



**Project
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Understanding Russia's military vulnerabilities

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Summary

- This paper draws preliminary conclusions about Russia's warfighting capabilities based on the initial 12 months of its invasion of Ukraine in February 2022.
- The first year of Russia's invasion of Ukraine exposed key aspects of Russian ground capabilities, several of which the Russian military had itself previously observed but did not successfully address. It is important to separate the consequences of Russia's poor choices in this war from systemic Russian weaknesses – but those same systemic weaknesses will preclude Russian forces from quickly and effectively rectifying their mistakes.
- The threats to Western airpower, and therefore to the viability of NATO's conventional deterrence strategy against Russia, have always been Russia's ground-based integrated air defence system (IADS) and long-range precision strike capabilities. Both of those have performed broadly as expected in Ukraine.
- Western sanctions must be better adapted to the nature of the maritime industry: many systems – such as propulsion, sensors and navigation – are still classed as civilian items under the current set of export restrictions.
- There is still no significant evidence that Russia is trying to reconsider its basic approach towards electronic warfare (EW). Moreover, known EW exercises in 2022–23 focused solely on the tactical defence of frontline positions and command points from adversary units, reconnaissance, and combat unmanned aerial vehicles (UAVs) and loitering munitions.
- US and NATO defence planners should pay close attention to how adversaries like Russia and possibly China develop and use artificial intelligence (AI) to augment their advantage in mass – the ability to mass firepower and manpower to overwhelm the adversary – as well as exploring what types of existing and new defences can be effective against such developments.
- Making the Kremlin fail faster on the battlefield is the most effective way to penetrate and disrupt the Russian information space and exacerbate the damage control burden on the Kremlin, as battlefield setbacks will increase the perception–reality gap that the Kremlin's information operations must bridge. The Kremlin cannot pivot rapidly in the information space, but a reprieve on the battlefield provides an opportunity for the Kremlin to adapt its narratives and leverage its ability to manipulate perceptions.

Introduction

Mathieu Boulègue

This document brings together the presentations from two workshops on Russia's military vulnerabilities, held in April and June 2023. The introduction and conclusion reflect the workshop discussions, and offer policy recommendations for NATO allies on how best to understand and exploit Russia's vulnerabilities.

More than a year and a half of high-intensity warfare in Ukraine has taught Western military planners a lot about the Russian armed forces and Russia's way of war.

Although many blind spots remain, we know more about how Russia deploys and sustains military power. There is also more visibility about what Russian warfighting weaknesses and vulnerabilities are – especially regarding military structure, planning, capabilities and military technology.

Russia's full-scale invasion of Ukraine in February 2022 demonstrated poor planning and exposed critical issues in military capabilities. Furthermore, robust and continued international sanctions are crippling the ability of the military industry to produce more advanced capabilities in the near future.

It is possible to draw preliminary conclusions about Russian warfighting capabilities to inform Western military planners and policymakers. This is particularly relevant as the Russian armed forces remain a potent threat to the United States, NATO and its allies. Moscow can still hold US and NATO assets at risk of destruction in a stand-off or warfighting situation, whether conventionally or asymmetrically.

It is therefore vital to make realistic assessments of Russian warfighting capabilities and military procurement to craft a balanced policy response, especially in the context of varying assessments of Russia's performance in Ukraine.

This document explores the impact of the war on Russian capabilities in conventional domains (land, air and naval forces) and non-conventional domains – especially electronic warfare (EW) capabilities, the information space, and military innovation and modern technology.

It offers an assessment of key vulnerabilities and challenges affecting Russian capabilities in these specific domains, as well as how the armed forces have adapted to the war against Ukraine. The paper also discusses preliminary lessons learned and policy implications for the US, NATO and their partners.

Russia's ground forces

Mason Clark

Assessment of the war in terms of Russia's ground capabilities

The Russian military's force structure and decisions in Ukraine have undercut its strengths and amplified its weaknesses. Initial errors, including an unoptimized force structure, unclear command and control (C2) and early officer casualties, have proved self-reinforcing and difficult to remedy. President Vladimir Putin's plan was based on flawed assumptions of both Ukrainian and Russian capabilities. The Russian military began what it likely considers a local or at most regional war (that the Kremlin rhetorically frames as a large-scale war with the West) with units (BTGs) designed for a smaller 'armed conflict'.¹ The Kremlin is preparing for a protracted war but will struggle to correct exposed vulnerabilities while major operations are ongoing.

Observed Russian operational art is surprisingly poor. Putin reportedly failed to appoint a theatre commander in February 2022, leading to competition for resources between different axes of advance. Putin appointed a succession of commanders (Alexander Dvornikov, Gennady Zhidko and Sergey Surovikin) prior to Valery Gerasimov's assumption of command in January 2023.² Russian forces have consistently attempted to support more simultaneous efforts than they can sustain.

Russian forces invaded on four main axes of advance and assigned arguably their worst forces to the capture of Kyiv. Repeated attempts to conduct wide encirclements of Ukrainian forces in Donbas throughout 2022 regressed to heavy fighting for Severodonetsk. Since September 2022, Russian commanders have continued an almost robotic effort to gain ground in several areas, regardless of the operational realities. While Russian commanders have somewhat scaled down their focus (discussed below), Russian operations remain hasty and largely divorced from proper doctrine.

Russian planners likely over-projected the utility of BTGs from previous fighting in Donbas and did not prepare for sustained combat. These decisions exposed several structural weaknesses:

¹ It naturally is up for debate which typology of war from established doctrine the Russian military applies to its invasion of Ukraine, and how it is reconciling – if at all – the tensions inherent in conducting a 'special military operation' to conquer a neighbouring state. See Kofman, M. et al. (2021), *Russian Military Strategy: Core Tenets and Operational Concepts*, CNA Research Memorandum, Arlington, VA: CNA, p. 8. https://www.cna.org/archive/CNA_Files/pdf/russian-military-strategy-core-tenets-and-operational-concepts.pdf.

² SMD commander Dvornikov was appointed as overall commander in April 2022; head of the Military-Political Directorate Zhidko commanded from May to October 2022; and Surovikin commanded from October 2022 to January 2023, when Gerasimov took over as overall commander.

- Russian commanders failed to command at the army/division level, fouling proper chains of command. Operating BTGs without their full parent units disrupted C2, reduced the longevity of BTGs and likely contributed to high rates of friendly fire.
- Russian commanders treated BTGs interchangeably and did not task-organize them, though Russian commanders increasingly rectified this problem in late 2022.
- The ad hoc combination of damaged BTGs from different parent units exacerbated poor performance.

Russian tactical formations have further devolved throughout the war. Russian attacks are (with some exceptions) piecemeal, committing units at the company or smaller level rather than concentrating necessary forces, predominantly due to poor coordination between units.³ Russian forces around Bakhmut have increasingly created 'assault detachments' for urban fighting, but these units will struggle to conduct manoeuvre warfare. The heterogeneity of Russian forces has only worsened throughout the war, with the inclusion of irregular and proxy forces disrupting logistics and command.⁴

This poor operational art and force employment nullified what should be Russian advantages in mass and effective fires and exposed Russian tactical weaknesses. Russian troops often lack basic soldiering skills – struggling with map reading, offroad movement and combined arms tactics. Russian forces consistently fail to translate tactical gains into operational successes. Poor operational security and over-concentration expose Russian troops to dangers.

Russian units furthermore lack the communications systems necessary to coordinate effective operations, leading to high casualties among officers who must deploy close to the front. Low morale due to the use of increasingly poor ad hoc units, unmotivated mobilized personnel and high officer casualties has additionally exacerbated tactical shortcomings.⁵

³ As early as 15 March, for example, Russian forces were reduced to conducting at most battalion-level attacks around Kyiv. Many attacks in eastern Ukraine are conducted at most by platoons.

⁴ For example, the Russian forces in Kherson Oblast just prior to the Ukrainian counteroffensive in August 2022 were composed of EMD, SMD, VDV and Rosgvardia troops. Stepanenko, K., Hird, K., Mappes, G. and Kagan, F. W. (2022), 'Russian Offensive Campaign Assessment, August 14', Institute for the Study of War, 14 August 2022, <https://www.understandingwar.org/backgrounder/russian-offensive-campaign-assessment-august-14>.

⁵ The Ukrainian General Staff reported as early as April 8 that up to 80 per cent of personnel in some Russian units refused to return to the front once withdrawn from Kyiv. See Clark, M. and Stepanenko, K. (2022), 'Russian Offensive Campaign Assessment, April 8', Institute for the Study of War, 8 April 2022, <https://www.understandingwar.org/backgrounder/russian-offensive-campaign-assessment-april-8>. Russian units reportedly began replacing casualties with personnel from separate branches and even groups by May 2022, with reports of PMC personnel joining VDV units and Black Sea Fleet ship crewmembers joining the 810th Naval Infantry Brigade. See Stepanenko, K., Kagan, F. W. and Barros, G. (2022), 'Russian Offensive Campaign Assessment, May 15', Institute for the Study of War, 15 May 2022, <https://www.understandingwar.org/backgrounder/russian-offensive-campaign-assessment-may-15>. Russian commanders reported having to simplify tactics in assaults in the Vuhledar area in November 2022 due to the slow quality of reinforcements and an inability to contact brigade commanders. See Stepanenko, Kagan and Barros (2022), 'Russian Offensive Campaign Assessment, November 15'.

The performance of Russia's main combat arms has proved uneven. Russian operations have demonstrated the pitfalls of low-quality and insufficient infantry. Mobilized personnel cannot follow the infiltration tactics that more elite personnel can use effectively in urban areas, requiring the expenditure of valuable, relatively elite units such as the Russian Airborne Forces (VDV) and Naval Infantry. Adapting to use low-quality troops to skirmish with Ukrainian positions under the support of massed artillery has enabled small gains but cannot deliver the rapid advances the Kremlin desires and necessitates high casualties.

Massed artillery fire has succeeded to a certain extent in eastern Ukraine, and Ukrainian artillery is frequently outmatched by Russian units. At one point in June 2022, Russian forces in eastern Ukraine possessed 10–15 artillery pieces to each Ukrainian barrel. However, Russian fires are inflexible and the massed, static supply dumps necessary for this approach are vulnerable to Ukrainian strikes.

Additionally, the use of tactical groups of artillery coordinated at the division or even higher level is inefficient, with several-hour delays between requests and fire missions. Russian armour has not been used effectively as a manoeuvre element, and Russian tanks are now primarily used for direct fire support. Russian armour has also suffered substantial losses that Russia will struggle to replace quickly.

Russian forces have been unable to implement their desired 'reconnaissance-fire strike complex' in Ukraine. Russia's ability to effectively employ advanced precision-guided munitions and other systems has lagged behind their theoretical capabilities and pre-war Russian intent. Furthermore, the use of limited quantities of advanced munitions against infrastructure targets has prevented Russia from achieving asymmetrical battlefield effects. Russian forces are additionally running low on shells after previous massed fires. Russian unmanned aerial vehicle (UAV) use has been effective, but these systems have suffered remarkably high rates of attrition.

Russian adaptations and impact of the war on future operations

The Russian military has made limited adaptations and remains a dangerous force. However, most Russian adaptations have addressed the overall conduct of the war and the Kremlin's increasing recognition that it faces a protracted conflict, rather than operational planning and necessary tactical changes. The Russian military has shifted its near-term objectives over time (within limits), even doing so in the first 72 hours of the invasion.

