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The Asymmetries Generated by New Weapon Systems and Their Role in Achieving Success on the Battlefield. The Impact of HIMARS on the Conflict in Ukraine

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Abstract

The advent of new weapon systems, which integrate the latest technologies, is transforming the battlefield and redefining the character of contemporary modern warfare. The recent armed conflicts in Syria, Yemen, Nagorno-Karabakh, and Ukraine, by their complexity, serve to illustrate the diversification of threats and the adaptation of military capabilities to counter them. Regardless of the type of conflict, success on the battlefield depends on the ability to gain an advantage over the enemy and exploit it. Such an advantage may be derived from the realization of asymmetries on the battlefield, which may be generated at all levels of military operations. The equipping of the Ukrainian forces with the HIMARS system in the summer of 2022 has given them a significant position of advantage, creating a number of tactical and operational asymmetries. In this context, the objective of this research is to identify the asymmetries generated by the HIMARS system and to determine how they contributed to the battlefield success. The key findings are of significant value due to the fact that most NATO member states, including Romania, are making efforts to strengthen their HIMARS capabilities.

Keywords:
contemporary battlefield; new weapon systems; tactical and operational asymmetries; position of advantage; HIMARS.

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The war in Ukraine, which is characterized by extreme brutality and has significant implications for the future of European security, can also be viewed as a conflict characterized by asymmetries. These asymmetries are evident in the operations of both parties, manifesting in the utilization of all instruments of state power (diplomatic, informational, military, and economic), with consequences for both Russian and Ukrainian society. From a strategic standpoint, the Russian Federation possesses the capacity to engage in full-scale warfare, conducting strikes and exerting influence across all operational domains and throughout the entire territory of Ukraine. Conversely, Ukraine exhibits a constrained capability to launch strikes on Russian soil and a notable deficiency in its capacity to operate in maritime environments, outer space, and the electromagnetic spectrum, when compared to its adversary. However, in contrast to the Russian Federation, Ukraine has consistently received support from several Western states, which have provided the Ukrainian state with a significant military resource for the war effort. Additionally, the Russian Federation is subject to a number of economic sanctions that have a significant and long-lasting impact on Russian society as a whole. Furthermore, the level of determination and motivation among the population differs. The Ukrainian people are engaged in a defensive war against an unprovoked aggressor, which creates a stronger will to fight than that observed among the Russian military (Ryan 2023).

From an operational point of view, the Ukrainian forces displayed a notable capacity to adapt to the evolving demands of the battlefield. Despite facing numerical superiority and technological disadvantages, the Ukrainian commanders were able to leverage Western weapon systems, combat techniques, and equipment to their advantage (Reynolds and Watling 2022). The introduction of the M142 HIMARS system into combat and exploitation provides a relevant example in this regard. Its engagement in the summer of 2022 generated a series of asymmetries that placed the Ukrainian forces in a position of relative advantage. In this context, the principal objective of this study is to determine the extent to which the HIMARS tactical-operational multiple launcher missile system contributed to battlefield success by creating asymmetries at the tactical and operational levels of operations. In order to direct the research activities and meet the proposed objective, a series of research questions were formulated:

- What has been the impact of HIMARS on the tactical and operational levels of military operations?
- What was the impact generated by the deployment of HIMARS for the development of the operational asymmetries?
- What role did the operational asymmetries generated by HIMARS play in determining the success of military operations on the battlefield?

The study considers the period between the second half of June and the end of September as a temporal framework, coinciding with the planning, preparation, and execution of the Ukrainian counter-offensive in Kharkiv in the autumn of 2022. The research findings were obtained through a systematic analysis of satellite images,

which revealed temperature anomalies in the Donbas and Herson areas of operations. By interpreting and comparing images provided by NASA's *Fire Information Resource Management System*, it was possible to identify trends in the conduct of operations, while also highlighting the asymmetries achieved by the Ukrainian armed forces, which were likely the result of the use of HIMARS. The doctrinal model of operation of the Russian forces and the technological characteristics of the HIMARS system empirically validate the results obtained. However, it should be noted that the information on the conduct of operations on the Ukrainian front and the HIMARS system's deployment may be subject to alteration. This is due to the insufficiency of data, the need to protect certain information, or the tendency of both combatants to distort it in order to influence and mislead.

