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Introduction

This study will critically evaluate defence and international affairs specialist James Bosbotinis' article (2023) titled 'The Lessons of the Ukraine War and its Implications for Artillery,' weighing up its strengths while also providing analysis on the topic of artillery in Ukraine. Bosbotinis' article is an in-depth and well-sourced study of what NATO and its Western allies more generally can learn from the tactics and weapon systems used by both sides of the Russo-Ukrainian war. Presenting an exhaustive analysis of the use of artillery, it evaluates the complementary nature of higher-end precision or guided systems and cheaper unguided conventional weapons. The nature of the war has highlighted the vulnerabilities that NATO countries could encounter if they were to directly engage against Russia. From munitions stockpiles to the risks associated with having large logistical chains, to the ever-increasing importance of intelligence, surveillance, and reconnaissance (ISR), artillery seems to have proven itself to be a key player in the waging of modern warfare. However, in a context that has witnessed the employment of a varied range of weapon systems and their respective tactical use, artillery is only one part of a broader set of lessons that can be drawn from the conflict.

The particularity of Bosbotinis' work stems from his choice to exclusively focus on artillery. Although this approach limits the article in the exploration of other key factors brought to light by the conflict, purely focusing on artillery is a defensible point of view. Often referred to as the 'King of Battle' within the broader military consciousness, artillery has occupied a key role on the battlefield for extended periods of history, and the Russo-Ukrainian war has proven to be no outlier. However, the last two years have shown that Western allies may have underestimated the extent of artillery's relevance on the battlefield, demonstrated by the rapid depletion of artillery shells in Western stockpiles as a result of providing military aid (Siebold & Irish, 2023). Moreover, before Vladimir Putin's full-scale invasion of Ukraine in 2020, Brigadier Ben Barry, senior fellow for land warfare at the International Institute of Strategic Studies and one of the authors widely cited throughout Bosbotinis' article, expressed his concerns that Russian divisions possessed a higher number of gun and rocket artillery than NATO equivalents (House of Commons, 2020). Hence, Bosbotinis engages with an issue directly relevant to transatlantic security and Western allies' preparation for worst-case scenario contingencies. His article is written for the average informed reader, supplemented by illustrations and eye-catching formatting. Due to these factors, along with a flowing style of writing and Bosbotinis' modest but strong array of sources, the piece succeeds in providing a valuable introduction to the specific issue at hand.

Key Observations within Bosbotinis' Article

In his article, Bosbotinis makes a number of key observations collected from the Russo-Ukrainian war on the topic of artillery. Although sceptical about how precisely the military circumstances in Ukraine would translate to a potential Russo-Western confrontation, Bosbotinis (2023) urges that the lessons in artillery tactics be absorbed by key Western actors, such as the British and US armies, hopeful that they will continue to increase their procurement of artillery systems.

As previously mentioned, he also underlines the necessity for large stocks of artillery munition, guided missiles, and precision artillery to meet the exhausting nature of attrition warfare, while emphasising the essential role of ISR capabilities in effectively utilising artillery assets.

From Bosbotinis' perspective, the coupling of these ISR capabilities with precision weapons has emerged as indispensable in conducting effective defence. However, the article touches upon vulnerabilities in this realm which have arisen in Ukraine, as Russian forces have attempted to thwart the effectiveness of Ukrainian high-precision artillery by using electronic warfare (EW) systems (Bosbotinis, 2023). Still, Russia has faced challenges and limitations of its own in the realm of ISR capabilities, leading to difficulties in targeting systems, such as M142 High Mobility Artillery Rocket Systems (HIMARS) and M270 Multiple Launch Rocket Systems (MLRS). Bosbotinis also points out Ukraine's heavy reliance on Arthur radars to locate Russian artillery, whilst Russia employs loitering ammunition, which has unreliable effectiveness on the battlefield. Finally, the article also discusses precision-guided munitions, weighing up their combat value against cost considerations.

Artillery as a Necessary Tool

Bosbotinis hits the bullseye in stressing the key role of artillery in the Ukraine war. Artillery, in what has been witnessed in Ukraine and in other conflicts involving fighting between more conventional armies, is a key tool in adapting to counter enemy tactics and is a top factor in slowing down or stopping offensives (Bosbotinis, 2023; Gressel, 2020). More importantly, artillery is by far the most lethal weapon on the Ukrainian battlefield, inflicting the largest number of casualties on both sides (Rice, 2023). As suggested in the article, the effective use of Ukrainian artillery was the real stopping force that prevented the fall of Kyiv (Bosbotinis, 2023). Most notably, the author underlines its neglect by the mediatic narrative, which, in the early stages of the war, largely focused its attention on the supplied Javelin shoulder-launched ATGMs (Bosbotinis, 2023). Instead, Bosbotinis stresses the sheer scale in which artillery has been used and the effectiveness of its weapon systems, most notably the HIMARS.