Russian forces belatedly but still necessarily recognized the need to withdraw from Kyiv. The withdrawal from the right bank of Kherson freed up badly needed VDV units for fighting in Luhansk. Russian forces have made some tactical adaptations, including the use of artillery discussed previously, task-organized detachments, steady improvements towards

mutually supporting advances in summer 2022 and improved electronic warfare (EW) and UAV use.

However, Russian command culture and the loss of experienced officers and personnel will impede adaptation. The Russian military astutely observed several lessons from its fighting in Syria that it then failed to implement prior to the invasion of Ukraine; the Russian military will likely similarly struggle to implement quickly the lessons learned in Ukraine.

Russian officers have repeatedly demonstrated a lack of care for their personnel and committed their forces to hasty operations with high casualty rates. Russian operations at times seem driven more by tactical inertia than any operational considerations. Putin's prioritization of loyalty over capability and the continued dismissals of senior Russian officers who are ordered to achieve impossible objectives will further degrade the confidence and effectiveness of Russian officers. The Ministry of Defence (MoD) deserves much of the blame, not only Putin. With Gerasimov's reappointment and officer reshuffles, the Russian military is declining to leverage the now-experienced officers who would most effectively implement lessons learned.

Russia's initial force deployment and operations throughout the first year of the invasion have probably committed the Russian military to replicating many of its mistakes for the duration of the conflict. There are likely no intact regiments or brigades remaining in the Russian military, and efforts to construct small units solely out of mobilized personnel will not generate effective forces.

Russia's 'partial mobilization' and ad hoc efforts to generate additional forces exposed deficiencies in Russia's mobilization system. The Kremlin would likely face severe challenges if it belatedly decided to enact full mobilization in the near term. The long-service contract soldiers – and more importantly, the officers and trainers – who form the 'cadre' component of Russia's 'cadre and reserve' system have suffered frightful casualties, and Russia cannot rebuild effective cadres while involved in major combat operations. The Russians likely have no choice but to deploy individual replacements and ad hoc units until they have rebuilt entire formations, a process that could take years and would require a pause in Ukraine that Putin is unlikely to approve.

The Russian military is unlikely to regain its ability to fight with large units at echelon, or threaten NATO conventionally, in the near term. The Kremlin apparently intends to reverse the remnants of the Serdyukov reforms in the coming years and integrate Donetsk People's Republic and Luhansk People's Republic and other forces more completely into the MoD structure, which will bring its own challenges.

The Russian MoD's intended force changes through 2026 (an expansion of the military to 1.5 million, military district restructuring, and the creation of 12 new divisions) will not have a near-term effect on the war. However, this announcement demonstrates that the Russian military is reverting to a

Soviet ideal without the economy and manpower to support it. Gerasimov is likely belatedly but necessarily centralizing the Russian command structure, but it remains far from clear if this new structure will be more effective.

Attempting to undertake major reforms and force restructuring mid-offensive will generate short-term disruptions, but there is no indication that Putin will accept a necessary pause to properly reconstitute Russian forces. Finally, the spectre of limitless Russian manpower is a myth. Putin can and will recruit and deploy more manpower without full mobilization, but he will face mounting costs and diminishing returns.

Lessons learned and policy implications

The first year of Russia's invasion of Ukraine has exposed key aspects of Russian ground capabilities, several of which the Russian military had itself previously observed but did not successfully address:

- The 'well-structured management of a diverse group [of forces]' requires a unified effort 'from the military district to the brigade', which Russian officers observed the need for in Syria but have struggled to implement in Ukraine.
- Russian forces require sustained investment in improved communications and the desired 'automated control systems'.
- Russia requires a generational effort to inculcate initiative and creativity in its officers but will struggle to change the entrenched military culture.
- Russia's focus on precision weapons and other advanced systems is important but lags behind the actual scale of deployment.
- Russian forces must improve their EW and UAV capabilities.

The invasion has additionally highlighted several lessons to be learned about future conflicts. These observations are not unique to Ukraine and have been observed previously, but are worth emphasizing:

- Modernized and networked C2 systems are essential to enable rapid and flexible decision-making.
- Modern warfighting consumes large stockpiles to sustain combat operations, particularly in forces lacking effective precision weapons that instead leverage mass fires.
- Long-range, precision weapons have reduced the safety of rear areas, increasing the operational depth vulnerable to enemy fires.
- Truly effective urban combat is incredibly difficult and requires a strong base layer of capabilities, notably including effective infantry.

Russian forces will struggle to correct these errors in the next two years. Some experts have argued that analysts should not over-project Russian failures in Ukraine, noting that the Russian military may not abandon so many of its doctrinal frameworks in a hypothetical future conflict with NATO. This note of caution is warranted, and it is important to separate the

consequences of Russia's poor choices in this war from systemic Russian weaknesses – but those same weaknesses will preclude Russian forces from quickly and effectively rectifying their mistakes.

In the near term, Gerasimov will likely preside over a disorganized command structure plagued by endemic, persistent and self-reinforcing failures that he largely set in motion in his initial role before the invasion of Ukraine.

The loss of officers and elite personnel will have generational ramifications for the Russian military. The Russian military does not currently have a way of conventionally threatening NATO at scale. To be sure, the Russian military remains dangerous and Ukraine faces a long road ahead, with its own challenges and vulnerabilities. However, Western militaries must be clear-sighted in separating the long-term potential of a rebuilt Russian military from its current, highly degraded capabilities when planning Ukrainian policy and NATO defence.

Russia's Aerospace Forces (VKS)

Justin Bronk

Assessment of the war in terms of Russia's air capabilities

The Russian Aerospace Forces [*Vozdushno-Kosmicheskiye Sily*] (VKS) have been heavily engaged in combat operations as part of the large-scale invasion of Ukraine since February 2022. However, despite the fact that Russia's fixed-wing and rotary combat aircraft fleets both outnumber and significantly outclass Ukraine's, the VKS have failed to establish air superiority over Ukrainian-held territory.

The VKS have also failed to make a major impact on the course of the war on the ground. Both these failures stem from systemic weaknesses in tactics, training and equipment that in aggregate have prevented the VKS from carrying out a successful destruction of enemy air defences (DEAD) campaign against Ukrainian surface-to-air missile (SAM) systems.

During the first three days of the invasion, Russian aerial, land and maritime forces conducted a suppression of enemy air defences (SEAD) campaign, including a bombardment with hundreds of ballistic and cruise missiles, concentrated use of electronic warfare (EW) effects and around 140 strike sorties per day by fixed-wing Su-35S, Su-30SM fighters and Su-34 fighter bombers. These various effects were directed at the Ukrainian air defence network: they achieved a significant degree of suppression and some destruction of static and semi-mobile SA-3 and SA-10 sites and early-warning radars, especially in the south of the country.

Russian target lists were comprehensive and were based on a deep understanding of the Ukrainian air defence network from human intelligence sources and stand-off reconnaissance with Su-24MR and Il-20M intelligence aircraft. The strikes with stand-off missiles and sticks of unguided bombs dropped from medium altitude by Su-34s largely hit their intended target locations against Ukrainian air defence positions. However, Ukrainian forces had received several hours of advanced warning that the invasion was beginning, and almost all the air defence assets and Ukrainian Air Force munitions stores that could be moved were already repositioning by the time the strikes began.

As would later prove to be the case when it attempted to find and strike high-priority Ukrainian mobile battlefield assets such as HIMARS rocket artillery systems, the Russian targeting process was too slow and too rigid to track Ukrainian air defence system movements and update strike coordinates in time to hit them. Consequently, the number of physical Ukrainian losses among mobile SAM units was limited.

However, for the first two days of the war, the SAM systems were still forced to conduct large-scale relocation and dispersal efforts, while attempting to repair and reset radar systems that had been disabled or damaged by

electronic attack. This left the VKS fixed-wing fighter and strike fleets relatively free to conduct high-level combat air patrols and medium-level strike sorties up to 300 km inside Ukrainian airspace.

The Su-27 and Mig-29 fighters of the Ukrainian armed forces were forced to assume primary air defence responsibility, despite being badly outnumbered and completely outclassed by the air-to-air missiles and fire control radars carried by VKS Su-35S and Su-30SM fighters. Furthermore, although Russian tactical SAM units equipped with systems like the SA-17 and SA-15 were frequently disorganized and separated from the units they were assigned to protect during the first week of the invasion, long-range SA-21 (S-400) and SA-23 (S-300V4) SAMs were active and posed a major threat to Ukrainian sorties up to 150 km from the borders.

With this combined fighter and long-range SAM threat, the VKS forced Ukrainian fighter and ground attack sorties to fly at very low altitudes to try and avoid detection via terrain masking. Both sides claimed a significant number of air-to-air kills during the aerial clashes in the first few days, but a majority of both Ukrainian and Russian combat air losses were caused by long-range Russian SAMs, especially S-400 systems near the borders with Belarus and Belgorod oblast.

This is because Ukrainian fighters had to rely on semi-active R-27 series and short-range R-73 missiles, which greatly limited their tactical effectiveness even in pop-up ambush attacks on Russian sorties, whilst Russian pilots' rigid employment procedures and poor beyond-visual-range tactics have limited the probability of kill for their theoretically much more capable R-77-1 active radar missiles. The latter have remained a limitation for Russian fighter pilots throughout the conflict, although since September 2022 increasingly mainstream use of the longer-ranged and much faster R-37M from both Mig-31BM interceptor and Su-35S fighter aircraft has compensated for some tactical weaknesses and has increased Russian air-to-air lethality.

Russian adaptations and impact of the war on future operations

Once the Ukrainian SAM systems had completed initial dispersal and relocation operations and radars had been reset and repaired, Russia swiftly lost the ability to operate sustainably over Ukrainian-controlled territory. Consequently, from the first week of March onwards, all VKS rotary and fixed-wing sorties that crossed the Ukrainian frontlines were undertaken at very low altitudes to reduce the effective detection and engagement ranges for radar-guided SAMs.

However, two major limitations with this approach quickly became apparent. Firstly, at low altitudes man-portable air defence systems (MANPADS) like Iгла-S, Piorun and Stinger posed a prohibitive threat to sustained daylight operations, with Russian jet and helicopter losses mounting rapidly throughout the first week of March. Secondly, due to the line-of-sight and sensor field-of-view limitations inherent to the very-low-

altitude flight regime, Russian fighter and strike pilots were unable reliably to find and hit Ukrainian battlefield targets with either precision-guided munitions or the much more common unguided bombs and rockets they were carrying.

A rapid switch to night operations in the second week of March 2022 reduced losses to MANPADS because operators without night-vision goggles could not see and aim their weapons effectively. At the same time, this further increased the navigation, targeting and weapon-aiming challenges of low-level attack sorties. Here, the VKS demonstrated that only a small proportion of their pilots were capable of reliably carrying out such missions effectively; of these, most were in the specialized Su-34 fighter bomber fixed-wing and Ka-50 and Mi-28N attack helicopter fleets.

Even for the Su-34 units, strikes were generally only carried out by night at low level against the besieged cities of Mariupol, Kharkiv and Chernihiv due to the difficulties of finding and accurately identifying and hitting battlefield targets. The continued trickle of losses and low effectiveness of such sorties meant that even by night, penetrating sorties across the Ukrainian front lines largely ceased by April 2022.

Since then, the Su-34 and helicopter gunship fleets have carried out semi-regular stand-off attacks from several kilometres behind the front lines, using laser-guided missiles like the Kh-29L and anti-tank guided missiles against known fixed targets and dug-in vehicles. The bulk of VKS air support to Russian forces on the ground has been limited to unguided rocket salvos from low level and the occasional direct rocket and bombing run attacks.