Advantage position and operational asymmetry

In a conventional armed conflict between two opposing forces, the aspiration to gain the advantage is a constant and fundamental objective. This advantage can be achieved at all levels of military operations. Such an advantage is not permanent and can be exploited by opposing forces, resulting in a similar advantage for them. Failure to exploit an advantageous position can result in its alteration, which, over time, can become a position of vulnerability. At the strategic level, advantage can be quantitative and qualitative in terms of economic resources, national and international political support, available forces and capabilities, or the contribution of allies. The quality of leadership and the will to fight are factors that can constitute a position of advantage regardless of the level of operations. At the tactical level, advantage is often defined as the ability to gain a superior position in relation to the enemy, whether in terms of spatial, temporal, or procedural advantage. This can be achieved through the control of a key point in the terrain, the attainment of numerical superiority in specific phases of the operation, the misleading of the enemy, the exploitation of terrain and weather characteristics, or the realization of information superiority.

The advantage is frequently the result of operational asymmetries. Asymmetries manifest in the form of disparate operational approaches employed by combatants. Such asymmetries may be physical in nature, manifesting as the exploitation of new technologies or weapons systems with superior technical and tactical characteristics, or procedural in nature, involving the engagement of the enemy in a manner that deviates from expectations. Both types of asymmetries facilitate surprise, with the implementation of this principle of army combat creating prerequisites for success on the battlefield. Furthermore, they generate operational dilemmas for the enemy, and the greater the number of such dilemmas, the greater the number of advantageous positions (Department of the Army 2017, 1-19)

The concept of advantage, regardless of its nature, is relative. Consequently, the attainment of such a position does not necessarily guarantee success. In the Winter

War (November 1939-March 1940), the Soviet forces enjoyed a decisive advantage in terms of strength, combat technique, and armaments. However, the Finnish army, despite being the weaker force, was able to hold its ground for several months by employing asymmetric tactics and exploiting the characteristics of the terrain. In contrast, the German armored forces, which were operating according to an innovative doctrine, managed to surprise the French army and defeat it in a matter of weeks in the spring of 1940. Operation Desert Storm (1991) provides the clearest illustration of how success hinges upon exploiting operational asymmetries. The rapid and decisive victory achieved by the international coalition against the Iraqi armed forces was made possible by the integration of advanced new weapons systems under the overarching Big Five concept (Ortiz 2021). The most illustrative example of the variable nature of advantage can be observed in unconventional conflicts, where asymmetries render traditional advantages inconsequential while simultaneously creating new ones. Despite technological advances and superior firepower, U.S. forces were compelled to withdraw from Vietnam in 1973, suffering a strategic defeat at the hands of the Vietcong. Similarly, the mujahideen guerrillas, employing unconventional tactics, gradually eroded the combat strength of the Soviet 40th Army in the Russo-Afghan conflict of 1979-1989. A similar sequence of events occurred approximately a decade later, when NATO forces withdrew from Afghanistan and the Taliban subsequently assumed control of the country.

The contemporary geopolitical landscape has highlighted the necessity to re-examine the efficacy of particular armed combat operations (Scrogin 2019). The necessity of attaining and exploiting advantage remains a fundamental principle, and operational asymmetries continue to be a significant factor in achieving success. Ukraine has demonstrated this through the implementation of a distinct command philosophy and the exploitation of innovative tactics and operational procedures, which have enabled it to effectively counter a quantitatively superior force (Aliyev 2022). Western weapons systems have constituted a factor that has provided the Ukrainian forces with a tangible tactical advantage, creating opportunities for them to launch attacks against the enemy. In this regard, regardless of how the conflict progresses, we are interested in the effects of the recently introduced weapons systems, including the M142 HIMARS strike complex.

Asymmetric effects generated by the M 142 HIMARS system in the Donbas area of operations

Over the past two decades, the probability of conventional armed conflict has risen considerably. The ongoing conflicts in Georgia, Lebanon, Ukraine, and Nagorno-Karabakh serve to illustrate this point. Furthermore, the risk of non-conventional armed confrontation is also considerable, as evidenced by the ongoing conflicts in Yemen and the Gaza Strip. The advent of new technologies has led to the development of advanced weapons systems, which are being deployed in the context of modern

conflicts. These developments present an opportunity to test and validate the latest generation of anti-tank systems (Spike NLOS, FGM-148 Javelin, NLAW), kamikaze drones (Swichblade, Shahed), strike-capable drones (Bayraktar TB 2, Orlan-10), and the M142 HIMARS artillery and missile system (Johnson 2022).

