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Introduction

The war in Ukraine has revived interstate warfare in the current strategic practice. This war illustrates the use of various old and new techniques in warfighting, employing both Western cutting-edge and Soviet-era equipment. Different innovations and adaptations have been witnessed across domains. Each war is unique, but it can provide some distilled lessons for learning about the ongoing trends in warfighting and the employment of new and old equipment. Although the experiences of the war in Ukraine are universal, each country selects a set of lessons suitable for their distinctive geopolitical location and strategic situation. This paper explores the lessons that can be learned from the land domain, focusing on the relevance for the potential Taiwan–China conflict.

Taking into consideration modern trends in warfighting, the Ukrainian experience of building fighting power in the land-centric war, asymmetric characteristics of the potential conflict between Taiwan and China and the distinctive features of Taiwanese military geography and military capabilities, this paper arrived at five primary points for consideration. This is not an exhaustive list. However, these considerations provide opportunities to strengthen one's readiness and resilience of fighting power in various warfighting scenarios. The main points outlined in the paper include:

1. Numerical superiority, artificial and critical mass
2. Increased tempo of warfighting, innovation and adaptability
3. Inter-state warfare can involve elements of manoeuvre as well as positional warfare – readiness for both is required to boost adaptability and survivability of one's fighting power. Effective air-land integration to support both is essential.
4. High-intensity land-centric warfare dictates the importance of the terrain
5. People as an asymmetric advantage

Numerical superiority, artificial mass and critical mass

The last two and half years of war have illustrated various considerations regarding numbers and equipment quality. Having less equipment at its disposal, both in terms of Soviet-era stocks and that provided by Western partners, Ukraine has had to focus on combining effects through precision strikes on carefully chosen targets due to the constant scarcity of ammunition and fire delivery systems. In contrast, the Russians have applied the traditional numerical approach of indiscriminate bombing both in terms of artillery fire on the frontlines and the mass long-range bombardment of Ukrainian cities.

On the one hand, Western cutting-edge technologies have confirmed their crucial contribution to the achievement of desired kinetic effects, significantly degrading Russian assets across domains and functions. On the other hand, with numerical superiority Russians could sustain their fires over a longer period of time, covering a wider area if not achieving greater tactical, operational or strategic effects. Consequently, their numerical advantage has been undermined by passive defences, decoys and degrading of their logistics in the rear positions.

The scale of this inter-state war and its protracted attritional character illustrate the requirement of balancing artificial mass (achieved through cutting-edge technologies like improved intelligence, surveillance and reconnaissance (ISR), command and control (C2), and precision characteristics of the materiel) and traditional mass (numerical superiority) or what can be defined as **critical mass** – ‘the ability to rapidly produce and/ or have sufficient numbers of military capabilities to deploy, modify, sustain and integrate into the force structure of a given operating environment according to the operational requirements.’¹

Ukraine managed to overcome its lack of sufficient capabilities across domains with assets from other domains and the mass production of drones, which compensated for the lack of sufficient numbers across functions and tasks. However, while drones are being used for everything from tactical ISR and close air support (CAS) and even air-to-air combat, they do not compensate fully for the more traditional equipment like tanks, ground-based air defences (GBAD) or artillery pieces. Yet, their combination with the more traditional equipment provides more sophisticated and layered effects in the battlespace.

The case of Ukraine illustrates that critical mass can be built rapidly if the military industry was in place prior to the beginning of the war. Furthermore, the capacity to build critical mass would largely depend on the ability of the military industry to reorient from a peace- to a wartime tempo of production and the ability to survive under conditions of ongoing warfighting. Ukrainian solutions have included the dispersal of the military industry, going underground and abroad.

On the Russian side, despite having numerical superiority, continuous mass long-range attacks have illustrated the need for the sustainment of the intensity and tempo, with consequent focus on strengthening both the cutting-edge side of the equipment and cheap mass. This trend is demonstrated in the Russian reorientation toward the mass production of drones. Accordingly, Russia aims to produce 1 million of drones by 2026 and 1.5 million by 2035, with an average annual production rate of more than 13,000 for 2023–2026.²

Furthermore, the draining of Russian ammunition stockpiles and lack of desired results from mass shelling show the requirement to reorientate from the Russian doctrine of mass fire toward more precise strikes, which became evident during the 2023 Ukrainian counteroffensive. Accordingly, the Russian focus shifted to the wider use of drones for reconnaissance and fire coordination and the increased production and use of Krasnopol laser-guided 152-mm shells.³

In this context, the lesson for Taiwan is to focus on building sufficient critical mass across capabilities and domains. Combining both more sophisticated cutting-edge technologies and simpler and cheaper equipment allows to build or renew its mass faster and in the most cost-effective way, if and when needed.

1 Viktoriya Fedorchak, *The Russia–Ukraine War: Towards Resilient Fighting Power* (Routledge, 2024), 18.

2 Pavel Luzin, *Russian Military Drones*. Philadelphia: FPRI, 2023, 23, accessed October 6, 2024. <https://www.fpri.org/wp-content/uploads/2023/11/russian-military-drones-.pdf>.