SEAD efforts have continued with Su-35/30 fighters and Su-34 fighter bombers launching regular stand-off attacks on Ukrainian SAM radars with Kh-31 and older Kh-58 anti-radiation missiles. These have caused some damage, and have forced Ukrainian SAM operators to place strict limits on their radar illumination periods and relocate frequently to avoid being hit. However, the only statistically significant attrition against Ukrainian SAMs has come from Russian Ground Forces-operated Orlan-10 UAVs locating and designating SA-11 and SA-8 units for strikes with artillery, ballistic missiles and loitering munitions.

Meanwhile, Russian attempts at strategic air attacks have been restricted to stand-off cruise missile and ballistic missile attacks, joined by waves of lighter Iranian-supplied Shahed-136 munitions since October. These have caused great damage to Ukrainian infrastructure and defence industry installations, and have also put pressure on the long-term ammunition stocks for Ukrainian SAMs.

However, these stand-off weapons are limited to attacks on fixed targets. Ultimately, Russia has proven unable to generate strategically decisive effects from the air without the ability to leverage its much more responsive and cost-effective fixed-wing fast jet fleets directly. Despite very cautious tactics since the start of April 2022, the VKS suffered 78 independently verified fast jet losses during the first year of the invasion, from a starting

force of around 350 modern aircraft available for operations. These are serious losses, especially given the mediocre results obtained.

Lessons learned and policy implications

As of February 2023, the first year of the invasion of Ukraine has not cast the VKS in a particularly positive light. The VKS's strengths include:

- a respectable ability to strike fixed targets with stand-off Kh-101 cruise missiles launched from Long-Range Aviation Tu-160 and Tu-95 bombers, or Kh-59 launched from fast jets;
- an ability to pose a significant air-to-air threat against opponents lacking long-range air-to-air missiles, who are forced to fly at low level due to Russian SAM coverage;
- an ability to sustain a moderate operational tempo for a year, despite taking losses of more than 10 per cent to key fleets such as the Su-25, Su-34 and Ka-50; and
- the ability to deliver large quantities of unguided bombs relatively accurately from medium level where there is no serious SAM or air-to-air challenge.

By contrast, notable weakness include:

- limited employment of precision-guided munitions in most rotary and fixed-wing fleets;
- highly varied crew experience levels that limit tactical flexibility and multi-role capabilities;
- poor close-air support capabilities in support of the Russian Ground Forces, especially at low altitudes;
- a cumbersome targeting and battle damage assessment cycle; and
- most of all, an inability to conduct complex large-scale air campaigns of the sort that would be required to destroy the Ukrainian SAM network.

Ultimately, however, this may be of little comfort for European powers worried about the medium-term threat from Russia. NATO air forces, especially the US Air Force, Royal Air Force and French *Armée de l'Air et de l'Espace*, were always confident in their ability to overmatch the VKS in an aerial context.

The threats to Western airpower, and therefore to the viability of NATO's conventional deterrence strategy against Russia, have always been Russia's ground-based integrated air defence system (IADS) and long-range precision strike capabilities. Both of those have performed broadly as expected in Ukraine, forcing the Ukrainian Air Force to disperse and regularly move its aircraft on the ground and operate at very low altitudes, even at significant distances from the front lines, due to the lethal Russian SAM threat.

Russia's naval capabilities

Robin Häggblom

Assessment of the war in terms of Russia's naval capabilities

Compared with the air and ground domains, where we have seen recent conflicts featuring modern weapons and systems, the naval domain has seen significant developments since the last conflict, with modern naval systems in widespread usage. In fact, the last conventional war in which adversaries operated modern systems was arguably the Falklands War of 1982, a conflict now somewhat closer in time to the Second World War than to the present day. While the war in Ukraine has not seen conventional naval battles, it has seen combat using modern anti-ship systems and naval support for ground operations, as well as an undeclared blockade.

Most Russian operations can be divided into four different areas:

- Attempts at establishing sea control.
- Long-range surface-to-surface fires.
- Threatening amphibious operations.
- Logistical support to ground operations.

In addition, the Russian Navy plays a key role in protecting its own ports and bases.

Of these four areas, the Russian Navy has been fairly successful in providing long-range fires. The strikes conducted with Kalibr cruise missiles, launched both from surface ships and from submarines, represent a limited percentage of the total amount of munitions used in strikes against Ukrainian infrastructure. Yet the Navy's ability to launch from directions unavailable to ground-based systems, while providing less of a pre-launch warning than air-launched missiles, offers value for Russian planners. At the same time, the cost of procuring and operating high-end platforms such as the four Project 636.3 Improved Kilo-class submarines cannot be justified solely by their use for Kalibr strikes.

The success of the amphibious force is more difficult to judge. Before the attack on 24 February 2022, six large amphibious vessels⁶ from the Northern and Baltic Fleets crossed into the Black Sea, more than doubling the number of such vessels in the area. During the early stages of the war, they made several demonstrative sorties towards Odesa, but no major amphibious landings took place either in the direction of Odesa or in the east at the shores of the Sea of Azov. Whether Russia had initially intended to launch a large amphibious operation on Odesa is unclear, but considering the limited number of troops that could have been carried in a single wave, any landing

⁶ Project 775 'Ropucha'-class Olenegorsky Gorniyak (012), Project 775/II 'Ropucha'-class Minsk (127), Georgy Pobedonosets (016) and Kaliningrad (102), Project 775/III-class 'Ropucha' Korolev (130), as well as Project 11711 'Ivan Gren'-class Pyotr Morgunov (117).

would have had to meet little opposition and hope to quickly link up with friendly ground forces.

The stalled Russian advance west from Kherson doomed any plans for a larger landing, and most naval infantry units would eventually need to serve as infantry. At the same time, by presenting a somewhat credible threat – at least for a large-scale raid – the Russian amphibious force did tie up Ukrainian troops and resources in a coastal defence role far away from the actual front line.

Russian attempts at establishing sea control, which were a prerequisite for successfully providing logistical support to the ground units as well as aiding in upholding the blockade, would eventually fail. The sinking of the cruiser *Moskva* demonstrated Russia's inability to operate safely in the waters between Snake Island and Crimea, eventually forcing the evacuation of the island. The Russian Navy would have to settle for preventing the Ukrainians from using the Black Sea for many of their intended purposes.

However, the main strategic goal the Russian Navy tried to achieve by controlling the northwestern parts of the Black Sea was an undeclared blockade of the Ukrainian coastline. With a significant part of Ukraine's foreign trade, including crucial grain exports, going through the country's Black Sea ports, enforcing an (undeclared) blockade would put serious pressure on Ukraine's economy. Full control of the seas is not necessary for a successful blockade; denying the enemy room to operate is enough.

On paper, Russia should have had no problem closing Ukrainian ports to civilian shipping. However, Russia's inability to stop Ukrainian exports exposes more of a diplomatic failure than a military defeat. The global reliance on sea-based trade flows has ensured that the principle of freedom of navigation has proved resilient, to the extent that the Black Sea Grain Initiative was signed under the auspices of the United Nations in July 2022 and continued to function even after Russia announced its withdrawal in late October. Experts such as Anders Puck Nielsen have pointed out that a total closure of international waters in the Baltic Sea or Black Sea in the event of a conflict could prove to be counterproductive to Russia's own political goals.⁷

It is worth noting that all of this happened despite the Russian Navy having its own naval air arm, equipped with modern fighters that should in theory be able to provide air cover to the ships – even in cases where inter-service rivalry or a lack of inter-service coordination impacted coordination with the Russian Aerospace Forces (VKS).

⁷ 'Russia will have to bend to meet the concerns of other parties if they wish to maintain any hope of international recognition of a new geopolitical reality. If they do not relax the area denial regime, they will never achieve their political goals.' Puck Nielsen, A. (2020), 'Defeating the A2/AD Umbrella – Concepts for Exploitation of Russia's Operational Weaknesses' in Jonsson, M. and Dalsjö, R. (eds) (2020), *Beyond Bursting Bubbles*, Stockholm: FOI.

Russian adaptations and impact of the war on future operations

Russia has adapted to the changing situation at different levels. A key tactical adaptation that initiated widespread commentary has been to address the need for increased air defences: in particular, to protect naval auxiliaries used in supply runs taking place within reach of Ukrainian weapon systems and the large patrol vessels of the Vasily Bykov class.

The most visible example has been the use of standard ground-based air defence systems, strapped to the decks. A noticeable detail is that the Tor-M2KM has been developed to allow an independent module to be fitted to different chassis and has performed live-firing trials while deck-mounted.⁸ As such, this is not quite the desperate stopgap solution called out by some.⁹ However, its effectiveness is questionable and the *Vasily Bekh* tug was reportedly fitted with a Tor-M2KM module when hit and sunk.¹⁰ Trust in these systems also seem to be limited on the Russian side, as their implementation has not stopped the Russian Navy from switching to more cautious operational patterns.

Following the stalled ground offensive towards Odesa, the retreat from Snake Island and the Black Sea Grain Initiative, there was little to be achieved by keeping vessels operating within range of Ukrainian weapons. This largely pushed Russian operations further towards the south and east. Relatedly, there has been increased reliance on Novorossiysk on the Russian mainland as a naval base of operations rather than Sevastopol in Crimea, following attacks on the latter.

The use of unmanned systems – airborne as well as surface – has received attention in the media. While they represent a new approach from a technical point of view, for the time being they are a new tool achieving an old goal by targeting the enemy fleet while it is at anchor. While this will call for some adaptations, such as more anti-sabotage nets in the water, these are largely minor issues.

The new stance represents a significant shift from the original posture and a blow to Russian prestige. At the same time, its impact should not be overstated. Russia operating further out to sea still allows the Navy to perform fire-support missions, as well as denying the Ukrainians free use of

⁸ Altman, H. and Rogoway, T. (2022), 'Ground-Based Tor SAM System Seen Strapped To Russian Black Sea Warship', The Drive, 7 June 2022, <https://www.thedrive.com/the-war-zone/russian-black-sea-warship-now-equipped-with-ground-based-sam-system>.

⁹ Pfarrer, C. (@ChuckPfarrer) via Twitter (2022), 'SEA-GOING COPE CAGE? Fearing missile attack, the RU navy has resulted [sic] to lashing TOR anti-air systems to the flight decks of surface ships. These land based systems are not 'navalized'-- and are thus unsuitable for use at sea-- their usefulness is highly doubtful.', 11 August 2022, <https://twitter.com/ChuckPfarrer/status/1557546660682776576?s=20>; Telenko, T. (@TrentTelenko) via Twitter (2022), 'Chaining a Tor M2 / SA-15D GAUNTLET to the helicopter deck of a corvette does not provide AAW capability against the TB2. A vehicle based TOR lacks the roll and pitch stabilisation of a true Naval SAM, nor reload capability. It -might- work on a glass calm day. 1/3', 12 June 2022, <https://twitter.com/TrentTelenko/status/1535784170944962560?s=20>.

¹⁰ Newdick, T. (2022), 'Ukraine Claims Harpoon Missile Attack On Russian Navy Ship', The Drive, 17 June 2022, <https://www.thedrive.com/the-war-zone/ukraine-claims-harpoon-missile-attack-on-russian-navy-ship>.

the sea. As such, this new posture can be expected to be kept in place until the facts on the ground change drastically in one way or another.

