

# Anniversary of Russia-Ukraine War: Battlefield Experience and Lessons about the Main Battle Equipment

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## 1. News Highlights

Russian troops invaded Ukraine on February 24, 2022, in what Russian President Vladimir Putin declared a “special military operation” aimed at disarming Ukraine. So far, Russia has not only failed to achieve its goal of disarming Ukraine, but Ukraine is still able to maintain its resilience in fighting Russia with the support of Western countries. The Russo-Ukrainian War is the first large-scale conventional war of the 21st century, and military observers around the world are watching closely and trying to understand what lessons the conflict will provide for future wars.

## 2. Security Implications

Recently, think tanks in the US, Britain, and other Western countries have been closely observing the progress of the conflict and exploring its implications for possible wars in the future. The US, currently Ukraine’s largest arms provider, is investing hundreds of billions of dollars annually in its advanced weapons development. However, policymakers can hardly know whether these enormous investments are paying off without actually putting them to the test on the battlefield. RAND believes that the era of industrial warfare seems to have returned, and the US may have to fight a war that is very different from what it is today.<sup>1</sup>

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1. “Is the U.S. Military Capable of Learning From the War in Ukraine?” *Foreign Policy*, February 2, 2023, <https://foreignpolicy.com/2023/02/02/us-military-lessons-war-ukraine-russia-weapons-tactics/>.

## **2-1. Lessons from the use of major conventional weapons on the battlefield**

In the Ukrainian war, there are many new views on conventional weapons and their value in combat. For instance, the ubiquitous drones and anti-tank weapons are making people wonder whether main battle tanks are still worthwhile. However, Ukraine's following counterattack showed that it could not have fought back and reclaimed the lost territory without tanks. On the other hand, the role of manned warplanes in the Ukrainian battlefield had receded to the second line as the Ukrainian air force had not completely lost the initiative in air combat, and the Russian Air Force didn't perform satisfactorily in ground support missions. Advanced Western weapon systems, such as high-precision artillery, Javelin anti-tank missiles, Stinger MANPADs, and the Highly Maneuverable Artillery Rocket System (HIMARS), have displayed their ability to compensate for Ukraine's losses and deficiencies and supported its

operational resilience to this day.

The Ukrainian army has achieved excellent results against Russian armored forces. The Ukrainians destroyed thousands of Russian tanks, armored vehicles, and heavy trucks, mostly thanks to portable anti-armor weapons provided by NATO countries (British NLAWS and US Javelin missiles) as well as intelligence from the West. However, this is still not the time to phase out tanks and switch to other new weapons, such as unmanned drones. Tanks are still effective weapons, but they must be deployed in combination with other systems to avoid being destroyed by low-cost weapons.<sup>2</sup>

Helicopters and low-flying fighters providing close air support are evidently vulnerable to low-altitude anti-aircraft weapons.<sup>3</sup> Russia has lost 170 helicopters in Ukraine to date, while the US has lost less than 75 in its counter-terrorism wars in the past two decades. On the battlefield of information transparency, portable anti-aircraft missiles, drones, long-range firepower, loitering weapons,

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2. "What the U.S. Military Needs to Learn from the Ukraine War," *Time*, April 11, 2022, <https://time.com/6165506/military-strategy-ukraine-war/>.

3. Ibid.

and even anti-tank missiles all cast doubt on the survivability of helicopters.<sup>4</sup> Some reports suggest that the US Army needs to invest more in expendable drones for intelligence, surveillance, reconnaissance, and close air support missions, along with loitering munitions, and rely on the more survivable Air Force and Navy aircraft. Supplies may be delivered by expendable transport drones or manned/unmanned vehicles. Troops need armored vehicles with better survivability or disperse and penetrate on foot as light infantry units.<sup>5</sup>

## **2-2. The challenge of modern surveillance capabilities for ground warfare**

Information transparency on battlefields poses a challenge to ground operations. Advanced sensors can penetrate weather cover, and sensors using artificial intelligence (AI) may be more lethal in combat by switching between target tracking and locking modes. Large military units such as armored vehicles and intricate logistical networks will be

targeted. In the case of Ukrainian tactics, attacking the logistical system may be more effective than attacking the main battle units. US Army Secretary Christine Wormuth agreed that the lessons learned from the Russian-Ukrainian conflict are that the Army needs to reduce its electronic signal exposure, be capable of countering advanced drones, and maintain ammunition reserves and defense industrial bases.<sup>6</sup>

The Royal United Services Institute (RUSI) also believes that the ubiquitous intelligence, surveillance, target acquisition, and reconnaissance (ISTAR) capabilities on modern battlefields and the deployment of multiple tactical-level sensors make it difficult for ground troops to remain concealed. To survive, ground units must spread out sufficiently to become an uneconomic target. Fast movement can disrupt the enemy's kill chain and thus avoid attacks. Combat units should prioritize concentration of effectiveness while considering firepower concentration only under favorable

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4. "The Other Big Lessons That the U.S. Army Should Learn from Ukraine," *War on the Rocks*, June 27, 2022, <https://warontherocks.com/2022/06/the-other-big-lessons-that-the-u-s-army-should-learn-from-ukraine/>.