3 Jack Watling and Nick Reynolds, *Stormbreak: Fighting Through Russian Defences in Ukraine's 2023 Offensive* (London: RUSI, September 2023, 15–19, accessed October 6, 2024. https://static.rusi.org/Stormbreak-Special-Report-web-final_0.pdf.

Increased tempo of warfighting, innovation and adaptability

The increasing tempo of warfighting is not a new trend. It can be traced to the Gulf War, with further intensification during counterinsurgency operations in Iraq and Afghanistan. However, in the war in Ukraine the tempo has increased even further. This has been conditioned by the same reason as in the first two cases – the increase in cutting-edge technologies and innovations across domains, resulting both in significantly more visible battlespace and an increased tempo of warfighting. The proliferation of drones has made tactical ISR and the consequent need for rapid tactical decision-making the reality of this war. Whether it is about coordinating fire from different sources against a moving target or, through the use of drones, identifying enemy movement in the trenches, timing has become a crucial factor in survival and success. Accordingly, the side that adapts fastest to the increased tempo can gain an advantage over the enemy.

During the first year of the full-scale invasion, Ukraine demonstrated targeted '*smart innovations*', taking advantage of app-based solutions. The most prominent of these was the artillery fire coordination app 'Kropyva', which enabled the improvement in the precision and coordination of fire from various sources. It also enhanced the survivability of howitzer batteries by reducing deployment time '*to 3 minutes, the engagement with an unplanned target to 1 minute and the opening of counter-battery fire to 30 seconds*'.⁴ Furthermore, the introduction of Western missiles and artillery combined with Ukrainian shoot-and-scoot tactic proved counter-battery fires to be effective against Russian artillery, which required more time to strike back.⁵

During the last year, the Russians began to mimic Ukrainian practice and focused on reducing the response time of their artillery. They developed and applied the 'Strelets' fire control and communication system, which reduced the response time of their artillery from 20–30 minutes to 2–3 minutes.⁶

The tempo of warfighting is unlikely to slow down; the side that can introduce more disruption into the adversary's decision-making and optimise it for oneself – that is, the side that innovates and adapts the fastest – can gain situational advantage in the battlespace. However, the tempo also dictates that the extent of this advantage will depend on how fast the enemy can adapt and come up with new disruptions.

Inter-state warfare can involve elements of manoeuvre and positional warfare – readiness for both is required to boost adaptability and survivability of one's fighting power. Effective air-land integration to support both is essential.

Although the tempo of war continues to increase, some features of land-centric warfare remain the same – it takes much more effort to regain territory than to hold it. The earlier stages of warfighting were characterised by greater manoeuvring and flexibility in liberating territories temporarily occupied by the Russians. However, with the establishment of the relatively stable frontline, the complexity of gathering significant numbers of equipment for mass attacks against well-dug-in multilayered defences made the price of a mile even more costly, as shown during the Ukrainian counteroffensive of 2023.

⁴ Fedorchak, *The Russia–Ukraine War*, 85.

⁵ Forthcoming – Viktoriya Fedorchak, 'The "Spring Offensive" 2023' in *Russia's War in Ukraine and Modern Warfare: Strategy, Tactics, and Technology*, eds. Mikael Weissmann and Niklas Nilsson (Oxford University Press, 2025).

⁶ Gustav Gressel. *Beyond the Counteroffensive: Attrition, Stalemate, and the Future of the War in Ukraine*. Berlin: European Council on Foreign Relations, January 18, 2024, 15, accessed October 6, 2024. <https://ecfr.eu/publication/beyond-the-counter-offensive-attrition-stalemate-and-the-future-of-the-war-in-ukraine/>

Mechanised assaults remain significantly undermined by minefields, anti-tank guided missiles (ATGMs) and drones used to spot their movement. The first days of the 2023 Ukrainian counteroffensive illustrated that *'immediate losses in equipment were due to a lack of sufficient numbers of critical mass and air support to reinforce the mechanised assault'*.⁷ While mutual air denial showed relative parity in the aerial domain, during the Ukrainian counteroffensives 2023, the Russians gained additional advantage by having a wider use of drones for ISR and attack roles and having improved air–land integration of K-52 helicopters for close air support (CAS) and air interdiction missions.

In the case of Ukraine, the lack of sufficient aerial capabilities over the last two and a half years has resulted in significant pressure on the ground forces. With regard to their mechanised assaults and trenches, this has meant a lack of sufficient air cover and a lack of reach to degrade the Russian's well-established three layers of defence consisting of minefields, many kilometres of trenches, and reinforcement. Under the conditions of relative technological parity, a breakthrough can be reached with the introduction of a completely new technology or new tactics. In a situation where the battlespace is almost completely visible, the former is more likely to have a greater effect than the latter.