A longer-term question is the future force structure of the Russian Navy. While Russia has built a number of new classes of modern frigates, corvettes and fast attack craft in recent years, the fact that no new destroyers or cruisers have been laid down since the fall of the Soviet Union was highlighted by the loss of the *Moskva*.

One conclusion to be drawn from the war is that to be able to operate within range of enemy coastal defences, one needs vessels with enough air defence weapons to fight their way in and out of 'hot' areas. This should translate into the procurement of large new surface combatants, such as the planned Project 23560 Lider-class heavy destroyer or the planned Project 22350M 'Super Gorshkov' heavy frigate. However, the current status of both projects is uncertain, as both have reportedly been suspended or cancelled at different times.

At the same time, doubts remain as to whether the Russian naval shipbuilding industry is capable of designing and building such complex platforms. The hesitancy to risk high-profile assets that became apparent after the loss of the *Moskva* raises questions about whether Russia's political leadership would get the kind of value out of these large surface platforms that the investment would necessitate.

If Russia sees the role of the Navy in a conventional war as largely restricted to supporting ground forces through firing long-range missiles and protecting their own coastlines, a continued focus on frigates and smaller vessels can be expected.

Lessons learned and policy implications

The naval war in the Black Sea has highlighted lessons for the modern naval battlefield at all levels, despite Ukraine lacking a fleet to begin with. On the policy side, following a decade of 'A2/AD scare', the diplomatic and economic challenges associated with closing global commons have been highlighted through the failure of the Russian blockade and the success of the UN-sponsored Black Sea Grain Initiative.

Closer to the battlefield, the lethality of modern long-range weaponry in the maritime domain, the value of accurate targeting data and situational pictures, and the importance of assisting Ukraine with both of the above have become clear. On the opposing side, the war has underscored the need for resilient multi-layered air and missile defences and modern damage control systems and procedures aboard vessels operating within reach of enemy systems.

Continuing with targeted sanctions against the Russian military industry has clear value for Western countries. However, the sanctions must be better adapted to the nature of the maritime industry: many systems – such as propulsion, sensors and navigation – are still classed as civilian items under the current set of export restrictions.

Electronic warfare capabilities

Pavel Luzin

Since the beginning of the 2000s, Russia has invested significant efforts in developing and acquiring electronic warfare (EW) capabilities. These cover a whole spectrum of ground, sea, air and space-based jamming systems, as well as radio interference and radio-electronic and signal intelligence systems. There were two main triggers for Russia's push into EW capabilities: NATO's intervention in Yugoslavia in 1999 and US operations in Iraq in 2003. As a result, Russia's focus on developing EW capabilities must be understood as an asymmetric enabler against more technologically advanced competitors.

The main goals of Russian EW capabilities are defined as:

- contributing towards non-nuclear strategic deterrence in relations with the United States and its allies; and
- seeking to decrease the efficiency of NATO's advanced weapons systems and C4ISR,¹¹ to compensate for Russia's conventional weaknesses in case of conflict.

In accordance with Russia's military strategy, the Kremlin planned to procure, deploy and use EW capabilities in the context of a conventional war between regular armed forces for a limited period of a few weeks or, as a worst-case scenario, several months.

It is unknown how much Russia has been investing in EW capabilities over the past two decades. However, according to fragmented data from the Rostec subsidiary KRET, spending on procurement amounted to 153.3 billion roubles (\$3.4 billion) between 2012 and 2016; this sum represents almost 2 per cent of the 7,760 billion roubles (\$173.8 billion) of all spending on arms procurement during that period. KRET is responsible for manufacturing about 60 per cent of Russian EW systems for ground, air and sea.

Assessment of the war

Since February 2022, Russia has developed and deployed more than 20 different types of ground-based EW systems, as well as several types of air and naval-based systems. Yet after 15 months of war against Ukraine, Russia has only demonstrated moderate success in using its EW capabilities.

Several critical problems can be outlined. The first consists of issues around the duplication, lack of synchronization and inadequate integration of different systems in theatre. In other words, Russia failed at transforming its extensive quantity of EW systems into quality for warfare purposes. Second, most deployed systems required modernization early within their operating cycles, due to the changing communication environment and Ukrainian countermeasures.

¹¹ C4ISR = 'Command, control, communications and computers (C4) intelligence, surveillance and reconnaissance (ISR)'.

Finally, Russia was not able to fill the gap in advanced air-, sea- and space-based electronic intelligence systems. The armed forces only deployed three Il-22PP aircraft¹² and two Tu-214R ELINT/SIGINT aircraft,¹³ in addition to several Soviet-era Il-20M EW aircraft and two ELINT/SIGINT Yuri Ivanov-class ships (project 18280), instead of four as originally planned. Furthermore, the *Liana* naval ELINT/SIGINT satellite system did not allow Russia to significantly improve real-time combat awareness.

War operations against Ukraine have shown that Russian EW capabilities are hardly effective in offensive operations, except to sustain sieges such as in Mariupol. EW systems have been more effective in defensive operations aimed at maintaining control over occupied territories. This is explained by the fact that for defensive purposes, EW capabilities are used within the framework of their original concept of operation: to decrease or eliminate the superiority of the attacking/counter-attacking forces for advanced weapons systems and C4ISR.

During the early phase of the war, Russian forces repeatedly sought to jam satellite communication channels and the navigation signals of the Starlink and GPS systems.¹⁴ Ground-based Starlink terminals and onboard navigation were the main targets, as jamming prevents their connection with satellites. However, even though Russian EW created some issues for Ukrainian forces (especially affecting their front-line communications and the targeting systems of Western-supplied missiles), results were mixed. The intensity of signal jamming was different across the front line, worked sporadically and not continuously, and its effectiveness is sensitive to terrain features, distance and physical obstacles between the jammed terminals and the jammer.

Russian forces also fell victim to 'cyber fratricide', especially for communication and navigation systems as well as UAVs. EW troops also faced another problem: the operational lifetime of most EW systems is limited, barely exceeding 900 hours before each system needs to be overhauled. This essentially means that the intensity of EW will decrease over time.

EW troops are supposed to be embedded within other branches of the armed forces, usually as part of particularly well-equipped and well-trained ground troops that rely on air support and precision weapons systems. However, when Russia turned to more defensive operations in the autumn

¹² NewsFront (2022), 'Над Донбассом замечен постановщик помех Ил-22ПП российской армии' [A Russian army Il-22PP jammer was spotted over the Donbas], <https://news-front.info/2022/02/24/nad-donbassom-podnyalsya-postanovschik-pomeh-il-22pp-rossiyskoj-armii/>, 24 February 2022; Defense Express (2022), 'Росіяни підняли у повітря раритетні "глушилки" Іл-22ПП, безсила "чудо-зброя" проти нашої ППО' [The Russians deployed rare Il-22PP "jammers", a powerless "miracle weapon" against our air defence], 21 May 2022, https://defence-ua.com/weapon_and_tech/rosijani_pidnjali_u_povitrja_raritetni_glushilki_il_22pp_bezsila_chudo_zbroja_proti_nashoji_ppo-7037.html.

¹³ Военное обозрение [Military Review] (2022), 'Ту-214Р в специальной военной операции на Украине: не прошло и года' [Tu-214R in the special military operation in Ukraine: not even a year has passed], 27 September 2022, <https://topwar.ru/202346-tu-214r-v-specialnoj-voennoj-operacii-na-ukraine-ne-proshlo-i-goda.html>.

¹⁴ Horton, A. (2023), 'Russia tests secretive weapon to target SpaceX's Starlink in Ukraine', *Washington Post*, 18 April 2023, <https://www.washingtonpost.com/national-security/2023/04/18/discord-leaks-starlink-ukraine/>.

of 2022, it had already lost crucial parts of its ground troops and had lost air superiority altogether.

EW troops allow the Russian army to create force-multiplier effects on the battlefield, but they cannot be used as originally planned in offensive operations or help other branches retake the combat initiative. In essence, they failed to complete their intended mission of neutralizing enemy capabilities, generating force-multiplying effects for other Russian branches and preventing the adversary from adapting to a challenged environment. An additional challenge was that the 2022 war did not reproduce the conditions of the first war in Donbas, where Russia had tested many of its EW systems.

Ukrainian forces were able to adapt to Russian EW capabilities and prevent them from jamming Ukrainian satellite communications and navigation. Russian systems therefore represent a permanent but solvable challenge to Ukraine. Ukrainian troops have adapted their combat behaviour and practices relatively quickly – not least because many Russian EW systems were initially deployed within the kill zone of Ukrainian multiple-launch rocket systems (MLRS) and artillery systems. Ukrainian forces quickly started to hunt for Russian EW capabilities: Russian forces reportedly lost at least 36 ground-based EW systems of different types, several jamming UAVs and two Mi-8 EW helicopters.¹⁵

Russian adaptations and impact of the war

Two decades of Russian EW preparation have been consistently challenged by 19 months of war against Ukraine. However, at the time of publication, there is still no significant evidence that Russia is trying to reconsider its basic approach towards EW.

Moreover, in contrast with previous years when EW troops conducted complex training in defensive and offensive tasks at the tactical and theatre levels,¹⁶ the focus of known EW exercises in 2022–23 was solely the tactical

¹⁵ Oryx (2022), 'Attack On Europe: Documenting Russian Equipment Losses During The Russian Invasion Of Ukraine', 24 February 2022, <https://www.oryxspioenkop.com/2022/02/attack-on-europe-documenting-equipment.html>.

¹⁶ See Ministry of Defence of the Russian Federation (2022), 'В Приамурье состоялась тренировка по РЭБ подразделений ВВО' [A training session on electronic warfare units of the Air Defence Forces took place in the Amur region], 25 January 2022, https://function.mil.ru/news_page/country/more.htm?id=12405153@egNews; Ministry of Defence of the Russian Federation (2021), 'Специалисты связи и РЭБ Южного военного округа организовали защищенные системы управления войсками' [Communications and electronic warfare specialists of the Southern Military District organized secure command and control systems], 10 September 2021, https://function.mil.ru/news_page/country/more.htm?id=12383244@egNews&; Ministry of Defence of the Russian Federation (2020), 'Специалисты РЭБ ЦВО применили комплекс «Тирада» на противоспутниковом учении на Урале' [EW specialists of the Central Military District used the Tirada complex at an anti-satellite exercise in the Urals], 21 October 2020, https://mil.ru/memorial_cemetery/news/more.htm?id=12320606@egNews; Ministry of Defence of the Russian Federation (2021), 'В Волгоградской области проходят специальные учения войск радиоэлектронной борьбы ЮВО' [Electronic warfare troops of the Southern Military District are holding special exercises in the Volgograd region], 17 August 2021, https://function.mil.ru/news_page/country/more.htm?id=1237716@egNews.

defence of front-line positions and command points from adversary units, reconnaissance, and combat UAVs and loitering munitions.¹⁷

Since 2022, the scale and scope of EW exercises have shrunk, with fewer military personnel and no significant effort made towards the combination and integration of existing types of EW systems. This reluctant simplification of approaches means that Russia's combat priority is now to maintain and prolong the sustainability of its existing forces rather than consider EW troops as a force-multiplying tool enabling the Russian army to retake the combat initiative.