In a press release dated 15 July 2022, the U.S. Department of Defense announced the supply of 12 M142 HIMARS systems to Ukraine. The press release stated that these capabilities would enable Ukrainian forces to strike enemy command points, high-precision search and strike systems, installations, and facilities, ammunition, or fuel-lubricant depots (Lopez 2022). The HIMARS system represents a distinctive, highly effective capability that strategically combines the advantages of extended range, high accuracy, and mobility. This has the significant impact of reducing the Russian forces' artillery advantage (Kalin and Michaels 2022). The strike systems were introduced to the Ukrainian forces at a time when the Russian Federation forces were assuming the initiative in operations in Eastern Ukraine, specifically in the Donetsk and Luhansk regions. Subsequent to the capture of Sieverodonetsk and Lysychansk, the Russian forces augmented their offensive operations in the direction of Bakhmut-Kramatorsk, concurrently with extensive envelopment maneuvers from Lyman (North) and Horlivka (South), with the objective of encircling the Ukrainian forces in the area of Kramatorsk (Hird, Stepanenko *et. al* 2022). In accordance with the findings of the Institute for the Study of War (ISW), the Ukrainian Armed Forces (UAF) initiated the utilization of American M142 HIMARS systems, successfully striking a number of pivotal targets belonging to the Russian forces (Hird, Mappes *et. al* 2022).

In light of the aforementioned information and the primary objectives of this weapon system, it is estimated that HIMARS was employed in support of the forces engaged in the Donbas area of operations with the objective of impeding the advancement of Russian forces along the Bakhmut-Kramatorsk offensive axis. A number of satellite images captured by the Forward-Looking Infrared Radar (FIRMS) system in the Lyman - Bakhmut - Horlivka contact zone have revealed the presence of several thermal anomalies within the area of operations at the contact, as well as thermal anomalies in the rear of the Russian forces. The thermal anomalies are characterized by a high thermal footprint, which can be temporally and spatially delineated with the aid of GIS (Geographic Information System) tools. By taking 6 July 2022 as a reference date, it can be observed that there is a high frequency of thermal anomalies along the front line, which are also of high intensity. The thermal anomalies indicate elevated temperatures at the ground level, which, according to experts, are caused by the intense firing of artillery and rocket systems. The anomalies occur in both the area of the points of origin (POO) and the area of the points of impact (POI) of the hits. Consequently, the analysis of the thermal spectrum of the contact area indicates that on 6 July, Russian forces sustained an intense artillery barrage, most likely in order to shape a future offensive operation.

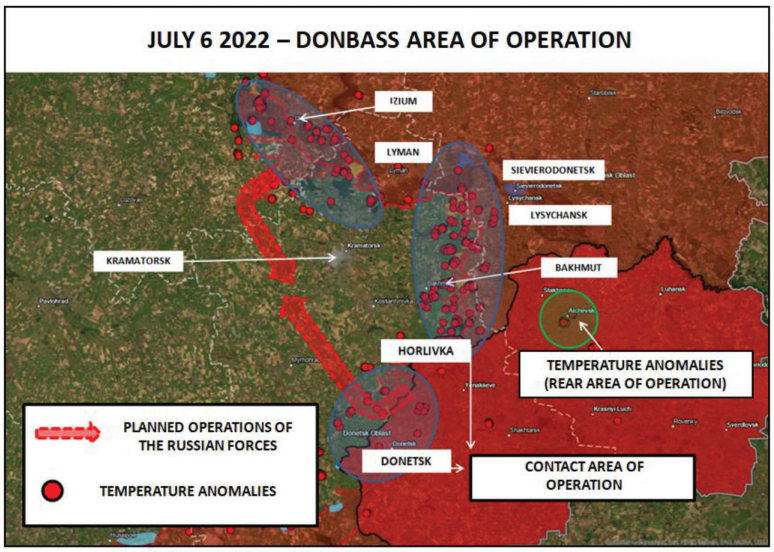

Figure 1 Analysis of thermal anomalies on July 6, 2022
Source of satellite image with thermal anomalies: FIRMS (Fire Information for Resource Management System)/NASA, ESRI, Maxar, Earthstar Geographics, https://www.understandingwar.org/

