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The Impact and Consequences of the War in Ukraine on Military Space Policies and Operations

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The war in Ukraine has shed light on the strong added value provided by space solutions for military operations on the ground. In particular, the major involvement of private actors in the delivery of data to Ukraine has demonstrated that private space companies will likely become key actors in future conflicts. This raises important questions for decision-makers, who need to strike a balance between the benefits stemming from such a vibrant private space ecosystem while avoiding total reliance on these actors and designing necessary measures to protect them.

KEYWORDS: space defence, war in Ukraine, commercial space companies, counterspace capabilities

Az ukrajnai háború hatása és következményei a katonai űrpolitikára és műveletekre

Az ukrajnai háború egyértelművé tette, hogy az űrtechnológia komoly hozzáadott értéket jelent a szárazföldi katonai műveletek számára. Különösen a magánszereplők jelentős részvétele az Ukrajnába irányuló adatszolgáltatásban világított rá, hogy az űriparban tevékenykedő magánvállalatok valószínűleg kulcsfontosságú szereplőkké válnak a jövőbeli konfliktusokban. Mindez fontos kérdéseket vet fel a döntéshozók számára, akiknek egyensúlyt kell teremteniük a virágzó magán-űrökoszisztémából származó előnyök és az ezen szereplőktől való teljes függés között, ugyanakkor meg kell tervezniük a védelmükhöz szükséges intézkedéseket.

KULCSSZAVAK: űrvédelem, ukrajnai háború, kereskedelmi űrvállalatok, kozmikus elhárító képességek

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Introduction

On February 24th, 2022, Russia started a full-scale war against its neighbour, Ukraine. Since then, the conflict has had considerable consequences on international relations and has impacted many sectors of the economy (e.g., energy, food production, etc.). Contrary to most of the conflicts since the start of the 21st century, which were opposing expeditionary forces to guerillas, the war in Ukraine is a "traditional" conflict witnessing the clash between two states and their armed forces. Interestingly, the space dimension has been a major component of this conflict and has gone beyond the classical use of GPS for navigation or precision-guided weapons. In this context, the employment of space solutions, and the conditions surrounding this use, in particular the major role of private actors, have created valuable lessons that will impact future conflicts.

The space dimension, a key factor of the war in Ukraine

Space solutions have enabled a lot of activities and operations related to the Ukrainian war. To better understand the importance of their role and influence, a few examples illustrating their use can be provided.

First, in the months preceding the start of the conflict, the U.S. company Maxar published several pictures documenting the gathering of Russian troops at the border. These pictures were used by U.S. authorities to corroborate their other sources of information and convince their partners and public opinion that Russia was preparing a large-scale attack against the country.[1]

On the first day of the invasion, a cyberattack, since then attributed to Russian hackers, targeted the telecommunications satellite KA-SAT. The spacecraft belonged to the U.S. company Viasat and a part of its capacity was used by Ukrainian forces to conduct their operations. The attack also had ripple effects in other European countries, for instance in Germany, where thousands of wind turbines, which were managed through the satellite, stopped working.[2] Similarly, Ukrainian cyber activists claimed that they disrupted Russian communications satellites used by Russian military forces[3]. Cyberattacks, due to their relative simplicity and cost-efficiency, are therefore tools that are appealing to both sides of the conflict.

A few weeks after the start of the war, the Ukrainian government called to SpaceX[4] to provide access to its Starlink system to retrieve communications capabilities for the military and the population. Terminals were quickly shipped and Ukrainian troops used the satellites to communicate among themselves and better coordinate their offensives, but also to pilot and retrieve information from drones. However, at the end of 2022, SpaceX decided to curb some capabilities of the service due to disagreements over the way its satellites were used, especially in the case of

1 McLeary 2021.
2 Poirier 2021.
3 Petkauskas 2022.
4 Fedorov 2022.

"offensive purposes"[5] (e.g. to support lethal drone attacks). Similarly, it was recently revealed that SpaceX turned down the Starlink network over Crimea to prevent a major Ukrainian attack against the Russian navy.[6]

During the conflict, commercial remote sensing companies have also provided a wealth of data to Ukraine, through allies or directly, including for free. Interestingly, the quick development of commercial imagery companies in recent years have allowed to diversify the type of data provided beyond the "traditional" optical visible imagery. Therefore, Ukraine and its partners also received optical infrared and radar imagery, as well as radiofrequency mapping.[7] This allowed the country to receive the most accurate data possible, adapted to the weather and the type of application considered. These technologies were also used by journalists and analysts to get an objective view on the evolution of the combats.