At the same time, the future of the air component of EW capabilities remains unclear. On the one hand, EW helicopters are still used to support the most valuable combat aircraft during bombings. This was recently the case on 13 May 2023, when two such helicopters were shot down together with a Su-34 fighter bomber and Su-35 fighter.¹⁸ The Russian military industry continues to develop and modernize such systems.¹⁹

On the other hand, the use of EW/ELINT aircraft is less prevalent in Ukraine than it was in Syria. This situation can be explained by Russia's absence of air superiority; Russian aircraft cannot enter airspace that is controlled by the Ukrainian armed forces and can work only at a distance from which the efficiency of onboard EW equipment is relatively low. However, there is also a possibility that the onboard EW equipment of these aircraft (old-fashioned Il-20, modernized Il-22PP and even Tu-214R) is insufficient for the electronic environment of the war.

Simply speaking, such systems may be useless against the modern military command, control and communication systems of Ukrainian armed forces located in highly urbanized areas, and/or they may be 'blinded' by the friendly signals of different Russian forces (regular army, national guard etc.) operating nearby.

When it comes to naval systems, the main lessons of the war so far have come from the loss of the *Moskva* battle cruiser and several minor combat ships to Ukrainian drone attacks against the Black Sea fleet in occupied Sevastopol. Russia adapted by developing modular onboard EW systems,

¹⁷ See *Krasnaya Zvezda* (2022) 'Оасваивают комплексы РЭБ' [Mastering electronic warfare systems], 4 March 2022, <http://redstar.ru/osvaivayut-kompleksy-reb/>; *Krasnaya Zvezda* (2022), 'Тренировка подразделений РЭБ в Приморском крае' [Electronic Warfare units training in the Primorsky region], *Krasnaya Zvezda*, 19 December 2022 <http://redstar.ru/trenirovka-podrazdelenij-reb-v-primorskoy-krae/>; Ministry of Defence of the Russian Federation (2023), 'Военнослужащие РЭБ ЦВО на занятии в Сибири предотвратили воздушную атаку условного противника' [EW Central Military District personnel prevented an air attack of a mock enemy at a training session in Siberia], 9 January 2023, https://function.mil.ru/news_page/country/more.htm?id=12450914@egNews; *Krasnaya Zvezda* (2022), 'Тренировка подразделений РЭБ в Приморском крае'; Ministry of Defence of the Russian Federation (2023), 'Специалисты РЭБ ЦВО отработали борьбу с беспилотными летательными аппаратами' [EW specialists from the Central Military District practised counteracting unmanned aerial vehicles], 16 May 2023, https://function.mil.ru/news_page/country/more.htm?id=12467483@egNews.

¹⁸ BBC Russian Service (2023), 'Падения российских летательных аппаратов в Брянской области: что известно' [The downing of Russian aircraft in the Bryansk region: what is known], 13 May 2023 <https://www.bbc.com/russian/news-65584633>.

¹⁹ Grischenko, N. (2021), 'Комплекс РЭБ для подавления систем управления создадут на базе Ми-8АМТШ' [EW complex to suppress control systems will be created on the basis of the Mi-8AMTSh], *RG.ru*, 28 September 2021, <https://rg.ru/2021/09/28/kompleks-reb-dlia-podavleniia-sistem-upravleniia-sozdatut-na-baze-mi-8amtsh.html>.

deployed on standard 40-ft containers to protect combat ships and support vessels from UAVs and cruise missile attacks.²⁰ However, it is too early to say whether this approach will bear fruit.

Lessons learned and policy implications

Several policy pathways can be outlined for the US and NATO in considering the best response to Russian EW systems and troops. The aims of such pathways should be to:

- improve the sustainability and flexibility of existing C4ISR and targeting systems in environments where the adversary extensively uses EW capabilities;
- develop back-up navigation options that rely either on low-Earth orbit commercial satellites, or work independently from space-based assets but could be added to existing satellite navigation systems;
- improve the resistance of commercial communication and Earth observation satellite systems to jamming and interference;
- further develop and train for EW countermeasures and protocols that may be used by combat units and single soldiers on the battlefield; and
- develop additional measures for the identification of EW systems and signatures in theatre, allowing NATO forces to eliminate these assets faster.

²⁰ Kretsul, R. (2022), 'Шумящий патруль: российские корабли защитят системы радиоэлектронной борьбы' [Noise patrol: Russian ships will be protected by electronic warfare systems], *Izvestiya*, 8 September 2022, <https://iz.ru/1392104/roman-kretcul/shumiashchii-patruel-rossiiskie-korabli-zashchitiat-sistemy-radioelektronnoi-borby>.

Military innovation and emerging technologies

Margarita Konaev

Since 2008, Russia has pursued extensive military modernization efforts aimed at improving combat readiness and coordination across service branches, modernizing military equipment, recruiting and retaining professional soldiers, implementing force structure changes, strengthening command and control (C2) and electronic warfare (EW) capabilities, streamlining logistics, and developing long-range and precision-strike capabilities, among other priorities.²¹

Investments in robotics, autonomy and artificial intelligence (AI) are part of this larger military modernization push. As such, over the past decade the Russian Ministry of Defence (MoD) has set up a network of research and development organizations that encompasses academia, the private sector and the defence-industrial complex focused on emerging technologies. Guided by a pragmatic approach to military innovation, the Russian defence establishment has reportedly been pursuing a wide range of initiatives related to AI and autonomous technologies for applications in robotics, C2, EW, cyberspace and information warfare, military logistics and others.²²

Russian political and military leaders, as well as strategists and researchers, have put forth a broad spectrum of ideas about the role of autonomy and AI. These ideas range from long-term predictions offered by some experts from the Advanced Research Foundation (Russia's DARPA equivalent) positing that robots will replace humans on future battlefields, to more modest notions about using AI to process massive amounts of complex data to speed up decision-making and improve situational awareness.

Despite progress in experimentation and some experience with deploying AI-enabled capabilities in combat operations, the Russian military faces significant challenges with wide-scale AI adoption. Some are unique to the Russian case, while others such as talent, legacy systems and bureaucratic inertia are similar in nature to the obstacles confronting more advanced military powers like the United States and China, albeit more severe in scope.

Looking ahead, it is difficult to predict how the Russian military will change in the aftermath of the war in Ukraine. On the surface, interest in autonomy and AI remains high. In August 2022, the MoD announced the formation of a specialized department that will coordinate the development of AI across

²¹ Congressional Research Service (2020), 'Russian Armed Forces: Military Modernization and Reforms,' 20 July 2020, <https://crsreports.congress.gov/product/pdf/IF/IF11603>.

²² Galkin, D. V., Kolyandra, P. A. and Stepanov, A. V. (2021), 'The Condition and Use Prospects of Artificial Intelligence in Military Affairs', *Военная мысль [Military Thought]*, January 2021, pp. 113–24; Burenok, V. M., (2021), 'Искусственный интеллект в военном противостоянии будущего' [Artificial intelligence in the military confrontation of the future], *Военная мысль [Military Thought]*, April 2021, pp. 106–12.

the different research and development bodies, as well as itself work to create 'models of weapons for military and special equipment'.²³

The trajectory of Russian military autonomy and AI – and the modernization effort more broadly – is uncertain. Russia's domestic defence-industrial production capabilities in new technologies and systems are limited and already under duress, while Western sanctions are impeding access to advanced components such as microchips.

The war in Ukraine has also exposed structural, organizational and cultural weaknesses across the Russian defence establishment that will likely hinder the Russian military's ability to implement AI across its forces, systems and future missions. That said, it is also important to acknowledge that even with diminished military capacity and without access to the most advanced technology, Russia can still use AI-enabled technologies and capabilities to undermine US and NATO interests.

Assessment and strengths (potential, demonstrated and debated)

In theory, the Russian military's pragmatic approach to technological innovation could allow it to move faster with 'good enough' technology. In Russian military writing, AI technology is cast in a supporting role, primarily viewed as useful for expanding on and enhancing existing concepts, tactics and technologies. Thus, President Vladimir Putin's grand declaration about mastering AI to rule the world notwithstanding, Russia's approach to military innovation, including in emerging technologies such as AI, is overall best described as evolutionary rather than revolutionary.²⁴

This approach is fundamentally different from the American approach to technological innovation, which strives for ground-breaking progress and exquisite technologies and capabilities. From the US standpoint, therefore, Russia's pragmatic approach has sometimes been perceived as a weakness – at best a necessary adaptation to talent and resource constraints, at worst a sign of a declining, second-rate power that lacks the capacity for true innovation.

Such thinking, however, is misguided. For one thing, there is an ongoing debate about the merits of being a fast follower in AI, rather than the leader. Much of the progress in AI has come from open research, making data and algorithms accessible to all without the price tag that led to these breakthroughs. Technology developed in the commercial sector in areas such as computer vision, image classification and natural language

²³ TASS (2022), 'В Минобороны РФ создали управление по работе с искусственным интеллектом' [The Ministry of Defence of the Russian Federation created a department for working with artificial intelligence], 17 August 2022, https://tass.ru/armiya-i-opk/15492531?utm_source=defensenews.com.

²⁴ Grau, L. W. and Bartles, C. K. (2016), *The Russian Way of War: Force Structure, Tactics, and Modernization of the Russian Ground Forces*, Foreign Military Studies Office, p. 378, <https://www.armyupress.army.mil/Portals/7/Hot%20Spots/Documents/Russia/2017-07-The-Russian-Way-of-War-Grau-Bartles.pdf>.

processing (NLP) can be adapted for military purposes, meaning that some advanced capabilities can be bought even if not built in-house.

With a higher risk tolerance for casualties and a lower threshold for performance and precision, the Russian military could move faster with less sophisticated but 'good enough' technology that could be used asymmetrically against high-tech adversaries.

Russia could leverage AI to obtain an asymmetric advantage and interfere with the enemy's command, control and communication systems. In Russian military writing, there has been an emphasis on disrupting and disorganizing the enemy's C2 through a combination of information warfare (including cyber operations), EW and strikes against enemy command structures.²⁵

To an extent, these ideas build on some of the more progressive elements of Soviet military thinking from the 1980s about the increasing importance of information and communication networks. More so, however, these concepts reflect experiences and lessons learned in recent conflicts, particularly those related to EW. For example, in Syria the frequency of Russian interference with communications at all levels led the head of US Special Operations Command to describe the war as 'the most aggressive electronic warfare environment on the planet'. Similarly in 2015, US General Ben Hodges observed that Russian electronic warfare 'completely shut down' Ukraine's communications in the Donbas and effectively grounded its drones.²⁶

Analysts have posited that the integration of AI into EW could enhance the speed and accuracy of these systems, providing Russian forces with a timely and complete picture of the electromagnetic environment while simultaneously degrading the enemy's frequency and communications capabilities.²⁷ If the Russian military can harness AI developments in these areas, it could presumably use AI to limit the ability of adversaries to command forces and communicate across different units.

Importantly, the application of AI capabilities in this fashion could also alter the correlation of forces on the battlefield. This application area therefore illustrates the Russian military's interest in developing technologies and capabilities that can serve as force multipliers and be employed asymmetrically against high-tech opponents.²⁸

²⁵ Boston, S. and Massicot, D. (2017), *The Russian Way of Warfare: A Primer*, RAND Corporation, https://www.rand.org/content/dam/rand/pubs/perspectives/PE200/PE231/RAND_PE231.pdf; Clark, M. (2021). 'Russia's Main Lesson from Syria: Improving Command and Control', *The Russian Military's Lessons Learned In Syria: Military Learning And The Future Of War Series*, Institute for the Study of War, 2021, <http://www.jstor.org/stable/resrep28851.5>.

²⁶ Konaev, M. and Daniels, O. W. (2023), 'Agile Ukraine, Lumbering Russia', *Foreign Affairs*, 28 March 2023, <https://www.foreignaffairs.com/ukraine/russia-ukraine-war-lumbering-agile>.

