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Lessons from land warfare: One year of war in Ukraine

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Key lessons for land warfare

After the Russian invasion of Ukraine on Feb. 24, 2022, large-scale and even nuclear war in Europe is no longer inconceivable. Today, European armed forces are neither equipped nor prepared for high intensity-warfare. While strategic autonomy remains an ambition, it still is far from being real. American capabilities stay essential for the defence of European territory against Russian aggression. Meanwhile, as Washington's focus is shifting to the Indo-Pacific, European countries now look at how to rebuild their defence capabilities. What preliminary lessons can they learn?

In this first analysis, HCSS has focused on land warfare. Clearly, the war in Ukraine is waged in all dimensions and domains. The battles are fought on land, at sea, and in the air, while cyberspace, the electromagnetic domain, the information environment, and space play vital roles. But the war in Ukraine revolves essentially around capturing, defending and recapturing territory. The Russian and Ukrainian armies play the leading roles. All the resources of the Ukrainian and Russian states are dedicated to support this decisive fight on land. HCSS has made an analysis of the preliminary lessons for land warfare that can be drawn from the first year of this war:

- 1.** Understanding the enemy is of fundamental importance. Not only must we understand our enemy, but we must make certain our enemy also understands us. Deterrence becomes impossible if we do not recognise each other's signals. For Western countries, the scale of the Russian attack came as a surprise despite months of Russian preparation. In its turn Russia underestimated the West's strong reaction to the invasion.
- 2.** The war in Ukraine is characterised by the central role that heavy land forces play. Mechanised infantry, tanks and artillery operating as combined arms are essential for capturing, holding and recapturing ground.
- 3.** Unmanned aerial vehicles (hereafter drones) have significant operational value as a reconnaissance tool on multiple levels. The integration of Intelligence, Surveillance and Reconnaissance (ISR) systems, swift target acquisition and fire control for indirect fires, all supported by secure satellite communications into a 'reconnaissance-strike complex' is crucial to be decisive on the ground.

4. Although invisible to the naked eye, cyber- and electromagnetic warfare are no less important in supporting operations in all other domains. The disruption of radio traffic between units, radar, air-defence, data communication, internet, GPS and drone control has tremendous impact on the battlefield.
5. Sustainability is a critical prerequisite for military success. Both manpower losses and the consumption rates of equipment and ammunition are enormous. Sustaining a war requires enormous stockpiles of supplies and the ability to replenish losses and reconstitute units continuously.
6. The capability to adapt is the key to military success. The Ukrainian armed forces have very short and rapid learning cycles. But the Russian armed forces have also learned from their many initial mistakes and have adapted their behaviour and rectified some early shortcomings.
7. Regardless of how the current war ends, Russia will continue to pose a significant military threat to European security in the next ten to fifteen years in almost every scenario. If we wish to be prepared, we have to act now!



Source: State Emergency Service of Ukraine.

A war of old truths and new developments

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- The Ukraine War is a modern, high-intensity, and multidimensional war, fought from space to the phones of individual people. At the same time, it displays many characteristics of the 20th century's large-scale industrial wars. The war is fought on land, at sea, in the air, in space, in cyberspace, in the electromagnetic spectrum and in the minds of opponents (the so-called 'cognitive dimension'). Yet, the decisive battle space is on the ground.
- Manoeuvrability and firepower continue to remain crucial for both offence and defence. The main actors in the war are combined arms forces consisting of mechanised infantry, tanks and artillery supported by engineers, air defence, and anti-tank systems.
- Consumption rates and attrition of weapon systems are on par with previous industrial wars, and casualties are correspondingly high. Mass is important as the battlefields are expansive and losses are high. To sustain that mass in battle, an army needs constant replacements of men and materiel. This requires manpower, training, and production capacity. The cult of efficiency and doing just enough creates vulnerable armed forces that are quickly used up in a real war.
- Unmanned systems in all forms are used on a large scale. This trend was already visible in the wars in Syria, Libya and Nagorno-Karabakh.
- There is no safe rear-area in the war of the future. As sensors fly, drive, or walk around (e.g. civilians with smartphones) everywhere, battlefield transparency extends well beyond the frontline. This makes long-term concealment very difficult.
- The effective range of precision indirect fires by missiles, loitering munitions and artillery extends deep into enemy territory. The introduction of HIMARS-rocket systems on the Ukrainian side offers a good example of the impact of these weapons that make it much harder for the Russians to resupply their troops and leave Russian headquarters vulnerable.
- It is the combination of both "old" and "new" systems that has been decisive for success or failure on the battlefield of Ukraine. Established capabilities like mechanised infantry, tanks and artillery, supported by engineers, military bridging capabilities, anti-tank and anti-air capabilities, can only function optimally if they operate integrated with more recent capabilities like drones and electronic warfare.