However, a parallel argument may be posited regarding the narrative surrounding HIMARS. Although various sources underscore this weapon system's devastating impact on Russian positions, labelling it a 'game-changer' could potentially prove counterproductive (Lopez, 2022). Singular weapons often have a reputation for being decisive in war, reminiscent of the role played by US-supplied Stingers in the USSR's invasion of Afghanistan. It remains highly unlikely that new cutting-edge cruise missiles, such as the Taurus or precision-guided munitions such as the HIMARS, will lead either side to victory (Marquardt et al., 2023). These isolated systems are undoubtedly only components within a much more intricate operational environment (Gady, 2023).

The complex tactical requirements for efficient artillery use represent a greater lesson for Western observers.

For instance, the Russian use of artillery, despite being the central component of most Russian contingents, is highly dependent on the extensive use of fortifications, minelaying, and entrenchment, elements which were also majorly responsible for halting the Ukrainian counteroffensive in the spring of last year (Jones et al., 2023; Ankel, 2023).

As the vulnerability of artillery systems, specifically self-propelled platforms, experiences a concerning surge, its dependence on not just ISR but also appropriate concealment and mobility is as valuable of a lesson as its effective capabilities on the battlefield (Saw, 2023). Similar conclusions were reached by Ukrainian forces, which once again returned to prioritising deep entrenchment in the new year (Hnidy, 2024). Therefore, the primary lesson for European allies does not pertain merely to whether they should prepare themselves for artillery-heavy engagements, but rather to the question of whether they can afford to disregard other systems that could thwart artillery dominance on the battlefield.

Bosbotinis' assertions regarding the imperative for the West to re-evaluate procurement strategies should not be limited to artillery alone. Even though the stopping power of artillery is arguably unparalleled in Ukraine, the prevailing stalemate underscores that artillery alone cannot propel either side to victory (Daalder, 2023; [Wasielewski](#), 2023). This is indicated by Ukrainian requests for systems beyond artillery, emphasising the critical importance of heavy armour and aircraft (Gozzi, 2023; Piper & Macaskill, 2023). Likewise, Poland's 'wake-up call' in defence spending has manifested in plans to equip its land forces with substantial quantities of armour, instead of only artillery platforms (Jones, 2023). Despite criticisms on the efficacy of main battle tanks (MBTs) in Ukraine, recent shifts in Russian armoured doctrine reveal a reimagined role for tanks (Watling et al., 2023). Similarly, in spite of European frustrations with their performance, the strategies employed by Western-trained Ukrainian armoured battalions reflect how the war in Ukraine has inspired transformative changes across all facets of land warfare. Overemphasising artillery procurement, albeit supported by numerical data, remains an oversimplification of the highly intricate nature of joint combat.

Precision-Guided Munitions (PGMs) and Conventional Rounds in Ukraine

Another point of discussion within the article is the lesson Western allies ought to learn regarding the topic of PGMs during the Russo-Ukrainian war. Bosbotinis (2023) stresses the disproportionate effectiveness of precision rounds on the battlefield, however, by tying together numerous articles from the broader literature, he underlines the complementary relationship PGMs have with unguided munitions, as the latter has certainly remained a relevant component in the process of waging modern warfare.

Notwithstanding, Bosbotinis (2023) acknowledges the growing importance of long-range precision fires. After all, the development of these weapons has reduced the potential for collateral damage, while enabling attacks to remain effective when firing from a much greater distance (Acton, 2017). Additionally, far fewer rounds of ammunition are needed to strike enemy targets and, in turn, logistical requirements are eased, a point touched upon by Bosbotinis himself. All things considered and as previously noted, although not necessarily the 'game-changer' to the extent that Ukraine had hoped for in this particular case, PGMs have generally gone a long way in increasing the effectiveness of tactical military operations since their conception (Acton, 2017).

On the other hand, unguided rounds are beneficial when used in sync with their guided counterparts (Bosbotinis, 2023). Instead of engaging in activities such as the striking of munitions depots behind enemy lines like PGMs, these types of rounds have been a linchpin of both offensive and defensive operations in Ukraine. For instance, Russian forces have used unguided rounds to conduct barrage tactics, firing their artillery pieces at Ukrainian positions for extended periods of time to clear a path for the advancement of infantry and mobile units (Davydenko et al., 2022). Thus, Russia has often been able to compensate for ground force limitations due to the capacity of its artillery to fire at a high rate across large distances (Smith, 2023). The by-product of Russian inclination towards this sort of tactic, rather than a PGM-heavy approach, is, without doubt, an increase in civilian casualties and overall destruction, but it has facilitated military success at times (Fasola, 2022). Therefore, unguided rounds should be held in useful yet potentially destructive regard in the minds of Western allies attempting to learn from this conflict.