The analysis of satellite imagery from the period following 6 June 2022 indicates a gradual decline in the thermal anomalies. This is evidenced by the data presented in Figure No.2, which shows that the anomalies are significantly reduced on 14 July in comparison to the thermal spectral image of 6 July. Based on this information, we can make the following estimation:

- there was a notable reduction in the intensity of artillery fire in the contact zone between 9 and 14 July 2022;
- one of the reasons for the reduction in thermal anomalies caused by artillery fire is the decrease in the quantity of ammunition available to the Russian forces to support their offensive actions;
- it seems reasonable to conclude that the introduction of the HIMARS system in combat allowed the Ukrainians to strike at the main lines of communication and the ammunition depots of the Russian Federation forces located on the tactical depth of the maneuver brigades and divisions; the thermal anomalies that have been recorded in the rear zone of the combat device of the Russian units appear to confirm the hypothesis that the logistics facilities have been hit;
- the necessity to impede the advancement of Russian forces along the Bakhmut-Kramatorsk axis is likely to have been the primary factor in the extensive deployment of the HIMARS system in this operational area; the variations in thermal anomalies observed empirically appear to corroborate this hypothesis;
- the deployment of the HIMARS system has had an asymmetric impact, resulting in the culmination of the Russian forces' engagement along the primary offensive axis, Bakhmut-Kramatorsk.

On 15 July, there are several indications that Russian forces are intensifying their preparations to resume the offensive in three main directions converging on the

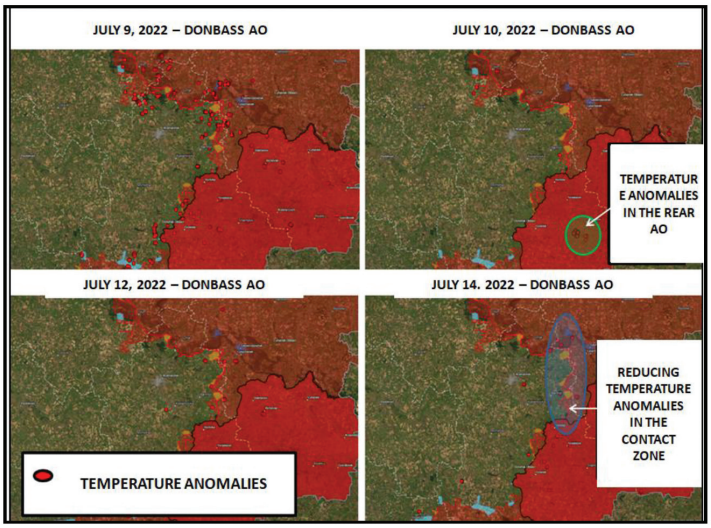

Figure 2 Thermal anomaly analysis from July 9-14, 2022
Source of satellite images of thermal anomaly: FIRMS (Fire Information for Resource Management System)/NASA, ESRI, Maxar, Earthstar Geographics, https://www.understandingwar.org/

city of Kramatorsk. This is with the aim of encircling Ukrainian forces in the so-called "cauldron" formed between Yizum, Bakhmut, Horlivka, and Donetsk. At this juncture in the military campaign, the city of Kramatorsk remains a key objective in the Donbas region. The capture of Kramatorsk would have constituted a significant milestone in the broader strategic objective of the Russian Federation to "liberate" the two breakaway provinces (Hird, Mappes *et. al* 2022). At the time, Western experts had reservations about the capacity of Russian forces to concentrate sufficient combat power to breach Ukrainian defences. The deployment of HIMARS systems in combat has served to reinforce these concerns, with military specialists anticipating the sustained targeting of communication lines, command points, and, in particular, concentrations of logistical resources (Ryan 2022). The analysis of satellite imagery from 15-20 July 2022 reveals the progression of thermal anomalies in the Donbas area of operations. Based on this analysis, it can be concluded that between 15 and 16 July, the Russian Federation forces increased the intensity of their strikes in the contact zone, indicating a probable preparation for further offensive actions. The thermal anomalies observed in the rear area of the Russian forces' combat device are likely to be the result of strikes on ammunition depots, as evidenced by the subsequent fire and anomalies in the thermal spectrum (see Figure No. 3).