Heavy weaponry and advanced systems dominate the battlefield

Combining mobility, armour, and firepower. Main Battle Tanks are still the core of combined arms formations

In future wars, drones will be indispensable for every army and must be integrated at all levels

- The war in Ukraine shows the lasting value of 20th-century weapons systems such as tanks, artillery, and other "traditional" weapons - if properly applied.
 - Artillery remains crucial. Indirect fires reach deeper than ever before, obstruct manoeuvre and inflict 90% of all casualties. Russian decision-making often proves too slow and inflexible. But if the chain of target acquisition-decision making- execution is fast enough (often <1 min), artillery is terrifyingly lethal. Robust communications, rapid fire control, precision, and ammunition supply determine the effectiveness of artillery.
 - Combining mobility, armour, and firepower. Main Battle Tanks are still the core of combined arms formations, provided they cooperate properly with infantry and artillery, and are passively or actively protected against the increased air-threat that now includes drones.
 - Ukrainian forces have expanded tank employment creatively: in addition to their classic role in the (counter)attack, i.e. providing shock and direct firepower, Ukraine also deploys its tanks as tactical artillery using indirect fire.
 - Maintenance and logistical support are essential enablers. Mechanised systems require a lot of both to keep functioning.
- Drones play a notable role in the war in Ukraine. In future wars, they will be indispensable for every army and must be integrated at all levels.
 - In Ukraine, drones are widely deployed and consumed. Drones represent a new aerial threat. Defence against drones is vital for all, requiring electronic warfare to neutralize their effects and air-defence to destroy them.
 - Drones shine when executing aerial reconnaissance missions. Together with artillery and swift fire control, they constitute a deadly combination on the battlefield.
 - Armed drones can attack targets directly, but their vulnerability is relatively high and their survivability is correspondingly limited. At the beginning of the war the effect of armed drones was magnified in the media for reasons of public relations.
 - Investment is needed in the capacity to mass-produce relatively simple and cheap drones that are easily replaced if lost.
- Ground based air-defence (GBAD) plays a crucial role in air warfare. The very long range of heavy, modern surface-to-air missiles (SAMs) can deny manned aircraft and drones the use of airspace at mid- to high-altitudes. At lower altitudes, mechanised air-defence systems and Man Portable Air Defence Systems (MANPADS) can be deadly. This can result in a situation in which neither side can operate effectively in the air, and air support becomes either impossible or prohibitively costly. As long as this mutual air denial holds,

air power plays a much smaller role in the battlefields of Ukraine than was previously expected.

- The war in Ukraine also highlights the importance of gathering and disrupting intelligence; Intelligence, Surveillance & Reconnaissance (ISR), Command and Control (C2), electronic warfare and cyber elements.
 - Both Russia and Ukraine use space assets for ISR and C2.
 - The battle of the electromagnetic spectrum is not physically visible, but the scale and intensity of the fighting to access and use this spectrum shows its importance. C2, ISR, the deployment of precision weapons, as well as the ability to manoeuvre on the battlefield with or without being spotted are heavily dependent on the electromagnetic spectrum.
 - Cyber operations require lengthy and focused preparation. Russia opened with a massive cyberattack on Ukraine's satellite communication links but due to solid preparation the Ukrainians managed to minimize the impact. Russia continues to launch continuous waves of intense, but relatively limited, cyberattacks. Ukraine manages to cope with them. In practice a cyber balance appears to exist.
- Despite the strength of defensive warfare, major (counter)attacks remain possible. These are crucial to force a decision on the battlefield. Deception, skilful command, the rapid concentration of troops, and the effects of supporting weapons can create the conditions for a breakthrough. Tanks are the core of an attacking force, but deployment must always be in combination with infantry and artillery support.
- Airborne and amphibious operations are difficult to conduct. Not only is air superiority and the suppression or destruction of air defences (SEAD/DEAD) a necessary precondition, but even with superiority and SEAD/DEAD helicopters remain vulnerable, as do airborne troops relatively lightly armed and lacking mobility. Moreover, known landing zones can quickly be taken under artillery fire. Modern coastal defences - specifically mobile anti-ship missiles - make coastal waters very hazardous for amphibious operations.

The battle of the electromagnetic spectrum is not physically visible, but the scale and intensity of the fighting to access and use this spectrum shows its importance

People and skill make the difference between winning and losing

The war in Ukraine shows the importance of mastering tactical skills in a war of combined arms acquired through training and professionalism

Doctrine and technology must be aligned

- It is not just about armed forces possessing weapon systems, but also about knowing how to use these weapons effectively. Concept and doctrine development, advanced combat training and exercises, experimentation, and product development remain essential to effectively deploy and continue to deploy the combination of various weapons systems in a dynamic environment. The introduction of new weapons and technology only makes this knowledge and expertise more relevant.
- Handling this mix of old and new systems in combination with adaptive deployment is proving to be a major challenge for the Russians, while the Ukrainians are showing themselves to be very capable in this area and are taking advantage of it.