Lastly, in his article, Bosbotinis (2023) considers another important point which strengthens the need for a complementary relationship between PGMs and unguided munitions: the cost factor. As he notes in his article, any future land campaign relying on precision weapons will inevitably need to be supplemented by a large stockpile of unguided munitions and, even for the world's largest defence budgets, the likes of an Excalibur 155mm guided round are not to be used too lightly, costing upwards of \$200,000 (Ukrainian Military Centre, 2022). In contrast, before the beginning of the full-scale war in Ukraine, the price for one conventional artillery shell was €2,000, but that number has quadrupled since February 2022 according to NATO's Chair of the Military Committee Admiral Rob Bauer (Siebold, 2023). Thus, due to their relatively cheap price in comparison to precision models and their demonstrable significance on the Ukrainian battlefield, conventional artillery rounds should occupy a place within national stockpiles as precision has in no way rendered superfluous the need for mass, as echoed in Bosbotinis' article (2023).

The Role of Intelligence, Surveillance, and Reconnaissance (ISR) in the Realm of Artillery

The role of ISR proves to be crucial in detecting and eliminating enemy artillery. The article makes the point that precision weapons, coupled with ISR capabilities, have emerged as indispensable elements for effective defence (Bosbotinis, 2023).

However, vulnerabilities increased with the extensive use of Russian EW systems, particularly targeting Ukrainian high-precision artillery. In the context of deep and close battles, Russia employed shock-fire tactics, relying on the Krasnopol 152mm laser-guided artillery rounds. Still, Russia has faced challenges in its ISR capabilities, leading to difficulties in locating and targeting systems such as HIMARS and MLRS. Communication issues in identifying and prioritising targets were identified as shortcomings. As previously stated, both the Ukrainian overreliance on Arthur radars for locating Russian artillery and the Russian use of loitering ammunition come with their respective challenges.

The value of precision-guided missiles is acknowledged, but must be balanced against cost considerations and the requirement to maintain substantial stocks.

However, various aspects of ISR in Ukraine could have been developed in order to create a more accurate picture of why Ukraine's intelligence is, in certain fields, superior to its Russian counterpart on the battlefield. In fact, there are some aspects which distinguish the intelligence of Ukraine from that of Russia. One such aspect is Ukraine's use of Unmanned Aircraft Systems (UAS), which has been significant in this conflict, especially in an ISR capacity. UAS have a unique capacity in intelligence gathering, as these systems are capable of gathering intelligence with better image quality than the nearest cheap alternative for Ukrainian scout units, despite unfavourable weather conditions and high speeds (Tech4Humanity Lab, 2023).

Moreover, Russian drone countermeasures have been inadequate until now, with its military lacking both man-portable and mounted anti-drone weapons. This has forced the Russian armed forces to resort to Soviet-era anti-aircraft weaponry, which has had a hard time shooting down nimble drones, allowing Ukrainian UAS capacities to move more freely than expected while gathering intelligence (Tech4Humanity Lab, 2023). This is not to say that Russia is not using the same ISR methods itself; however, it has limited high-tech capacities due to a dependence on imported parts whose supply chain has been cut by sanctions. Thus, microelectronics must either be produced illicitly in lower quantities by companies run and established by Russia's secret service or acquired alternatively (National Crime Agency, 2023). The purchase of Iranian loitering munitions is a prime example of the latter (Watling et al., 2023).

One last aspect that could have been mentioned in the article is the resistance movements and their role in gathering intelligence for artillery reconnaissance. In Russian-occupied territories, Ukrainian resistance movements are significant and create human intelligence networks (Danylyuk, 2023). Their intelligence gathering can be effective as these people can quickly withdraw after carrying out an action, while not posing any risk of demasking a whole spy network if captured. Although they are often trained by Ukrainian special services, the risks they pose to their network are significantly lower compared to conventional intelligence personnel (Watling et al., 2023).

Implications for Europe

As determined in the previous sections, lessons learnt from both sides of the conflict have resonated deeply in European defence strategy and industry.

Many European countries, impressed with the performance of PGMs on the battlefield, have expressed interest in procuring US-made HIMARS or developing their own models (Peck, 2023). Poland, for example, agreed to purchase 18 HIMARS along with an ample supply of PGMs worth \$10 billion from the United States (Defense Security Cooperation Agency, 2023).