The Russian forces continued their offensive operations on 17 July, but these were unsuccessful. By 18 July, the analysis of thermal anomalies in the contact zone indicated that the intensity of the Russian forces' offensive was diminishing. In conclusion, it can be stated that the offensive actions of the Russian Federation forces on 15-20 July 2022 have reached their peak as a direct consequence of the lack of resources, in particular artillery ammunition. It is highly probable that since 18 July, the quantity of ammunition available to the contact forces has been significantly reduced as a result of the interception and obstruction of ground communication lines in the rear area, as well as the destruction of ammunition depots.

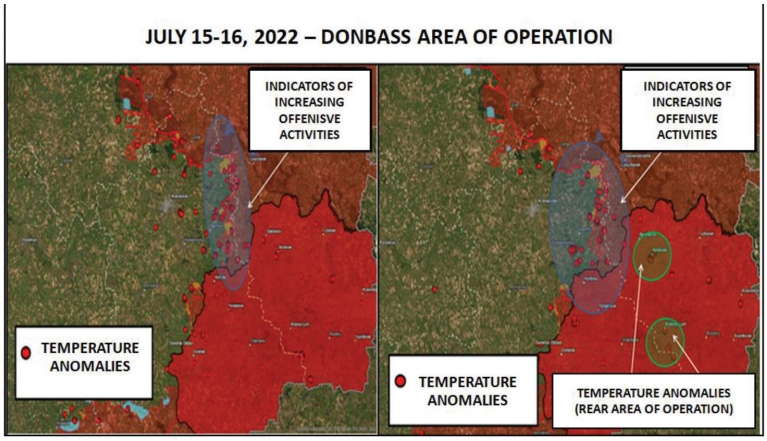

Figure 3 Thermal anomaly analysis conducted on 15-16 July 2022
Source of satellite images of thermal anomaly: FIRMS (Fire Information for Resource Management System)/NASA, ESRI, Maxar, Earthstar Geographics, https://www.understandingwar.org/

The effective utilization of HIMARS systems enabled the Ukrainian forces to achieve their tactical objectives in the Donbas area of operations. These included the blocking of offensive actions in the Bahmut-Kramatorsk direction and the creation of conditions conducive to an offensive. The constant targeting of rear lines of communication, logistic depots, training and concentration areas, and Russian command points resulted in the creation of tactical asymmetries that contributed significantly to the success of the Ukrainian forces. These asymmetries manifested in the capacity to engage vulnerable targets with enhanced precision, at extended ranges, and with greater efficacy than analogous systems operational within the Russian armed forces. The system's inability to counter both the munition and the platform represents another tactical asymmetry with decisive implications for achieving success. Consequently, the GPS-guided projectile-reactive munitions with a range of up to 80 km enabled the targeting of the logistic system of enemy regiments

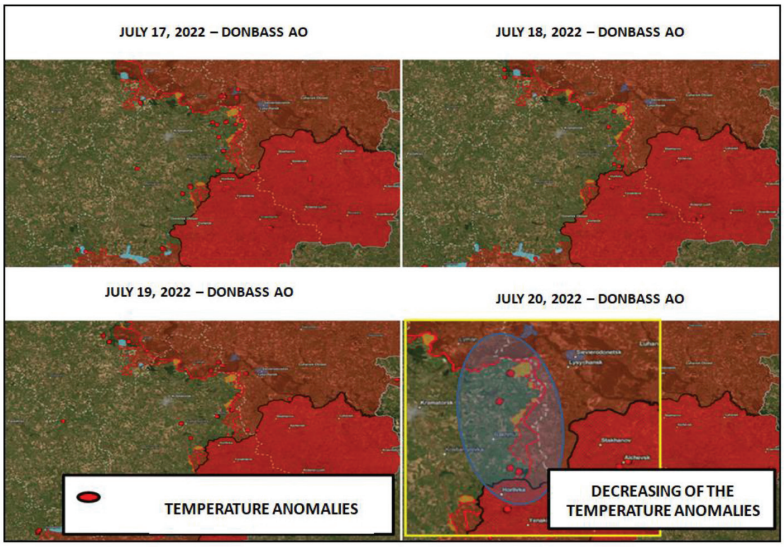

Figure 4 Thermal anomaly analysis conducted between the 17th and 20th of July, 2022
Source of satellite images of thermal anomaly: NASA/FIRMS (Fire Information for Resource Management System), ESRI, Maxar, Earthstar Geographics, https://www.understandingwar.org/