²⁷ Stefanick, T. (2019), 'AI in the Aether: Military Information Conflict' in Ruggie, F. (2019), *The Global Race for Technological Superiority: Discover the Security Implications*, Brookings, https://www.brookings.edu/wp-content/uploads/2019/12/FP_20191211_military_information_conflict_stefanick.pdf.

²⁸ Boulègue, M. et al (2021), *Advanced military technology in Russia*, London: Royal Institute of International Affairs, 23 September 2021, <https://www.chathamhouse.org/2021/09/advanced-military-technology-russia>.

That said, some experts have been sceptical of Russia's ability to develop advanced AI-enabled EW systems that would give it the upper hand on future battlefields.²⁹ Russia's EW against Ukraine, for instance, has seen mixed results. Although Russian forces in Ukraine have often struggled to deploy EW systems effectively without undermining their own ability to communicate and operate, Russian jamming, interference and GPS signal-blocking efforts have also evolved and, to some extent, rendered the critical HIMARS artillery rocket system used by Ukraine less effective.³⁰

The Russian military has previously shown a willingness to test new technologies in operational conditions, more so than the US military, perhaps due to a higher tolerance for accidents or failures, or less concern about casualties and ethical or legal codes of conduct in war. The war in Syria in particular has been described as a 'proving ground' for new Russian weapons, with Russian and external sources estimating that over 600 weapons and other items of military equipment have been tested in Syria, with 200 of these described as 'next-generation'.³¹

AI is a new technology that has seen few battlefield deployments (before the current war in Ukraine) and is known to have problems when deployed in environments different from those it was trained in and designed for. Russia's experience testing high-tech weapons in near-operational and combat conditions in Syria (and, in some reported instances, also in eastern Ukraine in 2014) is therefore relevant. Operational experimentation can provide much-needed information about a system's capabilities and limitations, and what still needs to be done before it can be deployed reliably in combat. The data collected during testing and experimentation in operational settings are also valuable since battlefield data are hard to access but essential for training new AI algorithms to be embedded in various military systems. Furthermore, the experience Russian soldiers have presumably gained in using these advanced systems could play a critical role in informing future advances in human-machine teaming.

During the current war, Russian forces have reportedly made use of drones and loitering munitions with some autonomous functions (including the KUB-BLA loitering munition, which the manufacturer has claimed can use AI to identify targets). In some instances, Russian actors seem to have employed AI to enhance information operations and scale up disinformation campaigns on social media platforms.³²

²⁹ Stefanick, T. (2019), 'AI in the Aether: Military Information Conflict' in Ruggie, F. (2019), *The Global Race for Technological Superiority: Discover the Security Implications*, Brookings, https://www.brookings.edu/wp-content/uploads/2019/12/FP_20191211_military_information_conflict_stefanick.pdf.

³⁰ Marquardt, A., Bertrand, N. and Cohen, Z. (2023), 'Russia's jamming of US-provided rocket systems complicates Ukraine's war effort', CNN, 6 May 2023, <https://www.cnn.com/2023/05/05/politics/russia-jamming-himars-rockets-ukraine/index.html>.

³¹ Bybelezer, C. (2018), 'How Russia is using Syria as a military 'guinea pig'', *Jerusalem Post*, 28 February 2018, <https://www.jpost.com/Middle-East/How-Russia-is-using-Syria-as-a-military-guinea-pig-543839>.

³² Bendett, S. (2023), 'Roles and Implications of AI in the Russian-Ukrainian Conflict', *Russia Matters*, 20 July 2023, <https://www.russiamatters.org/analysis/roles-and-implications-ai-russian-ukrainian-conflict>.

Overall, however, the Russian military has shown little inclination or capacity to experiment with new technologies, especially when compared with the ingenuity, inventiveness and adaptability of the Ukrainian forces.³³ That said, it is very likely that Russia is collecting and storing battlefield data that can be used for assessment, planning and training of future AI systems, as well as observing how the Ukrainians, with Western aid, are using advanced technologies in the fight.

Russian adaptations, vulnerabilities and impact of the war

The war in Ukraine has exposed a significant gap between operational reality and Russian military concepts and doctrinal guidance, including those related to the potential use of new technologies such as autonomy and AI. Some of these discrepancies can be explained by the broader pathologies of the Russian military: poor training, decrepit equipment, flawed intelligence-sharing procedures, incompetent leadership and corruption, to name a few.

There are, however, lessons that can be learned from Russia's experience that are relevant for more advanced militaries. Indeed, some such experiences – for instance, the difficulty of recovering combat effectiveness in the aftermath of significant intelligence failures, the inability to secure uncontested air superiority, the hardships of conducting offensive operations in urban environments – have little to do with overall Russian incompetence but are in fact a feature of the operational environment and of high-intensity conventional war. Failing to see this could lead to costly mistakes for US and NATO forces in future conflicts.

Fragmented C2 and flawed information-sharing and information fusion procedures could severely hinder efforts to integrate and deploy AI-enabled technologies and capabilities. The war in Ukraine has exposed severe and systemic problems with the Russian military, including stagnant and unresponsive C2 arrangements and persistent intelligence failures.

These problems were likely exacerbated by the lack of effective information and intelligence fusion processes, which has prevented systems and operators from being able to develop an integrated and timely operational picture, detect inconsistencies and increase resilience to enemy deception measures.³⁴ These pathologies will likely shape the Russian military's efforts to develop, adopt and use AI in future operations. But the broader lesson here is that siloed intelligence and rigid C2 could undercut the advantages AI promises to deliver for information processing, battlefield sense-making, situational awareness and high-speed decision-making.

³³ Konaev and Daniels (2023), 'Agile Ukraine, Lumbering Russia'.

³⁴ Zabrodskiy, M., Watling, J., Danylyuk, O. V. and Reynolds, N. (2022), *Preliminary Lessons in Conventional Warfighting from Russia's Invasion of Ukraine: February–July 2022*, London: Royal United Services Institute, <https://static.rusi.org/359-SR-Ukraine-Preliminary-Lessons-Feb-July-2022-web-final.pdf>.

There are also limits to AI-enabled information warfare. High-profile cyberattacks and Russian influence operations – particularly those surrounding elections in democratic countries, as well as certain examples of seemingly successful applications of information warfare in Syria and eastern Ukraine – have popularized the narrative that Russia is highly capable of manipulating the information environment to its advantage.

Russian military thinking, as previously noted, has also emphasized the importance of dominating the information environment. The potential of AI, as one senior adviser to the Russian military observed, is to ‘supplement the information space with a large volume of artificially created data’ and ‘virtual truth’.³⁵

Thus far, however, for as much as can be gleaned from open sources, the war in Ukraine has revealed the limits of Russia’s AI-enabled (as well as human-driven) information warfare capabilities. For one thing, there have been only a handful of reports identifying the use of AI to expand the spread of disinformation on social media; even in these situations, it does not appear that Russian actors have effectively used AI to hyperpower disinformation to any notable operational or strategic effect.

Moreover, an assessment of the cyber elements of the war in Ukraine found that Russian cyber ‘fires’ (disruptive or destructive attacks) have ‘neither added meaningfully to Russia’s kinetic firepower nor performed special functions distinct from those of kinetic weapons’.³⁶

These observations raise several pertinent questions for US and NATO defence analysts and planners:

- Have Western analysts overestimated Russia’s information warfare capabilities and the potential power of Russia’s AI-enabled information warfare? Or are peacetime influence operations just fundamentally different from wartime efforts to shape the information environment?
- Has the Russian military focused too much on the psychological dimension of information warfare at the expense of the technical dimension?
- While AI could have a significant impact on disinformation in the digital world – for instance, crafting and tailoring compelling messages that are disseminated with greater accuracy, speed and scale – how would these efforts translate to the physical world, especially amid active conflict?

³⁵ Losev, A. (2018), ‘Военный искусственный интеллект’ [Military Artificial Intelligence], *Арсенал Отечества* [Arsenal of the Fatherland], 24 January 2018, <https://arsenal-otechestva.ru/article/990-voennyj-iskusstvennyj-intellekt>.

³⁶ Bateman, J. (2022), *Russia’s Wartime Cyber Operations in Ukraine: Military Impacts, Influences, and Implications*, Carnegie Endowment for International Peace, 16 December 2022, <https://carnegieendowment.org/2022/12/16/russia-s-wartime-cyber-operations-in-ukraine-military-impacts-influences-and-implications-pub-88657>.

Lessons learned and policy implications

- 1). US and NATO defence planners need to track and understand what the Russian defence establishment is learning from how the Ukrainians, with Western support, have used AI throughout the war. In turn, defence planners need to assess carefully how the Russian military might leverage this newly acquired operational knowledge to undermine US and NATO interests.

There are two areas in which the Ukrainians, with Western help, have had the edge over Russia when it comes to emerging technologies. The first is in their ability to appeal to commercial technology companies and integrate commercial technology into battlefield operations. The second is in information fusion and what has been described as an ad-hoc 'joint all-domain command and control' (JADC2) capability. Russian military leaders have previously acknowledged the importance of the private sector in driving innovation in emerging technologies and the need for public-private partnerships as part of the broader military modernization push.

But the unique involvement of major tech companies in Ukraine,³⁷ as well as the speed and agility with which the Ukrainians have been able to integrate commercial technology into military operations, may lead Russian defence planners to reassess their approach to collaboration with private sector companies, procurement methods and the sourcing of components and systems from abroad (China, Iran, the UAE, etc.). This may also prompt Russian planners to reassess training and existing concepts of operations. Russia is also likely to try and identify ways to exploit Western vulnerabilities in these areas.

- 2). US and NATO defence planners should dedicate resources to studying and better understanding the limits of technological innovation and experimentation in high-intensity conventional war.

Major losses of equipment and troops have put the Russian military under enormous pressure to retain whatever combat effectiveness it can, significantly reducing its capacity to experiment with new technologies. To some extent, this could be another manifestation of Russian military deficiencies.

That said, it has been a long time since NATO forces have been deployed in high-intensity conventional warfare. The difficulty and complexity of such an environment will certainly test and likely humble even the most advanced of militaries.

- 3). US and NATO defence and technology analysts and researchers should focus on understanding how AI is best leveraged in conflict: specifically, whether it is best used to augment existing strengths or moderate existing vulnerabilities.

³⁷ Fox, C. H. and Probasco, E. S. (2022), 'Big Tech Goes to War', *Foreign Affairs*, 19 October 2022 <https://www.foreignaffairs.com/ukraine/big-tech-goes-war>.

One early lesson emerging from the war in Ukraine that could be relevant for the US and NATO as they proceed to integrate AI into military systems and missions is that AI and autonomous technologies may be better suited to augmenting existing strengths, such as Ukraine's flexible C2 or effective intelligence exploitation protocols, than in making up for existing weaknesses, such as Russia's rigid C2 or siloed and incongruent intelligence-processing and -sharing methods.

Following this logic, US and NATO defence planners should pay close attention to how adversaries such as Russia and possibly China develop and use AI to augment their advantage in mass – the ability to mass firepower and manpower to overwhelm the adversary – as well as exploring what types of existing and new defences can be effective against such developments.

The Kremlin's challenges and vulnerabilities in the information space

Nataliya Bugayova

The ability to shape domestic and global information spaces remains one of the Kremlin's core capabilities. However, its over-reliance on this capability also creates vulnerabilities and challenges.

