinformation tactics on their own people.[570]

The post-war period of World War II only grew the Soviet Union's disinformation campaigns and intelligence agencies' capabilities. After World War II, the Soviet Union now controlled almost all Eastern Europe, which was a challenging task. To better control its territories, the Soviet Union created the KGB (evolved from the GPU), the First Chief Directorate, Department D in the 1950s. The KGB produced forgeries and overall propaganda for the Soviet Union starting in the 1940s and continuing onwards to undermine the United States' vision for world peace and lessen the influence and power of the United States.[571] This

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[567] Spyscape, "Inside Russia's Notorious 'Internet Research Agency' Troll Farm," Spyscape, accessed April 13, 2023, https://spyscape.com/article/inside-the-troll-factory-russias-internet-research-agency.

[568] Aaron F. Brantly, "A Brief History of Fake: Surveying Russian Disinformation from the Russian Empire through the Cold War and to the Present," in *Information Warfare in the Age of Cyber Conflict* (Routledge, 2020), 28.

[569] Richard Shultz and Roy Godson, *Dezinformatsia: The Strategy of Soviet Disinformation* (New York: Berkley Books, 1986), 34.

[570] Ladislav Bittman, *The KGB and Soviet Disinformation: An Insider's View* (Washington D.C.: Pergamon-Brassey's International Defense Publishers, 1985), 36-37.

[571] Brantly, "A Brief History of Fake," 30.

department was later renamed to Department A in 1968 as the active measures department.[572]

Active measures are the comprehensive influence activities of the Kremlin through espionage, propaganda, and sabotage.[573] They were "directed by the KGB [and] designed for internal demoralization and erosion of power in target countries."[574] The goals of the KGB and its active measures included exterminating foreign intelligence networks and agents while simultaneously manipulating these foreign intelligence agencies' intentions to help achieve Soviet counterintelligence goals.[575]

In the late 40s and 50s, active measures by the Soviet Union included international fronts and shell organizations to promote Russian foreign policy such as the World Peace Council of 1949 and the Afro-Asian People's Solidarity Organization in 1957 to spread Soviet influence in the Third World.[576] In the 1980s, the Soviet Union used active measures against the United States during Operation Infektion.[577] The KGB prompted the idea that the United States was responsible for the creation and outbreak of HIV by publishing an article titled "AIDS may invade India: Mystery disease caused by US experiments."[578] This only prompted further articles by the Soviets and KGB, and soon enough, the United States credibility was ruined in the eyes of the world, especially in the third world where HIV rates are much higher.[579] Another example comes from the manipulation of oil prices. In 1981, a report from *PetroStudies* (a shell company out of Sweden run by a communist exile from Yugoslavia and geologist) claimed that the Soviet

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[572]Shultz and Godson, *Dezinformatsia: The Strategy of Soviet Disinformation*, 37.

[573]Sanshiro Hosaka, "The Kremlin's Active Measures Failed in 2013: That's When Russia Remembered Its Last Resort—Crimea," *Demokratizatsiya: The Journal of Post-Soviet Democratization* 26, no. 3 (2018): 321–64, 321.

[574] Bittman, *The KGB and Soviet Disinformation: An Insider's View*, 2.

[575]Krzak, "Operational Disinformation of Soviet Counterintelligence during the Cold War.", 269.

[576]Shultz and Godson, *Dezinformatsia: The Strategy of Soviet Disinformation*, 25-26.

[577] Brantly, "A Brief History of Fake," 34.

[578] Brantly, "A Brief History of Fake,", 34.

[579]Ibid.*,* 34-35.

Union found 4.5 trillion barrels worth of oil in Siberia.[580] This disinformation created by the KGB sent oil prices down and allowed Soviet satellite states to buy oil at lower prices.[581]

It is important to note, however, that there were no independent broadcasts or journalists in the Soviet Union, as all independent media was essentially banned.[582] The Soviet Union's tight grip on the media effectively censored domestic but also foreign media because foreign broadcasts must follow Soviet broadcasting rules (i.e., not cover censored or banned topics) to be aired.[583] Today, the Kremlin still restricts the information entering the Russian Federation and the information that reaches its people while simultaneously manipulating perceptions about itself outside of its borders.

These types of active measures were not used just one time but would later be seen throughout many of Russia's disinformation and propaganda campaigns, especially during its annexation of Crimea and eventual invasion of Ukraine.

Disinformation from 2013 Euromaidan Revolution and 2014 Annexation of Crimea

The Russian Federation continues to use its disinformation tactics not only against its enemies during the Cold War or during the 2016 American Presidential elections, but it utilized these tactics in campaigns against Ukraine during its 2013 Euromaidan Revolution and the 2014 annexation of Crimea.[584] When Ukrainian President Viktor Yanukovych refused to sign the association agreement with the European Union in 2013, protesters took to the streets of Kyiv to

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[580] Bittman, *The KGB and Soviet Disinformation: An Insider's View*, 214.
[581] Ibid., 214-215.
[582] OECD, "Disinformation and Russia's war of aggression".
[583] Ibid.
[584] Brantly, "A Brief History of Fake,", 28.

protest their government's close relationship with Vladimir Putin and Russia.[585] Before the early 2000s, Ukraine was almost indistinguishable from Russia and many Soviet symbols and leaders remained in place even after Ukraine's independence in the early 90s.[586] Many Ukrainians wanted to break their ties with Russia as a former Soviet nation and align more with the West. By early 2014, protests against Yanukovych's government became violent, and many Ukrainians were arrested, assaulted, and even kidnapped after he enacted repressive anti-protest laws.[587] By late February, Yanukovych fled the country, and the Ukrainian parliament gave his administration a vote of no confidence, thus resulting in the election of Petro Poroshenko as president a few months later.[588]

However, Putin's buffer zone (Ukraine) against Western powers no longer exists if Ukraine were to become a member of the EU. As Putin felt Ukraine slipping away from his grasp and into his enemies' hands, he sought a way to bring Ukraine back under Russian influence, i.e., a disinformation campaign using active measures. The Russia's Federation's plan was simple: "prevent Ukraine from signing the association agreement; formulate an influential network of pro-Russian social and political forces; [and] neutralize the political and media influence of Euro-integration supporters."[589] Russia used active measures against protesters and portrayed anyone supporting Euromaidan as fascists.[590] The Kremlin even mobilized internal service

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[585] Peter Dickinson, "How Modern Ukraine Was Made on Maidan," *Atlantic Council* (blog), August 21, 2021, https://www.atlanticcouncil.org/blogs/ukrainealert/how-modern-ukraine-was-made-on-maidan/.
[586] Ibid.
[587] "Understanding Ukraine's Euromaidan Protests," Open Society Foundations, May 2019, https://www.opensocietyfoundations.org/explainers/understanding-ukraines-euromaidan-protests.
[588] Ibid.
[589] Hosaka, "The Kremlin's Active Measures", 331.
[590] Chad W. Fitzgerald and Aaron F. Brantly, "*Subverting Reality: The Role of Propaganda in 21st Century Intelligence,*" *International Journal of Intelligence and CounterIntelligence* 30, no. 2 (April 3, 2017): 215–40, https://doi.org/10.1080/08850607.2017.1263528, 231.

members through Russian social media networks to participate in these rallies.[591] At these rallies, the internal service members would promote Ukrainian "fascism" and Nazi ideals to undercut the Ukrainian government's control over its people in 2013 and 2014.[592] However, after examining Ukraine and its relationship with Jewish people, one sees that Jewish people have held many important political roles including the role president, as evident of Volodymyr Zelensky, who has Jewish heritage.[593] Additionally, beginning in the early 2000s, the Kremlin took advantage of the growing internet sphere by focusing heavily on creating spam and search optimization to spread misinformation.[594] As the internet exploded across the globe, Putin had the perfect place to employ his propaganda online.[595]

One example of the Russian Federation using disinformation tactics against Ukraine was during the annexation of Crimea in 2014. After Yanukovych fled Ukraine and a vote of no confidence was enacted by the Ukrainian Parliament, Putin decided to send troops into Crimea.[596] The Kremlin initially denied any involvement of Russian troops in Crimea or involvement with insurgents in the Donbass region.[597] Putin insisted that Russian forces did not occupy government buildings nor surround Ukrainian military bases, but rather it was local self-defense forces.[598] With the help of the Internet Research Agency (IRA), the West was unable to

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[591] Todd C. Helmus et al., "Russian Social Media Influence: Understanding Russian Propaganda in Eastern Europe" (RAND Corporation, April 12, 2018), https://www.rand.org/pubs/research_reports/RR2237.html,16.
[592] Ibid.
[593] Sam Sokol, "Russian Disinformation Distorted Reality in Ukraine. Americans Should Take Note. – Foreign Policy," Foreign Policy, August 2, 2019, https://foreignpolicy.com/2019/08/02/russian-disinformation-distorted-reality-in-ukraine-americans-should-take-note-putin-mueller-elections-antisemitism/.
[594] S. Sanovich, "Computational Propaganda in Russia: The Origins of Digital Misinformation," June 19, 2017, 1–25, .9.
[595] Ibid.
[596] Dickinson, "How Modern Ukraine Was Made on Maidan."
[597] Bill Chappell and Mark Memmott, "Putin Says Those Aren't Russian Forces In Crimea," NPR, March 4, 2014, sec. The Two-Way, https://www.npr.org/sections/thetwo-way/2014/03/04/285653335/putin-says-those-arent-russian-forces-in-crimea
[598] Ibid.

fully confront the Russian Federation about the annexation of Crimea because of the mass

confusion caused by the IRA's false account of Russia's participation in the events.[599] The IRA

also portrayed the invasion of Crimea as the idea of the Ukrainian people to reunite with Russia,

and the insurgency in Donbass as a civil war that was started by pro-Russian Ukrainians that

wanted to reunite with Russia.[600] President Vladimir sat down with Russian journalists and

answered their questions about the events surrounding Ukraine, saying it "was an anti-

constitutional takeover, an armed seizure of power" by Ukrainians.[601] Throughout the rest of the

interview, Putin went on to blame the Ukrainian government for allowing this violence that could

have been avoided if the "government had been strong, confident, and had built a stable

system."[602] He argued that "no nationalists would have been able to carry out those programs

and achieve the results that we see now" if it were not for the weakness of the Ukrainian

government.[603]

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[599] Larissa Doroshenko and Josephine Lukito, "Trollfare: Russia's Disinformation Campaign During Military Conflict in Ukraine," *International Journal of Communication* 15, no. 0 (October 28, 2021): 4662-4689, 4666.
[600]Ibid.
[601] Team of the Official Website of the President of Russia, "Vladimir Putin Answered Journalists' Questions on the Situation in Ukraine," President of Russia, March 8, 2014, http://en.kremlin.ru/events/president/news/20366.
[602] Ibid.
[603] Ibid.

Additionally, the Kremlin attempted to deny these accusations of Russian involvement by using Russian state news networks. TASS (Russian state channel) quoted the Russian Defense Minister Sergei Shoigu as saying the people in unmarked uniforms in Crimea have no affiliation to the Russian army (Figure 1). High ranking government officials in the Kremlin outright
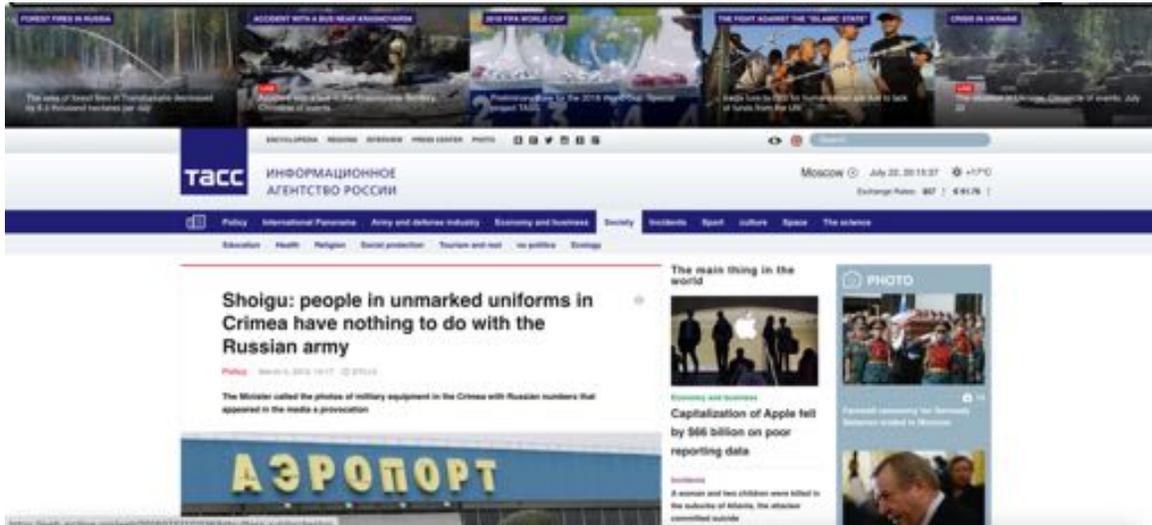

Figure 1: TASS Network denying claims of Russian soldiers in Crimea.

TASS Russian News Agency. Shoigu: people in unmarked uniforms in Crimea have nothing to do with the Russian army. 2014. Website screenshot. TASS Russian News Agency,
https://web.archive.org/web/20150716061221/http://tass.ru/obschestvo

denied these accusations, even with evidence piling up against them. By examining Russian social media sites, there is evidence to substantiate the fact that Russian troops did invade Crimea. These Russian soldiers hid "under masks and [wore] uniforms without insignia. They called themselves 'polite people', and in the media they were dubbed – 'little green men.'"[604]

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[604] Vasgri, "Identified: Servicemen of 49th Army Who Participated in the Aggression against Ukraine," InformNapalm.org (English), November 12, 2021, https://informnapalm.org/en/identified-servicemen-of-49th-army-who-participated-in-the-aggression-against-ukraine/.

Inform Napalm, an international volunteer community, investigates and debunks Russian disinformation.[605] Using Russian social media websites, Inform Napalm was able to identify one Russian soldier from the 49th Army who participated in the invasion of Crimea.[606] This man's name is Stanislav Zhelokov, and he is a Russian soldier in the 49th army.[607] On April 7th, 2014, Zhelokov posted on the Russian social media website ok.ru pictures of his medal and certificate for participating in the invasion of Crimea (Figure 2). Even with evidence of Russian troops
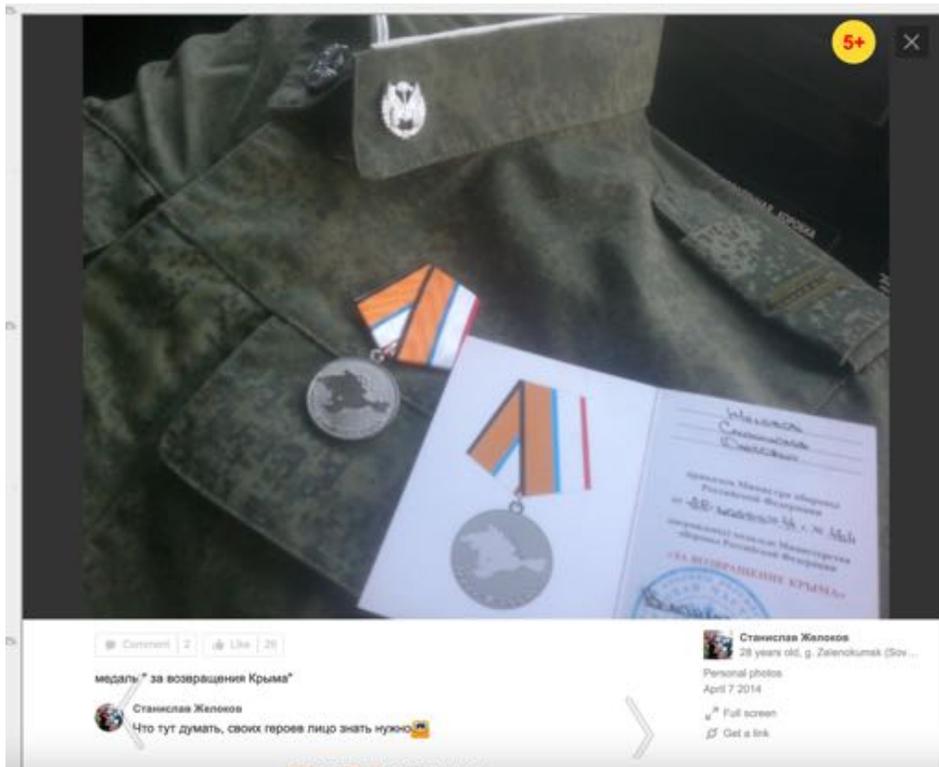

Figure 2: Zhelokov posting his medal and award for his actions in Ukraine.

Stanislav Zhelokov. Ok.ru Post. April 7, 2014.

posting their involvement with the invasion of Ukraine, the Russian Federation still denied these accusations and claimed it was pro-Russian forces operating inside of Ukraine. With denial and

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[605] Ibid.
[606] Ibid.
[607] Ibid.

subversion from Putin and the defense minister, the Kremlin can manipulate online media and cast doubt over the annexation of Ukraine.

Kowalewski summarizes the way in which Russia used disinformation during the invasion of Crimea in her article:

> Russia attempted to disguise the presence of Russian forces by deploying men in uniforms without insignia and concealed its goals and involvement by publicly denying Russian participation. On other fronts, Russia simultaneously continued to threaten NATO and the West through overflights and hinting at the use of nuclear weapons. Together, these acts constitute a 'denial and deception' operation.[608]

From this point on, Russia annexed Crimea and their disinformation campaign only fractured the regions of eastern Ukraine even more. These "increases in disinformation further isolated the target population from objective information frameworks, making even preposterous stories seem accurate and plausible."[609] This disinformation campaign made it difficult to decipher the truth about events taking place in Ukraine. While ambiguity plagued Ukraine, the main actor at play- Russia- retained plausible deniability and was able to achieve its goals of annexing Crimea.

Malaysian Airlines Flight 17 (MH17) serves as another prime example of weaponized disinformation. The Russian Federation tried to claim that Ukrainians shot down the flight instead of Russian led troops.[610] Russia tried to back these claims with doctored satellite images that were promoted on Channel One (state-funded Russian channel) on Mikhail Leontiev's Odanko program in November of 2014.[611] Later, these findings were posted all over Russian

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[608] Annie Kowalewski, "Disinformation and Reflexive Control: The New Cold War," Georgetown Security Studies Review, February 2, 2017, https://georgetownsecuritystudiesreview.org/2017/02/01/disinformation-and-reflexive-control-the-new-cold-war/.

[609] Fitzgerald and Brantly, "Subverting Reality.", 232.

[610] Bellingcat Investigation, "MH17 - The Open Source Investigation, Three Years Later," July 17, 2017, https://www.bellingcat.com/news/uk-and-europe/2017/07/17/mh17-open-source-investigation-three-years-later/.

[611] Ibid.

media, including the TASS news agency (Figure 3).[612] This "break in the case" for Russia

proving Ukraine shot down MH17 all came from one blog posting a doctored satellite image of a
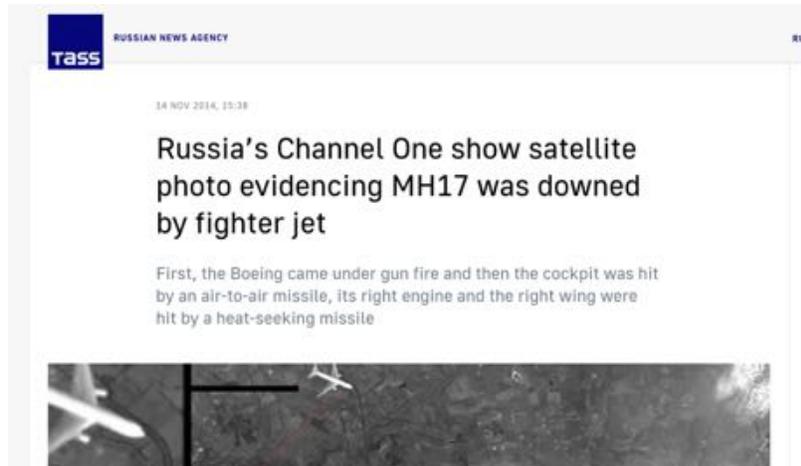
Figure3: TASS News Agency supporting claim that Ukraine downed MH17.

TASS Russian News Agency. Russia's Channel One show satellite photo evidencing MH17 was downed by fighter jet. 2014. Website screenshot. TASS Russian News Agency, https://tass.com/world/759835

supposed Ukrainian fighter jet in the vicinity of MH17 on July 27, 2014 (Figure 4).[613] However,

many people noticed discrepancies with the photo in terms of the fighter jets model, cloud and

crop formations, and the plane's relative size/scale to its altitude.[614] This satellite image was then

debunked as a fake, but not before Russia caused confusion and created doubt amongst the

international community.[615]

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[612] Ibid.

[613] "Kremlin Has Mastered Propaganda, But Not Photoshop: Fake MH17 Photo Lights Up RuNet," *Global Voices* (blog), November 15, 2014, https://globalvoices.org/2014/11/15/russia-photoshop-kremlin-mh17-ukraine-crash/.

[614] Ibid.

[615] Bellingcat Investigation, "MH17 - The Open Source Investigation, Three Years Later."

Figure 44: Manipulated satellite image of Ukrainian fighter jet shooting down MH17.
Shmon. Message Board. July 26, 2014. 7:13 p.m. https://obkon.ucoz.com/forum/59-1403-1#6869.

Later, new evidence came out and implicated Russian-led troops as the ones who shot

down the passenger plane with Russian missiles, killing all 298 passengers on board.[616]

Ukrainians living in the vicinity of Hrabove posted on social media pictures of a rocket trail

around the same time MH17 crashed (Figure 5 & 6). These pictures helped identify where the

Figure 42: Witness taking photo of rocket launch.
Мізору₄₄ія крокує планетою. Twitter Post. July 17, 2014, 12:23 p.m. https://twitter.com/WowihaY

Figure 43: Witness taking photo of rocket launch. Maxim Podchasov. VK Post. July 17, 2014, 1:29 p.m. https://vk.com/maximpodchasov

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[616] Ibid.

missile launch site resided and that it was a land-based rocket that took down MH17 (not a Ukrainian fighter jet as Russia claimed).

The Russian Federation conducted disinformation campaigns during its annexation of Crimea and around the crash of MH17. Through meticulous planning and efficient use of propaganda tactics, the Russian Federation was able to cast doubt over these events, which allowed them to annex Crimea with impunity and deny their involvement with MH17. By creating differing opinions surrounding these events in Ukraine, Russia was successfully able to sow doubt and mask its true intentions because "if nothing is true, then anything is possible."[617]

How Russia Conducts Disinformation in Today's World:

With the advancement of technology and availability of high-speed internet, information is available within seconds of a google search. Within seconds of something happening in one part of the world, the other half already has access to video footage, images, and reports of that event. News outlets and social media platforms flood people's feeds, and it can be difficult to conceptualize the facts when numerous sources report different accounts. The Kremlin takes advantage of this initial confusion and cycles disinformation into their news feeds to manipulate people's understanding of the situation for Russia's own gain.[618] Before diving into the different agencies and non-state actors responsible for disinformation, it is important to note the framework in which Russia creates and manipulates disinformation against its enemies. Its active

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[617] Doroshenko and Lukito, *"Trollfare", 4666.*
[618] Kowalewski, "Disinformation and Reflexive Control: The New Cold War,".

measures (means of conducting disinformation) include a large spectrum of propaganda/disinformation techniques and reflexive control.

The spectrum of propaganda techniques ranges from white, gray, and black.[619] The technique of "white propaganda refers to unambiguous, openly identifiable sources in sharp contrast to black propaganda in which the source is disguised. Gray propaganda sits somewhere in between these classes with the source not being directly credited nor identified" making it exceedingly difficult to trust these sources without further probing the information presented.[620] Black propaganda becomes the most dangerous form of propaganda, as these disguised sources have no true origin and their intent can be misleading, thus causing negative effects on the thing or person it targets.[621]

The other framework Russia uses is reflexive control, a Cold War strategy used by the Russian Federation that manipulates another state into making decisions favorable to the Kremlin.[622] In other words, "reflexive control is a sustained campaign that feeds an opponent select information so that the opponent makes the decisions that one wants him/her to."[623] Not only is the goal of this tactic to provide disinformation, but it is to provide an absurd amount of disinformation to confuse the enemy and not allow for a clear path in their decision.[624] There are four dimensions to reflexive control: dismissal, distortion, distraction, and dismay.[625]

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[619] Marco Bastos and Johan Farkas, "'Donald Trump Is My President!': The Internet Research Agency Propaganda Machine," *Social Media + Society* 5, no. 3 (April 1, 2019): 2056305119865466, https://doi.org/10.1177/2056305119865466.

[620] Ibid.

[621] Johan Farkas and Christina Neumayer, "Disguised Propaganda from Digital to Social Media," in *Second International Handbook of Internet Research*, ed. Jeremy Hunsinger, Lisbeth Klastrup, and Matthew M. Allen (Dordrecht: Springer Netherlands, 2018), 1–17, https://doi.org/10.1007/978-94-024-1202-4_33-1, 10.

[622] Kowalewski, "Disinformation and Reflexive Control."

[623] Ibid.

[624] Doroshenko and Lukito, *Trollfare,* 4664.

[625] Ibid.

Doroshenko and Lukito provide an understanding of each of these dimensions in their article

Trollfare:

> Dismissing presents evidence in a way that obfuscates objectives of the controlling agent or denies presented evidence. Distortion alters one's perception of reality by presenting various falsehoods: from made up "facts" to characteristics of institutions and people. Distraction creates a real or imaginary threat or reveals new evidence, which forces an adversary to reconsider a decision. Dismay buffs and dramatically escalates the situation to discourage an opponent from taking an action.[626]

With each of these dimensions, Putin slows the speed of his opponent's decision-making abilities, i.e., with an overload of information, his enemies are forced to disseminate through it all. Speed remains an extremely important part of an actor's ability to win a war because speed over time is tempo, which allows forces to operate efficiently and quickly. Putin slows down his enemies with reflexive control by preventing them from making a decision, which ultimately allows him to seize the initiative and operate on his own terms.[627] Due to its efficacy, this assessment argues with a high level of confidence that the Russian Federation will continue to use reflexive control and white, gray, and black propaganda techniques as methods to spread disinformation across the globe.

The Russian Federation uses a three-step process to spread disinformation and cause confusion. The first step-lurking- has a Russian troll post controversial information about a certain event.[628] The second step -taking the bait- involves regular viewers responding to the original post, but before someone would respond, more trolls would post comments in agreement

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[626] Ibid., 4665.

[627] Marek N. Posard et al., "From Consensus to Conflict: Understanding Foreign Measures Targeting U.S. Elections" (RAND Corporation, October 1, 2020), https://www.rand.org/pubs/research_reports/RRA704-1.html.

[628] Helmus et al., "Russian Social Media Influence." 22.

or opposition to the original article/tweet to prompt regular viewers to respond.[629] The last step-haul in- would have trolls disagree with the article's opinion, making it seem as if there were differing views on the invasion and there was no right or wrong perspective.[630] This false hero in the third step that seems to be pro-Ukrainian now prompts pro-Russian viewers to respond and engage with the article.[631] This tactic employed by the Russian Federation and its internet trolls only creates a feedback loop where more people engage with the article, and the difference of opinions becomes increasingly a mainstream topic. This "differing of opinions" amongst people examining this conflict only further perpetuates confusion and misunderstandings about Russia's true intentions and goals.[632] By using these strategies, the Russian Federation paints itself in a better light and makes its invasion of Crimea seem like a reasonable and fair action to take. Putin and his internet trolls operated under the motto "if nothing is true, then anything is possible," and continued to create mass confusion for the rest of the world.[633] An overwhelming amount of false information does not allow readers to grasp the facts of the conflict and makes anything written by Russian internet trolls seem like a possible event.

When looking at the ways the Russian Federation conducts its disinformation campaigns, it is imperative to examine the different state agencies and non-state actors responsible for producing intelligence for Russia and the Kremlin. State agencies include the Foreign Intelligence Service of the Russian Federation (SRV), the Federal Security Service (FSB), the Main directorate of the General Staff of the Army (GRU), and non-state actors such as the

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[629] Ibid., 22.
[630] Ibid., 23.
[631] Ibid.
[632] Paul and Matthews, "The Russian 'Firehose of Falsehood' Propaganda Model: Why It Might Work and Options to Counter It.", 2.
[633] Doroshenko and Lukito, *Trollfare,* 4666.

IRA.[634] While some of these agencies have other specific functions like security or military aspects, all these agencies seek the attention of the Kremlin and compete against each other to provide and manipulate intelligence that shapes world perception of Russia in a better light, or generate strife and contention in his enemies' countries.