However, in terms of conventional artillery munitions, the artillery-heavy nature of combat in Ukraine has forced states across the old continent to rethink their strategy due to a clear lack of preparation in this area. Western artillery shells have been depleted at an irreplaceable rate by the continuous aid provided to Ukraine (Siebold & Irish, 2023). This has prompted some reactions by the EU and its Member States. For instance, the EU adopted the Act in Support of Ammunition Production (ASAP) in mid-2023, agreeing to send further rounds of ammunition to Ukraine, to jointly procure one million rounds of them, and to ramp up production capacity within the defence industry (European Parliament, 2023). Calls have also been made to address the lack of standardisation of artillery shells. However, this seems to be an area in which rapid change has been slow and may continue to prove challenging moving forward due to protectionist tendencies among NATO allies (Siebold, 2023). In learning the lessons of the Russo-Ukrainian war, particularly as it pertains to the significance of artillery combat, there is a need for Western allies to increase their efforts in the domains of standardisation, production, and procurement in order to create prepared and diverse national stockpiles.

Regarding ISR, there is a shift occurring in the European security framework, as European intelligence agencies redirect their efforts towards the gathering and provision of intelligence to the Ukrainian armed forces (Lindley-French, 2023). This poses a significant strain on foreign intelligence services since the nature and extent of the Ukraine war are largely unprecedented. This is considerable when taking into account all the resources employed by intelligence services and all the different areas they need to address, such as Russian supply chains, the assessment of sanctions' effectiveness, and Russian recruiting efforts (Schmitt et al., 2022).

In any case, it is imperative to determine the impact of the conflict in Ukraine on the evolution of domestic intelligence within European nations as well. For the first time, Russia is using European networks to smuggle electronic components used for drone production into the country (Cook & Seddon, 2023). Moreover, Russian spy networks in unoccupied Ukraine send their intelligence in European border states, such as Poland and Romania (Watling et al., 2023). These actions, among extensive efforts to combat disinformation, represent further strains on domestic intelligence agencies (Dov Bachmann et al., 2023). Consequently, the Western intelligence community has to develop careful risk management and prioritisation mechanisms to stay on top of the additional intelligence strain posed by the Ukraine conflict (Păiuș, 2022). Thus, how European countries address the implications for artillery tactics will be highly dependent on such re-evaluation of intelligence and other elements, which dictate the strengths and vulnerabilities of cross-domain operations.

The conflict in Ukraine has been the catalyst for a notable reassessment of military capabilities among European nations, prompting a strategic focus on the enhancement of land force arsenals beyond traditional artillery considerations. As the dynamics of modern warfare continue to evolve, European countries are increasingly recognising the need for diversified and adaptable land forces. This shift encompasses advancements in different areas, such as portable EW systems, armoured vehicles, and interoperable platforms (European Defense Agency, 2023). By recognising the importance of agility, resilience, and technological sophistication, European nations are investing in the modernisation of their land force arsenals to better address the challenges posed by asymmetric threats (European Commission, 2023). This strategic realignment underlines the importance of a comprehensive approach to defence, which Bosbotinis (2023) arguably falls short of describing in his focus on artillery implications for the US and UK.

Conclusions

Overall, in his article, Bosbotinis (2023) offers a level overview of what has become a significant battleground within the broader Russo-Ukrainian war: the realm of artillery. He succeeds in his analysis in a variety of ways, including but not limited to his observations on the deep consequences of artillery use in Ukraine, the key role that PGMs continue to play in combination with a complementary conventional munitions arsenal, cost considerations of such equipment, and the importance of enhanced ISR capabilities to improve artillery's effectiveness on the battlefield. For this reason, Bosbotinis' article (2023) acts as a useful piece in dissecting the lessons of the broader Russo-Ukrainian puzzle. However, there are certain topics where Bosbotinis could have pushed further to produce an even more pertinent picture. One of these is his lack of research as to the impact of the conflict beyond just its belligerents. Thus, in addition to the analysis from a Russo-Ukrainian perspective, the article could have explored the consequences that the current use of artillery has had on European stockpiles or how the use of ISR within the framework of the war has consequences on ISR in European states.

Another point of emphasis is the predominance of an Anglo-American perspective in the article (Bosbotinis, 2023). The war has primary implications in its immediate vicinity and naturally has lesser consequences on other states across the globe, such as the United Kingdom and the United States. Although, regardless of this narrow scope, many relevant points are brought up, greater attention on a continental European perspective, particularly of bordering states, such as Poland and Romania, would have been appreciated.

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