and maneuver brigades situated at a distance of 25-40 km from the front line. By conducting brief incursions, HIMARS systems were capable of striking targets at distances of up to 60-70 km, encompassing the areas of maneuver divisions' logistic deployment within the system's operational range (Ponomarenko 2022). The Russian forces' command and control system was the primary target of the combined assault on Ukrainian forces, with HIMARS playing a key role in the destruction of vital command infrastructure. The strategic targeting of high-level command nodes and the elimination of numerous officers and generals not only disrupted the Russians' command and control capabilities but also contributed to the overall success on the battlefield (Beagle, Slider and Arrol 2023). Finally, the Ukrainians have exploited the inefficiency of information security operations conducted by Russian forces, utilizing HIMARS to strike training and accommodation facilities. This asymmetry has had a significant impact on the morale of Russian troops, further contributing to the erosion of trust within the chain of command (Kirby 2023).

Asymmetric effects generated by the M 142 HIMARS system in the Herson area of operations

The Ukrainian Armed Forces continued to successfully employ M142 HIMARS systems throughout August 2022, utilizing them to shape the battlespace and create a range of asymmetric effects. The strikes conducted by these systems were designed to degrade the logistical system of Russian Federation forces at the tactical and operational levels. This was achieved by striking a range of strategic targets, including ammunition depots, command points, supply and refueling points, bridges over waterways, airfields, reserve concentration districts, and key points on the ground. The objective was to disrupt enemy lines of communication (Kalin and Michaels 2022). The creation of these effects was intended to achieve the objectives set out in the offensive operations conducted in the Herson and Kharkiv operational areas. The intensification of strikes in the rear area of Russian forces in Herson resulted in the transfer of some Russian forces from the Kharkiv area of operations. This facilitated the success of the offensive operations carried out by Ukrainian forces in this direction in early September. Concurrently, the systematic targeting of forced crossing points and logistical hubs in the Herson area caused confusion among Russian commanders regarding the primary direction of the effort. The relocation of the reconnaissance effort from Kharkiv enabled the Ukrainian forces to concentrate sufficient resources in the area to impede the enemy's activities, which ultimately contributed to the success of the offensive operation. Figure 5 illustrates the striking of the primary crossing points (permanent and temporary) over the Dnieper River utilized by the Russian Federation to resupply forces on the right bank of the river.

The research findings indicate that this was feasible only through the rapid deployment of Ukrainian armed forces from the Mykolaev region and the utilization of HIMARS systems to neutralize the targets. Given the necessity of executing high-

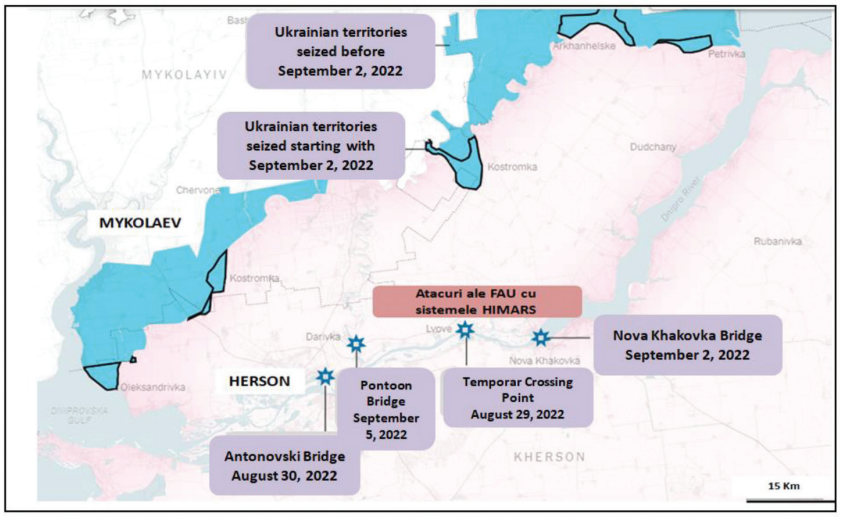

Figure 5 Hitting the crossing points over the Dnieper used by Russian forces
Image source: https://www.nytimes.com/interactive/2022/world/europe/ukraine-maps.html

precision strikes to achieve the desired effects, it is notable that the forces in question had various sensors in the vicinity of the target. These were used to provide the coordinates and maintain positive identification (PID), as well as to perform target effects assessment (BDA). Figure 6 illustrates the range capabilities of the HIMARS system. In the period under consideration, GMLRS-type munitions were employed, whereas ATACMS munitions were not available to the Ukrainian forces.