The Russian Federation has three main intelligence agencies that provide the Kremlin with information and conduct intelligence operations themselves. The three agencies are the SVR, FSB, and the GRU.[635] The SVR (foreign civilian intelligence agency) comparable to the Central Intelligence Agency (CIA), the FSB (an agency responsible for domestic security and counterintelligence) comparable to the FBI, and finally the GRU (foreign military intelligence agency) also comparable to the CIA serve as Russia's primary intelligence agencies.[636] These government agencies remain highly involved in disinformation campaigns and play a significant role in their success. However, the intelligence agencies of the Russian Federation operate much more aggressively than their American counterparts and compete amongst another, which results in high-risk taking.[637] They have seen a massive influx of funds and growth of power under Vladimir Putin and hold more power than ambassadors or even the foreign minister.[638] However, with this power comes great corruption and competition amongst the agencies. With Putin in charge of their resources and power, each of these agencies works to outdo the other or faces "being swallowed whole" by another intelligence agency for their perceived shortcomings.[639]

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[634] Mark Galeotti, "NATO Review - Russian Intelligence Is at (Political) War," NATO Review, May 12, 2017, https://www.nato.int/docu/review/articles/2017/05/12/russian-intelligence-is-at-political-war/index.html.

[635] Ibid.

[636] Ibid.

[637] Anders Åslund, "Putin's Consolidation of Power," in *Russia's Crony Capitalism*, The Path from Market Economy to Kleptocracy (Yale University Press, 2019), 38–67, https://doi.org/10.2307/j.ctvgc61tr.6, 44.

[638] Galeotti, "NATO Review - Russian Intelligence Is at (Political) War.".

[639] Donald N. Jensen, "Moscow in the Donbas: Command, Control, Crime and the Minsk Peace Process" (NATO Defense College, 2017), https://www.jstor.org/stable/resrep10291 1-16, 6.

This also promotes a culture of these agencies telling Putin what he wants to hear instead of accurate intelligence assessments. This produces aggressive responses and sometimes hastily put together missions by these agencies.

In the military, inaction is a killer, as it will get troops killed, therefore it is better to act than to stand by idly. However, the Russian Federation takes this to a whole new level and their intelligence agencies operate with blind ambition, applying the spectrum of propaganda techniques and reflexive control to launch offensive attacks against the Russian Federation's enemies.[640] For example, it is more acceptable for these agencies to act without considering the consequences than taking no action, even if these actions have international repercussions when found out, such as when they meddled in U.S. presidential elections or pushing disinformation into Ukraine. Additionally, the GRU, FSB, and SVR operated as if they were in a wartime status even before the invasion of Ukraine.[641] They promote policy based on their intelligence estimates and procure active measures to achieve these policy objectives against NATO and democratic nations that undermine the Russian model. A hybrid war, or a pre-war strategy, is employed by these agencies to distract NATO from undermining the Kremlin's influence, and these pre-battlefield tactics can achieve the same goals without using traditional warfare.[642] Nuclear capabilities aside, NATO is stronger than Russia alone, but the Russian Federation's use of active measures hurts the credibility of these NATO countries and undermines their influence and actions against Russia.[643]

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[640] Åslund, "Putin's Consolidation of Power.", 59.
[641] Galeotti, "NATO Review - Russian Intelligence Is at (Political) War.".
[642] Ibid.
[643] Maria Snegovaya, "Putin's Information Warfare in Ukraine: Soviet Origins of Russia's Hybrid Warfare," PUTIN'S INFORMATION WARFARE IN UKRAINE (Institute for the Study of War, 2015), https://www.jstor.org/stable/resrep07921.1, 15.

The intelligence agencies of the Russian Federation attack their objectives by not only producing intelligence information but by influencing policy within Russia. As part of Putin's inner circle or Siloviki, they seek his attention and will step over each other to convince Putin of their abilities, even if it means making careless mistakes and manipulating intelligence to suit Putin's needs and goals without ever questioning him.[644] Unlike American intelligence agencies that usually act with more caution, these agencies will aggressively pursue their goals by almost any means necessary. Aggression by these agencies causes many issues because the nations they target now notice their tactics, and as a result, continue to support sanctions and other punitive actions against the Russian Federation.[645] This kind of power and culture only adds to the danger of Russian intelligence agencies, especially when conducting operations against the United States or other members of NATO.

While the Russian Federation has state agencies to produce and manipulate intelligence, the IRA (while not an official state organization) operates as a company that runs out of St. Petersburg, Russia, owned by Yevgeniy Prigozhin, that produces propaganda for the government.[646] The IRA uses the whole spectrum of disinformation and propaganda techniques (white, gray, and black) to promote the Kremlin's short-, middle-, and long-term goals.[647] They mainly focus on social media platforms such as Twitter to create fake accounts that tweet out fraudulent information and use online news sources.[648] Forty-two percent of the disinformation produced by the IRA is black propaganda, forty percent is white propaganda, and eighteen

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[644]Ibid., 18.
[645]Åslund, "Putin's Consolidation of Power.", 63.
[646] "Who Is Yevgeny Prigozhin, the Man behind the Wagner Group?," *The Economist*, September 22, 2022, https://www.economist.com/the-economist-explains/2022/09/29/who-is-yevgeny-prigozhin-the-man-behind-the-wagner-group.
[647]Bastos and Farkas, "'Donald Trump Is My President!'", 8.
[648]Ibid., 1-2.

percent is gray propaganda.[649] The IRA uses black propaganda, i.e., accounts created by bots with high numbers of followers and many posts to drive wedges in other states' societies and create animosity.[650] Bot accounts are a group of accounts that are usually run by one person that pretends to be a real person by liking tweets and content.[651] They can act maliciously and try to intimidate, bully, and persuade viewers to believe untrue things or act in ways that are fueled by false information.[652] The other propaganda technique used by the IRA includes gray propaganda, which draws on fear and populist sentiments that ultimately encourages people to act hostile towards the group attacked by the disinformation.[653] Lastly, the IRA uses white propaganda from official Russian agencies and state-sponsored news networks that follow along with world events, are openly pro-Kremlin, and are usually in Russian and Ukrainian.[654]

However, the IRA does not just spread misinformation with these propaganda techniques, as they engage "in reflexive control—a Cold War–era strategy to alter key factors in an adversary's perception of the world, thereby encouraging that adversary to make decisions that were favorable to a controlling agent."[655] These different techniques emphasize the advanced degree of detail that the IRA uses to plan out their campaigns ahead of time and how they use these different levels of propaganda to construct various types of disinformation campaigns based on their strategic objectives.[656] Through its various techniques, the IRA possesses the

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[649]Ibid., 6.

[650]Farkas and Neumayer, "Disguised Propaganda from Digital to Social Media.", 6.

[651]Alison Johansen, "What's a Twitter Bot and How to Spot One," Emerging Threats, September 5, 2022, https://us.norton.com/blog/emerging-threats/what-are-twitter-bots-and-how-to-spot-them..

[652]Ibid.

[653] Bastos and Farkas, "'Donald Trump Is My President!'", 6.

[654] Howard Becker, "The Nature and Consequences of Black Propaganda," *American Sociological Review* 14, no. 2 (1949): 221–35, https://doi.org/10.2307/2086855, 221.

[655] Doroshenko and Lukito, *Trollfare,* 4663.

[656]Caitlin Carroll and Rachel Cohen, "Press | Intelligence Committee: New Reports Shed Light on Internet Research Agency's Social Media Tactics," U.S. Senate Select Committee on Intelligence, December 17, 2018, https://www.intelligence.senate.gov/press/new-reports-shed-light-internet-research-agency%E2%80%99s-social-media-tactics.

capability to blur fact and fiction by posing as credible news networks and propagating fake tweets and twitter accounts to distract its readers from reality.

Through the framework of reflexive control and the spectrum of propaganda techniques, the Russian Federation knows how to effectively use active measures to produce disinformation for its enemies. From its official state intelligence agencies: GRU, SVR, and FSB, to its non-state actors such as the IRA, the Kremlin has a comprehensive strategy when it comes to disinformation campaigns. However, the aggressiveness of its actors while getting results creates a potential liability for the Russian Federation as they each compete for Putin's ear and take bolder actions than the last.[657] Yet, Putin does not seem to be slowing down when it relates to his disinformation campaigns, and he only seems to be ramping up their frequency as the years goes on to effectively undermine his enemies and pursue his objectives, especially in the case of Ukraine.

Key Judgement Two:

Examples of Disinformation During the 2022 Invasion of Ukraine through the Present

The Russian Federation invokes irredentism (a political movement where one nation seeks to occupy a territory that they previously believed to be theirs, but at some point in history they lost that desired territory) when it comes to its campaign to control Ukraine.[658] As previously mentioned, Putin's invasion of Ukraine can be traced back to Ukraine's desire to "Westernize" and join organizations like the EU or NATO. If Ukraine joined these organizations,

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[657] Galeotti, "NATO Review - Russian Intelligence Is at (Political) War.".

[658] Everett Munez, "Irredentism | Territorial Claim | Britannica," Britannica, April 10, 2023, https://www.britannica.com/topic/irredentism.

Russia would lose its buffer zone between Western Europe and itself, thus allowing these nations to potentially stage military weapons and troops right along Russia's borders.[659] With reflexive control and propaganda, Russia fabricated many false stories in the news, online media, and on social media to justify their invasion, including the idea of Nazis and a fascist government existing in Ukraine.[660] After the invasion in 2022 began, the Kremlin only increased the amount of propaganda it produced against Ukraine to undermine western influence. This report assesses with high confidence that Russia is conducting disinformation against Ukraine during its invasion. Examples of Russian disinformation during the Ukrainian War include grain stealing, crippling the Ukrainian Army's resolve, and denying the shelling of civilian areas. As Russia produces this disinformation, fighting continues in Ukraine and Putin only skews the narrative more each day with his active measures.

One example of current Russia disinformation includes a false narrative about the Kremlin's claims of increasing their grain stock and exporting it to poor nations all around the globe.[661] Deeper examination reveals Russia's additional exports of grain comes from the grain

Figure 45 Russia exported over 20 million extra metric tons of grain after stealing grain from Ukraine.
TASS Russian News Agency. *Russia exported 23 mln metric tons of grain without UN help- Lavrov.* 2023. Website screenshot. TASS Russian News Agency, *https://tass.com/economy/1501783*

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[659]Hosaka, "The Kremlin's Active Measures Failed in 2013.", 331.

[660]Kowalewski, "Disinformation and Reflexive Control."

[661] Madeline Roache et al., "Russia-Ukraine Disinformation Tracking Center," *NewsGuard* (blog), March 15, 2023, https://www.newsguardtech.com/special-reports/russian-disinformation-tracking-center.

they stole from Ukrainian fields, which also triggers the potential for food insecurity in

Ukraine.[662] In April of 2022, the Russian Ambassador to the United States, Anatoly Antonov,

denied this claim, but pressing evidence of grain stealing exists in the Russian occupied regions

of Kherson and Zaporizhia.[663] TASS News put out a story regarding the increase of Russian

grain to Latin America and the Caribbean in 2022 (Figure 7). This article paints Russia in a better

light, claiming they are trying to feed poorer nations from their "newfound" grain supply when in

reality, they found this extra grain by stealing it from Ukraine.[664] The Kremlin uses white

propaganda, i.e., the source of the misinformation is known to spread propaganda and

misinformation using official channels.[665]

The Kremlin also employs the IRA to use its troll accounts and bots to spread

misinformation on platforms like Twitter. Their internet trolls post propaganda using fake

accounts and amass all kinds of pro-Russian followers that then "retweet" and spread their

disinformation without any effort from Russia.[666] This only amplifies and maximizes their reach

and influence across the globe. Their campaigns on Twitter reach millions of viewers and

hundreds of thousands repost this false information after viewing the content in support of

Russia.[667] One way to examine the use of bots and their influence on twitter comes from an

algorithm called Botometer created by Indiana University, a project of the Observatory on social

media.[668] This learner algorithm assesses the probability that a Twitter account is created by a

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[662] Ibid.
[663] Ibid.
[664] Tracking Where Russia Is Taking Ukraine's Stolen Grain," *BBC News*, June 27, 2022, sec. Reality Check, https://www.bbc.com/news/61790625.
[665] Farkas and Neumayer, "Disguised Propaganda from Digital to Social Media.", 6.
[666] Helmus et al., "Russian Social Media Influence.", 23-24.
[667] Ibid.
[668] Sayyadiharikandeh et al., "Detection of Novel Social Bots by Ensembles of Specialized Classifiers." 2725.

human or by a bot based on factors such as linguistics, friend networks, activity patterns, etc..[669]

Much of the disinformation that bots release then gets reposted or retweeted on the internet by

real people with pro-Russian allegiances. The Twitter account @TrumpFix posted a video on

their feed showing the Luhansk People's Republic (LPR) sending substantial amounts of grain

by rail to Russia (Figure 8). After entering this account's username on Botometer, it returned

results indicating this was a bot account.[670] This account manipulates viewers into believing that

Ukraine and the contested area of Luhansk were happy to give grain to Russia. Viewers do not

realize that much of this grain was forcibly taken from farmers in Russian occupied zones rather

than exported through willing trade.[671] The most dangerous aspects of this kind of disinformation

by social media bots comes from the engagement and reposting to other accounts. After

@TrumpFix tweeted this, others viewed this post and reposted it on their own accounts, as was

the case with @buttpub (Figure 9). This account reposted the information of a bot account onto

their own page and spread Russian disinformation further on social media platforms. These

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[669]Ibid.
[670]Ibid.
[671]"Tracking Where Russia Is Taking Ukraine's Stolen Grain,".

tweets by Russian bots only distract viewers from the real situation and sows doubt about Russia's grain stealing in Ukraine.

However, there is substantial evidence to indicate that Russia is stealing grain from Ukraine. In May of 2022, Maxar Technologies published satellite imagery proving that Russia was stealing grain from the Sevastopol Port in Crimea (Figure 10). In fact, the Kremlin is not only stealing grain from Crimea, but days later it is shown to be unloading grain in Syria, one of

Figure 8: Bot account posts about Russia acquiring new grain shipments.

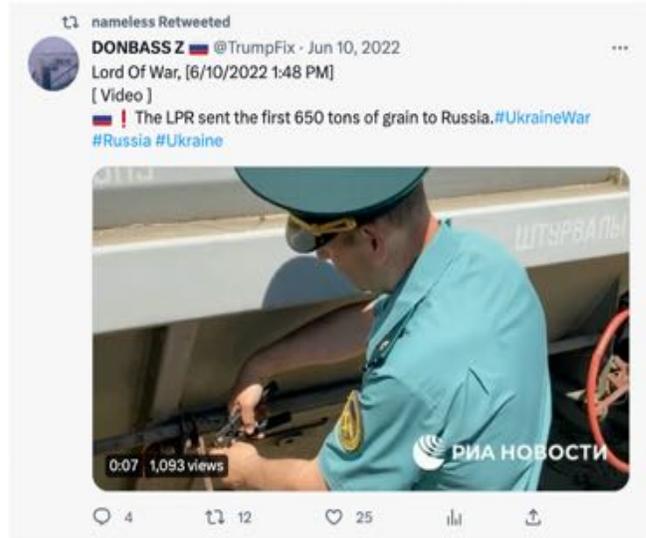*DONBASS Z. Twitter Post. June 10, 2022, 3:38 p.m., https://twitter.com/TrumpFix.*

Figure 46: Retweet of @TrumpFix post by another account. nameless. Twitter Post. June 10, 2022, 3:38 p.m., https://twitter.com/buttpub.
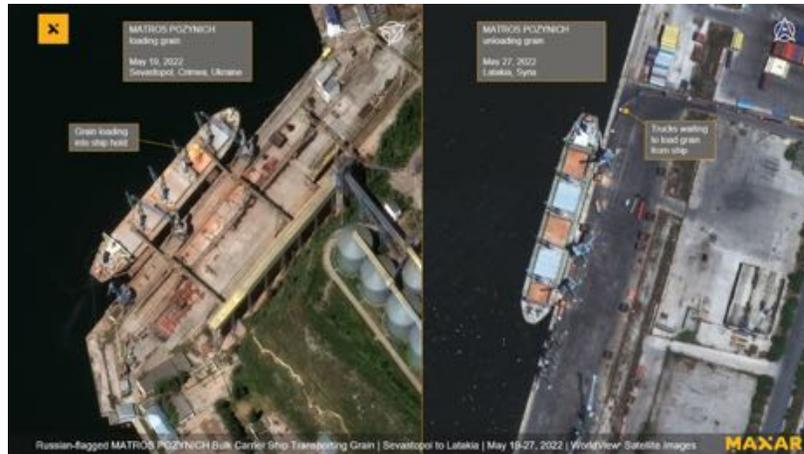
Figure 10: Maxar Technologies, Russian Carrier Ship transporting grain from Ukraine to Syria.

WorldView Satellite Images, Bulk Carrier Ship Transporting Grain. 2022. Satellite image. Maxar Technologies, Sevastopol to Latakia, https://blog.maxar.com/earth-intelligence/2022/maxars-weatherdesk-predicts-a-significant-decline-in-ukrainian-crop-harvests.

its allies.[672] Satellite imagery substantiates Ukraine's claims about the Kremlin and exposes Russian leaders as liars. The West is correct in its assumption that Russia is laundering grain to its allies and away from Ukraine. Advisor to the Minister of Internal Affairs of Ukraine, Anton Gerashchenko, posted video evidence of locals filming trucks supposedly carrying grain in Mariupol (Figure 11). Satellite imagery and videos by locals substantiates with high fidelity that the Russian Federation is stealing Ukrainian grain all while boasting about large "Russian grain" exports to Latin American countries.

Using white propaganda tactics and bot accounts created by internet trolls, the Russian government conducts disinformation through distortion. This is evident by the denial of stealing Ukraine's grain while promoting their exportation of grain to Latin American countries. Through its manipulative active measures, the Russian Federation is using disinformation throughout the Ukrainian War.

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[672]Madeline Roache et al., "Russia-Ukraine Disinformation Tracking Center,".

Figure 11: Video footage of Russian trucks carrying grain shot by local Ukrainians.
Anton Gerashchenko. Twitter Post. July 25, 2022, 9:02 a.m., https://twitter.com/Gerashchenko

The Kremlin also uses active measures in attempts to create dismay amongst soldiers in the Ukrainian Army and weaken their resolve as a cohesive unit. Internet trolls on Twitter (with the help of the Russian government and the IRA) possess the ability to push out alternative narratives about Ukrainian soldiers and the state of their capabilities/morale all in one central location, i.e., Twitter. Russia consistently pushes out disinformation about the Ukrainian army and their actions inside of Ukraine or about their soldiers' morale and capabilities. One example of this comes from the Twitter account @ROSmit13, a self-proclaimed anti-globalist who consistently posts pro-Russian content on Twitter. Important to note though are the accounts that he retweets. The accounts include @RussianArmy56, @DevendraGanesh1, @d_ewinger, and @ricwe123. When entering these account names on Botometer, they all return results indicating they are fake accounts or bots.[673]

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[673]Sayyadiharikandeh et al., "Detection of Novel Social Bots by Ensembles of Specialized Classifiers."

Upon examining each of these bot accounts, the posts that @ROSmit13 retweeted are all pro-Russian propaganda meant to confuse viewers. Much of it includes false information about the Ukrainian military and their current morale/capabilities, alongside promoting the Wagner Group and their successes (even though Ukraine consistently beats back their mercenaries) (Figure 12). These bot accounts, most likely created by the IRA, then see their most success

Figure 47: @ROSmit13 retweeting information produced by bot account.
P.O. CMNT. Twitter post. March 14, 2023, 12:44 p.m. https://twitter.com/ROSmit13.

when an account owned by a real person such as @ROSmit13 reposts their propaganda and spreads it to other humans across the globe. The original tweets the user (in this case @ROSmit13) reposts creates a false narrative to demoralize Ukrainians, spread lies that undermines Ukraine's morality, and sow doubt amongst Ukraine's supporters as to whether they can win this war. Because of the numerous narratives, opinions, and information these posts create, uncertainty takes hold of viewers and creates confusion as to what really is happening during the Ukrainian invasion.

When looking at @dana916's account further, it demonstrates the disinformation spread by Russian troll accounts and supports the Kremlin's claim that Ukrainian soldiers have killed hundreds of children in the Russian backed region of Donetsk (Figure 13). This song she posts
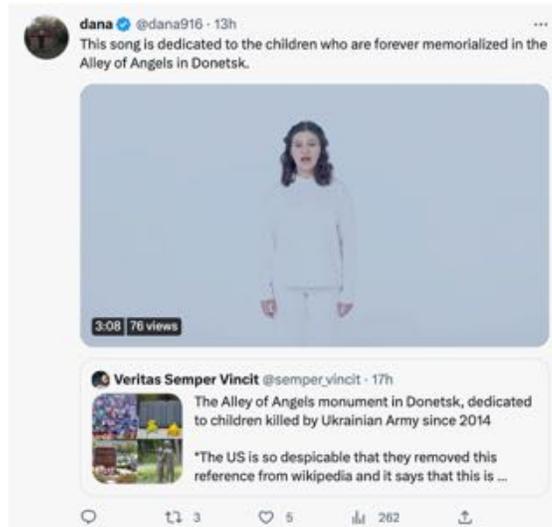

Figure 13: @dana916 promoting a song about children killed in Ukraine by the Ukrainian Army.

Dana. Twitter post. March 19, 2023, 1:17 a.m. https://twitter.com/dana916.

spins a false depiction of the way Ukrainian soldiers operate and erodes their credibility against Russia. One can also analyze the other bot accounts that @ROSmit13 has retweeted, such as @DevendraGanesh1 and @d_ewinger, to see that these accounts mainly spread false information about the Ukrainian War and try to manipulate sentiments about Russia's involvement. @DevendraGanesh1 mostly reposts information about the military aspect of the invasion and how the Wagner Group continues to strategically advance through Ukraine with minimal casualties while also proclaiming their inevitable victory (Figure 14). @DevendraGanesh1 uses gray propaganda in the tweet shown by not disclosing or directly citing his source for the pictures/information.[674] He spreads gray propaganda by making grand assumptions that UAF lines are collapsing without any evidence.

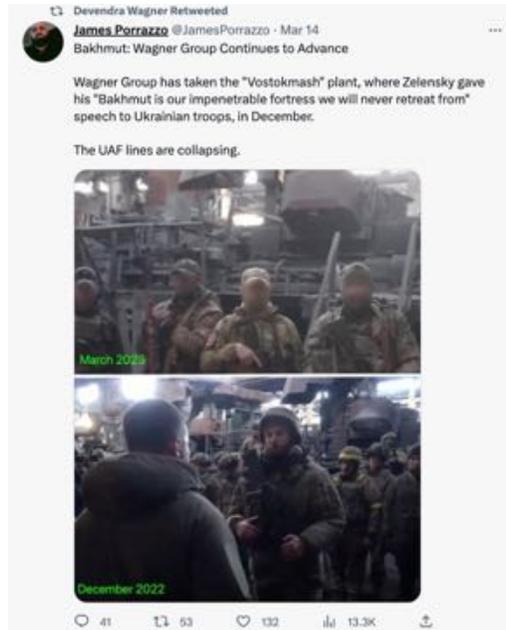[674] Bastos and Farkas, "'Donald Trump Is My President!'", 3.

Figure 14: Retweet of Russian propaganda to persuade viewers Ukrainian forces cannot beat Russian forces.

Devendra Wagner. Twitter post. March 14, 2023, 9:47 a.m. https://twitter.com/DevendraGanesh1.

By studying this page, viewers realize all the posts on this account relate to Russian military victory in Ukraine and never report on Ukrainian victories or advances. This makes it seem as if Russia controls the battlefield, when in fact Ukraine retains a strong military capable of fighting back against Russia. The Kremlin's goal is to portray the Ukrainian military as weak and dissuade NATO and the rest of the globe from supporting a losing side. @d_ewinger, another bot account that @ROSmit13 retweets and spreads misinformation from, also tries to demoralize Ukrainian forces by portraying them as weak and lacking confidence in its fight against Russia (Figure 15). Her post attempts to highlight Ukrainian soldiers' defeatist attitude and their inability to beat Russia, even though they have successfully fought back against Russian forces multiple times. The Russian Federation and IRA's use of fake Twitter accounts affirms their strong persistence in falsifying information and creating an alternative narrative about the events in Ukraine to undermine their support.

Figure 15: @d_ewinger posts content to undermine Ukraine's victories during war and demoralize Ukrainian soldiers.

Illinois Girl Desi. Twitter Post. March 15, 2023, 11:01 a.m. https://twitter.com/d_ewinger.

In the case of the Ukrainian Army, the Kremlin uses reflexive control to impose assumptions on viewers around the world and make them doubt their support and sentiments towards Ukraine. These Twitter posts by bot accounts make Ukraine out to be a "bad guy" and dissuade support for Ukraine by other nations through the distortion of facts. This causes a decline in American economic and military aid for Ukraine, in addition to public opinion softening for Ukraine, as lawmakers can no longer support substantial amounts of spending when Americans at home do not have all the necessary resources.[675] Successful employment of reflexive control i.e., casting doubt over Ukrainian military actions and capabilities, implies assumptions that Ukraine cannot win this war. Therefore, U.S. lawmakers can no longer support

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[675] "Support for Ukraine Aid Softens in U.S. Public, Poll Says," PBS NewsHour, February 15, 2023, https://www.pbs.org/newshour/politics/support-for-ukraine-aid-softens-in-u-s-public-poll-says.

spending for a losing side that also possibly hurts innocent civilians, which is exactly the outcome the Russian Federation wants.

After examining different examples of Russia's disinformation campaigns against Ukraine, it is also important to highlight how the Kremlin uses cyber warfare tactics in concurrence with its disinformation campaign. In the early days of the invasion, actors associated with the GRU used "wipers" (a cyber warfare mechanism that permanently deletes files or renders machines unusable) against Ukraine to affect government systems, destroy their commercial sector, and wipe out critical infrastructure.[676] This cyber-attack creates an inability for the Ukrainian government to functionally serve its people, ultimately undermining people's confidence in the Ukrainian government (similar to propaganda tactics). Another cyber weapon the Kremlin utilized against Ukraine in 2022 included phishing messages to compromise important corporations responsible for drones, protective equipment, and military supplies.[677] Utilized by the Russian Federation, cyber-attacks and disinformation campaigns together created a highly efficient tool to undermine Ukraine and cripple their capabilities without using copious amounts of physical force early in the invasion. Mitchell Orenstein discusses how Russia uses cyber warfare tools in conjunction with information warfare tactics in his report:

> The report concluded that the Russian military intelligence service (commonly known as the GRU), foreign intelligence service (or SVR), and federal security service (or FSB) "have conducted destructive attacks, espionage operations, or both, while Russian military forces attack the country by land, air, and sea." The objective, the

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[676] "A Year of Russian Hybrid Warfare in Ukraine: What We Have Learned about Nation State Tactics so Far and What May Be on the Horizon" (Microsoft Threat Intelligence, March 15, 2023), https://www.microsoft.com/en-us/security/business/security-insider/wp-content/uploads/2023/03/A-year-of-Russian-hybrid-warfare-in-Ukraine_MS-Threat-Intelligence-1.pdf .7.
[677] "Ibid., 8.

company added, was "to disrupt or degrade Ukrainian government and military functions and undermine the public's trust in those same institutions.[678]

Looking at the second year of Russia's invasion into Ukraine, this report assesses with high confidence that Russia will employ these same methods at a grander scale while coinciding with military action to double down on their efforts to eradicate Ukraine's government and infrastructure systems. In the latter half of 2022, the Kremlin focused its efforts on disrupting the government and communication lines but may turn more of its focus to essential infrastructure like water and power.[679] Already, Russia uses miliary action to wipe out key sectors of Ukraine, but with Ukraine refusing to back down, this report assesses with moderate confidence they will attack its NATO allies next. The SVR, GRU, and FSB will look for ways to infiltrate military and key infrastructure in Ukraine's allies to try and weaken them and convince Ukraine to surrender.[680]

Disinformation conducted by the Russian Federation during the invasion of Ukraine is highly substantiated by the evidence above. In every aspect of information, the Kremlin finds some way to sow doubt and confusion about the events surrounding the Ukrainian War. Whether it comes from Russian officials, television, websites, or from social media, there is a never-ending supply of falsified information created by the Russian Federation using its propaganda tactics. The firehose of information that the Russian government floods the internet, social

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[678]Mitchell Orenstein, "Russia's Use of Cyberattacks: Lessons from the Second Ukraine War - Foreign Policy Research Institute," Foreign Policy Research Institute, accessed April 16, 2023, https://www.fpri.org/article/2022/06/russias-use-of-cyberattacks-lessons-from-the-second-ukraine-war/.
[679] Ibid.
[680] "A Year of Russian Hybrid Warfare in Ukraine: What We Have Learned about Nation State Tactics so Far and What May Be on the Horizon.", 10-11.

media, and TV networks with only further highlights Putin's deep commitment to undermining Ukraine and its support by the international community in this war.

Key Judgement Three

Has International Support Wavered for Ukraine?

After entering year two of Russia's invasion in Ukraine and examining all its disinformation tactics to skew perception about the war, this analysis holds with high confidence that these operations have undermined international support for Ukraine. The reasoning behind the Kremlin's disinformation tactics was to undermine Ukraine's position and persuade the international community to accept the Russian Federation's perspective of the invasion and possible annexation of the eastern regions of Ukraine.