The tactical skills of warfare are decisive in combat

- The war in Ukraine shows the importance of mastering tactical skills in a war of combined arms acquired through training and professionalism.
 - Warfare with tanks, mechanized infantry, artillery, and all the support needed requires a balance between orchestration and freedom and between skill and art. The battlefield is full of sensors that produce vast amounts of data and information. Under time pressure and uncertainty, relevant intelligence must be filtered and analysed from these sensors to make the best decisions. Turning those decisions into effects involves many resources that must be deployed in a synchronised fashion. Being able to plan and direct all those resources requires professional commanders who can rely on the knowledge and skills of those executing them.
 - The range and penetration of sensors and weapon systems makes the modern battlefield much deeper and deadlier than before. Static concentrations of people and resources will be attacked. Ukraine has used dispersion and mobility enhanced by camouflage and deception (both physical and electronic) in response. This results

The range and penetration of sensors and weapon systems makes the modern battlefield much deeper and deadlier than before. Static concentrations of people and resources will be attacked

in thinly occupied frontlines and continuously moving units behind the frontlines. It requires command posts that can act while dispersed and mobile.

- A professional non-commissioned officer (NCO) corps ensures the tactical flexibility and leadership needed to act within the chaotic conditions of the modern battlefield. Individual education and joint unit-wide training are the backbone upon which success is built. This requires a large and continuous education and training effort.
- The integrated performance of Ukrainian units has proven decisive for their success. This means that infantry, tanks, artillery, engineers, medics, maintenance, repairs, and supply must function as one smooth-running and thinking organism.
- Mobilisation on the Ukrainian side has created the required mass and the West (Operation Interflex: the education and training of Ukrainian soldiers in the West) is providing the corresponding education and training effort needed to convert this mass into effective combat power.
- Small composite units, such as the Russian battalion tactical groups, have been an important element of the modernisation of the Russian armed forces. Yet in the invasion of Ukraine, they were not deployed effectively, lost much of their combat power in relatively minor setbacks, and were not embedded in a divisional-army structure from which they were commanded and supplied. Thus, it became impossible for the Russians to act as a combined arms force, while intelligence failed to reach the end-users, and air support could often not be effectively allocated.

Materiel preparations ensure sustainability

The war against Ukraine has so far been an endless series of battles that grind down people and equipment

The war of attrition is merciless

- As in the past, expectations of a short war turned out to be utopian. The anticipated Shock and Awe on the part of Russia did not materialise, nor a decisive first battle. The war against Ukraine has so far been an endless series of battles that grind up people and equipment. This means that much larger stockpiles of ammunition than previously estimated are necessary to sustain the fight.
- In this context, high-quality but expensive and specialised equipment alone provides too narrow a basis for sustainability. The growing cost of high-end modern technological systems makes buying and maintaining only expensive platforms unaffordable and unfeasible in the long run. Especially in a war of attrition, quantity is a quality all of its own. High-quality but low-affordability systems must therefore be complemented by large quantities of cheap and consumable equipment in order for a mix of resources that guarantees combat power over the long(er) term. This means that not only large ammunition stockpiles are needed, but stockpiles of nearly all equipment, spare parts, etc.
- An arms industry organized on a peace footing cannot supply an army during a high intensity war. The capability to increase production must be built-in from the start.
- The mass required for combat requires sufficient numbers of well-trained professional soldiers and reservists. Both Russia and Ukraine cannot escape mobilisation to sustain the war.

Logistics determine whether units are able to fight

- Logistics units and stockpiles of supplies are priority targets. This means that the logistic tail must be able to operate in as dispersed and highly mobile a manner as the manoeuvre units they are supporting. Container transport in the last tactical mile to the frontline – which was arguably possible in the conflicts in Afghanistan and elsewhere that Western fought in over the past decades – is a pipe dream in a more competitive environment.
- Dispersed and highly mobile operations mean many small distribution channels and geographically dispersed delivery points. This requires a logistical concept and system

of units (including logistics command structures) capable of converting huge amounts of logistics data and bulk goods and many (short-lived) distribution points closely behind the front line.

- There is friction between effectiveness and efficiency. Just in time-logistics are fine for the civilian sector, but deadly during warfare. A just in case-approach based on resilience and built-in redundancy is needed.

In conclusion

It is likely that Russia will continue to pose a real threat to European security for at least the next ten to fifteen years

- The war between Russia and Ukraine can still have multiple outcomes. In almost every scenario Russia will remain a formidable military adversary in the future. The Russian armed forces have combat experience, may learn from their failures, and adapt. It is likely that Russia will continue to pose a real threat to European security for at least the next ten to fifteen years.
- The war in Ukraine is not the only template for future wars. After all, war is a many-headed monster. But the combination of the threat and the impact of this type of large-scale, high-intensity conventional war requires preparation for a worst-case scenario.
- European armed forces stand at the start of a period of reconstruction and rearmament. They should draw their insights on strategy, organisation and command, technology and platforms, concepts of operation, and education and training from an analysis of this horrific war on the European continent.