The West should not underestimate the Kremlin's power to influence narratives. Russia's ability to manipulate perceptions remains a core capability, allowing the Kremlin to advance its goals beyond the limits of its hard power. Domestically, the Kremlin has expanded its control over Russia's information space throughout the past 20 years and is using this control – so far effectively – to force the Russian population to accept rather than protest against an increasingly worse reality, notably including the human and economic costs of Russia's invasion of Ukraine.

Globally, the Kremlin has manipulated perceptions to advance its goals for years.³⁸ While the US has demonstrated an increasing ability to strip the Kremlin of its information advantage, Russian information operations continue to profoundly shape Western perceptions about Russia's war in Ukraine. Specifically, the Kremlin seeks to muddy assessments of the impact of Western aid on Ukraine's capabilities, the Kremlin's intentions and the risk of escalation.³⁹

The Kremlin is not invulnerable in the information space, however, and faces several challenges in this area.

Challenge 1. The Kremlin's narratives, when misaligned with the Kremlin's requirements, can constrain rather than amplify Russia's actions.

Russian President Vladimir Putin has generally taken care to maintain a façade of legitimacy for his actions, both at home and abroad. The Kremlin downplayed both its 2014 and 2022 invasions of Ukraine instead of owning up to Russia's true objective – control of Ukraine and the eradication of Ukraine's statehood.

In 2014, the Kremlin was unable to advance its offensive without openly committing to a large-scale invasion of Ukraine.⁴⁰ The Kremlin had planned

³⁸ Bugayova, N. (2020), *Putin's Offset: The Kremlin's Geopolitical Adaptations Since 2014*, Washington, DC, Institute for the Study of War, September 2020, <https://www.understandingwar.org/report/putins-offset-kremlin%E2%80%99s-geopolitical-adaptations-2014>.

³⁹ Stepanenko, K. and Kagan, F. W. (2023), 'Russian Offensive Campaign Assessment, February 12, 2023', Institute for the Study of War, 12 February 2023, <https://www.understandingwar.org/backgroundunder/russian-offensive-campaign-assessment-february-12-2023>; Bugayova, N. (2023) 'Reframing The Us Policy Debate On A 'Long War' In Ukraine', Institute for the Study of War, 27 April 2023, <https://www.understandingwar.org/backgroundunder/reframing-us-policy-debate-%E2%80%98long-war%E2%80%99-ukraine>.

⁴⁰ Bugayova (2020), *Putin's Offset*.

to capture at minimum six regions (beyond Crimea) in Ukraine, under the false pretence of supporting the aspirations of Russian speakers.

However, the Kremlin massively overestimated support for Russia in Ukraine, underestimated Ukrainian resistance, and overestimated Russia's ability to create a proxy force capable of achieving military objectives without a large-scale Russian deployment. As a result, Russia was able to secure only portions of Donetsk and Luhansk regions. It would have likely secured even less territory, had it not deployed the Russian military to prevent Ukrainian forces from liberating more of these areas.⁴¹

In 2022, the Kremlin self-imposed a different narrative. Russia launched a full-scale invasion of Ukraine, but Putin refused to call it a war and instead framed it as a 'special military operation'. Putin most certainly assessed at the time that a 'special military operation' would be sufficient to accomplish Russia's objective of controlling Ukraine. However, Putin chose not to change this framing even as the true scale of Russia's military requirements became clear – in part because it likely reached the limit of what Putin assessed he could demand of the Russian people.

Putin may eventually change his narrative, but for now the gap between the framing and reality creates several issues. Putin's efforts to position the 'special military operation' as an existential fight for Russia and compare it with the Great Patriotic War as he tries to mobilize resources clash with his refusal to call this war a war. The Kremlin's efforts to patch gaps in its capabilities through half-measures – crypto-mobilization as opposed to full mobilization – are limiting Russia's ability to reconstitute its forces.

In both cases, the Kremlin established an information frontier short of the information cover required to support its objectives, in large part because the Kremlin incorrectly assessed its requirements.

Challenge 2. The Kremlin is vulnerable to realities that undermine the narrative of a powerful Russia and a powerful Putin.

Putin has rallied the population and his regime around the goal of re-establishing Russia as a great power for more than 20 years.⁴²

Setback after setback following Russia's 2022 invasion has demonstrated that many Russians place great importance on their country being perceived as powerful. The most vocal pushback has been provoked by Russian setbacks on the battlefield, such as forced withdrawals from Ukrainian territory, Ukraine's sinking of the Russian Black Sea flagship *Moskva*,

⁴¹ Holcomb, F. (2017), *The Kremlin's Irregular Army: Ukrainian Separatist Order of Battle*, Institute for the Study of War, September 2017, https://www.understandingwar.org/sites/default/files/ISW%20Separatist%20ORBAT%20Holcomb%20017_Final.pdf.

⁴² Bugayova, N. (2019), *How We Got Here With Russia: The Kremlin's Worldview*, Institute for the Study of War, March 2019, <https://www.understandingwar.org/report/how-we-got-here-russia-kremlins-worldview>.

Russia's botched attempt to cross the Siverskyi Donets river, and Ukrainian drones reportedly reaching Russian territory.⁴³

The Kremlin is unlikely to deliver on the promise of victory in Ukraine to his nationalistic base, given the gap between Russia's goals in Ukraine and its military capabilities. Putin is also unlikely in the short term to address the flaws in Russia's military and economic structures that create this gap. His kleptocratic regime, combined with badly misjudged ventures such as the full-scale invasion of Ukraine, has been stripping Russia of its real capabilities.

Instead, the Kremlin may already be taking steps to soften information blows related to potential future Russian setbacks. In May, the Russian media outlet Meduza reported on a manual that reportedly instructed Russian media not to lower expectations of the anticipated Ukrainian counteroffensive, suggesting the Kremlin may be preparing for the possibility of additional Russian failures.⁴⁴

Future battlefield setbacks will likely result in additional shocks across the Russian information space regardless of the Kremlin's mitigation strategies; overcoming these shocks will require the Kremlin's focus.

It is not just the narrative of a powerful Russia that the Kremlin needs to protect – it is the narrative of a powerful Putin as well. After decades of presenting himself as a political strongman, he cannot afford to be perceived as weak, yet the Kremlin's constant efforts to portray Putin and members of his circle as effective leaders clash with reality. Putin's rare and highly staged 'wartime leader' overtures, such as his visit to Mariupol, contrast with Ukrainian president Volodymyr Zelenskyy's regular visits to the front line and have caused criticism within the Russian nationalist community.⁴⁵

Challenge 3. The Kremlin's control over the Russian information space is dominant, but not ironclad.

There are fractures that require the Kremlin's attention. The Russian nationalist community, which is central to the Kremlin's ability to continue the war and sustain the regime, is not monolithic. Managing various tensions has required, and will continue to require, effort and attention on the part of the Kremlin. Such tensions have included those between the late Wagner Group financier Yevgeny Prigozhin and the Russian MoD, which

⁴³ Bugayova, N. (2022), 'Putin on Track to Disappoint Multiple Competing Factions in Russia', Institute for the Study of War, 18 October 2022, <https://www.understandingwar.org/background/putin-track-disappoint-multiple-competing-factions-russia>.

⁴⁴ Bailey, R., Mappes, G., Stepanenko, K. and Clark, M. (2023), 'Russian Offensive Campaign Assessment, May 2, 2023', Institute for the Study of War, 2 May 2023, <https://www.understandingwar.org/background/russian-offensive-campaign-assessment-may-2-2023>.

⁴⁵ Stepanenko, K. et al. (2022), 'Russian Offensive Campaign Assessment, December 20', Critical Threats, 20 December 2022, <https://www.criticalthreats.org/analysis/russian-offensive-campaign-assessment-december-20>; Stepanenko, K. et al. (2022), 'Russian Offensive Campaign Assessment, December 22', Institute for the Study of War, 22 December 2022, <https://www.understandingwar.org/background/russian-offensive-campaign-assessment-december-22>.

resulted in Wagner's armed rebellion in June 2023; those between the Russian milblogger community and the traditional Russian military establishment; and those between more extreme nationalists and less extreme ones.⁴⁶

Putin has demonstrated a strong ability to balance stakeholders over the years. However, this skill is being tested anew as Russia's military failures highlight the gap between Putin's goals and means. Ukrainian counteroffensives in 2022 have resulted in shockwaves in the Russian nationalist information space.⁴⁷ Had Ukraine's counteroffensive operations continued without interruption into the winter of 2022–23, it is unclear how well the Kremlin would have been able to control the information space.

The Kremlin has additionally given up some control in the information space. Putin chose not to silence the Russian milblogger community, even as it repeatedly drew attention to shortcomings in Russia's conduct of the war. Putin likely assesses that he needs milbloggers – who have shown to be effective at rallying Russians in support of the war⁴⁸ – to augment traditional Russian propagandists whose influence and credibility have limits.

Putin is cautious about when and how he tests the limits of the Kremlin's information control – as the stability of his regime in part depends on it. In 2020, the Institute for the Study of War (ISW) assessed that Putin must increasingly sustain the perception that an alternative to his rule in Russia would be either worse or too costly to fight for.⁴⁹

Putin has exercised caution in the information space since Ukraine's 2022 counteroffensive. His traditional New Year's Eve address, delayed address to the Russian Federation Assembly and even the 2023 Victory Day address contained boilerplate rhetoric and were absent of calls for a much-needed full mobilization.⁵⁰ This indicates Putin's reticence to push the information frontier beyond the boundary of what he can demand of the Russian people.

The gap between the desired narrative and reality is sometimes too large to bridge. No matter how much Putin is trying, he cannot – at least not yet –

⁴⁶ Stepanenko, K. et al. (2023), 'Russian Offensive Campaign Assessment, April 25, 2023', Institute for the Study of War, 15 April 2023, www.understandingwar.org/backgrounder/russian-offensive-campaign-assessment-april-25-2023; Bugayova (2022), 'Putin on Track to Disappoint Multiple Competing Factions in Russia'; Stepanenko, K. et al. (2023), 'Russian Offensive Campaign Assessment, January 27, 2023', Institute for the Study of War, 27 January 2023, <https://www.understandingwar.org/backgrounder/russian-offensive-campaign-assessment-january-27-2023>; Bailey, R. et al. (2022), 'Russian Offensive Campaign Assessment, December 27', Institute for the Study of War, 27 December 2022, <https://www.understandingwar.org/backgrounder/russian-offensive-campaign-assessment-december-27>.

⁴⁷ Bugayova (2022), 'Putin on Track to Disappoint Multiple Competing Factions in Russia'.

⁴⁸ Stepanenko, K. and Kagan, F. W. (2023), 'Russian Offensive Campaign Assessment, February 26, 2023', Institute for the Study of War, 26 February 2023, <https://www.understandingwar.org/backgrounder/russian-offensive-campaign-assessment-february-26-2023>.

⁴⁹ Bugayova (2020), *Putin's Offset*.