Residents of Ukraine must now possess the capability to decipher between pro-Russian propaganda and factual news every time they use the internet or watch television. While some viewers can discern which information is propaganda and which is real news, many Ukrainians cannot decipher propaganda surrounding economic issues.[681] The disinformation campaign utilized by the Kremlin has created vast uncertainty for many Ukrainians. Pro-Russian propaganda targeting Ukraine's economy remains a struggle for many Ukrainians who are unable to decipher fact from fiction.[682] In the past, Ukraine had economic issues relating to corruption,

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[681] Aaron Erlich and Calvin Garner, "Is Pro-Kremlin Disinformation Effective? Evidence from Ukraine," _The International Journal of Press/Politics_ 28, no. 1 (January 1, 2023): 5–28, https://doi.org/10.1177/19401612211045221, 7..
[682] Ibid., 20.

and Russia exploits this by promoting "stories that disparage the domestic economy because they [Ukrainians] are accustomed to hearing true stories of economic mismanagement and corruption."[683] Russia's ability to confuse people with its disinformation creates uncertainty, and with uncertainty, comes an inability to react quickly in Ukraine's best interest. This allows the Kremlin to interject itself into Ukrainian economics with propaganda methods and manipulate them for its own gain by making Ukrainians act/feel a certain way about their government (which is an example of the Russian Federation using reflexive control).

Soviet practices of disinformation highly parallel the tactics used by the Kremlin today in its war on Ukraine when garnering international support. Knowing that the Kremlin could not snuff out poor public opinion of Russia by the United States or the West, they decided to present dissenting voices and alternative facts to confuse the international community.[684] A central location with worldwide access, Twitter became Russia's best tool to conduct this operation. After combing through bot and troll accounts, pro-Russian content generated popularity amongst countries like South Africa and India, with their "likes" and follower counts rising after each pro-Russian post. [685]However, because these accounts targeted some of the countries mentioned above, many of the posts remained invisible to American viewers.[686] One study on Russian propaganda during the invasion of Ukraine revealed that about a fifth of all disinformation relating to Ukraine was disseminated through bots (many created at the start of the invasion) and mainly reached audiences in the United States, India, and South Africa.[687]

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[683] Ibid., 9.

[684] "Russia Is Swaying Twitter Users Outside the West to Its Side," *The Economist*, May 14, 2022, https://www.economist.com/graphic-detail/2022/05/14/russia-is-swaying-twitter-users-outside-the-west-to-its-side.

[685] Ibid.

[686] Ibid.

[687]Dominique Geissler et al., "Russian Propaganda on Social Media during the 2022 Invasion of Ukraine" (arXiv, February 10, 2023), https://doi.org/10.48550/arXiv.2211.04154. 2.

With pro-Russian attitudes, these nations allow Russia to get around the sanctions imposed by the West since they now have new allies to import supplies from, ultimately allowing Russia to continue their assault on Ukraine with impunity.[688] The Russian Federation knows that for western sanctions to truly have an impact, other powerful nations outside the West must follow them too, i.e. China, India, Turkey, etc..[689] Russia then began an outreach campaign, pushing its own narrative and version of the events to countries all around the world, specifically "in countries such as South Africa, India, Brazil, and Mexico… to develop support for Moscow's position and to build empathy against sanctions."[690] With well-planned campaigns targeting various countries in Africa such as South Africa, Ghana, and Nigeria, 23 million tweets followed from these nations with hashtags #IstandwithPutin and #IstandwithRussia.[691] Putin's campaign also impacts Spanish speakers, as many of the tweets posted by pro-Russian troll accounts show engagement by Latinos all across Central and South America.[692]

Many African countries see aid from both the European Union and Russia, causing a split in allegiance for the continent. The invasion in Ukraine only hurts African nations needing resources from these two powers, and with sanctions against Russia, this provides a revenue opportunity for African countries to supply Russia with what they are missing.[693] The continent stands divided over who it will support, but with this division and uncertainty, it provides Putin the perfect opportunity to spread misinformation and persuade African countries to support

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[688] Paddy Hirsch, "Why Sanctions against Russia Aren't Working — Yet," *NPR*, December 6, 2022, sec. Planet Money, https://www.npr.org/sections/money/2022/12/06/1140120485/why-the-sanctions-against-russia-arent-working-yet.

[689] "Russia Is Swaying Twitter Users Outside the West to Its Side. ",.

[690] Adam Kowalski, "Disinformation Fight Goes beyond Ukraine and Its Allies," Chatham House – International Affairs Think Tank, June 8, 2022, https://www.chathamhouse.org/2022/06/disinformation-fight-goes-beyond-ukraine-and-its-allies.

[691] Ibid.

[692] Ibid.

[693] Ordu and Blankenship, "Russia's Narratives about Its Invasion of Ukraine Are Lingering in Africa."

Russia. A propaganda tactic of whataboutism exists in Russian troll accounts, and its purpose is to distract African Twitter users from what is happening in Ukraine and shift blame to the West.[694] Whataboutism is "the act or practice of responding to an accusation of wrongdoing by claiming that an offense committed by another is similar or worse," and the Kremlin uses this tactic against Ukraine.[695]

Tweets about aid held up for countries like Ethiopia and emergency meetings in the UN over Ukraine spread all over Twitter, targeting different African countries to make it seem like the West cares more about Ukrainians than Africans (Figure 16).[696] Botometer identifies the
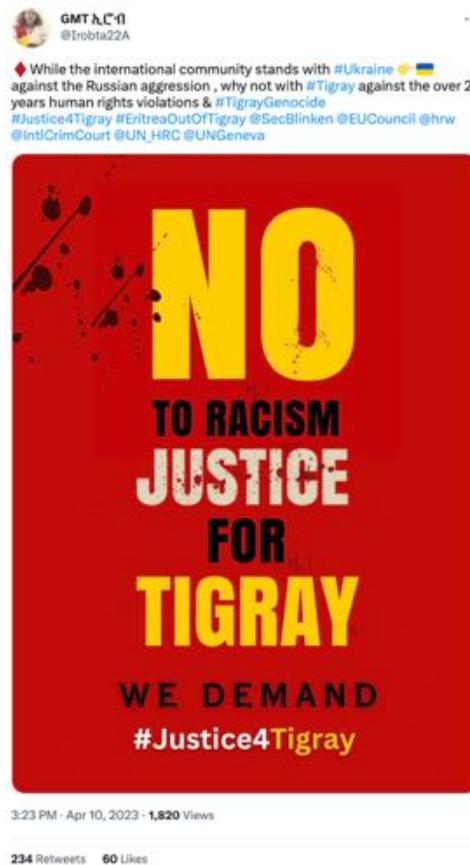
Figure 16: @Irobta22a calls out the international community over its support for Ukraine but not Tigray with whataboutism. Illinois Girl GMT. Twitter Post. April 10, 2023, 3:23 p.m. https://twitter.com/Irobta22A

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[694] Ibid.

[695] "Definition of WHATABOUTISM," Merriam-Webster, April 13, 2023, https://www.merriam-webster.com/dictionary/whataboutism.

[696]Ordu and Blankenship, "Russia's Narratives about Its Invasion of Ukraine Are Lingering in Africa.".

account @Irobta22A as a bot account, and this account created in February 2023 already has 16,000 tweets about Tigray, blaming the West for not intervening.[697] Russia employs hashtags in its tweets to draw up racial sentiments about the West's actions in Ukraine and the lack of action in Africa to draw African nations over to Russia's side.[698] It utilizes hashtags that call out the EU council, Geneva, and the ICC to shift the blame and attention off Russia, distract African twitter users, and undermine the West's support for Ukraine while persuading other nations to not support this cause.

Russian disinformation also plays a significant role in Chinese media. With influence from Russian media outlets, Chinese news consistently blames the West for starting the conflict, but promotes diplomacy and peace moving forward.[699] Studies done by Stanford University indicate that Chinese media cites Russian media outlets more often when the articles spread disinformation and propaganda.[700] China looks to blame the United States for starting the conflict and portray them on the wrong side of the conflict due to their currently strained relationship and desire to supersede them as the number one world power.[701] They want to look like the peace brokers of this situation without condemning Russia for its actions. Additionally, Russian influence on Chinese media strongly shows that popularity amongst Chinese viewers increases when they mention the Ukrainian War and cite Russian propaganda when reporting the story.[702]

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[697] Sayyadiharikandeh et al., "Detection of Novel Social Bots by Ensembles of Specialized Classifiers."
[698] Ordu and Blankenship, "Russia's Narratives about Its Invasion of Ukraine Are Lingering in Africa."
[699] Hans W. A. Hanley, Deepak Kumar, and Zakir Durumeric, "'A Special Operation': A Quantitative Approach to Dissecting and Comparing Different Media Ecosystems' Coverage of the Russo-Ukrainian War" (arXiv, November 17, 2022), http://arxiv.org/abs/2210.03016.1.
[700] Ibid., 2.
[701] David Bandurski, "China and Russia Are Joining Forces to Spread Disinformation," *Brookings* (blog), March 11, 2022, https://www.brookings.edu/techstream/china-and-russia-are-joining-forces-to-spread-disinformation/.
[702] Hanley, Kumar, and Durumeric, "A Special Operation." 8-9.

Chinese citizens' sentiments about the Russian-Ukrainian War heavily favor Russia with "many [seeing] Russia as the first line of defense of their own interests."[703] Many Chinese citizens also believe that if Russia falls, the aggression from NATO and the United States will come to their door steps next.[704] Furthermore, state media in China refused to call Russia's invasion a war and echoed Russian media calling it a special military operation.[705] Chinese media also spreads black propaganda to its people to skew the narrative about Ukraine in Russia's favor. For example, a Chinese media group, Reference News, reported a story about the support Ukraine had for joining NATO citing RT News (which is a Russian state news organization).[706] While 62% of Ukrainians supported joining NATO, this story from RT said only 20% of Ukrainians supported joining NATO.[707] These claims from RT have no source and are unsubstantiated, i.e., black propaganda, but China decided to spread this propaganda to help Putin undermine support for Ukraine. As Russian news outlets penetrate Chinese media, disinformation will continue to circulate in China and paint the supporters of Ukraine as evil while painting Russia as the hero.

The effect of Russia's disinformation campaign remains highly dangerous for Ukraine. This report assesses with high confidence that Russian disinformation is undermining support for Ukraine. Any uncertainty created by Russia's propaganda causes delays in resources and military supplies they desperately need to fight off Russian forces. The West and the United States need cooperation from around the globe to stop Russia's invasion. Sanctions and punitive actions for

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[703] Bandurski, "China and Russia Are Joining Forces to Spread Disinformation."
[704] Ibid.
[705] Jason Li, "Ukraine at One Year: Has China Supported Russia? • Stimson Center," *Stimson Center* (blog), February 13, 2023, https://www.stimson.org/2023/ukraine-at-one-year-has-china-supported-russia/.
[706] Bandurski, "China and Russia Are Joining Forces to Spread Disinformation."
[707] Ibid.

Russia will no longer work as well if other nations supply them with resources and support.[708] As Putin continues to push out pro-Kremlin information around the globe, uncertainty about the truth of the war will creep in, support for Ukraine will waver, and the Russian Federation will continue their invasion with impunity.

Conclusion

This report assesses with high confidence that Russian disinformation campaigns undermined support for Ukraine in the international community. From the origins of communist Russia, deception and disinformation have remained an essential tool for the government to control its people, the perception surrounding Russia, and influence the perception of its enemies.[709] This waver in support for Ukraine can be explained by the Kremlin's systematic use of reflexive control and active measures to purposely confuse people around the globe about the true events occurring in Ukraine. Utilizing state actors such as the FSB, GRU, and SVR, and non-state actors (still closely aligned in Putin's siloviki) such as the IRA, the Kremlin employs Russia's media sphere to invade and influence the global media sphere through many different tactics.[710] The spreading of white, gray, and black propaganda throughout different platforms of media such as Russian officials, social media, Russian news channels, and online news will advance the Russian Federation's narrative and facilitate them in seeking their objectives of annexing the eastern regions of Ukraine, i.e., creating a buffer zone between themselves and

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[708] Hirsch, "Why Sanctions against Russia Aren't Working — Yet.".
[709] Brantly, "A Brief History of Fake.", 27.
[710] Galeotti, "NATO Review - Russian Intelligence Is at (Political) War."

NATO countries.[711] By pursuing an aggressive disinformation campaign using the tactics mentioned above, Russia will undermine support for Ukraine and achieve its objectives through distraction, diversion, and subversion of reality.

To stop Putin's disinformation campaign and curtail Russia's invasion of Ukraine, the West has numerous options to create a methodical and deliberate approach. First, the United States and Western Europe could commit considerable effort into debunking and discrediting all Russian disinformation.[712] They could communicate with the public about this disinformation in ways that are "responsive to emerging narratives and reach all segments of society," as this "will all be critical to help counteract the threat posed by disinformation, both related to the war in Ukraine and more broadly."[713] Documenting specific instances of Russian disinformation and releasing the intentions behind the disinformation to Ukraine could illuminate Russia's true motives.[714] There could also be accountability and transparency from the social media platforms themselves with continuous review of posts to avoid the spreading of misinformation. After investigation into flagged posts, all those considered propaganda and misinformation by the Kremlin could be removed and permanently deleted from their platforms to stop lies and malicious narratives from spreading.[715] This includes accounts and posts from Russian officials, affiliated media, and Russian influencers that seek to spread disinformation.

Lastly, the international community could promote and fund independent and free media inside of Ukraine and Russia. Funding independent journalists and media outlets inside of

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[711] Hosaka, "The Kremlin's Active Measures Failed in 2013.", 331.
[712] "Disinformation and Russia's War of Aggression against Ukraine."
[713] Ibid.
[714] Zviad Adzinbaia, "How to Terminate Russian Disinformation," CEPA, May 12, 2022, https://cepa.org/article/how-to-terminate-russian-disinformation/..
[715] Ibid.

Ukraine and Russia could help counter the narratives created by Russian news. Advocating for free media and fact- based journalism could create a flow of trusted news outlets for people around the world to look towards when uncertainty creeps in.[716] By also supporting the free flow of media around the globe (not just Russia and Ukraine), Russian disinformation could have a much harder time convincing others of its false narratives and stop Russia from embedding itself in Ukraine and other vulnerable nations.[717] Furthermore, comprehensive sanctions that target Russian oligarchs who fund disinformation can prevent these people from producing pro-Kremlin content.[718]

Overall, the strategy to beat Russia's disinformation campaign will most likely require truth and transparency. The United States and other NATO countries could seek out the truth in all aspects of this invasion and call out Russian narratives when and wherever they appear. Ukraine and the West could be prepared for all narratives the Russian Federation creates and could be ready to fight an increase in disinformation as the invasion of Ukraine continues into its second year.

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[716]Adam Fivenson, "One Year Later, Lessons from Ukraine in Fighting Disinformation," Just Security, February 21, 2023, https://www.justsecurity.org/85200/one-year-later-lessons-from-ukraine-in-fighting-disinformation/.

[717] "Disinformation and Russia's War of Aggression against Ukraine."

[718] Adzinbaia, "How to Terminate Russian Disinformation."

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Russia-Ukraine Air War

BLUF

The outcome of the Russia-Ukraine conflict will be heavily influenced by each country's ability to supply, maintain, and appropriately train to strategically employ their air capabilities, such as ordinance and missile stockpiles.

ABSTRACT AND METHODOLOGY

This Estimate assesses possible outcomes of the Russia-Ukraine air conflict by comparing Ukrainian air defense capabilities with Russian strike capabilities. It describes the forces and technology available to Ukraine and Russia provided by both the state and its allies, Ukrainian air defense strategy, Russian air strategy, and possible outcomes of the air conflict.

Advanced Ukrainian and Russian air defense systems have mutually denied air superiority, which has limited both sides' ability to effectively perform close air support. Traditional aircraft must employ long-range weapons to avoid the reach of air defense systems resulting in tactical adaptations on both sides of the conflict. As a result, both countries have had to adapt their tactics to rely more heavily on ground-launched missiles and ordinance, along with more modern advancements, such as drones.[719] Furthermore, each country's allies have directly impacted the air war, especially as it increasingly becomes a war of attrition. Overall, an in-depth analysis of Russia and Ukraine's air capabilities and strategies is utilized to demonstrate the

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[719] Marrow, Michael. "In Ukraine Fight, Integrated Air Defense Has Made Many Aircraft 'Worthless': US Air Force General." Breaking Defense, March 7, 2023. https://breakingdefense.com/2023/03/in-ukraine-fight-integrated-air-defense-has-made-many-aircraft-worthless-us-air-force-general/.

untraditional air war occurring in Ukraine and to assess the potential outcomes of the Russo-Ukrainian air war.

KEY JUDGEMENTS

1. **Key Judgement 1: This report assesses with a high-level of confidence that neither Russia nor Ukraine has claimed a decisive victory in the air but doing so would heavily impact the end state of the conflict.** After the initial Russian invasion of Ukraine, the sky over the nations has become a no-man's-land as neither side can decisively gain control over the airspace. However, this aerial stalemate is not an indication of a lack of effort from either side. In fact, the stalemate has been maintained through aggressive Russian air strikes and effective Ukrainian air defense systems. Ultimately, both countries recognize the immense consequences of either side achieving a breakthrough in the air, and they are calling on all of their assets and allies to prevent this from happening. The West is supplying Ukraine with highly requested air defense systems, and Russia is utilizing fleets of Iranian drones, as well as relying heavily on their massive stockpiles of long-range weapons. Ultimately, neither Russia nor Ukraine can seem to claim a decisive victory in the air domain, however neither side can afford to lose it either.

2. **Key Judgement 2: This report assesses with high-level of confidence that Ukraine's layered air defense model has proven successful in rivaling Russian technology, but it is heavily reliant on Western support.** The Ukrainians have

employed a successful layered air defense model that utilizes their pre-war stockpiles of Soviet-era weapons, along with more modern air defense systems provided by the US and NATO. This strategic employment of short, medium, and long-range air defense systems has allowed Ukraine to deny Russia air superiority for longer than the international audience originally anticipated. Although this strategy has proven effective, as their missile stockpiles begin to dwindle, Ukraine is faced with mounting challenges. Western countries have been very hesitant to become more invested in the conflict for multiple reasons. First, Western countries cannot produce weapons and missile systems fast enough to replace them at the rate they are being depleted. Secondly, they can only deplete their own stockpiles to a certain extent before they are putting their own national security at risk. Finally, most Western countries fear overinvolvement in the conflict and international consequences, such as a world war or a nuclear attack. Ultimately, Ukraine has successfully employed an air-denial strategy against Russia, but they continue to face mounting challenges as this war of attrition continues.

3. **Key Judgement 3: This report assesses a medium level of confidence that Russia and Ukraine maintain similar missile and air defense capabilities, which makes the conflict primarily dependent upon weapon depletion.** Although many expected Russia to dominate the skies due to their more advanced aircraft and technology, their extensive air campaign throughout the initial phase of the conflict failed to secure air superiority over Ukraine. As a result, they were forced to change their air strategy, relying on long-range air strikes. Russia's large stockpiles of long-range cruise missiles has allowed them to conduct a large volume of air strikes on Ukraine that

have succeeded in destroying key Ukrainian targets. However, Russia's long-range missiles have also proven inaccurate, and they are expending missiles faster than they can be replaced. Sanctions and an inability to increase missile production levels has further exacerbated this issue. On another note, the recent Russian employment of Iranian Shahed drones has proven to be very effective in inexpensively attempting to destroy Ukrainian energy and civilian infrastructure and deplete Ukrainian air defense missiles. Overall, in this conflict of depletion, one may assume a Russian advantage, but after further examination of Russian missile attrition, accuracy, and production, it becomes evident that Russia and Ukraine maintain similar capabilities and technological advantages.

<div align="center">UKRAINIAN AIR DEFENSE CAPABILITIES</div>

Ukraine has primarily employed a layered air defense model comprised of both Soviet-era air defense systems, along with more modern Western systems provided by countries such as the US, Germany, and the UK.[720] Although this air defense model has been effective in defending against Russian missile and drone attacks, it also poses significant challenges, as each system requires specific maintenance and training. Because the Russia-Ukraine conflict hinges largely on both countries' ability to deny air superiority, Ukraine's capacity to maintain sufficient stockpiles of air defense systems and missiles and appropriately train troops in their employment is critical. Below, each Ukrainian air defense system is described, and figures for maintenance and production costs, production timelines, current stockpile estimates, and training timelines are provided.

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[720] Ibid.

S-300

The Soviet-era S-300 launcher was created as a mobile medium-range anti-aircraft missile system that could rapidly deploy.[721] Ukraine reportedly maintains supply of the S-300PT, S-300PS, and S-300MU variants, which primarily were developed for defense against aircraft and cruise missiles.[722] These variants currently utilize the 5V55K, 5V55R and 48N6 missiles, which are high-explosive fragmentation warheads triggered by proximity.[723] Each missile differs in interception speed and maximum effective range. The 5V55K and 5V55R variants can hit a target moving at 4,300 kph, whereas the 48N6 can strike targets moving up to 10,000 kph.[724] Also, the 5V55K has a maximum effective range of 47 km and the 5V55R and 48N6 have ranges of 75km and 150km.[725] Additionally, Ukraine has the S-300V1 variant, which maintains the capability to defend against ballistic missiles in addition to cruise missiles and aircraft.[726] This variant utilizes the 9M83 and 9M82 missiles to specifically target ballistic missiles across a 40-mile radius.[727]

At the beginning of the Russian operation on February 24, 2022, Ukraine reported approximately 100 active S-300 batteries, or around 300 launchers in total.[728] By April 8, 2022,

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[721] "Зенитные Ракетные Системы Ряда С-300П." Зенитные ракетные системы ряда С-300П | История систем ПВО и ПРО. Accessed March 13, 2023.
https://web.archive.org/web/20130506150159/http://www.raspletin.ru/zenitnye-raketnye-sistemy-ryada-s-300p.
[722] Foltynova, Kristyna. "Protecting the Skies: How Does Ukraine Defend against Russian Missiles?" RadioFreeEurope/RadioLiberty. Radio Free Europe / Radio Liberty, December 27, 2022.
https://www.rferl.org/a/ukraine-missile-defense-weapons-charts-russia/32192132.html
[723] Missile Defense Project, "S-300," Missile Threat, Center for Strategic and International Studies, May 4, 2017, last modified July 6, 2021, https://missilethreat.csis.org/defsys/s-300/.
[724] Ibid.
[725] Ibid.
[726] Thakur, Vijainder K. "Ukraine Negotiating to Acquire More S-300 Air Defense Systems; Request Comes after Nasams & Patriot Missiles." Latest Asian, Middle-East, EurAsian, Indian News, December 2, 2022.
https://eurasiantimes.com/ukraine-now-wants-more-s-300-air-defense-missile-systems/.
[727] Missile Defense Project, "S-300."
[728] Thakur, Vijainder K. "Ukraine Negotiating to Acquire More S-300."

photo evidence confirmed Ukraine had lost at least 21 S-300s.[729] Since then, the attrition rate of Ukrainian S-300s has been around 3-4 per week.[730] In an effort to replace the lost S-300s, the US and NATO have sent additional systems from Eastern European allies, such as Slovenia and Bulgaria. The S-300 is particularly easy to incorporate into the Ukrainian military because it is a system that has been utilized by Ukraine for years, and no additional training is necessary to operate the system. However, acquiring these systems is becoming increasingly more difficult because NATO has previously supplied all of the easily acquired systems to Ukraine.[731]

Buk-M1

Another Soviet-built air defense system being leveraged by Ukraine is the Buk-M1. This missile system is an improved version of the 9K37 (SA-11 Gadfly) and is a mobile, self-propelled medium-range surface-to-air missile (SAM) system that can engage six targets simultaneously. It primarily targets tactical and strategic aircraft, cruise missiles and helicopters. The Buk-M1 is comprised of the TELAR (9310M1), a loader/launcher (9A39M1), a Snow Drift surveillance radar (9S18M1), and a command-and-control vehicle (9S470M1).[732] The Buk-M1 battery takes 5 minutes to set up for engagement and can be on the move in 5 minutes. Also, the reaction time of a battery from target tracking to missile launch is approximately 22 seconds.[733]

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[729] Mitzer, Stijn, and Jakub Janovksy. "Attack on Europe: Documenting Ukrainian Equipment Losses during the 2022 Russian Invasion of Ukraine." Oryx, March 15, 2023. https://www.oryxspioenkop.com/2022/02/attack-on-europe-documenting-ukrainian.html.

[730] Axe, D. (2022, April 8). Ukraine is losing several S-300 anti-air launchers a week, but it still has hundreds left. Forbes. Retrieved April 26, 2023, from https://www.forbes.com/sites/davidaxe/2022/04/08/ukraine-is-losing-several-s-300-anti-air-launchers-per-week-but-it-still-has-hundreds-left/?sh=2d74c55d3ba8

[731] Cancian, Mark F. "Can the United States Do More for Ukrainian Air Defense?" CSIS. Accessed March 14, 2023. https://www.csis.org/analysis/can-united-states-do-more-ukrainian-air-defense.

[732] "OE Data Integration Network." ODIN. Accessed March 15, 2023. https://odin.tradoc.army.mil/WEG/Asset/9K37_Buk-M1_(SA-11_Gadfly)_Russian_Medium-Range_Surface-to-Air_Missile_System.

[733] Ibid.

The Buk-M1 utilizes the semi-active homing 9M38M1 missile, which has a minimum range of 3.25 km and a maximum range of 34 km. Its intercept altitude ranges from 30m to 22 km, and it maintains a 70 kg fragmentation high explosive (HE) warhead with a 17-meter lethal radius. Its single shot kill probabilities are reportedly 80% against helicopters, 60-90% against aircraft and 40% against cruise missiles. [734]

At the beginning of the Russia-Ukraine conflict, Ukraine reported 72 Buk-M1 systems available, and since the start of the war, 11 have been confirmed destroyed or captured through photo or video evidence, but there is high confidence that the actual number is much greater.[735] No NATO countries currently field the Buk system, and the Buk systems in storage that were previously operated by Finland were scrapped due to maintenance and training costs.

IRIS-T

In addition to the Soviet-era air defense systems already in the Ukrainian stockpiles, Western military aid continues to play a critical role in Ukraine's air defense campaign. The first Western system sent to Ukraine on October 11, 2022, was the IRIS-T (SL), or InfraRed Imaging System Tail/Thrust Vector-Controlled, which costs around $163 million per system.[736] This German machine is considered one of the world's most advanced air defense systems because it can detect low-flying missiles and has a range of 40 km and an altitude capability of 20 km.[737] Furthermore, it uses infrared homing technology to lock onto a specific target and destroy it. This

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[734] Ibid.

[735] Mitzer, Stijn, and Jakub Janovksy. "Attack on Europe: Documenting Ukrainian Equipment Losses during the 2022 Russian Invasion of Ukraine."

[736] Siebold, Sabine. "Under the Radar, Germany Trains Ukrainians on Advanced Air Defense Weapon." Reuters. Thomson Reuters, March 3, 2023. https://www.reuters.com/world/europe/under-radar-germany-trains-ukrainians-advanced-air-defence-weapon-2023-03-03/.

[737] Foltynova, Kristyna. "Protecting the Skies: How Does Ukraine Defend against Russian Missiles?" RadioFreeEurope/RadioLiberty. Radio Free Europe / Radio Liberty, December 27, 2022. https://www.rferl.org/a/ukraine-missile-defense-weapons-charts-russia/32192132.html.

capability has proved especially beneficial in targeting Russian cruise missiles seeking to destroy

Ukrainian infrastructure and the Iranian made Shahed drones that are being used by Russia.

According to a Ukrainian soldier, "The IRIS-T has hit 51 out of 51 targets, that's a 100% quota

for Shahed drones and cruise missiles." [738] Furthermore, the IRIS-T takes 1/3 of the time of a

Patriot to set up, which is critical because the system begins transmitting its position once the

radar is turned on.[739]

Currently, Ukraine has received one IRIS-T system from Germany, but Germany plans to

send another system in the next few weeks and three additional systems as the manufacturer

finishes producing them. The IRIS-T provides greater effectiveness than the Soviet-era air

defenses, but it cannot be operated by simply turning a switch on and off. As a result, around 40

Ukrainians are currently being trained on the system at an undisclosed Bundeswehr military base

in Germany.[740] This proactiveness will allow trained Ukrainians to be prepared to utilize the

IRIS-T effectively in combat by the time they arrive in Ukraine.

NASAMS

The next Western missile system being utilized in Ukraine is the National Advanced

Surface-to-Air-Missile Systems (NASAMS), which are mid-range air defense systems developed

jointly by Raytheon (US) and Kongsberg Defense and Aerospace (Norway). NASAMS are

employed to destroy fixed and rotary wing aircraft, cruise missiles, and unmanned aerial

vehicles.[741] Additionally, they are specifically designed to protect population centers against air-

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[738] Gault, Matthew. "Ukraine Hopes the New Iris-T Weapon System Will Protect It from Suicide Drones." VICE, March 6, 2023. https://www.vice.com/en/article/4a3gxd/ukraine-hopes-the-new-iris-t-weapon-system-will-protect-it-from-suicide-drones.

[739] Person, and Sabine Siebold. "Under the Radar, Germany Trains Ukrainians on Advanced Air Defense Weapon."

[740] Ibid.