High-intensity land-centric warfare dictates the importance of terrain

No war takes place in abstract conditions; in each situation terrain provides challenges and opportunities for both sides. However, defenders always have the additional advantage of knowing their terrain and having the opportunity to use asymmetry and dispersal to a greater advantage than the invading force: *'Despite technological developments, the core of land warfare remains defined by the characteristics of the terrain and the advantage it provides to the defending side in using asymmetry against a numerically superior enemy.'*⁸

Although technologies have evolved significantly, ground warfighting in Ukraine has shown the advantages of the same hills, the vulnerabilities of the open spaces of the same steppe areas, the natural defensive lines, or the digging of defensive trench lines during the war just as during the Second World War. Some trenches were dug so well then, that they only had to be deepened this time. The Russians blowing up dams on various rivers in 2023 provided them with tactical advantage of establishing natural lines of defence.

Besides the natural characteristics of the terrain, the enduring trend is warfighting in urban areas. This tendency is only to become more profound due to the increasing tempo of urbanisation across the world. Urban warfighting is a separate type of land warfare that requires smaller units, greater precision, tactical reconnaissance capabilities and special operations forces training for the ground troops. The Russians lacked sufficient training in urban warfare. They were too heavily armoured. Their tanks and light vehicles were easy targets for Next Generation Light Anti-tank Weapons (NLAW). Furthermore, *'the heavily shelled buildings provided new positions for the Ukrainian Armed Forces (UAF) infantry and snipers to target Russian forces. Urban warfare requires relevant professional training and knowledge of the urban area.'*⁹

7 Fedorchak, 'The "Spring Offensive" 2023'.

8 Fedorchak, *The Russia–Ukraine War*, 198.

9 Fedorchak, *The Russia–Ukraine War*, 96.

Unmanned aerial vehicles (UAVs) have become an integral part of land warfare across different terrains. They are essential for the special operations forces, and ground troops on the tactical level; they deliver munitions and intercept other kamikaze drones; they provide close air support and long-range striking capabilities. UAVs remain the source of cheap mass with versatile functionality. However, their advantages are further multiplied when there is self-sufficiency in their local manufacturing, reducing the vulnerability of supply chains from abroad.

People as an asymmetric advantage

People are one of the significant elements of fighting power. *'The primary source of asymmetric advantage was the Ukrainian people, adaptable and innovative according to the war requirements.'*¹⁰ When technologies fail, or they are scarce, people are the ones to compensate for the shortfalls. In the case of Ukraine, the resilience of the Ukrainian people has contributed to the survivability of the nation under continuous Russian mass attacks on Ukrainian cities and boosting the morale of the UAF on the frontline. There is a strong connection between civilian and military fighting spirit in total war. However, resilience is not built overnight.

The resilience of ordinary people can be built from very basic training in survival activities, providing guidelines on what to do in crises and disaster situations. The adaptability of the Ukrainian people to various challenges has also been boosted by allowing a greater involvement of civil society in problem-solving – whether that involved the development of a smart-phone-based artillery app or an air alert siren app or the digital mapping of areas with access to electricity portable power stations and water supplies during the blackouts. Merging civil and military efforts to find solutions has proven to achieve significant results in the most difficult times.

The obvious military consideration is to increase military personnel across different services and activities. However, the focus should also be on developing the right skills required for the anticipated warfighting. This means up-to-date training on such specialised activities as urban warfare, fighting on different terrains, strengthening skills in IT and electronic warfare, and elements of guerrilla tactics.

One of the greatest strengths for the Ukrainian side was the already established reserves of the Territorial Defence Forces. Reserves are essential for the reinforcement of the war effort. As with every aspect of warfighting or preparation for it, the presence alone of reserves is not sufficient, they need to be constantly trained up to the required military standards and this training has to be of the same quality across different regions and units of the reserves. They should be trained in close-to warfighting conditions to adjust them to the requirements of the upcoming war.

Although a lot has been written about the innovations and adaptability of the Ukrainian military, one of the primary challenges was to find ways of transferring battlespace know-hows across the frontline and different units among the UAF. The development of a relevant centralised function for lessons learned and best practice might be of use in adjusting ongoing training of reserves and newly mobilised for the specifics of the ongoing warfighting.

¹⁰ Ibid, 198.

Conclusion

Overall, it can be concluded that there are various lessons learned from land warfare in Ukraine that can be applied to the potential Taiwan–China conflict. In asymmetric conflicts such as this, the focal point is on having sufficient assets to build and rebuild critical mass in a cost-effective manner. Technologies increase the tempo of warfighting, and the speed of adaptation and innovation allows gaining additional advantage in the battlespace. One needs to prepare for warfighting with elements of manoeuvre and positional warfare. Terrain continues to have a significant role in how and what type of engagements will occur. Urban warfare and the proliferation of drones remain integral elements of warfighting. Properly prepared and trained people can provide an asymmetric advantage. In essence, the core of strengthening the resilience of one's fighting power requires a systematic approach, taking full advantage of one's military geography and national capabilities, and preparations during both peace and war times.



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