The involvement of the space industry has been massive during the first year of the war and has reached such a level that specific initiatives were established. For instance, the group "Space Industry for Ukraine", which gathered 18 companies at its inception, was created. Each member of the group contributed $50 000 to support the implementation of critical humanitarian projects in the context of the conflict (related, for instance, to the supply of medical necessities and food, the restoration of communication, the facilitation of evacuation for civilians, etc.). However, while space companies that founded the group contributed financially, the projects on the ground were implemented by certified NGOs.[8]

The use cases of space in the context of the war in Ukraine are therefore multiple and varied, and the intensity of the use of these solutions is matched by a high involvement of private space companies, and its publicisation, which is rather uncommon. Following this situation, from a space perspective, two main lessons have been drawn from the conflict in Ukraine so far. First, the cyberattack against the KA-SAT satellite and ensuing Ukrainian "counterattacks" demonstrated the importance of the cyber dimension of space infrastructure. This created a wake-up call to better link both domains. Indeed, the fact that space and cyber are heavily interlinked was assumed before the start of hostilities but few concrete actions were implemented. This wake-up call has already had some impact: for instance, cybersecurity has become an important component of the EU Space Strategy for Security and Defence[9] released in March 2023 and, in the EU Policy on Cyber Defence of November 2022[10], the attack against KA-SAT is explicitly mentioned as a prime example of the vulnerability of space systems to cyberattacks and on the consequences such attacks have on defence systems, the society and the economy. Second, the role of commercial

5 Roulette 2023.

6 Talmazan 2023.

7 Torrieri 2022.

8 Howell 2022.

9 European Commission and High Representative of the Union for Foreign Affairs and Security Policy 2023.

10 European Commission and High Representative of the Union for Foreign Affairs and Security Policy 2022.

space actors (in particular in the telecommunications and Earth observation fields) has been crucial for the conduct of military operations on the ground, but also to communicate about the conflict itself. Indeed, satellite imagery was considerably used by Ukraine and its allies to document the scale of destructions caused by the war and point at alleged war crimes. Such a large ecosystem of space data providers was largely inexistent (or only in its nascent steps) a decade ago when Crimea was annexed. Due to this specificity, the current conflict in Ukraine has been nicknamed the "first commercial space war"[11] (as an obvious reference to the "first space war", i.e., the Gulf War of 1991).

A conflict taking place in an evolving military space environment

The war in Ukraine therefore displays a central space component, which has been noticed by many states. Therefore, it seems relevant to assess the impact of this conflict on space defence policies, in particular those of advanced spacefaring nations. However, it is first important to acknowledge that these policies were already undergoing a process of change before the start of the conflict. This evolution was revolving around three main dimensions.[12]

Firstly, major spacefaring nations triggered a change of their doctrines: they increasingly adopted the vision of space as a warfighting domain, together with the establishment of more assertive postures not shying away from planning operations directly in space. In parallel, some countries, especially the United States and other Western countries, called for international alliances with like-minded countries on military space issues, in order to defend common interests and values in the face of potential adversaries (namely China and Russia).

Secondly, organisational changes took place with the creation of entities dedicated to space in various militaries (i.e., space commands, space forces, etc.). The objective of these changes is usually twofold: on the one hand, better integrating space with other branches of the military and their associated operational domains (i.e., land, air, sea, and cyber); on the other hand, better protecting space assets in orbit, to make sure that they can continue to provide their services without interruption.