[741] "National Advanced Surface-to-Air Missile System (NASAMS)." Congressional Research Service, December 1, 2022. https://crsreports.congress.gov/product/pdf/IF/IF12230.

to-surface threats. Each NASAMS is armed with three launchers, each carrying up to 6 missiles and are comprised of the AN/MPQ-64 Sentinel Radar, the AIM-120 Advanced Medium Range Air-to-Air Missile (AMRAAM) and the Fire Distribution Center (FDC).

The Sentinel Radar is equipped with a 360-degree radar with a 75 km range to detect UAVs, cruise missiles and fixed and rotary-wing aircraft. Furthermore, it has an electronic counter-counter-measure (ECCM) system that can differentiate friendly and enemy aircraft and the system can engage 72 targets simultaneously in active or passive mode. The radar is transported using a High Mobility Multipurpose Wheeled Vehicle (HMMWV) or M1082.[742]

The AMRAAM missile can be utilized in the air-to-air mode or in surface-launch mode using NASAMS. In air-to-air mode, AMRAAMs utilize an active guidance sensor and seeker to destroy targets beyond visual range, even in difficult environments. The AMRAAMs employed by NASAMS have a 40 km range and longer-range missiles are currently being developed.[743]

Each NASAM battery costs $23 million and each AMRAAM missile costs $1.2 million. As a result, there is a high confidence that Ukraine will not receive NASAMS in large quantities, and the missile systems will be used primarily to protect the Ukrainian government and major command and control centers.[744] Ukraine received 2 NASAMS from the US in November 2022, according to multiple twitter posts and open-source intelligence showing the missiles being launched. Furthermore, the US Army awarded a $1.2 billion contract to deliver six more

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[742] Ibid.

[743] Ibid.

[744] Kadam, Tanmay. "Nasams: Ukraine May Get 'Second-Hand' Missile Defense Systems; US Negotiating for Faster Delivery." Latest Asian, Middle-East, EurAsian, Indian News, December 4, 2022. https://eurasiantimes.com/us-negotiates-to-supply-more-nasams-to-ukraine-oman-qatar/.

NASAMS to Ukraine by 2025. This deal also includes logistical support and training.[745] Because it takes roughly 2 years to build NASAMS due to the time required to buy rocket motors and electronic components, NATO has also reached out to Middle Eastern countries with NASAMS, such as Oman and Qatar to try to transfer those NASAMS to Ukraine and then backfill those systems with new NASAMS in the Middle East.[746]

Because NASAMS are significantly more complex that the Soviet-era systems the Ukrainians are accustomed to, training on the system poses some challenges. Norway has trained around 60 Ukrainians on 2 NASAMS. Training to properly use NASAMS usually takes approximately 6 months, but the Ukrainians were trained in 2 months.[747] Finally, for further support, Raytheon has set up a NASAMS support center in Eastern Europe to aid in technical support after the units are fielded.

Short-Range Air Defense Systems

In addition to medium and long-range air defense systems, short-range air defense systems have played an important role in Ukraine's layered air defense model. Among the most helpful have been the HAWK, Avenger, and Gepard air defense systems. First, the HAWK (Homing All the Way Killer) is a semi-active radar homing missile that has a 74 kg blast-fragmentation warhead. Its minimum effective range is 1.5 km, its maximum effective range is 35 km, its minimum altitude is 30 m, and its maximum altitude is 18 km.[748] Also, it can travel at

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[745] Hudson, Lee. "U.S. Looks to Shift Air Defense Systems from Middle East to Ukraine, Raytheon Chief Says." POLITICO. Accessed March 15, 2023. https://www.politico.com/news/2022/12/01/raytheon-air-defense-ukraine-middle-east-00071687.

[746] Ibid.

[747] Ibid.

[748] "OE Data Integration Network." ODIN.

a maximum speed of Mach 2.4. Ukraine has received 6 HAWK systems from Spain, and the US is working on refurbishing HAWK systems from storage.

Next, the Avenger is a fully automated, shoot-on-the-move, short-range air defense system. It utilizes 2 packs of 4 pedestal-mounted Stinger (PMS) missiles, which are described below and a sighting system that includes an optical sight, infrared camera, and a laser rangefinder.[749] The PMS is mounted to a mobile M988 Hammer vehicle, but it can be removed from the vehicle and fired as a stationary system. Each system is equipped with 8 Stinger missiles that are ready to be fired and 8 additional missiles in stock. It takes less than 4 minutes to reload.[750] In addition to the Stinger missiles, the Avenger is also equipped with an M3P .50 caliber machine gun to engage select air and ground targets. The US announced the transfer of 4 Avenger systems to Ukraine that are being taken directly from US military stockpiles.[751]

Finally, the German Gepard is a 35 mm self-propelled anti-aircraft gun system. Each system is equipped with 2 anti-aircraft guns that can each fire at a rate of 550 rounds/min (1,100 rounds combined), and it can fire on the move. It maintains an effective range of 3,500 m and a maximum effective altitude of 3,100 m. Furthermore, each system has one search radar and one tracking radar that can search and track incoming threats up to 15 km away. Germany has provided Ukraine with 30 total surplus Gepard vehicles, which they decommissioned in 2010.[752]

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[749] "Avenger Anti-Aircraft Missile System." Missilery.info. Accessed March 21, 2023. https://en.missilery.info/missile/avenger.

[750] Ibid.

[751] Trevithick, Joseph. "Avenger Air Defense Systems Headed to Ukraine." The Drive, November 10, 2022. https://www.thedrive.com/the-war-zone/avenger-air-defense-systems-headed-to-ukraine.

[752] Parsons, Dan. "Ukraine Situation Report: More German Gepard Air Defense Gun Systems on the Way." The Drive, December 2, 2022. https://www.thedrive.com/the-war-zone/ukraine-situation-report-more-german-gepard-air-defense-gun-systems-on-the-way.

Also, Germany is working with Rheinmetall to restart the production of Gepard ammunition to send to Ukraine.

MANPADS

Another vital player in Ukraine's integrated air defense campaign is Man-Portable Air-Defense Systems (MANPADS), such as the FIM-92 Stinger, 9k38 Ilga and the British Starstreak. These systems are lightweight, portable, short-range SAMs.[753] When flying against long-range air defense systems such as the S-300, enemy forces are forced to fly at extremely low altitudes. This is where the role of MANPADS becomes essential.

The FIM-92 Stinger is a MANPAD that can be fired by one person in order to engage low-altitude targets such as fixed-wing aircraft, helicopters, unmanned aerial vehicles (UAVs), and cruise missiles using an infrared seeker head. It has a maximum effective range of 4000 m and a minimum range of 200 m at a top speed of Mach 2.2.[754] Around 1,600 stinger missiles have been sent from the US to Ukraine, but the US stopped making Stingers in 2003. As a result, their stockpiles are dwindling. The Stinger manufacturer, Raytheon, has restarted production, but some of the parts are no longer available, so it will take around one year to redesign some electronics within the missile and be able to deliver the missile in large quantities.[755] Around 400 additional Stinger missiles have been transferred to Ukraine from countries such as Germany, Italy, Lithuania, the Netherlands, and Latvia.

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[753] "What Are Manpads That the West Is Sending Ukraine: Daily Current Affairs." Dhyeya IAS. Accessed March 17, 2023. https://www.dhyeyaias.com/current-affairs/daily-current-affairs/what-are-manpads-that-the-west-is-sending-ukraine.

[754] "OE Data Integration Network." ODIN.

[755] Cancian, Mark F. "Can the United States Do More for Ukrainian Air Defense?" CSIS. Accessed March 14, 2023. https://www.csis.org/analysis/can-united-states-do-more-ukrainian-air-defense.

The British Starstreak and Soviet-era 9k38 Ilga have also proven to be very helpful as short-range MANPADS. The Starstreak can be mounted on armored or protected mobility vehicles, and it was created to quickly engage fast, evasive, or heavily armed pop-up targets. It does so by accelerating to a speed in excess of Mach 4.0, making it the fastest short-range SAM in the world. It also maintains a minimum range of 300 m and a maximum range of 7,000 m.[756] When the missile is launched, 3 additional laser beam riding submunitions are employed, increasing the likelihood of hitting the desired target. Similarly, the 9k38 Ilga is a short-range, man-portable infrared homing SAM that utilizes aa 9M39 missile. It has a maximum effective range of 5,200 m, a maximum altitude of 3,500 m, and a maximum speed of 600 m/s. The Ilga utilizes a direct-energy blast fragmentation warhead and a passive homing device and night vision guidance system.[757] Overall, the use of MANPADS such as the Stinger, 9K38 Ilga and the Starstreak have proven to be especially beneficial to Ukraine because of the shortened training timelines associated with operating these weapons. Because the systems can be operated by one to two crew members, training can be shortened to just a few days.

Patriot

Since the start of the Russian invasion, Ukraine has been requesting the Patriot missile system from the US. Although the requests were originally denied, the US has agreed to send one Patriot missile system to Ukraine at the start of 2023. The Patriot is one of the world's most advanced air defense systems and is capable of intercepting cruise missiles, ballistic missiles, and aircraft.[758] Although its official ranges and coverage are classified, its radar system has a

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[756] "OE Data Integration Network." ODIN.
[757] Ibid.
[758] "Report to Congress on Patriot Missiles for Ukraine." USNI News, January 20, 2023.
https://news.usni.org/2023/01/20/report-to-congress-on-patriot-missiles-for-ukraine.

range of 150 km and the ability to track up to 100 targets. Additionally, the flight ceiling for the Patriot missiles is around 20 km and it can provide area coverage for about 15 to 20 km for incoming ballistic missiles.[759] The long-range capabilities of the Patriot will pair well with the other medium and short-range defense systems provided by the US and its allies such as NASAMS and MANPADS and will help strengthen Ukraine's layered approach to air defense.

Each Patriot system costs approximately $1.1 billion to acquire, which includes about $400 million for the system and $690 million for the missiles, each costing around $3-4 million.[760] The US plans on sending an existing Patriot battery to Ukraine from existing stockpiles. It is important to consider the impact of this on US operational forces or training and modernization cycles because the Patriot is a low-density, high-demand asset for the US air defense efforts. Furthermore, it is imperative to consider the training timeline for an advanced system like the Patriot. Training courses for the Patriot maintainers and operators usually take many months. For example, the launch system operator course takes 13 weeks, the fire control operator course is 20 weeks, and the system repair course is 53 weeks.[761] Although 90 to 100 Ukrainian soldiers have already begun training on the Patriot air defense system at Fort Sill, Oklahoma, it will be several months before enough soldiers are trained to operate, maintain, and sustain the Patriot.

It is important to consider the cost vs the impact of the Patriot on Ukraine's air defense capabilities. There is a moderate level of confidence that the single Patriot missile system being sent to Ukraine will do little to change Ukraine's level of air vulnerability, especially when considering the vast front of fighting. First, the Patriot was created to defend strategic assets

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[759] Ibid.
[760] Ibid.
[761] "Report to Congress on Patriot Missiles for Ukraine."

against sporadic attacks, but one of the biggest problems facing Ukraine right now is constant drone attacks. Using multi-million-dollar missile systems to take down drones that cost 100 times less is a questionable tactic. Furthermore, Ukraine boasts of interception rates of 85%.[762] Although this number is likely inflated, if Ukraine can adequately defend their airspace with their current capabilities, then the Patriot becomes an expensive target for Russia. Finally, the Patriot is a very complex system that requires extensive training. Although Ukrainian soldiers are receiving training on the Patriot in the US, in order to effectively employ the Patriot, US soldiers would need to be embedded within Ukrainian missile batteries.[763] Not only does this risk US casualties, but direct US involvement with Russia could escalate quickly. Overall, there is a moderate level of confidence that the US Patriot missile system being sent to Ukraine will have little impact on the air war and will become a risky and expensive Russian target.

RUSSIAN AIR CAPABILITIES

Russia's failure to gain air superiority at the start of the Russo-Ukrainian war forced Russia to engage Ukrainian targets from a long range. Their main air campaign has resorted to ground-launched, air-launched, and sea-launched long-range missile attacks and targeting major cities and important infrastructure with drones. Some of their most impactful air capabilities in this conflict have been the KH-101 cruise missile, the Iskander missile, sea-launched Kalibr cruise missiles, and Iranian Shahed drones. In recent months, increased volumes of attacks, especially on civilian energy infrastructure, has become increasingly concerning, as the

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[762] LaMear, Geoff. "Sending Patriot Missile Systems to Ukraine Is an Expensive Blunder." Military.com, January 21, 2023. https://www.military.com/daily-news/opinions/2023/01/21/sending-patriot-missile-systems-ukraine-expensive-blunder.html.

[763] Lopez, T. C. (2023, January 10). Ukrainian troops headed to U.S. for patriot missile training. U.S. Department of Defense. Retrieved April 26, 2023, from https://www.defense.gov/News/News-Stories/Article/Article/3264235/ukrainian-troops-headed-to-us-for-patriot-missile-training/

Ukrainian military struggles to balance the safety of Ukrainian citizens with a dwindling stockpile of air defense missiles. Below details some of the most effective and common Russian missiles being utilized in the Russo-Ukrainian conflict.

KH-101

The KH-101 is a stealthy, long-range cruise missile designed and produced by MKB Raduga with advanced guidance systems capable of hitting targets with accuracy. It is a descendant of the Soviet-era KH-55 missile, and it has the capabilities to be fitted with a nuclear warhead.[764] The KH-101 is an air-to-surface missile usually launched from strategic bombers such as the Tu-95MS (turboprop strategic bomber) or the Tu-160 (supersonic strategic bomber) but can be launched from the Su-34 fighter jet. Its cruise altitude is 30-70 m above the ground, and it has a range of 450-5500 km, depending on the type of aircraft that deploys it. Furthermore, the missile operators can change the missile's target mid-flight using the GLONASS navigation system that transmits live visual data of the ground throughout the flight.[765]

Another important advantage of the KH-101 is its stealth capabilities. The missile is fitted with radar-absorbing materials and low flight path abilities, which allows the missile to avoid radar and infrared sensors.[766] Also, its advanced guidance system authorizes the missile to avert obstacles and enemy air defense systems in order to fly at extremely low altitudes, which makes it very difficult for enemy air defenses to detect and shoot down.

The range and accuracy of the KH-101 also prove to be exceptionally beneficial to the use of this cruise missile because it allows the missile to be launched in near proximity to

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[764] Vermylen, Mark. "Kh-101/102." Missile Defense Advocacy Alliance, May 2017. https://missiledefenseadvocacy.org/missile-threat-and-proliferation/todays-missile-threat/russia/kh-101102/.
[765] Ibid.
[766] Ibid.

Russian borders, or even within Russian airspace. This is especially important when considering the aircraft that the Russians have available to employ the KH-101. Although the Tu-160 supersonic bomber is the newest and best choice for the employment of the KH-101, the Russians reportedly only maintain about 11 of these aircraft.[767] In contrast, the Russians manage a fleet of around 60 Tu-95MS aircraft. Although the Russians maintain more of these aircraft, the Tu-95MS utilizes an outdated turboprop design that has limited maneuverability and cannot survive within the range of enemy air defense systems. Ultimately, the KH-101's range allows the Russians to still effectively utilize the Tu-95MS aircraft.

Ukrainian intelligence estimates that the Russians' stockpile of KH-101s at the start of the invasion was around 144 missiles and 120 additional missiles have been produced. Furthermore, evidence suggests that the Russians depleted around 50% of their KH-101 stockpiles from the start of the conflict until November 2022.[768] Although some intelligence suggests that Russia still has a significant number of KH-101 missiles, a Conflict Armament Research (CAR) investigation that documents remnants of Russian missiles in Ukraine suggests differently. After a large-scale Russian missile attack in Ukraine on 23 November 2022, the CAR investigation team documented missiles that bore marks indicating that the missiles were produced between July and September 2022 and between October and November 2022.[769] This expenditure of cruise missiles manufactured just months before their use could be an indicator of stockpile challenges. Furthermore, this intelligence demonstrates that Russia is still capable of producing

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[767] Ibid.

[768] Kossov, Igor. "How Many Missiles Does Russia Have Left?" The Kyiv Independent, January 15, 2023. https://kyivindependent.com/national/how-many-missiles-does-russia-have-left.

[769] Conflict Armament Research. "Dating Newly Produced Russian Missiles Used in Kyiv Attacks." ArcGIS StoryMaps. Esri, December 7, 2022. https://storymaps.arcgis.com/stories/81bc6b71fdc64361a05a21020c3d6d5e.

guided weapons such as the KH-101 despite the sanctions imposed on important components and technologies produced by American and European companies.[770]

Iskander

Another destructive and highly effective force employed by the Russians is the Iskander missile. This missile is characterized as a road-mobile, surface-to-surface short-range ballistic missile, and it is one of the most utilized missiles in the Russia-Ukraine conflict. It can be fitted with 480 kg of nuclear or conventional warheads and weighs approximately 3800 kg. Furthermore, its maximum range is 400-500 km, and it can achieve an accuracy of 10-30 m circular error probability (CEP).[771] The Iskander can be fitted with conventional warheads such as fuel-air explosives, electromagnetic pulse (EMP) warheads, bunker-busters, and cluster warheads. It is equipped with a self-contained inertial navigation system, an optical homing head that can be controlled from an AWACS or UAV. Also, it is equipped with decoys to bypass enemy missile defense systems.[772] Overall, the Iskander has many capabilities that help it overcome enemy air defense systems and hit its designated target, even in undesirable environments such as fog or low visibility.

A complete Iskander system is accompanied by a loader-transporter, maintenance vehicle, command post vehicle, information post, ammunition equipment set and training aids.[773] The Iskanders utilize a mobile TEL that can transport and fire up to two missiles. Both missiles can

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[770] Ibid.
[771] "Iskander-M (SS-26)." Missile Defense Advocacy Alliance. Accessed March 19, 2023. https://missiledefenseadvocacy.org/missile-threat-and-proliferation/todays-missile-threat/russia/iskander-m-ss-26/.
[772] Ibid.
[773] Ibid.

be directed at different targets, and its guidance system allows it to change targets mid-flight, which aids in bypassing enemy missile defense systems.

Russia reportedly began the war with around 900 Iskander missiles in its stockpiles, but because of their prolonged use, they are currently down to less than 100 Iskanders.[774] The Novator plant and the Votkinsk plant are the primary manufacturers of Iskander missiles. The Novator plant has the capacity to produce several dozen Iskanders per year, and the Votkinsk plant has increased production from 50 to 60 missiles per year. Although both plants are trying to increase production, their lack of additional engineers, technical workers and mechanics means they will increase production rates by no more than 20%.[775] There were also numerous reports of Iskander missiles crashing immediately after their launch, which indicates some issues with production quality or the quality of certain components, such as the guidance systems.

Kalibr 3M-14

The sea-launched land attack Kalibr 3M-14 cruise missile developed by Novator has also been widely used by Russia in Ukraine. This missile has a maximum effective range of 2,500 km, a minimum range of 250 km a flight ceiling of 1,000 m, a maximum speed of 965 km per hour, and a 3 m circular error probability.[776] It is 6.2 m long, weighs 1,300 kg, and has a diameter of .533 m. It is equipped with a highly explosive conventional warhead that weighs 450 kg, and it is possibly nuclear capable.[777] All variants of the Kalibr utilize vertical launch systems and reach their targets through a combination of terminal active radar homing and inertial guidance

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[774] Brugen, Isabel van. "Russia Ramps up Missile Production as Putin Prepares for Long Haul." Newsweek, March 15, 2023. https://www.newsweek.com/russia-ramps-missile-production-putin-war-ukraine-conflict-1787864.
[775] Starchak, Maxim. "Missed Targets: The Struggles of Russia's Missile Industry." CEPA, September 23, 2022. https://cepa.org/article/missed-targets-the-struggles-of-russias-missile-industry/.
[776] "OE Data Integration Network." ODIN. Accessed March 19, 2023. https://odin.tradoc.army.mil/WEG/Asset/SS-N-30A_(3M-14_Kalibr)_Russian_Multi-Role_Long_Range_Cruise_Missile.
[777] Ibid.

or satellite signals using a digital scene matching area correlator (DSMAC). Additionally, each missile costs around $6.5 million to produce.[778]

According to a chart tweeted by Ukraine's defense minister, at the start of the Russia-Ukraine conflict, Russia maintained a stockpile of about 500 Kalibr cruise missiles. Since the start of the war until November 2022, Russia was able to produce around 120 more Kalibrs, and they used around 391 missiles. Ukrainian intelligence also estimates that Russia can produce 20 Kalibrs per month.

Many reports suggest that the Russian Kalibr missile is the equivalent to the American Tomahawk missile and can easily overcome Ukrainian air defense systems. In the initial assault on 24 February 2022, around 30 Kalibr missiles were launched from various platforms such as Buyan-class corvettes, Admiral Grigorovich-class frigates, and Kilo-class submarines of the Russian Black Sea Fleet.[779] These missiles were used to strike strategic and non-combat targets across Ukraine. Furthermore, throughout October, November, and December 2022, many Kalibr cruise missiles were fired from the Black Sea in order to target some of Ukraine's critical energy facilities across the country. As a result, at least 50% of Ukraine's energy sector was destroyed by November 2022.[780]

136 Shahed Kamikaze Drone

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[778] Guttman, Jon. "3M-54 Kalibr: Is Russia's Most Advanced Cruise Missile Being Wasted in Ukraine?" HistoryNet, August 22, 2022. https://www.historynet.com/3m-54-kalibr/.

[779] Eastwood, Brent. "Kalibr: Russia's Very Own 'Tomahawk' Cruise Missiles Is Hitting Ukraine." 19FortyFive, March 8, 2022. https://www.19fortyfive.com/2022/03/kalibr-russias-very-own-tomahawk-cruise-missiles-is-hitting-ukraine/.

[780] "Almost 50% of Ukraine's Energy System Disabled by Missile Attacks." Ukrainska Pravda, November 18, 2022. https://www.pravda.com.ua/eng/news/2022/11/18/7376976/.

Another critical system utilized by Russia has been the 136 Shahed Kamikaze (Geran 2) drone. This Iranian loitering munition (suicide drone) was designed by Shahed Aviation, produced by HESA, and sold in large numbers to Russia.[781] The 136 Shahed is not effective against moving targets, but its main role is striking stationary ground targets. It does this using pre-set coordinates. It weighs 200 kg and carries a HE fragmentation warhead weighing 36-50 kg. Furthermore, the Shahed drone has an estimated range of 1000-2500 km and a flight ceiling of 4 km.[782] The drone is launched from a rack that can hold up to 5 drones and can be attached to the back of a truck that looks like a standard logistical truck. It is launched almost horizontally using a rocket-assisted takeoff. The drone utilizes an inertial navigation system with a consumer-grade GPS system to strike its target using pre-loaded coordinates and does not have a remote control. These drones are not effective against military targets because they are very loud and slow, but some sources suggest that they were created specifically for destroying civilian infrastructure. They have been utilized to attack targets such a bridges, fuel-storage facilities, and frontline targets, but they have done the most damage to Ukraine's electrical sub-stations.[783]

Another advantage of the Shahed drone is it is relatively inexpensive. Although the exact price is unknown, estimates vary between $20,000 to $50,000, which is inexpensive when considering the level of damage it can achieve, especially to civilian infrastructure. As a result, employing SAMs to destroy these drones costs more than the drones themselves. They have proven to be very useful in expending the Ukrainians' air defense missiles. In order to limit the production of these drones, the US and other NATO countries have placed sanctions on critical

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[781] "Shahed 136." Military Today. Accessed March 19, 2023. https://www.military-today.com/aircraft/shahed_136.htm.

[782] Ibid.

[783] Brobst, Ryan. "How to Help Kyiv Go on a Drone Offensive." C4ISRNet. C4ISRNet, February 7, 2023. https://www.c4isrnet.com/thought-leadership/2023/02/07/how-to-help-kyiv-go-on-a-drone-offensive/.

parts, but examination of drones that were shot down or crashed in Ukraine demonstrates that the drones utilize several Western and Chinese parts in its construction. This shows that Iran was able to overcome the sanctions and obtain important parts not for sale to the general public such as a computer processor produced by the American company, Altera.

Ukraine's Defense Minister Oleksii Reznikov estimated that Russia had exhausted about 88% of their Shahed drone stockpiles, which would leave them with only 90 of the 450 drones originally in their stockpiles.[784] Also, Ukrainian President Volodymyr Zelensky has suggested that Russia has ordered nearly 2,400 Shahed drones from Iran, but they have only received batches of a few hundred due to Iran's slow production and their need to maintain their own stockpiles.[785] Iranian factories have the capacity to produce about 150 Shahed drones per month, and some sources suggest that Russia and Iran are planning to build a factory within Russia to further increase production quantities.[786]

Since before the start of the conflict, Russia has worked to increase production of these important missiles. Because the use of cruise missiles and ballistic missiles have become the backbone of Russia's air campaign, their stockpiles are being depleted faster than they can be restocked. One factor limiting Russia's ability to increase the production rates of these missiles is the sanctions that have further limited Russia's access to critical Western electronic components. For now, Russia is utilizing their stocks of foreign electronic components, but as they run out, Russia is looking to other countries that have not imposed sanctions and reviewing their supply

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[784] Cook, Ellie. "Russian Forces Rapidly Running out of Iranian-Made Shahed-136 Drones-ISW." Newsweek. Newsweek, January 9, 2023. https://www.newsweek.com/russia-ukraine-iranian-shahed-136-drones-institute-study-war-volodymyr-zelensky-1772102.
[785] Iran International Newsroom. "Russia Receives New Batch of Iranian Drones – UKR Official." Iran International. Iran International, December 19, 2022. https://www.iranintl.com/en/202212199035.
[786] Brobst, Ryan. "How to Help Kyiv Go on a Drone Offensive."

chains. However, if Russia can secure more components from other countries or begin to manufacture their own parts, more problems arise. Guided missiles have very specific requirements for mass and other dimensions, so each change in the components requires additional testing.[787] This not only slows production rates, but it will degrade the quality of the missiles even more.

<div align="center">UKRAINIAN AIR DEFENSE STRATEGY</div>

Although Ukrainian aircraft have fought occasional air-to-air missions against the Russians, their mobile, land-based air defense systems have become the backbone of their air defense and reshaped Ukrainian air defense strategy as the Russians continue to ramp up their use of missiles and drones. The Ukrainian military has leveraged a layered air defense model that utilizes a combination of long, medium, and short-range air defense capabilities to deny Russia air superiority.[788] It leverages many different systems to identify, track and intercept enemy aircraft and missiles. Based on the actions displayed by Ukraine in the Russia-Ukraine conflict so far, it is apparent that Ukraine has refocused their strategic priorities to air denial instead of trying to gain air superiority over Ukraine.

Between the months of February and August 2022, Russia was unable to make decisive progress toward a successful suppression or destruction of enemy air defenses (SEAD/DEAD) campaign despite their technical advantage on nearly all fronts. This can be contributed in part to Ukraine's effective and dispersed ground-based air defense operations that utilize the 'shoot and scoot' strategy. This strategy relies heavily on the mobility of Ukraine's air defense systems.

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[787] Starchak, Maxim. "Missed Targets: The Struggles of Russia's Missile Industry."

[788] Bremer, Col. Maximilian, and Kelly Grieco. "Air Defense Upgrades, Not f-16s, Are a Winning Strategy for Ukraine." Defense News, January 25, 2023. https://www.defensenews.com/opinion/commentary/2023/01/25/air-defense-upgrades-not-f-16s-are-a-winning-strategy-for-ukraine/.

Once the system's radar is turned on, it becomes a target for Russian SEAD initiatives. As a result, it is important for Ukrainian systems to be able to shoot down missiles quickly and then shutdown and move to another location so their position is not detected by Russian anti-air defense missiles. Ultimately, the effectiveness of Ukraine's ground-based air defense systems cost Russia the ability to operate above very low altitudes in Ukraine's airspace which has prevented Russia from being able to effectively employ heavy and efficient aerial firepower against strategic Ukrainian targets.

In recent months, however, Ukraine's air denial strategy has been increasingly challenged as Russia shifts its air strategy from traditional suppression of enemy air defense using fixed-wing aircraft to the use of missiles and drones. Russia is launching large, combined attacks of missiles and suicide drones at Ukrainian cities and infrastructure to force their air defense systems to deplete their missile stockpiles.[789] As a response, Ukraine has begun utilizing NATO provided MANPADS and other less expensive short-range air defense systems, such as the German Gepard, to shoot down the drones and saving its stocks of more advanced and less accessible missiles for Russian cruise missile attacks. Moving forward, Ukraine must continue to balance concerns for its people and infrastructure without severely depleting its air defense missile stockpiles.

Although Ukraine has been relatively successful in denying Russia air superiority and countering Russian missile attacks, it must be noted that a portion of this success should be attributed to the Western support of Ukraine. The US and NATO allies have provided Ukraine with billions of dollars in the form of humanitarian, financial and military support.[790]

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[789] Ibid.

[790] Masters, Jonathan, and Will Merrow. "How Much Aid Has the U.S. Sent Ukraine?" Council on Foreign Relations, February 22, 2023. https://www.cfr.org/article/how-much-aid-has-us-sent-ukraine-here-are-six-charts.