5. Ibid.

6. Ibid.

conditions, and they should also prioritize mobility as a key component of their survivability.<sup>7</sup>

### **2-3. Russian Army's performance is not as expected**

The RUSI also believes that the Russian military has a hierarchy of priorities. With the ground forces having the highest priority, there are different orders of use for different units and services. There are also flaws in the Russian military's education system: although joint training exists, the basic unit leaders lack the ability to integrate the troops since the Russian soldiers generally rely on orders from superiors and lack adaptability. Russia could probably lose the war if this leadership model is not changed. However, there are differences between the different military branches, and this culture is less evident in the Air Force than in the Army and Navy. The Russian military also generally lacks the ability of information integration, is reluctant to provide judgmental context to

those carrying out orders, and encourages false reporting. Russian operations and formations are prone to conflict, electronic warfare systems and other capabilities often interfere, and friend-foe identification and control measures are inadequate. The deficiencies force the commanders to use those combat capacities separately instead of integrating them into efficiency multipliers.<sup>8</sup>

Russia's defeat in Ukraine shows that attacking the enemy frontline is more difficult than defending itself. This is because it's challenging to perform tactical and strategic raids on a battlefield full of sensors, making undetected tactical movements very difficult since the battles in Ukraine mostly took place on the ground. At the same time, air and naval warfare were much faster and smoother.

### **3. Trend Observation**

The widespread use of drones, commercial space systems, and electronic

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7. "Preliminary Lessons in Conventional Warfighting from Russia's Invasion of Ukraine: February–July 2022," *Royal United Services Institute*, November 30, 2022, <https://rusi.org/explore-our-research/publications/special-resources/preliminary-lessons-conventional-warfighting-russias-invasion-ukraine-february-july-2022>.

8. Ibid.

warfare in Ukraine manifests that new forms of warfare are imminent. The weapons provided by the West enabled Ukraine to get rid of the old Russian arsenal, and its soldiers are adapting to Western weapons quickly. Though these weapons are not particularly advanced, the Ukrainian troops can still make good use of them and employ them with appropriate tactics to play a key role on the battlefield. In addition, Ukraine is still pursuing more effective weapons, such as F-16 fighters.<sup>9</sup>

### **3-1. Ukraine makes good use of Western equipment to improve its combat prowess**

The war between Russia and Ukraine has been going on since February 2022. It was thought that Ukraine might collapse quickly under Russia's overwhelming military power. Still, with the continuous supply of weapons, information, and technical support from the West, plus the effectiveness of the operators, Ukraine has maintained its advantage against the Russian force. The deputy commander of NATO's Allied Command Transformation

said that the military technology provided by the West is the key to Ukraine's ability to contend Russian forces.

Some believed the Ukrainian forces won because they adopted NATO standards, including building a team of professional non-commissioned officers and a decentralized Western military philosophy known as "mission command." In the early stages of the war, NATO-style training was considered to give Ukrainian soldiers an edge by enabling them to build a decentralized, flexible defense system different from Russia's. Similarly, NATO instructors have also learned from Ukraine's experience, and Ukrainian troops often improvised in a style different from NATO or Russian command systems.

War requires large reserves and great tension. Despite the outstanding performance of its anti-chariot weapons, Ukraine still relied on massive artillery firepower to defeat the Russians. In the course of the war, the Ukrainian Army still maintained an artillery balance in the first one and a half months, then began running

9. "6 Wrong Lessons for Taiwan From the War in Ukraine," *Foreign Policy*, November 2, 2022, <https://foreignpolicy.com/2022/11/02/lessons-ukraine-russia-war-taiwan-china-military-weapons-strategy-tactics/>.

out of ammunition. By June 2022, Russian firepower had a 10:1 advantage; the NATO countries did not have sufficient reserves or the industrial capacity to support large-scale operations, and only the US could provide sufficient ammunition. By the end of October 2022, the US had sent US\$17.6 billion in aid to Ukraine from the border.<sup>10</sup> The US provides weapons such as Stinger anti-aircraft missiles, Javelin anti-tank missiles, 155mm howitzers, drones, unmanned ships, tactical vehicles, helicopters, electronic jamming equipment, radar, mortars, grenade launchers, small-caliber weapons, million rounds of ammunition, body armor, helmets, and other weaponry, followed by HIMARS rocket systems with improved firepower and accuracy, National Advanced Surface-to-Air Missile System (NASAMS), and ground-launched Advanced Medium-Range Air-to-Air Missiles (AMRAAM). Other NATO countries also provide weapons such as artillery pieces, tanks, infantry fighting vehicles, short-range anti-aircraft missiles,

and anti-aircraft armored vehicles.