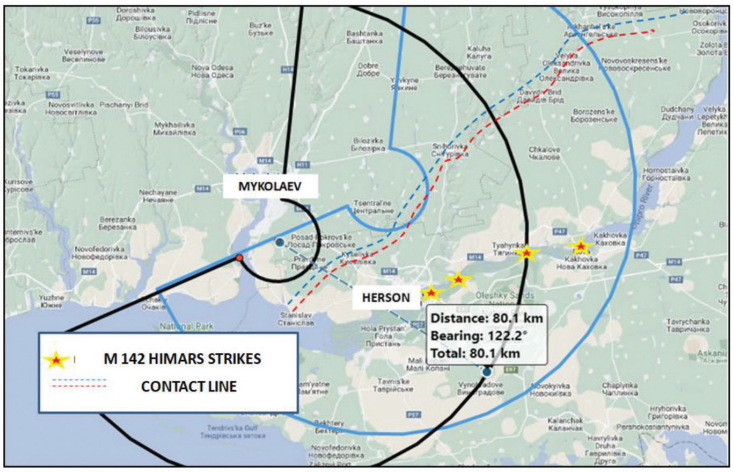

Figure 6 HIMARS system's possibilities of action in the Herson area of operations
Note: the processing was done with the ArmyMap application accessed at https://www.map.army/

Conclusions

The analysis conducted led to the generation of results that, by virtue of their consistency, provide answers to the research questions. The effects generated by the American-origin M142 HIMARS system facilitated the implementation of a maneuver approach to operations, allowing the Ukrainian forces to strike at the enemy's

vulnerabilities, affecting both the physical and psychological components of their combat power. In consideration of the assessed time period, it can be observed that the operational asymmetries generated by the combat engagement of the HIMARS system enabled the Ukrainians to gain an advantageous position, concomitant with the disintegration of the command and control system of the Russian armed forces and the isolation of their forces. By striking at the ammunition depots situated at the tactical depth of the Russian forces' defensive perimeter, the Ukrainian forces were able to inflict consistent and significant damage to the advantage held by the Russian Federation in terms of artillery capabilities. Furthermore, by methodically targeting the crossings over the Dnieper, the Russian forces' supply capacity on the right bank of the river was gradually reduced. The impact of the HIMARS systems in the Herson area of operations contributed to misleading the Russian forces about the commencement of another large-scale operation in the Kharkiv area of operations. The redeployment of Russian forces in the north to counter the potential threat in the Herson area created the necessary conditions for a successful Ukrainian counteroffensive in the Kharkiv area. Furthermore, the sustained pressure on Russian forces in the Herson area of operations, coupled with the interception of their lines of communication, prompted the Russian Federation's political and military decision-makers to withdraw all forces on the left bank of the Dnieper by the end of October 2022. The Russian withdrawal South of the Dnieper, as well as the success of the Kharkiv counteroffensive, can be attributed to the effective exploitation of HIMARS strike systems. The analysis of resource imagery highlighting thermal anomalies in contact zones provides empirical results that validate the effectiveness of those firing systems and their ability to generate tactical asymmetries.

The adaptation process has enabled the Armed Forces of the Russian Federation to modify their operations in a manner that mitigates the impact of HIMARS systems. Over the past two years, tactical adaptations have manifested at both procedural and technological levels. In terms of tactics and procedures, the Russian forces have deployed their districts and logistic bases outside the HIMARS range. Furthermore, measures have been implemented to disperse forces outside the designated contact area and to minimize the multispectral footprint of command points. In terms of technological adaptation, electronic warfare systems have been calibrated to affect the precision and accuracy of munitions. The combination of air defense and EW capabilities has resulted in a notable reduction in their overall effectiveness. However, the continued deployment of HIMARS systems on the battlefield in Ukraine has demonstrated their continued lethality. Despite the reduced effectiveness of these systems, the Ukrainian Armed Forces have employed innovative tactics and misleading operations to create and exploit windows of opportunity, thereby overcoming the multiple layers of defense deployed by Russian Federation forces. It can be concluded that these versatile systems have the potential to continue to serve as combat power multipliers in the future, thus contributing to success on the battlefield.

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