Furthermore, the US and NATO allies have provided Ukraine with essential Soviet-era systems and newer, Western air defense systems that have impacted Ukraine's ability to continue to deny Russian air superiority. Some of the most notable systems have been the Patriot missile system, NASAMS, Avenger and Hawk systems, S-300s and numerous MANPADS such as Stingers and British Starstreaks.[791] In addition to physical assets, the US and NATO have also provided Ukraine with training on these systems, which is imperative in their effective employment. Furthermore, Western influence has helped Ukraine begin to see the benefits of the Western military structure. Ukraine has begun to adopt a more Westernized approach to fighting and has abandoned the Soviet-era centralized command-and-control structure. This has given enlisted personnel and NCOs more freedom to act on their own initiative, and in the air war, it has empowered the lower echelons to initiate air defense strikes. Overall, the US and other Western countries have allowed Ukraine to continue to deny Russian air superiority by providing the weapons and training necessary for Ukraine to maintain an integrated air defense strategy.

<div align="center">RUSSIAN AIR STRATEGY</div>

For the first few days of the Russian invasion that began on 24 February 2022, the Russian Air Force (VKS) was heavily involved in conducting sweeps, air strikes, and counter-air missions predominately in Ukraine's capital city of Kyiv. They were able to successfully take out hundreds of targets including Ukrainian air defense systems, storage sites, and radar installations deep within Ukraine using radar jamming and decoys to render Ukrainian ground-based air defense (GBAD) systems, such as the S-300 ineffective.[792] During this timeframe, Ukraine

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[791] Ibid.

[792] Mulay, PK. "Air Superiority or Air Denial: The Truth about the Air War in Ukraine." Indian Defense Review, February 22, 2023. http://www.indiandefencereview.com/news/air-superiority-or-air-denial-the-truth-about-the-air-war-in-ukraine/.

opposed a few of the Russian Sukhoi Su-34, Su-30SM and Su-35S fighters primarily with their Mig 29s. However, the Russian air campaign proved effective in the first days of the invasion because of their technologically more advanced fighters, longer-range missiles, and electronic warfare capabilities.

The Russian Air Force was forced to change its air strategy about one week into the invasion as it became clear that land forces were ineffective in capturing Kyiv due to unplanned logistical failures and unexpected Ukrainian ground resistance. This inability to capture Kyiv forced Russian forces to redirect their efforts to capturing the Donbas region and the city of Mariupol in southern Ukraine.[793] Here, it became apparent that the electronic warfare technology that had been effective in jamming Ukrainian air defense radars was also interfering with the communication of Russian ground forces. Furthermore, Russia's Air Force switched their primary mission from attacking Ukrainian air defense systems to supporting the ground forces. With the Russian inability to utilize electronic warfare capabilities and no offensive air presence, Ukrainian air defense systems began to pose a threat to Russian aircraft. As a result, Russian aircraft were forced to operate at lower altitudes and were constantly exposed to Ukrainian air defense systems with radar guided missiles and MANPADS supplied by the US and NATO.[794] Overall, this shift in the role and mission of the Russian Air Force allowed Ukraine to regroup and relocate their GBAD systems, which denied Russian attempts to destroy enemy ground forces and ultimately gain control of Ukrainian airspace.

One defining characteristic of the Russian Air Force is that its aircraft are viewed as extensions of the ground force and are predominately used for the delivery of firepower to

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[793] Ibid.
[794] Ibid.

support the troops on the ground. Although ground support is an important aspect of any air strategy, this focus has limited the VKS's ability to pursue its operations towards surface campaign goals. Furthermore, the Russian military strategy does not give the Russian Air Force the authority to pursue its own air campaign, and Russian doctrine is not focused on offensively achieving air superiority over contested airspace. Instead, the Russian Chief of General Staff, Valery Gerasimov characterized Russia's air strategy as one of "active defense". In other words, Russia has geared its air force towards defense from a large-scale, multi-domain attack to its heartland. In doing so, they lack the capabilities to conduct offensive operations with overwhelming force within Ukraine and have had to modify their air strategy several times throughout the course of the war.

In regard to Russia's long-range strike campaign, the VKS's primary objective at the start of the war was to "degrade and destroy Ukrainian air-defense capabilities".[795] Russia utilized electronic and signals intelligence to create a target plan months before the war that primarily targeted fixed radars, fixed SAM sites, command posts, airbases, and ammunition storage sites. Although these bombardments were successful in the first few days of the invasion, Ukraine's 'shoot and scoot' approach to air defense meant many targets had been moved by the time the missiles hit their designated aiming points. Additionally, the Russian Air Force had some success at the start of the war, but they ultimately failed to secure a quick military victory in the first few days. As a result, their long-range strike objectives were redirected from Ukrainian air defense sites to infrastructure and government targets.[796] Some of these strikes were successful, but Russia's missile stockpiles began to run low, and they failed to achieve the level of damage

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[795] Bronk , Justin. "The Russian Air War and Ukrainian Requirements for Air Defence." Royal United Services Institute for Defense and Security Studies , November 7, 2022. https://static.rusi.org/SR-Russian-Air-War-Ukraine-web-final.pdf?trk=public_post_comment-text.
[796] Ibid.

needed to make a decisive difference in the attack against Ukraine. Part of this was due to Russia's inability to accurately destroy its intended targets. Because of this inaccuracy, Russia was forced to expend a far greater number of missiles in attempts to hit a single target, which is having a large impact on their missile stockpiles.

Under the new leadership of General Surovikin, Russia's air strategy once again changed. Using 136-Shahed drones along with long-range precision strike weapons, such as the Iskander, Kh-101, and Kalibr missiles, Russia began to target critical civilian energy infrastructure.[797] Usually, Russia will launch cruise missiles alongside dozens of Shahed drones. Although Ukraine has been effective in shooting down most of these barrages using SAMs, MANPADS, and anti-aircraft fire, the munitions that do make it through Ukraine's defense systems have inflicted high levels of damage, especially on the civilian infrastructure. This type of destruction in the civilian sector presents many new sets of complex challenges, such as humanitarian concerns and Ukraine's inability to keep people warm throughout the winter months. Furthermore, the use of Shahed drones has proven to be an inexpensive way to deplete Ukrainian missile stockpiles. Ukraine must constantly choose between expending their air defense missiles on inexpensive drones in order to keep their people safe, or preserve their missile stockpiles for bigger threats, such as Iskander missiles and risk further destruction to civilian infrastructure. Overall, it is not yet apparent if Russia's current air strategy will change the course of the war, but their shift to targeting civilian infrastructure and utilizing coordinated attacks of drones and cruise missiles to deplete Ukraine's missile stockpiles is causing major problems for Ukraine and forcing Ukraine to rethink their air defense strategy.

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[797] Ibid.

POSSIBLE OUTCOMES AND SCENARIOS

After establishing an understanding of the capabilities and strategies of both the Russian and Ukrainian Air Forces, it is necessary to situate them in context with other outside influences in order to create possible future scenarios or outcomes of the Russia-Ukraine conflict, especially in regard to the air war. By comparing the Russian strike capabilities to Ukrainian air defense performance so far and considering the key judgments as explained previously, some possible outcomes include: a successful Russian depletion of Ukrainian air defense capabilities, continued Ukrainian denial of Russian air superiority, or a stalemate, or frozen conflict.

The first possible scenario to consider is an increase in the volume and frequency of Russian missile and drone attacks in an attempt to overpower Ukrainian air defense systems or deplete their missile stockpiles, rendering their air defense systems ineffective. For the first three days of the conflict, Russia demonstrated an ability to perform coordinated air attacks on Ukrainian air defense positions. Their employment of electronic warfare to jam radars proved highly successful and allowed Russia to destroy many critical targets deep inside the borders of Ukraine. However, a shift in Russian ground warfare strategy, along with the inability to continue to use radar jamming, Ukraine was able to regroup and reestablish many of their air defense positions. Considering Ukraine's success in denying Russian air superiority, the most likely scenario in which Russia gains air superiority would be if Russia could completely deplete Ukrainian air defense missile stocks.

With an increased number of cruise missile attacks on critical Ukrainian civilian infrastructure and the recent employment of inexpensive Shahed drones, this scenario is becoming more and more likely. If Ukraine prioritizes the safety and comfort of their citizens by shooting down these missile and drones, they run the risk of running out of air defense missiles.

The Shahed drones pose an increasingly problematic challenge because of their inexpensiveness in relation to the damage they can cause. One factor limiting this scenario is the Western involvement and support in Ukraine. Western countries have been supplying Ukraine with the munitions that have aided the Ukrainian air defense campaign in successfully denying Russian air superiority. However, the US and other NATO allies have struggled to procure weapons at the rate they are depleted, and Western countries must also preserve a portion of their military stockpiles for their own defense. Ultimately, with all factors considered, it is probable that Russia could gain air superiority by depleting Ukraine's missile stocks. As a result, Russia would dominate the skies with their technologically more advanced aircraft, and it would be very difficult for Ukraine to regain air superiority without far more extensive involvement from Western countries.

Another possible turning-point of the Russia-Ukraine air war would be if Russia ran out of strike capabilities, such as cruise missiles, and Ukraine was still able to deny air superiority. A major problem facing Russia since the start of the war has been the accuracy and failure rates of their cruise missiles. Some reports suggest that Russia's failure rate (defined as the inability to launch or hit the target) is around 20 to 60 percent. This high failure rate could be attributed to reliability, maintenance, or quality control issues. Also, Russia's use of aging missiles could also contribute to this high failure rate.[798] Evidence suggests that Russia has launched missiles that were designed in the 1980s as nuclear delivery systems, but the Russians had replaced their nuclear capabilities with conventional warheads. [799] Because of this high failure rate, Russia has depleted their missile stocks at a much faster rate than Ukraine in order to be successful in hitting

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[798] "Russia Firing Ageing Cruise Missiles Because Stocks Are Depleted, Mod Suggests." The Guardian. Guardian News and Media, November 26, 2022. https://www.theguardian.com/world/2022/nov/26/russia-firing-ageing-cruise-missiles-because-stocks-are-depleted-mod-suggests.
[799] Ibid.

some strategic Ukrainian targets. If Ukraine can continue to strategically utilize their own air defense missile stockpiles, along with Western support, it is likely that they could successfully defend against Russian missile attacks and completely deplete Russian missile stockpiles.

How long Russia will continue to launch cruise missile attacks will depend highly on how many missiles they had before the start of the war and how many they have been able to produce since then. It is estimated that Russia had around 2,500 missiles in their stockpile at the start of the war and now their stockpiles are well over 50% depleted.[800] Additionally, they have been successful in producing more missiles throughout the war, but they are producing missiles at a slower rate than they are using them due to a lack of necessary manpower and strict sanctions imposed by the West on critical missile components and electronics. If Russia runs out of missiles and other air munitions and Ukraine is able to maintain air superiority, Russia will have no other means of destroying key Ukrainian targets or depleting Ukrainian missile stockpiles. This could have decisive effects on the battlefield that could allow Ukraine to push Russian troops back and ultimately leave Russia defenseless in terms of air capabilities.

Another possible outcome in the ongoing Russia-Ukraine conflict would be a prolonged stalemate with neither side making notable strides toward an end to the conflict. In terms of air capabilities, this stalemate could occur for two reasons. First, Ukraine and Russia could go on as they have been with Russia firing missiles and drones at Ukrainian targets and Ukraine shooting them down. However, this type of warfare is limited by the number of missiles each side has or is able to produce. On the other hand, this type of stalemate could be further perpetuated as Russia and Ukraine begin to receive more aid from other countries. Secondly, a stalemate could

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[800] Wall, C., & Wegge, N. (2023, January 25). *The Russian Arctic Threat: Consequences of the Ukraine War*. CSIS: Center for Strategic and International Studies . Retrieved April 26, 2023, from https://www.csis.org/analysis/russian-arctic-threat-consequences-ukraine-war

develop if a lull in missile attacks occurs as an effort to preserve missile stockpiles. With both sides rapidly depleting missile stockpiles, this is a possibility. Either way, both scenarios pose large humanitarian risks and have the potential to further impact people globally. Not only will displaced Ukrainians not be able to return to Ukraine for an extended period of time, but citizens within Ukraine will have to continue to endure the anxiety of war, along with the constant attacks on critical infrastructure and on their homes. Additionally, other consequences of the Russia-Ukraine conflict, such as rising oil prices due to sanctions, could continue to have a direct impact on the entire world.

Finally, it is imperative to understand the impact US and Western support can have on the war in Ukraine. As demonstrated by Ukraine's ability to deny Russian air superiority and shoot down Russian missiles, the US and NATO allies have played an essential role in providing Ukraine with air defense capabilities and training. Although this aid is a necessity to defending Ukraine, there are risks associated with involvement in the Russia-Ukraine conflict. On one hand, too much Western intervention could possibly trigger another world war or even a nuclear war with Russia. On the other hand, Western complacency could lead to decisive turns in the conflict that benefit the Russians. If the US and NATO become too comfortable with Ukrainian successes, they could underestimate the level of aid needed and no longer provide sufficient support.

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Russian War Crimes in Doctrine and Their Effect in Ukraine

BLUF

Russia's use of war crimes in their doctrine has skewed the country's view on war fighting and made it to where criminal warfare is standard in all war fighting.

Abstract

In Ukraine the Russian Federation has become more hostile and has resorted to the bombing of hospitals and civilian centers, killing civilians, ultimately violating the Geneva Convention. While the use of war crimes and unlawful war tactics in Ukraine will be explored in this research, the ultimate goal of this analysis is to look at how war crimes and unconstitutional war fighting has been used in the past, and how such violating are ingrained in Russian military doctrine. Russia's use of war crimes in their doctrine has skewed the country's view on war fighting and made it to where criminal warfare is standard in all war fighting. Further research

paired with analysis of the conflict in Ukraine will be used to predict Russia's next movements and offensive measures against opposing Ukrainian forces.

Key Judgements

There are many theories as to why war crimes go uncondemmed in Ukraine within the past year. The first key judgment that will be analyzed is the lack of discipline and order that the Russian Federation has when it comes to just war fighting and lawful tactics. To be able to investigate this further, Russian military doctrine and foreign policy planning will be analyzed in order to gain a better understanding of how the Russian Federation and the government rationalize and operate. In regards to doctrine, the classification of war crimes in Russian society as well will also be analyzed in order to fully understand if the Russian Federation even considered civilian lives in their battle tactics and if they respect historical buildings.

A second key judgement that is going to be challenged is the idea that Russia is able to avoid criminal charges due to the fact that Ukraine is not a part of NATO, which in turn causes other states to want to hold off their engagement. With Russia being a peer adversary with the United States, the United States needs to be able to show their support and logistically support Ukraine, without causing an overall war with Russia due to their involvement with Ukraine. This aid, while it can be from ammo, financial aid, military machinery, the key aid that is going to be critical is the legal aid that NATO can provide and should provide. The international community as a whole must have the focus of capturing Russian soldiers and leaders and putting them on trial for their actions in the Ukraine invasion.

Research Methods

The strategic analysis of war crimes and crimes against humanity comes from official military and government legislature. For the sake of Ukraine, the analysis of key areas and the amount of destruction that has been released will be the building blocks for the argument presented. Couple this with the military manuscripts that infer that this behavior is acceptable by the Russian government, and the argument becomes more solidified.

The second half to this research is the actual use of the Russian positions and what cities will be affected next with more war crimes. It can be inferred that war crimes are bound to happen with the mass amount of reports that have come from Ukraine that the next step is to give policy makers a rightful assessment of where more unjust attacks can occur. Prediction of where the next attacks will occur within this second body of the analysis, there is a posited solution and a best course of action when it comes to obtaining Russian Federation personnel and trying them for the crimes that they have committed.

On March 17, 2023 the International Criminal Court (ICC) issued a criminal warrant for Russian President Vladimir Putin for his involvement in war crimes and "accusing him of personal responsibility for the abductions of children from Ukraine".[801] While President Putin is the leader of the Russian Federation and commanded troops to invade Ukraine, the accusation of abducting children stems from his direct involvement in the "deportation of (children) and that of unlawful transfer of (children) from occupied areas of Ukraine to the Russian Federation".[802] The difficulty in enforcing, or pursuing these allegations is that even though the entire international community sees this as a small victory in starting to bring down Putin and the entire Russian

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[801] Corder, Mike, and Raf Casert. "International Court Issues War Crimes Warrant for Putin." AP NEWS. The Associated Press, March 17, 2023. https://apnews.com/article/icc-putin-war-crimes-ukraine-9857eb68d827340394960eccf0589253.

[802] Ibid.

Federation, the challenge lies in the fact that Russia does not recognize the authority of the International Criminal Court. With this in mind, the last assumption with this issue is the fact that due to Russia not recognizing the ICC, Russia will continue to pursue the invasion of Ukraine by continually violating the Geneva Convention and the Rome Statute. This, alongside fact that with an international warrant, President Putin will not leave Russia or travel to any country that it does not consider its ally.

All of these key judgements, while validated in one sense or another from the continuous reports from Ukraine, will all be analyzed and used to suggest likely courses of action for the United States intelligence community and government.

Introduction

A year after the Russian invasion of Ukraine, there is a continued pattern of Russia committing mass atrocities. While Ukraine, and the entire international community, recognize that Russia is enacting a type of scorched earth tactic on the citizens and fighters of Ukraine, no other nations have intervened to fight, disrupt, or bring Russia to justice. These crimes include the bombing of hospitals and civilian centers, raping of women, and civilian executions. Reading further into Dr. Grau and Bartles' writings, they explain in their research about Russian military doctrine that Russian officers and NCOs (Non-Commissioned Officers), are conditioned and taught to operate in "the grey zone" because Russia continues to challenge norms and experiment "with undeclared wars and indirect and asymmetric methods" and when being morally relaxed is seen as being lawful and subordinate, Russian militants are more likely to continue fighting, to what the West sees as immoral.[803] While simple in the beginning this

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[803] Grau, Lester W, and Charles K Bartles. *The Russian Way of War: Forced Structure, Tactics, and Modernization of the Russian Ground Forces*. Fort Leavenworth , KS: Foreign Military Studies Office (FMSO), 2016.

behavior has allowed for the spread and continued teaching of unjust war fighting strategies that not only has plagued Ukraine for the last year, but all Russian enemies.

War Crimes Against Persons

When it comes to the civilian side of war crimes in Ukraine, there are many instances where citizens have been beaten, raped, and murder by Russian forces. In an article from the Human Rights Watch, they state that in the regions Chernihiv, Kharkiv, and Kyiv there were rapes, execution style killings, threats and unlawful violence, and lootings, all taking place from February 27, 2022 - March 14, 2022, not even three weeks into the invasion of Ukraine. Human Rights Watch was able to interview eyewitnesses when it came to the aforementioned war crimes. In the first instance, which took place on March 4, Russian forces in Bucha (Буча) rounded up 5 men and had them kneel on the ground and pull their shirts over their heads, "and shot one of the men in the back of the head".[804] Earlier on February 27, a similar instance occurred in Staryi Bykiv, in Chernihiv, where six men were rounded up and were killed execution style in the street.

In continuation with these executions a Ukrainian man and his daughter told Human Rights Watch, that they were threatened to be executed after a Russian soldier searched their home and found a "hunting rifle and a gasoline in the backyard".[805] Luckily another soldier intervened and stopped the execution from happening, yet the operation within the moral "grey area" is still happening.

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[804] Human Rights Watch, ed. "Ukraine: Apparent War Crimes in Russia-Controlled Areas." Human Rights Watch. Human Rights Watch, April 3, 2022. https://www.hrw.org/news/2022/04/03/ukraine-apparent-war-crimes-russia-controlled-areas.
[805] Ibid.

In a breach and clear style killing on March 6, a mother and son were executed after Russian soldiers threw a smoke grenade into a basement and killed the two after they emerged from the basement.[806]

When it comes to the other crimes, mentioned above, a woman from Kharkiv (Хáркiв), explains that she was raped at knife point after being beaten, in a school on March 13, the same location where "she and her family had been sheltering".[807]

While these are selected instances that the Human Rights Watch has covered and investigated in depth, the Ukrainian government is investigating "more than 58,000 potential Russian war crimes", that go on to include "killings, kidnappings, indiscriminate bombings and sexual assaults.[808] In an Associated Press video article titled "Crime Scene: Bucha | How Russian Soldiers Ran a 'Cleansing' Operation in the Ukrainian City" they explain that Russian forces started infiltrated the city and began rounding up civilians and began beating, torturing, interrogating, and executing civilians. CCTV footage shows mass atrocities and the rounding up of civilians through the streets. The headquarters for this operation was 144 Yablunksa street, and along this street is seen the most amount of concentrated killings.[809] The Ukrainian government has been able to use the CCTV videos to identify the Russian unit that is responsible for the invasion of Bucha and it is the the 76th division. The commander of the 76th division, Chubarikin

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[806] Ibid.

[807] Ibid.

[808] Biesecker, Michael. "Evidence of Russian War Crimes Mounts as Invasion of Ukraine Drags On." PBS. Public Broadcasting Service, December 30, 2022. https://www.pbs.org/newshour/world/evidence-of-russian-war-crimes-mounts-as-invasion-of-ukraine-drags-on.

[809] Associated Press. *Crime Scene: Bucha | How Russian Soldiers Ran a 'Cleansing' Operation in the Ukrainian City*. United States: Associated Press News, 2022. https://www.youtube.com/watch?v=WW8YYhUIK0s.

Sergei Viktorovich, is being pursued by the Ukrainian government to be tried for the crimes of his men.[810]

The backbone behind Russian forces being able to commit these war crimes against Ukraine is how Vladmir Putin continuously ignores the establishment of the Geneva Convention, and with this, also ignores the establishment of the Rome Statute, "which established the International Criminal Court and defined specific war crimes and crimes against humanity".[811] So while the rest of the international community recognizes that Russia is breaking international law regarding warfare, and wants to enact justice, Putin does not even recognize the international statutes that outline legal warfare and consequences for acting above the law.

This instance of not recognizing international law is also not new for Putin and Russia. This has been a deep-seated pattern that was also apparent in "Chechnya, Syria, and Georgia", and is a large component in Russian military strategy.[812] With continuing these crimes against people, and unjust killings, it is apparent that Russian forces are ordered to kill civilians and essentially plow through neighborhoods, leaving little survivors.

Destruction of Infrastructure:

While war crimes are commonly thought to be crimes against people or groups, war crimes can range from a wide variety of illegal acts in war. The Geneva Convention and the International Criminal Court (ICC) outline what acts can be regarded as war crimes. The Rome Statute from the ICC lists under war crimes that the intentional directing of "attacks against

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[810] Ibid.

[811] Biesecker, Michael. "Evidence of Russian War Crimes Mounts as Invasion of Ukraine Drags On." PBS. Public Broadcasting Service, December 30, 2022. https://www.pbs.org/newshour/world/evidence-of-russian-war-crimes-mounts-as-invasion-of-ukraine-drags-on.

[812] Ibid.

buildings dedicated to religion, education, art, science or charitable purposes, historic

monuments, hospitals and places where the sick and wounded are collected, provided they are

not military objectives" is a crime of war.[813] Within the last year and the invasion of Ukraine,

Russian forces have continuously targeted and destroyed buildings that fit this description.

According to the United Nations Educational, Scientific, and Cultural Organization

(UNESCO), there have been a total of 245 sites that hold religious, historic, or educational

importance that have been destroyed, since the start of the invasion on February 24, 2022 -

March 2, 2023. In regard to Yablunska street in Bucha, which is located in the Kyiv region,

which was mentioned earlier, there are a total of 38 destroyed sites. These sites range from

memorial sites such as the "Memorial Monument to villagers who died in the Second World

War", to churches or religious sites, to museums and libraries.[814] When looking at religious

centers in particular, just in Kyiv, there were a total of 16 buildings destroyed by Russian forces,

about half of all buildings destroyed in the region. This destruction of religious centers is a

common pattern in other regions in Ukraine. In the Donetsk region, which has been a major

contention point for the Russian invasion, there has been a total of 67 buildings of cultural

importance that have been destroyed as of March 2, 2023.[815] Out of these 67 buildings, 36 of

these are religious centers for various religions.[816] The other destroyed buildings in the Donetsk

region range from resident buildings, museums, monuments, libraries, and common centers, and

while these buildings hold importance in Ukrainian history and society, the ratio between these

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[813] *The United Nations Rome Statute of the International Criminal Court*. International Organizations, 2001. Web Archive. https://www.loc.gov/item/lcwaN0018822/.

[814] Mallard, Thomas. "Damaged Cultural Sites in Ukraine Verified by UNESCO." UNESCO. UNESCO, March 18, 2023. https://www.unesco.org/en/articles/damaged-cultural-sites-ukraine-verified-unesco#:~:text=As%20of%201%20March%202023,%2C%2019%20monuments%2C%2012%20libraries.

[815] Ibid.

[816] Ibid.

buildings and religious centers shows that Russian forces are favoring destroying religious buildings over any other building. In a report published by the United States Commission on International Religious Freedom (USCIRF), they state that since the beginning of the invasion, Russia has "weaponized religious rhetoric and antisemitism, and abused and distorted the legacy of the Holocaust by deliberately misusing the term 'Nazi' to justify this war".[817] This, in turn, has caused Russian Forces to destroy "foundations of religious freedom" and establish a pseudo-holy war, as a reason for their invasion into Ukraine.[818] In continuation of this idea that Russia has enacted a 'holy war' on Ukraine by marking religious centers as their number one priority target, it has also been documented that Russia has killed at least 20, and kidnapped 15 other religious leaders, adding more to the list of war crimes against person that were mentioned earlier.[819]

Now while religious centers have been a large focus of the Russian military, residential buildings look to be the next biggest target. Estimates from the Ukraine government state that "the total amount of damage to Ukraine's infrastructure by Russia has reached $137.8 billion".[820] Within these estimates as well, it is speculated that "131.4 thousand houses, 17.5 thousand apartment buildings, and 280 dormitories" have also been either damaged or destroyed by Russia and their attacks.[821] The Kyiv Oblast (region) has suffered the most of this residential distraught

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[817] United States Commission on International Religious Freedoms, ed. "USCIRF Concerned by Religious Freedom Implications of Russia's Invasion of Ukraine." USCIRF. USCIRF, February 24, 2023. https://www.uscirf.gov/news-room/releases-statements/uscirf-concerned-religious-freedom-implications-russias-invasion.

[818] Ibid.

[819] Ibid.

[820] Hersymchuk, Anastasiia. "When Buildings Can Talk: Real Face of Civilian Infrastructure Ruined by Russian Invaders." Ukraine World. Ukraine World International, February 2, 2023. https://ukraineworld.org/articles/stories/infrastructure-ruined#:~:text=A%20considerable%20proportion%20of%20this,apartment%20buildings%2C%20and%2028 0%20dormitories.

[821] Ibid.

with the village of Moshchun having roughly "90% of houses in" the area destroyed, leaving families with nothing.[822]

Looking at the Eastern front of Ukraine, we see a continuation of this behavior and see that the unlawful destruction of residential areas has severely displaced many citizens and families. In the village of Korobochkyne, which was on the frontline of the invasion for the first six months, the "once-prosperous village of 3000 now has just about 300 inhabitants" showing the magnitude of Russia's invasion in the village.[823] Looking outward at other areas, the same amount of destruction is apparent. In the villages of Kamyanka and Dolyna, the effect of the invasion is the same, and people are forced to live amongst the rubble of their old homes. With the destruction of these homes as well, utility infrastructure has been destroyed as well, leaving Ukraine citizens that live in the rubble of their old homes go without water, heating, and electricity, and must "rely on rain and snow for water and burning wood for heat."[824]

Outside of residential areas, and analyzing the loss of electricity further, it is apparent that Russia has been targeting the electrical grid, as a primary tactic that is "designed to instill terror", and harm civilians, making it a direct violation of lawful warfighting.[825] With the winter months just passing, there was high confidence from Ukrainian analysts and researchers that Russia was targeting the electrical grid as a strategy to instill fear and "deprive civilians of access to water, heat, and health services", but as well as to create environments where the weather would affect the morale and discipline of troops and civilians and discourage them from fighting back.[826]

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[822] Ibid.
[823] Ibid.
[824] Ibid.
[825] Human Rights Watch, ed. "Ukraine: Russian Attacks on Energy Grid Threaten Civilians." Human Rights Watch. Human Rights Watch, December 6, 2022. https://www.hrw.org/news/2022/12/06/ukraine-russian-attacks-energy-grid-threaten-civilians.
[826] Ibid.

In other cases, with the electrical grid being a multifaceted interface for both civilian and military use, it can be difficult to discern if attacks on electrical grids are classified as crimes of war, or justifiable acts due to the targeting of military assets. This is not the case with Russia and Ukraine because of the prohibition of "indiscriminate or disproportionate attacks", and because civilian deaths… have accumulated and were foreseeable for Russian military forces.[827] The International Committee of the Red Cross Commentary reinforces this as well, as they state that "although attacks on facilities that provide services to civilians but also direct support to military action can be legitimate, attacks and acts of destruction that are bound to have such serious effects on the civilian population that they would die or be forced to move, are not," and the goal to spread fear and suffering of civilians are classified as war crimes, whether it is military advantageous for attacks to ensue.[828] Even with the war in Ukraine being an urban setting and causing 'guerilla-style' fighting, destruction of urban infrastructure and residential buildings can be just, but the amount of destruction that Russia has enacted on Ukraine is over-exaggerated and constitutes violations of the Geneva Convention and the Rome Statute.