Western weapons enabled Ukraine to eliminate the old Russian systems, and Ukrainian soldiers are adapting to Western weapons quickly. These weapons are not particularly advanced, but the Ukrainian troops can still make good use of Western technology and employ them with appropriate tactics to play a key role in combat. For instance, drones were used to spot Russian targets for long-range artillery to perform precision strikes. When Russia used hardkill and network attacks to blockade Ukrainian communications, Ukraine used commercial space systems to keep the lines open and disseminate war updates to gain international support and effectively stop the Russian offensive. With commercial low-orbit satellites and other publicly available intelligence, Ukraine provides information about Russian military movements. It helps the outside world understand the current situation in the country and Russian deployment and movement. Ukraine also uses artificial intelligence services from

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10. "Ukraine War Proves Western Technology is Superior, German General Says," *DefenseNews*, October 26, <https://www.defensenews.com/battlefield-tech/2022/10/25/ukraine-war-proves-western-technology-is-superior-german-general-says/>.

civilian companies to conduct large-scale surveillance on Russian military maneuvers.<sup>11</sup> On the other hand, Russians took advantage of their superior electronic warfare capabilities to interfere with the combat communications and drone control of Ukrainian forces in the eastern part of the country and played an obstructive role. However, the captured Russian electronic warfare gears and Western electronic intelligence equipment also enabled the Ukrainian Army to acquire considerable insights into Russian electronic warfare capabilities.

### **3-2. Weapon system that didn't change the game rules**

Stingers, Javelins, TB2 drones, and HIMARS are considered to have revolutionized the Russian-Ukrainian battlefield. Still, the key was the coordinated effort from different units on the battlefield, and the coordination was possibly facilitated by the US intelligence, surveillance, target acquisition, and reconnaissance (ISTAR) support. For example, some of the TB2 drones were still able to operate successfully over the

battlefield thanks to the HIMARS that accurately destroyed Russian command and control nodes and radar systems, exposing vulnerabilities in Russia's air defense system.

The effectiveness of these weapons has received significant media coverage and sparked debates about whether heavy weapons such as main battle tanks and manned aircraft are still relevant on modern battlefields. Some believe these heavy platforms will become less relevant in future battlefields, and militaries must pay attention to lighter, smaller, and more mobile systems. However, lighter, smaller, more mobile systems are unlikely to dominate in a major power war. The battlefield in Ukraine shows that ground conflicts still rely on land-based artillery, with drones used primarily for reconnaissance and targeting; combat vehicles provide mobility, protection, and firepower for which there is simply no substitute in ground combat. Ukrainian forces have been asking for armored vehicles, artillery pieces, and mobile air defense systems rather than lighter, more maneuverable systems. Since the initial

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11. "As Russia Plots Its Next Move, an AI Listens to the Chatter," *Wired*, April 4, 2022, <https://www.wired.com/story/russia-ukraine-war-ai-surveillance/>.

breakthroughs and most fierce battles still need to be done by armored units, weapons with high firepower and heavy armament are still the mainstay on the battlefield.

Unmanned Aerial Systems (UAS) and Counter Unmanned Aerial Systems (C-UAS) are extremely important to all branches and combat units, as battlefield situational awareness is extremely critical to combat advantages. However, since 90% of the drones will be lost in use, drone systems must be inexpensive and disposable in most cases. For ground troops, drones must become part of the basic equipment of field units for improved situational awareness and target acquisition. On the battlefield in Ukraine, the main countermeasure to drones is electronic warfare.

### **3-3. Maintaining “the right to precision” on the battlefield is a necessity**

The RUSI believes there is no “safe zone” in modern warfare. The enemy can attack throughout the depths of the battlefield; as such, survivability depends on the ability to disperse ammunition depots, command and control (C2), logistics and maintenance, and combat

units such as aircraft squadrons. Commercial technologies such as consumer-class drones, Starlink satellite antennas, and satellite imagery from private companies have given Ukraine an edge in the war. This is because that in the Ukrainian theater, these commercial service providers based in Western countries are unlikely to be attacked by Russia. However, since there are no geographical havens in Ukraine, immobile facilities such as critical infrastructure will become the target of Russian long-range precision strikes.

The troops must fight for “the right to precision.” Precision gives the best operational results and allows troops to consume less ammunition from the logistic system, making them more survivable. But precision weapons are not only scarce but can be defeated by means of electronic warfare. Electronic warfare for attacks, protection, and targeting is a key element of coordinated multiservice operations today to enable the kill chain to function at a desirable speed.

That means the contention of electromagnetic spectrum is vital. Electronic warfare means can retard kill chains, increase battlefield chaos, and, most importantly, reduce the accuracy of



weapons; thus, developing firing solutions that disrupt electronic countermeasures to create precision strike windows is critical. The waves of electronic warfare and kinetic attacks (soft and hard kills) are essential to ensure that the limited inventory of precision weapons produces the desired effects. The method disrupts the enemy's attempts to deliver precision strikes by interfering with the navigation frequency and impedes the target acquisition of precision weapons. The combat units can use electronic warfare baselines to locate the source of interference or use non-precision fire to force the enemy to relocate their electronic warfare equipment; this will open a window for the friendly units to obtain coordinates for precision strikes. To guarantee the success of kill chains and ensure the effectiveness of precision ammunition, it is necessary to actively compete for superiority over the electromagnetic spectrum.

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