⁵⁰ Bailey, R. et al. (2023), 'Russian Offensive Campaign Assessment, January 18, 2023', Institute for the Study of War, 18 January 2023, <https://www.understandingwar.org/backgrounder/russian-offensive-campaign-assessment-january-18-2023>; Bailey, R. et al. (2023), 'Russian Offensive Campaign Assessment, February 23, 2023', Institute for the Study of War, 23 February 2023, <https://www.understandingwar.org/backgrounder/russian-offensive-campaign-assessment-february-23-2023>; Bailey, R. et al. (2023), 'Russian Offensive Campaign Assessment, January 18, 2023'.

make his invasion of Ukraine an existential fight for the Russians.⁵¹ The rout of Russian forces from the Kharkiv region of Ukraine in September 2022 led to hysteria in the Russian information space. Not only because it was a military humiliation, but because these failures contrasted with Putin's attempt to project an image of a 'great Russia' at his 30 September annexation speech and were followed by Putin's 'partial' mobilization order – another recognition of the gap between Russia's goals and means. The Russian information space has also struggled to unanimously portray costly tactical advances by Russian forces as significant, particularly in Soledar in January 2023 and Bakhmut in May 2023.⁵²

The Kremlin is adaptable, but it cannot rapidly pivot when it comes to shaping perceptions. Its methods are most effective when it has time to develop its narratives gradually; swiftly responding to events that clash with the Kremlin's storylines is not its forte. Examples include the Kremlin's inability to provide a prompt and coherent explanation for Russia's military failures, such as the above-mentioned rout from Kharkiv region, Ukraine's liberation of Kherson in 2022, or sabotage activities in the Belgorod Oblast in May 2023.⁵³

Challenge 4. A fixation on the façade or perception of a powerful Russia cannibalizes Russia's real capability.

The Kremlin has expended massive resources to secure only limited, symbolic gains in Ukraine. The battles for Mariupol, Severodonetsk, Soledar and Bakhmut have optical importance but are unjustifiable in their cost–military significance ratio.

Putin has created and must feed the Russian nationalists' appetite for victories, either real or imaginary – often at the expense of Russia's real capability. The Kremlin has been using costly missiles to generate effects in the Russian information space, even though such missiles are a limited resource, while attacks on Ukrainian civilian infrastructure do not

⁵¹ Bailey et al. (2023), 'Russian Offensive Campaign Assessment, January 18, 2023'.

⁵² Stepanenko, K. et al. (2023), 'Russian Offensive Campaign Assessment, January 17, 2023', Institute for the Study of War, 17 January 2023, <https://www.understandingwar.org/backgrounder/russian-offensive-campaign-assessment-january-17-2023>; Stepanenko, K. et al. (2023), 'Russian Offensive Campaign Assessment, May 21, 2023', Institute for the Study of War, 21 May 2023, <https://www.understandingwar.org/backgrounder/russian-offensive-campaign-assessment-may-21-2023>.

⁵³ Stepanenko, K. et al. (2022), 'Russian Offensive Campaign Assessment, September 10, 2022', Institute for the Study of War, 10 September 2022, <https://isw.pub/RusCampaignSept10>; Stepanenko, K. et al. (2022), 'Russian Offensive Campaign Assessment, September 9, 2022', Institute for the Study of War, 9 September 2022, <https://isw.pub/RusCampaignSept9>; Stepanenko, K. et al. (2022), 'Russian Offensive Campaign Assessment, September 10, 2022', Institute for the Study of War, 10 September 2022, <https://isw.pub/RusCampaignSept8>; The Bell (2023), 'Диверсанты под Белгородом, как оценивают в мире взятие Бахмута и помилование Протасевича' [Saboteurs near Belgorod, how the world assesses the capture of Bakhmut and the pardon of Protasevich], 22 May 2023, <https://thebell.io/diversanty-pod-belgorodom-kak-otsenivayut-v-mire-vzyatie-bakhmuta-i-pomilovanie-protasevicha>; Hird, K. et al. (2023), 'Russia Offensive Campaign Assessment, May 22, 2023', Institute for the Study of War, <https://www.understandingwar.org/backgrounder/russian-offensive-campaign-assessment-may-22-2023>.

fundamentally alter battlefield dynamics. Neither will they destroy Ukraine's will to fight.

The Kremlin has been reshuffling the Russian military leadership, in part to use senior officers and government officials as scapegoats for Russian military failures and satisfy the calls of the nationalist community for 'real action' and 'accountability'. However, as with attacks on Ukrainian infrastructure, the reshuffling of MoD figures can provide a short-term illusion of action but not lasting effects – not in the context of Putin's system that rewards loyalty over competence.

The Russian nationalist community has been increasingly glorifying the brutality of Russian forces against Ukrainians.⁵⁴ Acts of brutality can negatively impact Russia itself over time. Brutality is unlikely to stop with Ukraine – it will likely further spread within Russian forces, which can negatively impact their morale and professionalism. Russian society will also have to face brutality from the reintegration of Russian servicemen into civilian life.

Lessons learned and policy implications

The Kremlin retains strong information control at home and the ability to shape perceptions globally. The above-mentioned vulnerabilities and challenges, however, are real. While they do not put the Kremlin at imminent risk, accumulated Russian vulnerabilities in the information space carry several implications and opportunities for the West and Ukraine.

Making the Kremlin fail faster on the battlefield is the most effective way to penetrate and disrupt the Russian information space and exacerbate the burden of damage control for the Kremlin. Battlefield setbacks will increase the gap between perception and reality that the Kremlin's information operations must bridge.

The US must help Ukraine deny Russia any breathing space by fully resourcing successive Ukrainian counteroffensive operations. The Kremlin cannot pivot rapidly in the information space, but a reprieve on the battlefield would provide an opportunity for the Kremlin to adapt its narratives and leverage its ability to manipulate perceptions.

The Kremlin's propaganda also hurts the Kremlin itself as it prevents real assessments of Russia's problems from surfacing at the pace required for an effective response. The essential lesson here is, 'Don't interrupt your enemy when they are making a mistake.'

⁵⁴ Hird, K. et al. (2023), 'Russian Offensive Campaign Assessment, April 12, 2023', Institute for the Study of War, 12 April 2023, <https://www.understandingwar.org/background/russian-offensive-campaign-assessment-april-12-2023>; Hird, K. et al. (2023), 'Russian Offensive Campaign Assessment, February 13, 2023', Institute for the Study of War, 13 February 2023, <https://www.understandingwar.org/background/russian-offensive-campaign-assessment-february-13-2023>.

Conclusion and policy recommendations

Mathieu Boulègue

Understanding the nature of operational experience and the reality of lessons learned by the Russian armed forces in the context of the war against Ukraine is critical to proper calibration of future policy by the US, NATO and their allies.

At both the strategic and operational levels, it remains to be seen to what extent the Russian military can integrate the lessons learned from the war against Ukraine, not least because of the decimation of the corps of officers and the continuing inflexibility and resistance to change in the military organization itself.

Marginal tactical adaptations and technological innovation have undeniably been taking place and will likely continue as the war drags on. However, how well, how quickly and how deeply this knowledge will be adopted, disseminated and internalized across the military structure remains unknown.

Key variables include not only the extent to which the Russian higher command can integrate changes into the armed forces but also whether the 'right' lessons will be drawn in the first place.

In other words, it is still unknown whether the Russian military can be a 'learning organization', able to adapt its military culture while under severe stress. Whether the Russian army can implement lasting changes to its core underlying structures and organizational culture remains a key question.

Consequently, Western military planners must carefully observe and assess how Moscow digests and integrates battlefield adaptations, operational knowledge and overall lessons learned into future warfighting capabilities – and in turn, whether and how this will inform future military doctrine.

These assessments are vital for the US and NATO to maintain their technological edge against Russia's conventional and non-conventional capabilities, as well as to provide a crucial element of deterrence against Russian military adventurism.

Key findings from this document lead to the following overall conclusions and policy recommendations:

Conduct objective (re)assessments of Russian warfighting capabilities

- While recognizing the limits of Russian warfighting and force structure, it must be recalled that Russian conventional and non-conventional capabilities still pose a significant threat to NATO. Even with subpar technology, a ‘good enough’ military power with subpar technology can still cause real damage to more advanced adversaries.
- Poor performance in Ukraine should not be seen as a complete and absolute indicator of future performance in a stand-off or conflict against NATO – especially considering the nature of the battlefield in Ukraine and the varying extent to which Russian capabilities in different domains have been engaged there.
- At least for now, Moscow might not be able to coordinate a large-scale land operation into NATO territory. However, the Russian army still possesses weapons systems that will prove challenging to NATO – especially long-range precision strike capabilities and multi-layered integrated air defence systems. Obtaining a more comprehensive picture of Russia’s military industrial base (OPK) and its capacity for regeneration and innovation will be more critical than ever.
- While a careful reassessment of the military threat is necessary, Russia should not be disregarded as a ‘declining’ power when faced with more technologically advanced competitors, especially with the long-term potential of reconstituted and re-equipped armed forces.
- The Russian armed forces are still able to conduct sub-threshold operations and continued grey-zone destabilization efforts. Western policymakers must therefore expect and prepare for continued Russian attempts at probing asymmetrically when it comes to sub-threshold scenarios and unconventional operations, especially against critical national infrastructure.
- Analyses of Russian military technology should avoid applying the conceptual frameworks and metrics used by Western military planners to assess Western innovation pathways and breakthroughs.
- Future research into this topic should consider differentiating between vulnerabilities and pathologies specific to Russia’s armed forces (corruption, poor military training, C2 issues, etc.) and those that affect all modern military powers and the operational environment.

Invest in effective counter-capabilities

- Russia has an explicit intent to restore large-scale warfighting capability and undermine European and transatlantic security. It is also clear that Russia will remain a military threat to the US, NATO and their allies for the time being. Hence, it is vital to deny Moscow the use of its more technologically advanced conventional capabilities and asymmetry enablers.
- Russia's military performance in Ukraine has shown that its ground-based air defence capabilities, although finite, remain formidable and a primary obstacle for NATO in a potential stand-off. Western countries should therefore increase the quality and quantity of their 'suppression and destruction of enemy air defences' (SEAD/DEAD) capabilities to overmatch Russian conventional systems through better tactical airpower.
- The US, NATO and their partners should continue investing in military capabilities that can negate the effects of Russia's long-range precision strike systems and its integrated network of air defence systems. This especially includes sea- and air-launched precision-guided missiles.
- Western military planners must find ways to counter Russia's superiority based on use of its asymmetric enablers to gain tactical or operational advantage – notably electronic warfare systems, cyber warfare capabilities and space-based assets.
- The US and NATO must invest in ensuring the survivability of their C4ISR and targeting systems in highly contested environments, including through resilience and redundancy. This is especially true in the electromagnetic spectrum, for satellite navigation systems and space-based assets, as well as in the cyber domain.

Understand and exploit Russian vulnerabilities and weaknesses at war

- As new lessons learned about Russia's way of war continue to be observed, it is vital to understand where the US and NATO could potentially exploit known weaknesses and identified vulnerabilities in conventional and non-conventional domains.
- Exploiting such vulnerabilities is equally important in the information space, where Russian information and influence operations must be more effectively disrupted. This is especially the case when Russia faces battlefield setbacks that it seeks to deny or downplay.
- Western countries should exploit the informational gap between Russian operational realities in Ukraine and Moscow's fabricated and propagandistic narratives. This can be carried out, for instance, by systematically 'pre-debunking' Russian narratives.

- Continuing and increasing targeted sanctions against the Russian military industry is vital to limiting Russia's access to advanced civilian, dual-use and military technology. Western countries must deny Russia access to capabilities and technology that will help the Kremlin reconstitute its defence industrial base. Western policy must also be designed to impede Russia's procurement cycles and slow the pace of military recapitalization.
- Short- and medium-term assessments are highly contingent on Russia's military force regeneration and restructuring, as well as on re-equipment and overall recapitalization. The question of how fast and how well Russia can rebuild its armed forces is a core element of understanding the future of the threat environment.

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