Russian Doctrine

Russia, being an expansionist state, their modern military doctrine is founded upon "the struggle for world domination between the two geopolitical ideologies of Soviet socialism and Western capitalism.", that was reinforced in the 1950s and 60s with the beginning of the Cold War, and the race for obtaining, but not necessarily using nuclear warheads.[829] With the first ever

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[827] Ibid.

[828] Ibid.

[829] Pietkiewicz, Michal. "The Military Doctrine of the Russian Federation." *Polish Political Science Yearbook* 47, no. 3 (2018): 505+. *Gale Academic OneFile* (accessed March 21, 2023). https://link.gale.com/apps/doc/A665453720/AONE?u=viva_vpi&sid=googleScholar&xid=e360f8f4.

actual official doctrine proposed in 1993 and finally signed into Russian law in 2000, outlined two main reasons for Russia declaring war on other nations. First being Russian forces would be allowed to enact military actions against "illegal activity of nationalist, separatist and other organizations aimed at destabilising the Russian Federation internal situation and violation of its territorial integrity by use of armed violence".[830] The second concept that Russia outlines that permits military action is any "attempt to forcibly overthrow the constitutional order or disrupt functioning of organs of state power and control".[831] So while Russia was focused early on with world domination and ensuring that Western ideologies were not spreading too fast in their hemisphere, this early doctrine was focused on defensive ideologies and retaliation that would rebuild Russian political power, and their presence in the international community.

In 2010, with Russia's economy starting to rise, and the increase in resources, Russia started to gain more of its authority back and become a world threat once again. With this, Russia started to become more prominent in the international community and they started to formulate stronger partnerships within the BRIC summit (Brazil, Russia, India, and China) and the SCO (Shanghai Cooperation Organization). With these new partnerships and increased presence in the international community, Russia started to focus on national security interests as well as the "willingness to consider the interests of other powerful players if they are consistent with" Russian ideologies and practices.[832] Even with this added aspect of more partnership with other nations, the Russian Federation and its doctrine did not change too drastically. The doctrine does state that there is new "readiness to take into account the interests of other influential players, if

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[830] Ibid.

[831] Ibid.

[832] Ibid.

this does not contradict the national interests of the Russian Federation", so in a sense, Russia, while not enacting bigger changes into their national security doctrine, they are just broadening their horizons in the international community by trying to compete with the United States and NATO.[833]

The largest change in Russian military doctrine was the introduction of the "Military Doctrine of the Russian Federation" by Presidential Decree No. Pr-2976 in December of 2014.[834] This doctrine included more actions that would incite Russian responses, the first being outlined as any "movement of NATO forces into global representation or bringing this infrastructure to Russia and attempting to destabilize regions of importance or strategic value to Russia or [the] deployment of foreign military in countries or areas near Russia and its allies".[835] The other threats that the new doctrine says warrants Russian response include, the implementation and strategic placement of anti-missile technology and measures that would question Russian global power or "nuclear balance", the spreading of WMDs (Weapons of Mass Destruction), by other states, an excessive military force that goes against the UN Charter, and the "spreading terrorism and any other instances of radicalised violence".[836] These new additions to Russia's military doctrine, and by reviewing past doctrines, it can be discerned that Russia's government is very focused on the idea of growing their defense outward, in the sense that they naturally shift to an offense. Their doctrine started with being a solid defense that was aimed at preventing 'Western ideologies', and with little resources, it was all they could defend. Now with the introduction of

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more resources, Russia is on a power hunt. Much like if you give a fat kid candy, they are going to constantly strive to eat more. Russia, with the introduction of more resources, is going to constantly grab for more and more power. In the original adoption of this new military doctrine in 2014 President Vladimir Putin is stated with saying "Our military doctrine does not change, it is purely defensive in nature, but we will defend our safety consistently and harshly".[837] This threat of harsh retaliation from President Putin himself, demonstrates further that Russia's defensive position can be construed as offensive threats, especially when considering in the new doctrine compared to the doctrine from 2010 "implies that the Alliance is the main geopolitical opponent because the current relations between Russia and NATO are wavering on the brink of armed confrontation and the text pointedly avoids mentioning the United States" reverting the relationship of the two nations back to Cold War era like status.[838]

Michal Pietkiewicz's analysis of Russia's current military doctrine also predicts the invasion of Ukraine with the explanation that Russia has the continued "goal of retaining new gains of Russia in the Caucasus, Crimea and Ukraine" and that "a hybrid war in the territory of the post-Soviet space within the framework of the protection of Russian-speaking population" is highly likely and that the south eastern regions of Ukraine are a large potential threat.[839] So while the invasion of Ukraine may have been a surprise to the general public in the Western Hemisphere, international policy scholars had predicted this invasion, due to the evolution of Russian military doctrine.

Nuclear Armament and Threats

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[837] Ibid.

[838] Ibid.
[839] Ibid.

As Russia continues to be a peer adversary, there is the forever hanging threat of nuclear warfare. Since the collapse of the Soviet Union, the Russian Federation has had an estimated 5,799 nuclear warheads.[840] In an article from the Nuclear Threat Initiative (NTI), they explain that nuclear refinement and research facilities are placed closer to the border of Eastern Europe. Along these lines, the locations of missile centers, demonstrate that Russia has focused a large part of its missile program on defending the Western front.[841]

Looking at nuclear doctrine after the collapse of the Soviet Union, shows that Russia was hesitant to first start using nuclear warheads, but their interest in nuclear warfare "subsequently increased in the early 2000s amidst concerns" that NATO would limit Russia's research and stockpile to match other nuclear states.[842] This is apparent in their first military doctrine in 1993 where they no longer abided by the Soviet Union's "no-first use policy", but they instead "did not assign any specific missions to nuclear weapons and did not define any threats to which nuclear weapons were supposed to respond".[843]

In The Center for Naval Analysis's (CNA) report *Russian Military Strategy: Core Tenets and Operational Concepts,* they analyze the evolution of Russia's doctrine as well, and in their analysis, they see that Russia started to focus more on their nuclear program in the fifth generation of war. This armament of nuclear warheads is to pursue the goal of "destruction of armed forces of the adversary, destruction of [enemy] economy and overthrow of [the enemy] political system".[844] So, even with the continued efforts of NATO to pursue Russia and ensure

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[840] Nuclear Threat Initiative, ed. "Russia Nuclear Overview." The Nuclear Threat Initiative. The Nuclear Threat Initiative, October 11, 2018. https://www.nti.org/analysis/articles/russia-nuclear/.
[841] Ibid.
[842] Ibid.
[843] Ibid.
[844] Kofman, Michael, Anya Fink, Mary Chesnut, Jeffery Edmonds, Julian Waller, Kasey Stricklin, and Samuel Bendett. "Russian Military Strategy: Core Tenets and Operational Concepts." Stuttgart, Germany: Russia Strategic Intiative U.S. European Command, August 2021.

that they followed disarmament treaties, Russia still planned to increase nuclear warhead storage and production because of the "increased prospect of a limited conventional war, for which Russian conventional forces were ill-prepared, necessitated an expansion of the nuclear mission" in order to deter large conventional attacks.[845] When looking back at Michal Pietkiewicz's analysis of Russian military doctrine he states that current Russian Federation doctrine has the possibility for new 'hybrid wars', and the risk starts with "the southern and eastern parts of Ukraine, Moldova, Latvia and Kazakhstan", which he already knew was a threat, but Pietkiewicz continues and states that the new doctrine explains that "that Russia is prepared to use nuclear weapons in regional and even local conflicts".[846] With Ukraine being a so-called 'regional conflict', Russia is trying to lay claim to past Soviet-Union territory, and the threat comes from Russia being able to justify nuclear war with their doctrine. Just recently, on the 21st of February 2023, President Vladimir Putin announced that Russia "is suspending its implementation of the last remaining nuclear arms control treaty with the US", the New START treaty, as way to solidify his actions of using nuclear war as a blackmailing technique for Ukraine, and any state that tries to intervene.[847]

   Rotating back to the CNA's analysis on the evolution of the Russian 'generations of war', the last generation, is what can be assumed the conflict with Ukraine unfolds to be. The CNA describe the armaments in this generation to be "high-precision weapons based on land-air-sea, developed informational-space support" which would have consequences such as "conquering or

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[845] Nuclear Threat Initiative, ed. "Russia Nuclear Overview." The Nuclear Threat Initiative. The Nuclear Threat Initiative, October 11, 2018. https://www.nti.org/analysis/articles/russia-nuclear/.

[846] Pietkiewicz, Michal. "The Military Doctrine of the Russian Federation." *Polish Political Science Yearbook* 47, no. 3 (2018): 505+. *Gale Academic OneFile* (accessed March 21, 2023). https://link.gale.com/apps/doc/A665453720/AONE?u=viva_vpi&sid=googleScholar&xid=e360f8f4.

[847] International Campaign to Abolish Nuclear Weapons, ed. "Nuclear Risk: Russia Suspends New START, One Year on from the Russian Invasion of Ukraine." ICAN. ICAN, February 22, 2023. https://www.icanw.org/nuclear_risk_one_year_on_from_the_russian_invasion_of_ukraine.

establishing control over world resources of human livelihood, [the] establishment of loyal

power in states which have these resources on their territory, control of mass consciousness of

peoples and large groups of people".[848] It can be argued that Russia is using their nuclear

warheads for this, or being geared more at the fifth generation, which has the consequences of

destroying foreign powers and being able to overthrow Ukraine's political system, but it is clear

that the invasion of Ukraine, while a false 'territorial' claim by Russia, Russia themselves are

ready to enact what they deem necessary to defend their 'national security'.

While the legality of the situation has already been established, Russia clearly has backed

itself into a corner. Pietkiewicz concludes his analysis with the fact that even though Russia

"does everything in its power to provide national security for both its citizens and territory" and

will continue to target enemies that they deem necessary, "there are many stipulations in the

Russian Military Doctrines which may be considered incompatible with international law

regulations".[849] Even with any possible justification for their war crimes, due to differing

interpretations, "the Kremlin has laid the concept of a global military presence in the Military

Doctrine", and continued implementations of it in Ukraine will continue with unjust warfare.[850]

Current Response and Actions

With war crimes being committed against Ukraine every day, and the threat of more

ensuing all the time, Ukraine and the international community must continue to act fast in order

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[848] Kofman, Michael, Anya Fink, Mary Chesnut, Jeffery Edmonds, Julian Waller, Kasey Stricklin, and Samuel
    Bendett. "Russian Military Strategy: Core Tenets and Operational Concepts." Stuttgart, Germany: Russia
    Strategic Intiative U.S. European Command, August 2021.
[849] Pietkiewicz, Michal. "The Military Doctrine of the Russian Federation." *Polish Political Science Yearbook* 47,
    no. 3 (2018): 505+. *Gale Academic OneFile* (accessed March 21, 2023).
    https://link.gale.com/apps/doc/A665453720/AONE?u=viva_vpi&sid=googleScholar&xid=e360f8f4.

[850] Ibid.

to slow down and hopefully halt Russian war crimes. As of March 19, 2023, the International

Criminal Court has issued two warrants. Both President Vladimir Putin and the Commissioner

for Children's Rights in the Office of the President of the Russian Federation, Maria

Alekseyevna Lvova-Belova, are being held accountable for "the war crime of unlawful

deportation of population (children) and that of unlawful transfer of population (children) from

occupied areas of Ukraine to the Russian Federation (under articles 8(2)(a)(vii) and 8(2)(b)(viii)

of the Rome Statute)".[851] Even though it has taken over a year to release a warrant for Putin, and

even if it is not for the overall encompassing of all war crimes committed in Ukraine, they are a

political warning, that the international community is on the lookout for any opportunity to arrest

Putin at any moment.

Looking into the process of the International Criminal Court and how they prosecute

crimes, it can be seen that it is a lengthy process, much like other state courts. First, the ICC must

establish "whether there is sufficient evidence of crimes of sufficient gravity falling within the

ICC's jurisdiction, whether there are genuine national proceedings, and whether opening an

investigation would serve the interests of justice and of the victims".[852] Following this, the ICC

goes into their investigation, where they will identify their suspect and will execute one of two

actions. The first option is, having a judge issue "an arrest warrant", and the ICC will rely "on

countries to make arrests and transfer suspects to the ICC", or issue a "summons to appear",

where the suspect will appear on their own accord.[853] If the suspect does not appear voluntarily,

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[851] International Criminal Court, ed. "Situation in Ukraine: ICC Judges Issue Arrest Warrants against Vladimir
    Vladimirovich Putin and Maria Alekseyevna Lvova-Belova." International Criminal Court. ICC, March 17,
    2023. https://www.icc-cpi.int/news/situation-ukraine-icc-judges-issue-arrest-warrants-against-vladimir-
    vladimirovich-putin-and.
[852] International Criminal Court, ed. "How the Court Works." International Criminal Court. ICC. Accessed March
    21, 2023. https://www.icc-cpi.int/about/how-the-court-works.
[853] Ibid.

then a warrant will be issued. After the issuance of the warrant or summons, the trial will move into the 'Pre-Trial stage', where "three Pre-Trial judges confirm suspect's identity and ensure suspect understands the charges", and after "hearing the Prosecution, the Defence, and the Legal representative of victims" the judges will make another decision to continue on with the trial process.[854] Moving forward into the trial stage to where the "prosecution must prove beyond reasonable doubt the guilt of the accused", allowing for the judge to make their verdict, where they can sentence the accused to "up to 30 years of imprisonment," or in extreme cases, life sentences.[855] After this, verdicts are up for appeal by either the Defense, Prosecutor, victims, and convicted persons. An appeal in the ICC is headed by "five judges of the Appeals Chamber, who are never the same judges as those who gave the original verdict", and they will decide "whether to uphold the appealed decision, amend it, or reverse it".[856] This final appeal is the final decision unless "the Appeals Chamber orders a re-trial before the Trial Chamber", which would restart the entire process.[857] If this is not needed, and the trial comes to a verdict of not guilty, then the accused is released, but in the circumstances where the accused ends up being guilty, they are arrested and sentences can be "served in countries that have agreed to enforce ICC sentences".[858]

Now even with all of the information listed above in regards to the ICC and their criminal trial process, how is it that the Ukrainian invasion has only warranted two warrants, and they are for the instances of child trafficking? Well, the answer could lie in the fact that the ICC only works complementary to other states' court systems and only "prosecutes cases only when states do not [or] are unwilling or unable to do so genuinely".[859] Secondly, the ICC does not have their

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[854] Ibid.
[855] Ibid.
[856] Ibid.
[857] Ibid.
[858] Ibid.
[859] Ibid.

own police force, so they rely on the law enforcement of other states to bring international war criminals into court. This system can be problematic, if nations do not want to cooperate with the ICC, leaving these states to have the opportunity to prosecute war criminals as well. In regards to Ukraine, the Ukrainian Prosecutor General has met with the United States Attorney General to discuss the war crimes in Ukraine by Russian forces, and they have "outlined areas for enhanced collaboration and signed a memorandum of understanding (MOU) that will facilitate appropriate cooperation, coordination, and deconfliction between each country's respective investigations and prosecutions".[860] With states already forming partnerships where they will help in prosecuting criminals of the victim nation, a trial can happen in Ukraine, and the summoned suspect will never have to be tried by the ICC.

Now the question is, what will the Ukrainian government do now that there is a warrant for the President of the Russian Federation, and what will they do in their own courts? Currently, in Ukraine, Ukrainian officials and domestic courts are "focusing on "direct perpetrator" crimes, and at least 26 war crime suspects have been tried and convicted of rape and murder, shelling of residential infrastructure, cruel treatment and pillaging".[861] "Direct perpetrator" crimes are the easiest to prosecute and arrest for, because if caught in the act, Ukrainian courts can go straight to trial with the evidence from the crime scene that they gathered, much like any standard crime scene. The trouble comes with crimes that are committed by Russian leaders and commanders accountable for actions committed on their orders" and their cases "will most likely take

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[860] The United States Department of Justice, ed. "U.S. Attorney General and Ukrainian Prosecutor General Met to Strengthen Joint Efforts to Hold Accountable Perpetrators of War Crimes and Other Atrocities Committed in Ukraine." The United States Department of Justice. The United States Department of Justice, September 20, 2022. https://www.justice.gov/opa/pr/us-attorney-general-and-ukrainian-prosecutor-general-met-strengthen-joint-efforts-hold.

[861] Deutsch, Anthony, and Stephanie van den Berg. "Explainer: How Are War Crimes in Ukraine Being Investigated?" Reuters. Thomson Reuters, March 17, 2023. https://www.reuters.com/world/europe/how-are-war-crimes-ukraine-being-investigated-2023-02-23/.

years".[862] This instance of military leaders and commanders taking years to be prosecuted for their orders, is a direct example of the Nuremberg trial. The concept of just following orders or giving orders is not a suitable excuse for the war crimes that Russian military leaders have committed, but the difficulty lies in building "complex aggregate cases which establish the responsibility of those in the higher political and military leadership".[863] So, while it is paradoxical, being able to establish who is at fault is what prevents Russian military leaders, who hide behind their ground troops, from being prosecuted for war crimes. To aid Ukraine in their domestic courts though is the idea that "Russian military [operations are] inherently criminal, in the sense that you cannot seek to extinguish Ukrainian identity without the massive commission of war crimes and crimes against humanity and possibly genocide".[864] With this train of logic, Ukraine can in fact prosecute anyone they deem a war criminal, as long as they have sufficient evidence in their courts, except for "heads of state, heads of government and foreign ministers" because, under international law, these government positions can only be prosecuted by international courts, such as the ICC.[865]

When it comes to continued fighting in Ukraine and trying Russian fighters for war crimes, Ukraine must be careful not to retaliate, as it will discredit them to some degree. While it already has been proven that Russian forces have committed countless mass atrocities, a part of just warfighting is not retaliating. Yet, retaliation tactics, known as reprisals, can be an effective war strategy if used correctly. According to the International Committee of the Red Cross, reprisals are "a breach of international humanitarian law, which would otherwise be unlawful but in exceptional cases is considered lawful as an enforcement measure in response to a previous

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[862] Ibid.
[863] Ibid.
[864] Ibid.
[865] Ibid.

breach of international humanitarian law by the enemy, with the purpose of terminating the enemy's violation".[866] So in theory, a reprisal, or retaliation, would be violating the rules of fair warfare, after they were violated against you, in order to pressure the enemy into abiding by the rules of war and seizing to commit war crimes. The International Committee of the Red Cross further explains that "reprisals are only allowed under very strict conditions", and "reprisals against wounded, sick or shipwrecked persons, medical or religious personnel, medical units, transports and material, prisoners of war, the civilian population and civilian persons, civilian objects, cultural property, objects indispensable to the survival of the civilian population, the natural environment, works and installations containing dangerous forces and the buildings and material used for the protection of the civilian population are" all prohibited.[867] With all this being said, Ukraine could implement reprisals into their tactics, as long as they are solely for the purpose of putting pressure on Russian forces to eliminate crimes against Ukraine citizens and forces. A potential problem with this though is the fact that Russia has already shown no regard for international law and fair war fighting, how would they perceive attacks, specifically retaliation attacks from Ukraine? It could be taken as a sign that Ukraine is accepting anything that goes in this invasion. Another aspect is it could have no effect on Russian forces, and Russia would look past Ukraine's attempts to pressure its force back into fighting fairly, leaving Ukraine with no advantage after committing war crimes. A dangerous tactic that Ukraine could do, would be a reprisal against one of the prohibited attacks, which could ensure a response from Russia. The dangerous aspect of this is, it could lead to allies of Ukraine leaving Ukraine's side, and/or cause for Russia to enact worse crimes, or quite possibly enact nuclear warfare.

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[866] M. Sassòli, A. Bouvier, A. Quintin, J. Grignon, *How Does Law Protect in War?*, ICRC, Geneva, 2014
     https://casebook.icrc.org/a_to_z/glossary/reprisals: March 17, 2023
[867] Ibid.

Current Russian Force Location

Russian forces continue to invade and attack Ukrainian militants and civilians every day. With open-source resources, many maps have been produced when it comes to Russian forces in Ukraine. The Institute for the Study of War (ISW) and the Critical Threats Foundation, worked jointly on an interactive map that outlines Ukrainian territory, and how the Russian invasion has influenced it. Looking at their images, it can be seen that as of March 19, 2023, Russian forces have expanded outwards from their previously gained territory and have had very little advances to the northeast, and more growth in the southwestern region that bleeds out of the Donetsk region.[868] Partnering this map with the Rondeli Foundations, also known as the Georgian Foundation for Strategic and International Studies published another interactive map that was last updated in February of 2022, when the invasion started, it can be gathered what units were used for the military. Looking at the Donetsk region, the Russian Federation had its 1st Army Corps headquarters in the middle of the city. With the 1st Army Corps headquartered in Donetsk, they were able to support multiple special force battalions, mechanized battalions, and brigades, along with one artillery brigade and one tank battalion.[869]

Looking farther north into the Luhansk Oblast, which is the region a little north of Donetsk, the 2nd Army Corps was headquartered there before the initial invasion in February of 2022. Attached to the 2nd Army Corps were multiple mechanized brigades and regiments, an artillery brigade, a recon battalion, and a tank battalion.

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[868] Barros, George, Kateryna Stepanenko, Thomas Bergeron, Noel Mikkelsen, and Daniel Mealie. "Interactive Map: Russia's Invasion of Ukraine." Interactive Map: Russia's Invasion of Ukraine. Institute for the Study of War and AEI's Critical Threats Project, March 21, 2023. https://storymaps.arcgis.com/stories/36a7f6a6f5a9448496de641cf64bd375.

[869] Batashvili, David. Russian Military Forces: Interactive map - GFSIS. Rondeli Foundation, February 9, 2022. https://www.gfsis.org.ge/maps/russian-military-forces.

Both of these northeastern stationed headquarters were positioning forces into a vector-style formation that was preparing them for the initial invasion. Now when looking at an open-source intelligence compilation of Russian forces in present-day Ukraine from Project Owl, a community of people focused on gathering information from all over the internet in order to track Russian advances, their map as of March 19, 2023, shows that Russian and Ukrainian forces are fighting in the Donetsk region and on the outskirts of Luhansk (See image below). This open-source information has also allowed citizens and Ukrainian troops to learn about certain Russian forces movement patterns as the team behind Project Owl has worked to document past locations as well. This in-depth analysis which is shown in the map below, shows the entire battlefield of Ukraine and how Russian forces are acting and reacting to differing attacks.

In using these maps that are proctored by different organizations, aids in making predictions on future Russian movements, along with being able to plan attacks and

counterattacks.[870]
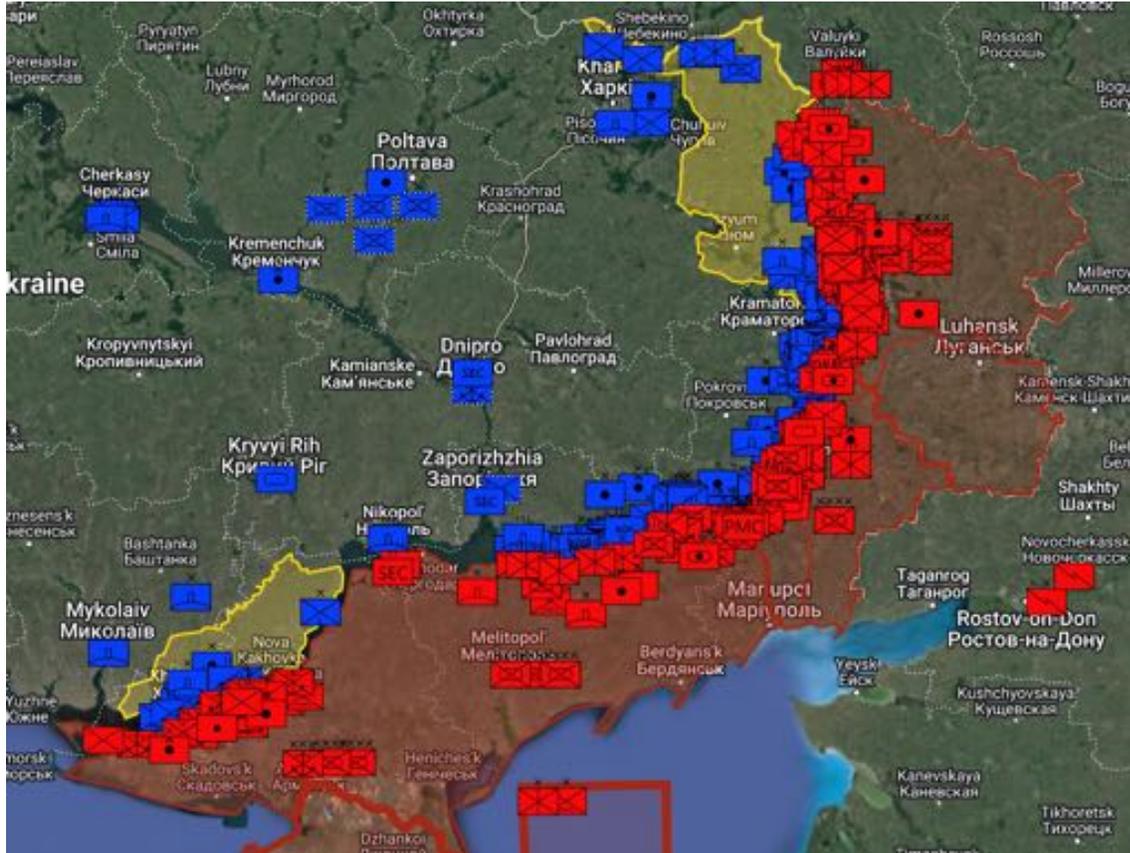
Predictions and Likely Courses of Actions

As discussed earlier, Russian Federation Forces have been committing a wide range of differing war crimes, whether it is the capturing and execution of civilians, the raping of women, destroying infrastructure, or etc. While these crimes are considered unjust to Western standards, it is clear that Russia does not recognize their actions as ill-tidings in warfighting, and the omission of these protocols in their doctrine, allows for the continued violation of war crimes. It is with high confidence that the ethical perspective of these crimes as well has been overlooked

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[870] Project Owl, ed. "Ukraine Control Map." Google. Project Owl, March 21, 2023.
    https://www.google.com/maps/d/u/0/viewer?mid=180u1IkUjtjpdJWnIC0AxTKSiqK4G6Pez&hl=en_US&ll=
    48.00977727013352%2C36.31603143755602&z=7.

due to the idea that Russia perceives Ukraine as a national security threat by viewing the Ukrainian people as "the strengthening of national, ethnic and religious extremism" groups, which could have the consequences of "attempt[ing] to forcibly overthrow the constitutional order or disrupt [the] functioning of organs of state power and control".[871] Pairing this with the fact that the "Russian government has weaponized religious rhetoric and antisemitism" and continued to misuse the term Nazi to categorize the people of Ukraine, and to base their allowance of the destruction of religious centers, it can be inferred that Russia views Ukraine as a national security threat by the formation of 'religious terrorist groups'.[872] This confidence is strengthened as well when looking into Putin's agenda and showing that Russia aims to reclaim countries that were a part of the Soviet Union, as if they never were not Russian land.

The newly issued warrant of Russian President Putin is a start in the right direction for Ukraine and the international community to actually start to hold Russian forces accountable. Because of this act by the ICC, there is mid-level confidence that Russian forces will start to 'pull their punches', because the international community is finally acknowledging the use of war crimes in Ukraine. While a step in the right direction, the fact that the warrant is issued for the "unlawful deportation of population (children)" and not other serious crimes committed against the Ukrainian people, can lower the validity of the international community's warrants.[873] Along with this, the fact that "Moscow does not recognize the court's jurisdiction or extradite its

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[871] Pietkiewicz, Michal. "The Military Doctrine of the Russian Federation." *Polish Political Science Yearbook* 47, no. 3 (2018): 505+. *Gale Academic OneFile* (accessed March 21, 2023). https://link.gale.com/apps/doc/A665453720/AONE?u=viva_vpi&sid=googleScholar&xid=e360f8f4.

[872] United States Commission on International Religious Freedoms, ed. "USCIRF Concerned by Religious Freedom Implications of Russia's Invasion of Ukraine." USCIRF. USCIRF, February 24, 2023. https://www.uscirf.gov/news-room/releases-statements/uscirf-concerned-religious-freedom-implications-russias-invasion.

[873] International Criminal Court, ed. "Situation in Ukraine: ICC Judges Issue Arrest Warrants against Vladimir Vladimirovich Putin and Maria Alekseyevna Lvova-Belova." International Criminal Court. ICC, March 17, 2023. https://www.icc-cpi.int/news/situation-ukraine-icc-judges-issue-arrest-warrants-against-vladimir-vladimirovich-putin-and.

nationals" to the ICC, can downplay the threat that Russia feels from this warrant making the Russian Federation not change anything about their battle tactics or target acquisition.[874]

With the introduction of retaliation tactics and reprisals in Ukrainian tactics, there is mid-level confidence that this will fend off Russian war crimes, as well as call them to halt a majority of all crimes. While it is unorthodox to fight fire with fire, the idea comes from what is stated earlier, in that Russia does not recognize the authority of the ICC and their warrants. So, while Russia does not recognize the criminal accusations of the crimes that Putin has committed, they will not stop. If Ukrainian soldiers were to enact reprisals into their warfighting tactics, and with NATO supporting them, it could fend off extreme war crimes from the Russian Federation. The success of this plan of action can only be assured by having NATO support Ukrainian reprisal actions, and if the reprisal actions are within reason. Any retaliation tactics that could be considered prohibited, and warrant for NATO to rescind their support, would cause Russia to gain leverage in the battlefield and cause for a continuation of war crimes.

The last option that Ukraine could enact to continue with the prevention of future war crimes would be to maintain the constant pressure to investigate crimes committed on domestic soil, and a reporting of these crimes to the ICC and other state courts. It is with high confidence that being able to continuously investigate crimes and inform the ICC about potential war criminals will help speed up the process of issuing an international warrant for their arrest. As stated before within the ICC "the Office of the Prosecutor must determine whether there is sufficient evidence of crimes of sufficient gravity falling within the ICC's jurisdiction".[875] If

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[874] Corder, Mike. "International Court Issues War Crimes Warrant for Putin." AP NEWS. Associated Press, March 18, 2023. https://apnews.com/article/icc-putin-war-crimes-ukraine-9857eb68d827340394960eccf0589253.

[875] International Criminal Court, ed. "How the Court Works." International Criminal Court. ICC. Accessed March 21, 2023. https://www.icc-cpi.int/about/how-the-court-works.

Ukrainian forces were able to sufficiently gather evidence from crimes and work with an ICC liaison officer, sufficient evidence can continue to be transferred between the two, and the prosecutor's office within the ICC can start to issue more warrants. Pair this with continuous partnerships from other states that support Ukraine, and the process only gets expedited.

Conclusion

The invasion of Ukraine has popularized the international community to mass atrocities, some to a degree that has not been since World War II. With the key judgments that Russian forces do not respect historical buildings and civilian lives and that the Russian Federation does not acknowledge the existence of the ICC and their statutes and criminal court, the investigation that Russian doctrine was flawed became more open. First starting with Russian military doctrine, it became apparent that Russia is solely centered on themselves and their own national security and sovereignty. Even when Russia started to prosper more and had more resources for international trade, they continued to focus on neighboring areas and paid close attention "on post-Soviet space and sought to enhance cooperation" within these states and the international community proved to show that Russia was focused on 'reclaiming' lost territory.[876]

Russia's aim to reclaim its territory in the name of national security was proved by the fact that Russia began to target religious centers and religious leaders, almost exclusively, demonstrating that Russia was continuing with the rhetoric that they felt that Ukraine and its forces were a threat because Russia perceived them as a terrorist organization. These "unsubstantiated terrorism charges based on… religious identity" are war tactics by the Russian

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[876]Pietkiewicz, Michal. "The Military Doctrine of the Russian Federation." *Polish Political Science Yearbook* 47, no. 3 (2018): 505+. *Gale Academic OneFile* (accessed March 21, 2023). https://link.gale.com/apps/doc/A665453720/AONE?u=viva_vpi&sid=googleScholar&xid=e360f8f4.

Federation that make their actions seem regular and fair in regards to their doctrine where under actions "against sabotage and terrorism" it explains that fair military action can be enacted if defending national security against "ethnic and religious extremism".[877]

The constant pattern of civilian deaths and destruction of residential infrastructure has shown to be a blatant disrespect towards the rules of war, paired with the mass executions and raping of women. Russian soldiers in these instances have never been morally challenged and have not had to answer to higher leadership. With Russia not having to answer to someone else in the past for any crimes or actions, and the constant disregard for international statutes and criminal courts, bent morals only worsen as they trickle down the chain of command. Much like in the United States military and their doctrine, prestige and discipline increase with experience and rank, and high-ranking officers set the example for how our operations should be executed. Take this model of thinking but replace discipline with "a nuanced view towards corruption" and constant instances of corruption will continue, making it more and more difficult to eradicate.[878]

While Russia is known for being a peer adversary in nuclear warfare ever since the beginning of the Cold War, and they have continued to blatantly disobey treaties of disarmament, there is low confidence that Russia will use nuclear warheads against Ukraine. While Ukraine has the continued support of NATO states, Russia knows that if they were to use nuclear warfare, it would lead to mutually assured destruction. At that point, all nations that support Ukraine, and that have nuclear warheads, would use them on Russia and any of Russia's allies. This shared feeling of tension and requirement to comply with international standards between Russia and

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[877]Ibid.

[878] Grau, Lester W, and Charles K Bartles. *The Russian Way of War: Forced Structure, Tactics, and Modernization of the Russian Ground Forces*. Fort Leavenworth, KS: Foreign Military Studies Office (FMSO), 2016.

NATO states pressures Russia to stay in line when it comes to nuclear warheads and ensure that they will not defect from this stand-off.

Even though it has been discussed before that Russia does not acknowledge the warrants issued by the ICC and the authority that they carry, the international message of having warrants issued is a large success for not just Ukraine, but for the rest of the international community. This is because it showcases the message to Russia that the international community is after them, and there are very few actions that Russia can enact to get itself out of the spotlight. Even if President Putin never steps foot outside of Russia in order to avoid being arrested by another nation, the constant pressure felt by the international community will still be present.

The conflict in Ukraine with the constant bombardment of war crimes is a politically difficult predicament that has many courses of action. With the constant threat of continued war crimes, Ukrainian forces could initiate retaliation tactics to level the playing field, continually investigate evidence of crimes and pass evidence off to the ICC, and pressure Russia by creating more warrants or continuing to request aid from NATO. The bottom line though, is that Russian doctrine has been the deciding factor in this invasion. Russian military doctrine has given the Russian military a political preference for invading Ukraine due to national security interests that have violated the sovereignty of Ukraine. Even with this criminal military doctrine, the constant implementations of war crimes must be solved in a criminal court, whether an Ukrainian court or international one.

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https://www.reuters.com/world/europe/how-are-war-crimes-ukraine-being-investigated-
2023-02-23/.

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2C%20and%20280%20dormitories.

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ez&hl=en_US&ll=48.00977727013352%2C36.31603143755602&z=7.

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The United States Department of Justice, September 20, 2022.
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concerned-religious-freedom-implications-russias-invasion.

Russian Air Forces in Ukraine

BLUF

Based on available intelligence, this report assesses with a high level of confidence that the Russian Aerospace Forces will be unable to make a large-scale impact on the outcome of the war due to insufficient supply trains and poor use of experienced pilots.

Abstract

This paper is meant to emulate, to the closest degree, a National Intelligence Estimate of the status of the Russian Air Force's capabilities to influence the outcome of the Russo-Ukrainian War that began in February of 2022. In short, the current status leads to a conclusion with a high level of confidence that Russia's Air Force (from now on referenced as the VKS) will continue to be unable to make grand-scale strategic missions while combating Ukrainian troops. That forces will also continue to dwindle as the war continues through 2023 and onward. VKS doctrine was not written to implement its own forces. Despite a sizable standing force before the onset of the invasion of Ukraine, Russia seemed to not account for the sanctions imposed on it, leading to low combat readiness after the start of the war. During combat and training, the VKS has little to no regard for the safety of its pilots and the aircraft, leading to a menagerie of crashes, malfunctions, and close calls with both the aircraft and their operators.. When examined in conjunction, these two significant issues of readiness within the VKS make it clear that the VKS is incapable of maintaining relevance in the fight against Ukraine. This report assesses with a high level of confidence that this will remain the same until substantial changes are made to the logistical trains that keep the aircraft ready and the training pipelines the new pilots of the VKS are going through.

Key Judgements Based on Observations of the VKS

Based on the available evidence, there are many possible methods in which the VKS may continue to operate in the future. The assessed courses of action will be organized from most likely to least likely. After reviewing the available information regarding the capabilities of the VKS, the Russians' most likely course of action is to continue down the current path of largely ineffective air operations against Ukraine. The VKS would continue heavy focus on enemy air suppression and impediment and both dangerous and ineffective close air support operations in conjunction with the Ground element of the armed forces of Russia. Another possibility is that the Armed Forces of Russia will push harder than before in hopes of ending the conflict without entering an even more extended operation. This report's final proposed possibility is that after this initial issue of a shortage of spare plane parts, Russia will nationalize these small third-party aircraft part manufacturers to become even less dependent on foreign parts and move away from cannibalizing their own aircraft. The following key judgments were drawn from the observations made about the status of the VKS, a general understanding of the importance of military doctrine, and the largely inflexible nature of doctrine for a joint service command such as the VKS, but more importantly, the Armed Forces of Russia as a whole.

The VKS will continue operations as usual and further cannibalize its aircraft to maintain its military air power.

This report assesses with a high level of confidence that central leadership in Russia will continue to utilize the VKS in the same method. The primary reason for this argument is that doctrine rules that command is to remain solid and centralized[879]. Due to the bulk of their fighter

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[879]Arms Control Association. "Arms Control Today." Russia's Military Doctrine, 2000. https://www.armscontrol.org/act/2000-05/russias-military-doctrine.

aircraft only being 4th generation, or "4th ++,"[880] and the VKS' expectation of a lack of air superiority,[881] it seems highly unlikely that the VKS will be able to reverse their fighting doctrine and find a method more effective in deploying their own forces. Even if there were a proposed idea, the centralization of leadership would cause a significant slowdown in implementing a new idea, especially in the middle of a major combat operation, such as the invasion of and hopeful annexation of the entirety of Ukraine. Such a drastic change would not go into effect until, at the very earliest, immediately after a peace deal with Ukraine, but likely would not go into effect until much later.

The centralization of command has been a cornerstone of Russian military doctrine for at least the past century.[882] Therefore, the only way for such a change, however necessary it may be, is for younger officers and younger NCOs to progress through the ranks and also to hold onto their ideas for change throughout their entire time in service, and finally be willing to implement them after many years in the service. This high level of dependence on older military personnel and their strategic knowledge is the primary reason that this report does not assess that there will be any broad changes within the VKS' tactics in the near future. The VKS' dependence on the centralization of command is a significant reason behind the difficulty for the Armed Forces of Russia to adapt and stay up-to-date on the current tactics of the modern military. For example,

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[880]Myers, Nicholas. "THE RUSSIAN AEROSPACE FORCE." Security Forum, 2018. https://doi.org/10.26410/SF_1/18/8. , 93

[881]Vayu Aerospace and Defence Review"The Ukraine/Russia Conflict: An Analysis on Air Warfare." 2022.Vayu Aerospace and Defence Review (5) (Sep): 85-90. http://login.ezproxy.lib.vt.edu/login?url=https://www.proquest.com/scholarly-journals/ukraine-russia-conflict-analysis-on-air-warfare/docview/2729114941/se-2. , 86

[882]Fischer, Jeffrey H. "Russia's Possible Doctrine Dilemma." The Defense Post, May 10, 2022. https://www.thedefensepost.com/2022/05/10/russia-military-doctrine-ukraine/#:~:text=For%20decades%20if%20not%20over,level%20to%20the%20lowest%20level.

their widespread difficulty in fighting using combined arms can at least partially be attributed to this, seeing as the high command of Russian Forces were most likely not using ground-to-air radio communications the same way a forward air controller uses it, since they were a Captain or similar rank equivalent. This often leads to a standard operating procedure that makes sense and could even seem optimized on paper. Still, in practice, such a standard operating procedure can often fall short in its application. Many officers, especially those that have been officers for a long time, are not as in touch with their equipment as their enlisted counterparts, NCOs, or otherwise. Therefore, enlisted service members will likely develop a more practical and efficient procedure than the average officer.

Some of the primary reasons this course of action may not be followed through are that it is very clear to a plethora of intellectuals that the current method of utilizing the forces employed by the VKS will cause either the pilots to be unable to continue the campaign at their operating tempo, causing major burnout,[883] or will strip all of the state-owned aircraft of nearly all parts but the electronics.[884] Despite the higher caliber of pilots that the VKS has in opposition to the Ukrainian Air Force (UkrAF) pilots, the determining factor of air-based warfare can often be decided by one to two minor choices. One vital aspect of air combat is the amount of rest a pilot gets, both in between combat operations and how much sleep the pilots have before their combat mission. Luckily for Russia, the pilots on the front lines are still only flying about half of what

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[883]Peck, Michael. "Prolonged Fighting in Ukraine Is Revealing the Russian Air Force's Fragility, Researchers Say." Business Insider. Business Insider, January 1, 2023. https://www.businessinsider.com/fighting-in-ukraine-reveals-russian-air-force-fragility-think-tank-2022-12.

[884]Mason, Josephine, Matt Scuffham, and Jane Merriman, eds. "Exclusive: Russia Starts Stripping Jetliners for Parts as Sanctions Bite." Reuters. Thomson Reuters, August 9, 2022. https://www.reuters.com/business/aerospace-defense/exclusive-russia-starts-stripping-jetliners-parts-sanctions-bite-2022-08-08/.

their NATO counterparts are flying.[885] Despite this, many experts claim that there is a plethora of evidence that there is an element of aircrew fatigue, and that either aircraft maintainers or pilots themselves are getting careless or reckless in the operation of Russian aircraft.[886] This slow deterioration of veteran and experienced pilots is not ideal when facing a near-peer threat, who will most likely try their best to hold out for as long as possible, playing a primarily defensive role in their fighting. This calls back to the Russian armed forces' affinity for a short and intense war rather than the long, drawn-out war of attrition it currently faces.

The ability to break down its civilian air fleet is only helpful to a certain extent, and it is already feeling the backlash from the issue, as the avionics and computer systems associated with airframes are already challenging to keep running due to the missing parts of the planes.[887] While this is not necessarily harmful to a high degree now, since many Russian-owned airlines are not flying quite as often due to sanctions, it is necessary to know that if Russia were to succeed in the annexation of Ukraine, there is a low chance of lifting the western-imposed sanctions on Russia.[888] Thus, without a foreseeable fix to this supply-chain problem, Russia is most likely viewing this approval of cannibalizing their civilian airliners for parts as the best possible solution to their shortage of spare parts. Therefore, they are unlikely to change course until a better option exists. Even though states support Russia, chances are they will not supply

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[885] Bronk, Justin. "Is the Russian Air Force Actually Incapable of Complex Air Operations?" Royal United Services Institute. RUSI, March 4, 2022. https://rusi.org/explore-our-research/publications/rusi-defence-systems/russian-air-force-actually-incapable-complex-air-operations.

[886]Bronk, Justin, Nick Reynolds, and Jack Watling. "The Russian Air War and Ukrainian Requirements for Air Defence." Royal United Services Institute for Defense and Security Studies, November 7, 2022, 1–43. , 20;24

[887] Mason et al., Exclusive: Russia Starts Stripping Jetliners for Parts as Sanctions Bite.

[888]Timofeev, Ivan. "Is It Possible to Lift Sanctions against Russia? - No." Modern Diplomacy, August 14, 2022. https://moderndiplomacy.eu/2022/08/15/is-it-possible-to-lift-sanctions-against-russia-no/.

Russia with spare aviation parts, seeing as many of them, including China, have heavy economic ties with Western states imposing the sanctions.[889] Given the preceding information, this report assesses with a high level of confidence that this is the VKS' preferred course of action. Despite all of this, due to Russia's heavy focus on short-term victories,[890] [891] they may hope to be able to outpace the Ukrainian forces during the short term and force them into submission without having to worry about a long-term invasion effort.

The VKS will push the tempo even further, hoping to capitalize on their own strengths in warfighting.

It is once again challenging to overlook the importance of the doctrine of the Russian Armed Forces. Analyzing this available doctrine shows that the Russian military values a short but high-tempo conflict strategy and implies that this is the preferred method of warfare. This doctrinal basis is the heaviest argument for this to be true. The pitfalls of the Russian military do not work well to continue the invasion effort at the same tempo, much less an effort to increase the tempo. Therefore, the major arguments against this course of action would be similar to the reasons behind the prior course of action, an increase in fatigue of aviators that would lead to even further deterioration of pilots flying capabilities, as well as the heavy losses of not only aircraft and their components, but more and more pilots due to crashes becoming increasingly common. Overall, this report assesses with a low to moderate level of confidence that this is the course of action for Russia's armed forces.

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[889] Mason et al., Exclusive: Russia Starts Stripping Jetliners for Parts as Sanctions Bite.

[890] Peck, Prolonged Fighting in Ukraine Is Revealing the Russian Air Force's Fragility, Researchers Say

[891] Kofman, Michael, and Lee, Rob. "Not Built for Purpose: The Russian Military's Ill-Fated Force Design." War on the Rocks. Texas National Security Review, June 2, 2022. https://warontherocks.com/2022/06/not-built-for-purpose-the-russian-militarys-ill-fated-force-design/.

To determine the viability of this course of action, it is first necessary to revisit the VKS' performance thus far in the conflict. Despite the predisposition of Russian troops to be reckless and aggressive in maneuvering their aircraft,[892] [893] at the onset of the invasion effort, Ukrainian fighters utilized superior maneuvering around low-level terrain and more aggression that caused VKS aircraft to struggle against these tactics. So far, the VKS has been less willing to make aggressive counter attacks against UkrAF fighters due to this initial concern. Depending on the perceived situation in Ukraine on the part of Russian command headquarters, there is a possibility that the Russian forces saw the continued conflict in Ukraine to be of higher cost to themselves than to Ukraine. And, if Russia continues to fight a long, attrition-based conflict that they will lose far more than they were expecting. This is already the case, as the original plan to invade Ukraine was a 10-day invasion and complete annexation by August 2022.[894] Nevertheless, it is already April of 2023.

Currently, there is still heavy resistance from the Ukrainian armed forces. This, paired with the difficulty of communications based on the centralization of command, could push Russian commanders to change their tactics in a way that is more conducive to their own fighting doctrine and increase the tempo to shorten the war. While it would likely be more costly to both sides of the conflict, this method would end the conflict much quicker, but determining the victor based on this alone would be difficult to assess. While possible, due to the advantage in this conflict given by aggression and the Russian's pre-existing lackadaisical application of safe

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[892] Peck, Prolonged Fighting in Ukraine Is Revealing the Russian Air Force's Fragility, Researchers Say

[893] Bronk et al., The Russian Air War and Ukrainian Requirements for Air Defence

[894] Zabrodskyi, Mykhaylo, Jack Watling, Oleksandr V Danylyuk, and Nick Reynolds. "Preliminary Lessons in Conventional Warfighting from Russia's Invasion of Ukraine: February–July 2022." Royal United Services Institute for Defence and Security Studies, November 30, 2022, 1

operation of aircraft, it seems that utilizing such an approach could bring a needed edge to the VKS' pilots and air power as a whole.

However, there are a few significant drawbacks to this possible course of action, including already dwindling spare part stockpiles, widespread evidence of either pilot or maintainer burnout throughout the VKS, and poorly-trained new pilots. While each of these drawbacks could be used to argue for an increase in tempo, it seems that the drawbacks of implementing such an increase would far outweigh the benefits. The fact that Russia is already facing a shortage of necessary parts to keep much of its air fleet aloft should be enough to, at the very least, dissuade it from increasing the tempo of air operations. If the current tempo requires swapping parts with civilian aircraft, then it makes little sense to push both aircraft and personnel to run more missions with less ground time to maintain and fix the aircraft while not in the air.

Regardless of wartime status, or tempo of operations, there is a specific amount of maintenance or ground time necessary for any aircraft to take before being allowed to take off once more[895]. For example, the F-16, an American late 4th generation aircraft, can require between 17[896] and 33 hours of maintenance per flying hour.[897] This is a hard limit to surpass, considering it is necessary for the operation and functionality of the aircraft. As spectators, we have already seen the consequences of neglecting these requirements. Watching advanced

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[895] Povilas. "Did You Know F-16 Fighting Falcon Needs 17 Hours of Maintenance for Every Hour of Flight?" Technology Org, January 2, 2023. https://www.technology.org/2023/01/02/did-you-know-f-16-fighting-falcon-needs-17-hours-of-maintenance-for-every-hour-of-flight/#:~:text=Did%20you%20know%20that%20for,is%20not%20even%20that%20surprising.

[896]Ibid.

[897] Duimstra, Duane. "114th Maintenance Group Instrumental in Achieving 4000 Flying Hours." DVIDS. 114th Fighter Wing Public Affairs, October 25, 2017. https://www.dvidshub.net/news/252906/114th-maintenance-group-instrumental-achieving-4000-flying-hours.

Russian aircraft crashing both in and out of combat,[898] it becomes clear that even with advanced aircraft, and in the case of the frontline, well-trained pilots,[899] there are still limitations to what can be accomplished when maintenance and new spare parts are neglected.

Concerning the ability to operate and maintain aircraft, and the surge in crashes, malfunctions, and similar occurrences, points not to significant flaws in the aircraft themselves but to a struggle to maintain or operate the craft. There are three possible reasons for this: ground crews are unable to inspect aircraft before takeoff, the pilots operate the aircraft haphazardly and dangerously, and both the ground crew and pilots are making things worse for each other, causing an even more significant issue to arise. It seems that the latter is the issue at large. There is a large amount of evidence that Russian pilots often operate their aircraft in unsafe conditions, causing an increased risk of mid-air collisions due to the proximity to other aircraft, attempting to land in dangerous inclement weather,[900] and often running training missions around their civilian populations, causing multiple crashes into apartment buildings.[901] However, often these crashes are not recorded from the cockpit. Therefore, we are left to assume their cause. The most common assumption is that a crash, if not shot down, was due to a malfunction or pilot error. While pilot error is an obvious possibility due to their constant self-endangerment, it is also worth noting that due to the lack of parts, not necessarily the unskilled nature of the ground

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[898] Bohnert, Michael. "Russian Aircraft Keep Crashing. Could Sanctions Be the Cause?" RAND Corporation. RAND Corporation, November 22, 2022. https://www.rand.org/blog/2022/11/russian-aircraft-keep-crashing-could-sanctions-be-the.html.

[899] Peck, Prolonged Fighting in Ukraine Is Revealing the Russian Air Force's Fragility, Researchers Say.

[900] Rich, Tory. "The Russian Air Force Is Its Own Worst Enemy." Sandboxx, March 26, 2021. https://www.sandboxx.us/blog/the-russian-air-force-is-its-own-worst-enemy/.

[901] Cordell, Jake, and Mark Trevelyan. "Two Pilots Killed as Russian Fighter Jet Crashes into Siberian Home." Edited by William Maclean. Reuters. Thomson Reuters, October 23, 2022. https://www.reuters.com/world/middle-east/russian-military-plane-crashes-into-residential-building-irkutsk-regional-2022-10-23/.

crews,[902] could very well have caused an uptick in malfunctions and crashes. It seems likely that pilots and ground crews have produced the sudden surge of crashes in the VKS.

After the initial attack on Ukraine, both the VKS and the UkrAF changed tactics to focus on low-altitude operations in small groups to avoid enemy air defense platforms.[903] This hints toward the possibility that the VKS may not have the power and cohesiveness as expected due to the fact that it can not mount complex operations and can only function in small, more vulnerable groups of one to four aircraft at a time.[904] Due to this, it seems even less plausible that the VKS will increase its tempo, considering this would also include higher levels of cooperation with adjacent units, which is not yet possible in the VKS. Given all this information,this report assesses with a low to moderate level of confidence that this would be the VKS' preferred course of action in the near future.

The Russian Government will nationalize small aviation manufacturers to produce more parts to fuel the ongoing conflict.

this report assesses that this outcome is the least likely of the three to occur by far but has a small margin of possibility. The only reason this is possible is the presence of over one hundred third-party aviation parts manufacturers operating in Russia[905] [906] that, despite their presence in the Russian economy, have not produced enough parts to maintain the war effort and continue

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[902] Bohnert, Russian Aircraft Keep Crashing. Could Sanctions Be the Cause?

[903] Zabrodskyi et al., Preliminary Lessons in Conventional Warfighting from Russia's Invasion of Ukraine: February–July 2022

[904] Bronk, Is the Russian Air Force Incapable of Complex Operations?

[905] Bohnert, Russian Aircraft Keep Crashing. Could Sanctions Be the Cause?

[906] Source, ASD. "Search Results - Russian Aerospace and Defense Companies." ASDSource. ASDSource, 2023. http://www.asdsource.com/source_advancesearch2_new.asp?pos=121&Keyword=&OrganisationType=&MainMarkets=&MainProducts=&Country=Russia&letter=&MP=&MPt=.

operating at total capacity. Enacting such a policy would bring about a significant change in the war, particularly in the VKS. Currently, many individuals believe that the sanctions imposed by the Western world caused widespread issues with maintenance,[907] crashing, and malfunctioning aircraft both on the frontline and in training operations and practice drills far away from the invasion itself. Due to the fact that the Russian government has green-lit the cannibalization of civilian aircraft[908], it is clear that the VKS is not supplied with enough spare parts to maintain its aircraft. This report considers the possibility that the Russian government had complete control over the production of spare parts and knew when and where newly-produced parts would be made available. In that case, the invasion effort could become more streamlined and planned out, with the ability to maintain aircraft, replace necessary equipment on the aircraft, and not hope for the part to be interchangeable with a part on a civilian airliner. While this might seem to be a solution on paper, it is also important to analyze why this may or may not be a genuine possible course of action.

One reason that this might be possible is that the Russian government has already declared martial law in occupied portions of Ukraine,[909] so there is already a precedent set that Russia is willing to enact harsher policies on citizens, so long as it means there is a better chance to make this invasion succeed. Despite the major leap in the levels of importance between the declaration of martial law and such a significant shift in economic policy, in the past, countries

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[907] Bronk, Is the Russian Air Force Incapable of Complex Operations?

[908] Aviationweek. "Russian Regulator Approves Aircraft Cannibalization amid Sanctions." Aviation Week Network, January 20, 2023. https://aviationweek.com/air-transport/maintenance-training/russian-regulator-approves-aircraft-cannibalization-amid.

[909] Liffey, Kevin, and Jon Boyle, eds. "Factbox: Putin Declares Martial Law in Russian-Occupied Parts of Ukraine: What Does It Mean?" Reuters. Thomson Reuters, October 20, 2022. https://www.reuters.com/world/europe/russian-martial-law-parts-ukraine-what-will-it-mean-2022-10-19/.

more opposed to the socialist policy were willing to implement similar policies. Even the United States, who has always been adamantly anti-socialist, has resorted to nationalizing methods of production when faced with war. Government programs such as the New Deal, instituted by President Franklin Roosevelt were implemented to relieve the economy and reinvigorate the American work force.

Despite higher levels of government involvement, Russia does not identify itself as a socialist nation, nor do the people who live there.[910] Interestingly, though, most Russians still consider the USSR as the best time in their history.[911] This does not mean that the Kremlin is interested in returning to a socialist economy, as that is not a part of the agenda for many of the representatives in the Russian government.[912] However, it suggests that many who live within Russia would likely not oppose the policy shift, as it would be a return to Soviet-like life. The Russian people all feel nostalgic for the age of the USSR.[913] However, the Western world perceives Russia as having invaded another sovereign nations, and this shift of regressing toward re-becoming the Soviet Union would be unlikely to go over well. All but a handful of states are supporting Ukraine in this conflict, and most of those states that do support Russia are primarily neutral in action, as opposed to the majority of Western supporters of Ukraine.[914] It would therefore be difficult to say what such a change would bring, seeing as much of the Western

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[910] Kobrin, Kirill. "To Avoid Descent into Barbarism, Russia Needs Real Socialism." openDemocracy, December 21, 2020. https://www.opendemocracy.net/en/odr/democratic-socialism-russia-barbarism/.

[911] Nikerichev, Andrei. "75% Of Russians Say Soviet Union Was Greatest Time in Country's History – Poll." The Moscow Times. The Moscow Times, March 24, 2020. https://www.themoscowtimes.com/2020/03/24/75-of-russians-say-soviet-era-was-greatest-time-in-countrys-history-poll-a69735.

[912]Aviationweek, Russian Regulator Approves Aircraft Cannibalization amid Sanctions

[913] Kobrin, To Avoid Descent into Barbarism, Russia Needs Real Socialism

[914]Marnin, Julia. "Which Countries Support Russia amid Its Invasion of Ukraine?" Miami Herald. McClatchy Media Network, February 16, 2022. https://www.miamiherald.com/news/nation-world/world/article258822748.html.

world is already supplying Ukraine with modern armaments. Still, it is hard to claim that there would be a widespread call for military action for such a change. All things considered, while unlikely and unrealistic, this report assesses that there is a slight chance that Russia may push for third-party manufacturers of war-related supplies to become nationalized so that they have better control over their invasion efforts and increase support for the continued war for far longer than the government initially anticipated.

Methodology

The primary method of research used while compiling the necessary information to make this intelligence estimate was Open-Source Intelligence, as other forms of intelligence-gathering needed to be more available or conducive to gathering relevant information. Under the umbrella of open-source intelligence, collecting text documents in the form of news articles, journals, and status reports on the VKS and Russia as a whole was the focal point of the research involved in retrieving information for this estimate. While this method is robust for research gathering, it is crucial to realize its strengths and weaknesses and consider some key assumptions related to most sources and topics. Some of the strengths of this type of research are that there is often plenty of helpful information in one place and that it saves the effort of sifting through massive amounts of data to find a helpful takeaway. Inversely, however, because the information has already been pre-sorted, it will likely have bias from the author. This bias may make the reader less likely to come to their conclusions, or it will have left out information essential to the research being conducted because it may not have been optional to the author's investigation. The most valuable fundamental assumption made while reading these articles is that the author had access to the information they presented. The method taken to ensure this basic assumption stays true is vetting the sources of information. For example, it was essential to ensure the source

is well-respected within the field it reports on, or use ".gov" or ".edu" sources if and when possible. This minimizes the chance of reporting false information. If either of these is not possible, the only way to ensure the validity of intelligence is to ensure multiple sources say the same information, even if it is slightly different in presentation. Otherwise, such information will not be utilized. Toward the end of the estimate, it will delve into predictive future modeling based on inductive reasoning, in which it was only possible to be able to make a proper hypothesis after having made many observations of the effects that the invasion of Ukraine has been having on the VKS, and that the theory is the most recent piece to the puzzle.

Background Discussion

To understand the validity of many of the assessments made within the most likely courses of action, it is first most important to understand the broader context of the VKS as a whole and its recent operations. As the second-largest air force in the world, the VKS was expected to be a prominent player as Russia invaded Ukraine due to the sheer amount of airpower being massed near the border.[915] However, this turned out not to be the case a year after the initial onset of the invasion. Air operations by the VKS against the UkrAF have been few and far between.[916] Available intelligence points primarily towards the presence of inefficient supply chains for the Aircraft of the VKS.[917] Paired with inadequate training of newly-winged (or otherwise, newly-trained) pilots of the VKS, led to an air force ill-suited to conduct any

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[915]Bielieskov, Mykola. "The Russian and Ukrainian Spring 2021 War Scare." CSIS, September 21, 2021. https://www.csis.org/analysis/russian-and-ukrainian-spring-2021-war-scare.

[916] Vayu, The Ukraine/Russia Conflict: An Analysis on Air Warfare

[917] Zabrodskyi et al., Preliminary Lessons in Conventional Warfighting…, 1

operations in even training scenarios, even less so in the context of a wartime environment.[918] [919] This is further underscored by the constant news of trainer and combat aircraft having crashes, accidents, malfunctions, etc.[920] That being said, unless there is a massive overhaul of both the training available to new pilots, as well as the supply chains keeping these aircraft aloft, this report assesses with a high level of confidence that the VKS will continue to be combat-ineffective and their forces will continue to dwindle without the ability to resume importation of spare aviation parts.

Before the invasion of Ukraine, the VKS fought ISIS in Syria in hopes of both assisting in the Syrian Civil War, as well as becoming familiarized with their new combat aircraft, such as new jets and new helicopters that were developed and made available to the VKS.[921] Before this, the most recent combat seen by many Russian Aviators was the Chechen war of 2000, as there have been minor skirmishes since then, but the use of aircraft has been minimal.[922] During this conflict, it was revealed to the command of the VKS that unguided munitions were ineffective because "no sighting device can provide accuracy of more than over a few dozen meters, given such height."[923] The VKS was in Syria for a long-term conflict, even stepping in as a mediator between the two sides of the civil war.[924] This was a significant

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[918] Cordell & Trevelyan, Two Pilots Killed as Russian Fighter Jet Crashes into Siberian Home.

[919] Charpentreau, Clement. "Russian Su-25 Crashes after Takeoff: Here's What We Know so Far." AeroTime, September 13, 2022. https://www.aerotime.aero/articles/32152-russia-su-25-crashes-after-takeoff.

[920] Rich, The Russian Air Force Is Its Own Worst Enemy

[921] Lavrov, Anton. "The Russian Air Campaign in Syria A Preliminary Analysis." Center of Naval Analyses, June 2018, 1-4,

[922] Zabrodskyi et al., Preliminary Lessons in Conventional Warfighting…

[923] Lavrov, The Russian Air Campaign in Syria A Preliminary Analysis., 1-4

[924] Ibid.

learning experience for the VKS. With less than 20 aircraft losses over three years, it seemed like the VKS was prepared for war with a modern adversary and was familiarized with their new equipment and aircraft.[925]

However, available evidence shows that this is not necessarily the case. Similar to the situation faced by the American military, there is a significant difference between the ability to fight ISIS-associated insurgents and a near-peer adversary, such as Ukraine. In Lavrov's article, the claim was made that VKS aircraft proved to be "invulnerable" to the air defenses employed by the ISIS-associated militants of Syria.[926] This would not be the case with the NATO-backed nation, Ukraine, armed with new military weapons supplied by countries like the United States. As of 2018, Myers reported in *The Russian Aerospace Force* that 5th Generation fighter aircraft were still not a part of the VKS and therefore had not been tested by them in combat until the current conflict with Ukraine. The Su-57 is, therefore, not fully combat-tested, and it remains challenging to train new pilots on the airframe. In conjunction with an ever-present poor supply chain that lacks necessary spare parts,[927] [928] this makes a VKS unprepared for near-peer offensive operations. This is evident through the doctrine within the VKS and their preference to use its air assets to impede the opposing air force so that they may allow their own ground forces' freedom of movement.[929]

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[925] Ibid.

[926] Ibid.

[927] Mason et al., Exclusive: Russia Starts Stripping Jetliners for Parts as Sanctions Bite.

[928] Bohnert, Russian Aircraft Keep Crashing. Could Sanctions Be the Cause?

[929] Vayu, The Ukraine/Russia Conflict: An Analysis on Air Warfare, 86

Moreover, their heavy reliance on centralized command[930] makes the military much slower to make tactical decisions and unable to revise plans after first contact with enemy forces without the approval of the individual's superior. Looking at the capability of the VKS from a holistic perspective, it is a modern air force with the ability to conduct operations against primarily insurgents without the ability to strike back, however, it is untested against modern combatants with peer-level equipment that is slow-learning and often inflexible.[931] While the military capability of the VKS may be intimidating on paper, it does not bode well for them in a long-term, drawn-out conflict, such as the one they are fighting in Ukraine. The Russian military, including the VKS, are well equipped for a "short and sharp war"[932] due to their method of manning their military and their short-term focused doctrine. This is further evidence of the lack of preparation and future ineffectiveness of the VKS in this near-peer conflict against Ukraine.

VKS in the near past, prior to the Invasion of Ukraine

In order to understand the current situation in the VKS, it is necessary to consider the start of the conflict. Only then can one comprehend the downward spiral the Russian Air Force has experienced. Before the invasion of Ukraine, Russia had already begun designing and constructing airframes that were heavily focused on using Russian-made parts to reduce their dependence on foreign-made parts.[933] While primarily true about the civilian sector of aviation, this aversion to dependence on foreign aviation parts, seems to be a preparation for the sanctions

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[930] Arms Control Association, "Russia's Military Doctrine"

[931] Lavrov, The Russian Air Campaign in Syria A Preliminary Analysis

[932] Kofman & Lee, Not Built for Purpose: The Russian Military's Ill-Fated Force Design

[933] Walker, Steven. "No Foreign Components: Russia Prepares to Launch Import-Substituted Jetliners in the Coming Years." Simple Flying, August 16, 2022. https://simpleflying.com/russia-prepares-import-substituted-jetliner-launches/.

incurred by Russia after the invasion of Ukraine. In which NATO-allied nations, such as the United States, many European states, and others will no longer be trading with Russia, including military aircraft parts, all war-related necessities required for their war effort.[934] Prior to said sanctions, Russia was importing over $520 million worth of spare aviation parts from different countries, including "Germany ($122M), Italy ($108M), France ($83.3M), Czechia ($50.1M), and United Kingdom ($49.8M),"[935] all of which are NATO-allied states. Therefore, these states are no longer supplying Russia with the parts they originally supplied.

Throughout the remainder of this estimate, it will become clear that no single factor has been the main driving force behind the widespread failures of the VKS while operating in Ukraine, but rather the combination of everything has contributed to this failure. Despite having a plethora of Russian third-party producers of spare aviation parts and equipment, [936] they have been unsuccessful in keeping their aircraft aloft, as will become evident later on. Russian air power was assumed to be a major deciding factor in the outcome of this conflict against Ukraine, and rightfully so. In 2020, Congress released a capabilities report on the Military of Russia, in which it said that the munitions associated with many modern aircraft were being updated and upgraded.[937] Neither the development of 5th generation fighter aircraft nor modernized strategic and tactical bombers were occurring at the time, and there was also a strong focus on the buildup

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[934]Ozili, Peterson K. "Global Economic Consequence of Russian Invasion of Ukraine." SSRN Electronic Journal, 2022. https://doi.org/10.2139/ssrn.4064770., 9-12

[935] OEC. "Aircraft Parts." OEC. Accessed April 17, 2023. https://oec.world/en/profile/hs/aircraft-parts.

[936] Bohnert, Russian Aircraft Keep Crashing. Could Sanctions Be the Cause?

[937] Congress, Russian Armed Forces: Capabilities

of air defense sites, which is also confirmed in the publicly available doctrine of the Military of Russia.[938] [939]

The VKS had approximately 4,200 aircraft in its possession during the invasion of Ukraine.[940] However, it is essential to know that many of the VKS aircraft were not fully combat-ready during this period.[941] Also, despite their combined air forces officially ranked at number 2,[942] stockpiles of many of the necessary tools for air operations, such as precision-guided munitions, targeting pods, and specialized Suppression of Enemy Air Defenses (SEAD) units, were not built-up enough before the invasion of Ukraine.[943] Neither were platforms built to conduct intelligence, surveillance, and reconnaissance missions,[944] leading to higher than necessary casualties at the early outset of the conflict. Overall, it seems that much of the necessary resources required for such a large-scale invasion were not present at the outset of the conflict. Therefore, the VKS was largely unprepared for an invasion of this size.

The VKS seemed largely unprepared at the beginning of this invasion, paired with a military doctrine that expects two things. The VKS is to fight defensively in the skies and focus on installing things such as anti-air defense sites to impede enemy combat effectiveness in the skies further.[945] This, therefore, leaves the VKS not an end on its own, rather a pure support arm

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[938] Kofman & Lee, Not Built for Purpose: The Russian Military's Ill-Fated Force Design

[939] Arms Control Association, Russia's Military Doctrine

[940] WDMMA, Russian Air Force (2022)

[941] Arms Control Association, Russia's Military Doctrine

[942] WDMMA, Russian Air Force (2022)

[943] Vayu, The Ukraine/Russia Conflict: An Analysis on Air Warfare, 86-87

[944] Ibid.

[945] Ibid.

of the armed forces, which is the second expectation of the VKS[946]- to support ground forces properly. However, the method which the Russian ground element used to request air support is all too often not enough to make a noticeable difference on the battlefield.[947] To make matters worse, communications between many of Russia's Armed Forces are prone to fratricide. [948] With this in mind, the VKS has become a supporting element that cannot function in conjunction with the element it is supporting and has a tendency not to question any orders once they are given, which is an ineffective method of employing the second greatest air force on the planet.

Current status of VKS during the invasion

The VKS has, thus far, not fared well throughout the conflict against Ukraine. There are multiple reasons for this, which are important to discuss separately. For one, the VKS is experiencing the full brunt of the economic sanctions imposed on Russia last year at the onset of the invasion, and maintenance is becoming problematic due to the lack of spare parts.[949]This problem has led to the complete halt of civil aviation in Russian airspace[950] and the cannibalization of Russian civil aircraft,[951] as well as a call for civil and military pilots alike to be more capable of repairing their own aircraft.[952] The VKS also has a very low combat-ready

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[946] Ibid.

[947] Kofman & Lee, Not Built for Purpose: The Russian Military's Ill-Fated Force Design

[948]Zabrodskyi et al., Preliminary Lessons in Conventional Warfighting from Russia's Invasion of Ukraine: February–July 2022, 50-52

[949] Bohnert, Russian Aircraft Keep Crashing. Could Sanctions Be the Cause?

[950] Lytvyn, Oleksandr. "When Will Passenger Planes Fly Again in Ukraine?" New Eastern Europe - A bimonthly news magazine dedicated to Central and Eastern European affairs, October 19, 2022. https://neweasterneurope.eu/2022/10/19/when-will-passenger-planes-fly-again-in-ukraine/.

[951] Mason et al., Exclusive: Russia Starts Stripping Jetliners for Parts as Sanctions Bite.

[952] Garbuno, Daniel Martínez. "Russian Official Suggests Pilots Should Learn to Repair Aircraft." Simple Flying, September 15, 2022. https://simpleflying.com/russia-pilots-should-repair-aircraft/.

number of aircraft available compared to the number one air force in the world, the United States.[953] This is made worse due to the decline in performance within the training pipeline for new pilots.[954] Additionally, the pilots on the flight line in Russia are flying with less and less simulator time and very little actual flight time between combat missions.[955] Moreover, due to their simplified and less rigorous training, it seems that rules of safety for Russian pilots are of less and less importance to Russian commanders,[956] and that a growing number of accidents, crashes, and malfunctions are likely to be attributed to Russia prioritizing the quick training of these pilots and associated personnel. Overall, this comes together to form a highly modernized but undermanned and under-maintained air force that is falling apart and becoming more and more combat ineffective as the invasion continues.

Sanction Effects on the VKS

The sanctions imposed on Russia have heavily impacted the VKS and halted nonmilitary aviation during this conflict with Ukraine. After the onset of the invasion of Ukraine, most Western nations implemented massive sanctions on Russia, including parts needed to maintain both the aircraft and the parts already installed on the aircraft.[957] Despite this, there are many third-party parts manufacturers operating within Russia,[958] including AeroTrade LLC Russia, Airfleet Russia, Aviasalon Company, Aviaexport PLC, and Design Bureau Aviaavtomik to name

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[953] Global Firepower. "2023 Russia Military Strength." Global Firepower - World Military Strength, 2023. https://www.globalfirepower.com/country-military-strength-detail.php?country_id=russia.

[954] Peck, Prolonged Fighting in Ukraine Is Revealing the Russian Air Force's Fragility, Researchers Say.

[955] Bronk, Is the Russian Air Force Incapable of Complex Operations?

[956] Rich, The Russian Air Force Is Its Own Worst Enemy

[957] Ozili, Global Economic Consequence of Russian Invasion of Ukraine., 9-13

[958] Bohnert, Russian Aircraft Keep Crashing. Could Sanctions Be the Cause?

a few.[959] Many of these companies fall into the small to medium-sized enterprises expected to be hit by the mobilization of Russia, as well as their armed forces or the uptick in conscription.[960]

This is further demonstrated by two separate but interlinked occurrences: the approval of parts cannibalization of passenger and other civil aircraft grounded in Russia[961] and supplying military aircraft with the necessary spare parts to keep them aloft. It is important to note that, while this cannibalization of parts was already occurring as of August of 2022, it was formally approved in December of 2022.[962] This demonstrates that while not something that Russia wanted to be public, they also knew that it would be necessary to release some sort of federally-approved guidance on the topic, seeing as it was a practice that had been in place, more or less secretly, since August. Despite some individuals, such as Bohnert, claiming that the production of spare aviation parts was not the problem, but the tooling and maintenance power available to Russia, this report assesses with a moderate to a high level of confidence that the sanctions imposed on Russia have also affected their ability to produce spare parts for their airframes. Reuters makes the claim that the parts being cannibalized by the Russian FAA equivalent (Rosaviatsia) are the specific parts included in the sanctions made by western nations.[963] This is

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[959] ASDSource.com, Russian Aerospace and Defense Companies

[960] Luzin, Pavel. "The Russian Army in 2023." Riddle Russia, January 18, 2023. https://ridl.io/the-russian-army-in-2023/.

[961] Mason et al., Exclusive: Russia Starts Stripping Jetliners for Parts as Sanctions Bite.

[962] Aviationweek. Russian Regulator Approves Aircraft Cannibalization amid Sanctions.

[963] TREASURY'S OFFICE OF TERRORISM AND FINANCIAL INTELLIGENCE. "Russian Harmful Foreign Activities Sanctions." Office of Foreign Assets Control | U.S. Department of the Treasury, April 2023. https://ofac.treasury.gov/sanctions-programs-and-country-information/russian-harmful-foreign-activities-sanctions.

one of the most likely causes of the motion to approve the cannibalization of aircraft parts during the halt of civil aviation.

The second interlinked occurrence is the push for pilots also to be made able to maintain their aircraft.[964] [965] Despite this push toward civil aviators, due to the nature of Russian state-operated airlines being halted, one can assume that this sudden request by Oleg Bocharov is heavily inspired by the current situation his country is facing in Ukraine. Bocharov is not only the Deputy Minister of Industry and Trade of Russia, but in college, studied at the Moscow Aviation Institute.[966] He would therefore understand the complexity required to maintain an airframe and that it is nearly unheard of to suggest that a pilot should both fly and maintain his or her own aircraft. These occurences combine to give at least one possible picture of the current status of Russian Aviation: below-par maintainability of the aircraft deemed inessential to the efforts in invading Ukraine. Overall, Russian air capabilities seem questionable, and delving into their training pipeline and concern for their forces only ameliorates the issue.

Training Capability of VKS Pilots

The average pilot currently being trained and certified by the VKS training program is significantly less skilled than the average VKS pilot trained before this armed conflict.[967] [968] Pilots making unsafe maneuvers, constant mid-air collisions, and even pilots engaging media

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[964] Garbuno, Russian Official Suggests Pilots Should Learn to Repair Aircraft.

[965] Venckunas, Russian Pilots Should Repair Aircraft Themselves, Says Official

[966] Roscongress, Oleg Bocharov

[967] Bronk, Is the Russian Air Force Actually Incapable of Complex Operations?

[968] Lavrov, The Russian Air Campaign in Syria A Preliminary Analysis

reporters with missiles[969] demonstrate that there is a high likelihood that the new generation of VKS pilots is not being taught the safety measures required to operate the aircraft, nor how to act in a situation where the safety of their aircraft has been compromised.[970] Many of these crashes, accidents, and malfunctions are not explained to the public, leaving many to hope for the release of video evidence to determine possible causes on their own. However, it is essential to remember that the speculation of spectators and sub-par viewing angles do not tell the step-by-step walkthrough of events leading up to a deadly crash in an airframe. Thus, the only option for anyone looking for more answers is to analyze the pattern of a sudden uptick in accidents after a significant shift in military focus.

This leads to the assumption that even if these pilots are of the same caliber as pre-invasion pilots, they may not be receiving the same careful attention to the rules of the air, and are more focused on aggression while in the sky. This is shown by VKS pilots being much more willing to make dangerous maneuvers in combat than other Western counterparts, like American pilots.[971] Because of the crashing of both training aircraft and combat aircraft alike, this report assesses that there are widespread shortcomings in the training pipeline of the VKS as a whole. These shortcomings may come in the form of an oversight on the importance of safe handling of the aircraft either in the sky or on the ground. While in the sky, there seems to be widespread disregard for safe aerial maneuvers, thus endangering the pilot and the aircraft together. While on the ground, it seems that there may be a large oversight on the part of maintainers and mechanics, further demonstrating the overstretched nature of the Russian supply chain.

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[969] Rich, The Russian Air Force Is Its Own Worst Enemy

[970] Ibid.

[971] Ibid.

Conclusion

Despite high praise and a massive stockpile of modernized aircraft, all before the beginning of the invasion of Ukraine in February of 2022, the VKS has been unsuccessful in deploying its forces. As stated previously, the most prominent reasons behind this are the inefficient supply chain that Russia has in place to keep the aircraft airworthy, the drastically low quality of instructor pilots, and perceivable disregard for the safety of pilots while in the cockpit, both on the ground and in the air. The evidence of this struggle of the VKS is transparent, from piloted aircraft making unsafe maneuvers,[972] to poor planning of locations for training flights that leads to military jets crashing into residential buildings,[973] to unsafe instructions from ground control who are instructing these pilots with less experience to try and land in dangerous conditions.[974] Pilots lose control of their aircraft in such a way that most who watch believe it to be a malfunction of the aircraft itself.[975] All these problems have caused fatalities of Russians in maneuvers conducted by their military. Unless the period of instruction for the pilots of the VKS or the supply chain problems are changed, this report assesses with a high level of confidence that this problem will continue for the remainder of Russia's invasion of Ukraine.

Before the current conflict, pilots of the VKS were allowed to gain some combat experience. Beginning in 2015, the VKS underwent operations in places like Syria, fighting ISIS-associated insurgents and familiarizing their pilots and maintainers with the new aircraft,

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[972]Ibid.

[973] Cordell & Trevelyan, Two Pilots Killed as Russian Fighter Jet Crashes into Siberian Home.

[974]Rich, The Russian Air Force Is Its Own Worst Enemy

[975] Charpentreau, Russian Su-25 Crashes after Takeoff: Here's What We Know so Far

albeit not 5th-generation fighters[976]. However, the VKS did demonstrate an intelligent evolution of operations, becoming much more effective in combating the enemy.[977] While initially the VKS started their missions in Syria by dropping unguided munitions with low accuracy of their strikes due to rules of engagement that required pilots to stay over 4 kilometers in altitude. Thus hindering their accuracy, especially so because the VKS prefers unguided munitions.[978] According to the Russian press, these strike aircraft "carried out 1,292 combat missions on 1,623 targets."[979] It is essential to note that these figures have been inflated due to the tendency to consider a target "destroyed" if the target was impacted, no matter how slightly, by the blast of the explosive.[980] It is difficult to determine how successful these missions were because of this. Still, the Russian government holds this statistic to indicate a considerable success for the VKS, despite having to withdraw forces from Syria by the end of the conflict and reducing the government of Russia to the position of a mediator after its intervention was completed. Even if the VKS was successful in its efforts to learn the proper implementation of its modernized arsenal of both aircraft and munitions, it has been nullified in the current invasion of Ukraine. This nullification of experience is due to both the implementation of significant sanctions on the Russian war effort, and the decrease in available instructor pilots with the necessary experience to instruct the new student aviators, who learn how to fly within an acceptable range of risk to their aircraft.

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[976] Myers, The Russian Aerospace Force, 93-93

[977] Lavrov, The Russian Air Campaign in Syria A Preliminary Analysis, 2-7

[978] Ibid.

[979] Ibid.

[980] Ibid.

During the Russian invasion of Ukraine, Russia has experienced significant sanctions against the Russian war effort, stopping any trade of critical resources required to operate the VKS' modern arsenal that veteran pilots have become accustomed to. There is a myriad of evidence supporting that these sanctions have proven effective, leading to a shortage in maintained aircraft, thus causing the government of Russia to approve the cannibalization of their civilian fleet of aircraft[981] to supply their military fleet with needed spare parts that are not available. These sanctions are further ameliorated by the allies of Russia being unwilling to supply these parts due to the Western world agreeing in their stance against this display of Russian aggression toward another sovereign country.[982] The unavailability of spare parts for the aircraft has led not only to the grounding of most Russian civilian aircraft, but a wide swath of maintenance issues. It is even thought to have led to some of the malfunctions and accidents in the takeoff and landing throughout the VKS, both on the front lines of the conflict and far removed from the front of the conflict have all experienced crashes and accidents, either due to the incompetence of their pilots or due to the poor maintenance of their aircraft. Given the nature of the crashes, it can be challenging to determine their cause since the aircraft is often destroyed afterward. Due to sanctions and the lack of instructor pilots, the combat effectiveness of the VKS, both its munitions and its aircraft, have been hampered.

Not only does Russia face the sanctions imposed by the western world, but there is also a shortage of experienced instructor pilots,[983] leading to an air force that either does not understand

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[981] Mason et al, Exclusive: Russia Starts Stripping Jetliners for Parts as Sanctions Bite.

[982] Marnin, Which Countries Support Russia amid Its Invasion of Ukraine?

[983] Peck, Prolonged Fighting in Ukraine Is Revealing the Russian Air Force's Fragility, Researchers Say.

safe operating procedures or does not care for them,[984] neither of which is preferable. The fact

stands that the VKS is facing a large-scale epidemic of crashes and accidents; whether or not the

government wants to admit it, this has been a significant detriment to its ability to fight and win.

A wide swath of accidents and crashes have occurred before and after this invasion's onset.[985]

This demonstrates that this is not only due to the current conflict but is caused by a deeper

seeded issue altogether. The training of VKS pilots has been hampered even further during this

invasion because their training cycle focuses on in-unit experience, which is unavailable during

forward-deployed units facing combat environments.[986] The evidence of this inadequate training

is clear when looking at the recent accidents of the VKS, from combat aircraft that was heavily

used in the invasion to aircraft used in training environments, both crashing, malfunctioning, or

losing control,[987] [988] there is little evidence of the training cycle for these VKS pilots being

successful. Some believe that the aggressive training of the UkrAF has exceeded that of the VKS

and, because of this, caused the VKS to take a far less effective, low-flying approach with

minimal aggression and maneuvering approach to the combat for the skies of Ukraine.[989] Despite

what seems to be such an obvious advantage on paper, with both better SAM sites and aircraft

available to the VKS.[990] However, the VKS is still a force to be reckoned with, and unless

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[984] Rich, The Russian Air Force Is Its Own Worst Enemy

[985] Bohnert, Russian Aircraft Keep Crashing. Could Sanctions Be the Cause?

[986] Zabrodskyi et al., Preliminary Lessons in Conventional Warfighting from Russia's Invasion of Ukraine: February–July 2022, 55-57

[987] Rich, The Russian Air Force Is Its Own Worst Enemy

[988] Charpentreau, Russian Su-25 Crashes after Takeoff: Here's What We Know so Far

[989] Bronk et al., The Russian Air War…, 11-13

[990] Myers, The Russian Aerospace Force, 93-94

Ukraine continues to receive foreign aid and fight as desperately as they have been, Russia could still emerge as a victor.[991]

This begs the question: "What is the VKS capable of in the Ukrainian invasion?" In simple terms, this report assesses with a high level of confidence that the VKS will continue to be ineffective in air-to-air combat and instead will focus on delaying enemy aircraft. This is due to their low logistical supply, the shrinking amount of available pilots to fly their aircraft, and their defensive air combat doctrine. Because the VKS is facing mass casualties from poorly-piloted aircraft and an ever-decreasing supply of spare parts to maintain their airframes, this report assesses with a high level of confidence that the VKS will maintain its stance as a support unit for its ground element. It will also continue to make combat decisions that do not needlessly endanger more aircraft or pilots than necessary. This course of action would mitigate the problems with both portions of its dilemma. Additionally, this report assesses with a low level of confidence that the VKS can afford - neither with their current economy nor their manpower - an uptick in operational tempo. VKS pilots are making questionable decisions already, even without the presence of an increase in aggressive mission sets. Such an increase in tempo would carry a high confidence of further damaging the number of available Russian aircraft and reserves of trained personnel. Not only the pilots in the cockpit but also maintainers, who will not be getting sufficient rest if the aircraft were even more damaged than they are already.

This question leads to another: "What are our options?" As Americans, this conflict serves two opportunities: protecting a newly-allied NATO nation, Ukraine, and probing the Russian military for weaknesses while fighting a near-peer competitor. Depending on the desired

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[991] Zabrodskyi et al., Preliminary Lessons in Conventional Warfighting from Russia's Invasion of Ukraine: February–July 2022 , 64-65

outcome of this conflict, there are several possible courses of action for the United States. One of these possible actions is to continue operating in the same manner throughout the conflict. Namely, supplying Ukraine with aid and modernized munitions and weaponry. While the Russian military has not been successful in its conflicts with Ukrainian forces, Russia has a much larger population to draft new soldiers from. On the other hand, as this invasion drags on, Ukraine is losing more combat-ready soldiers and even potential soldiers. Eventually, this could lead to the complete annexation of Ukraine by Russia.

Therefore there are additional options, one that is interested in maintaining the sovereignty of Ukraine and one that is focused primarily on maintaining distance from the war in Ukraine. The first of the two is increasing aid to Ukraine logistically and through instruction. Currently, the United States, alongside other NATO-allied nations, is funding much of the Ukrainian war effort, which is often not seen as an act of war but as support of an ally. The proposition is to continue this support and increase the training program for Ukrainian pilots in their aviation capabilities.[992] This would accomplish two things; maintaining large-scale neutrality and increasing the flying capabilities of the UkrAF even further. This would also give Americans a better perspective on how the VKS would react to air tactics similar to that of the U.S. Air Force. However, if we were to instruct Ukrainian Troops in American combat tactics, this would assist the Russian Military in analyzing an American approach to warfare. This would give them a major advantage in a hypothetical future conflict between the U.S. Air Force and the VKS.

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[992] Harris, House Authorizes Training for Ukrainian Pilots to Use US Aircraft,

Another course of action would be to pull the majority of the current funding plan for Ukraine, leave Ukraine to fend for itself, and utilize whatever resources have already been donated. While this would almost lead to the complete occupation of Ukraine, this would give the United States a far more neutral point of view of the entire situation and may allow other non-aligned states to follow suit. In terms of genuine benefits, this offers none, but focuses on mitigating the backlash from any states supporting the Russian invasion, primarily Russia and the People's Republic of China. There are other options as well; however, the main focus of this estimate is to determine the capabilities of the VKS as they stand now.

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