Finally, most of the major space powers proceeded with further advancement of their military space capabilities. Of particular interest is the increasing development, testing and, in some cases, fielding of counterspace or antisatellite systems, both destructive (with four tests having been conducted in the past 16 years by China, the United States, India and Russia) and non-destructive (e.g., lasers to blind other satellites, technologies for rendezvous and proximity operations with cooperative and non-cooperative objects tested in orbit, etc.).

These developments are fairly recent and most of them took place in the months and years immediately preceding the war in Ukraine. Therefore, it is unlikely that the conflict will lead to major changes in the approach taken by space powers towards the military use of space. On the contrary, one could even expect an

11 Erwin 2022.

12 Bataille and Messina 2020.

acceleration of the trends that have been ongoing. For instance, Philippe Adam, the French Space Commander, declared in a parliamentary hearing that the way in which space is used in Ukraine confirms the strategy of France in this domain and the decisions that have been taken in the past years, although he acknowledged that the implementation of these decisions could be rethought.[13] Moreover, the conflict appears as an opportunity to test some of the concepts about the use of space in war that were developed in the past but also reflections about the way to access these solutions. In this context, one of the trends that is likely to gain traction due to the conflict in Ukraine is the reliance on commercial actors for data provision, including for defence purposes. It becomes then necessary to assess the impact of this trend.

A range of impacts due to the increasing use of commercial satellites

The war in Ukraine demonstrated the growing role, and the added value, of commercial space companies for the conduct of military operations. The "first commercial space war" will likely have consequences on the organisation of the space support to military operations, but states will also need to reflect on the questions that it raises about their own responsibilities.

Controlling the growing integration of commercial space actors in the military field

First of all, the conflict will likely feed the current trend towards a stronger integration of commercial space actors into warfighting plans. For instance, the U.S. Department of Defence clearly established that these actors can become a military tool by listing the provision of commercial satellite imagery services as part of its overall U.S. security assistance provided to Ukraine.[14] The role of commercial actors is therefore not perceived as a beneficial byproduct of U.S. actions, but as part of the whole U.S. effort to support Ukraine. More significantly, the United States is now actively reflecting on the ways in which commercial operators could be activated during a potential conflict in which U.S. forces would be involved. In this context, plans for the creation of a Commercial Augmentation Space Reserve (CASR) are being elaborated. Following the model of the Air Force Civil Reserve Air Fleet, the CASR would allow the government to call upon commercial companies in times of crisis and benefit from pre-committed capacity of their spacecraft[15] (and independent from the other arrangements that the Department of Defence may have with these companies). It remains to be seen whether other countries will follow the example of the United States. This initiative, as well as general prospects for greater involvement of the private sector, pushed the Pentagon to also consider adding indemnification provisions in future contracts to compensate commercial companies if their satellites were attacked while supporting the U.S. military in a conflict.[16]

13 Assemblée nationale 2022.

14 Jewett 2022.

15 Erwin 2023b.

16 Erwin and Werner 2022.

However, the decision by SpaceX to reduce some of the capacities of its Starlink system to prevent some alleged "misuses" by Ukrainian forces also highlights the fact that this greater involvement of private actors should be carefully controlled. Indeed, states cannot afford to completely rely on private actors and they should take the appropriate measures to prevent these actors from becoming so powerful that they could directly influence the conduct of operations.[17] Moreover, the extension and relative novelty of this increased reliance on commercial companies raise new questions such as the responsibility of these companies in case the data they provide are erroneous and lead to strategic or tactical mistakes (in particular for remote sensing) and/or the loss of lives (military or civilian) as well as about the protection of commercial spacecraft themselves.

The difficult categorisation of commercial satellites

Space technologies have always been considered as dual-use technologies. However, there has long been spacecraft dedicated to military missions and other with predominantly civilian objectives. However, the current extensive use of commercial satellites in the conflict in Ukraine blurs even more the distinction between civil and military spacecraft. This situation has conducted some countries to amend their position vis-à-vis commercial satellites. Thus, Russian representatives expressed several times that "quasi-civilian infrastructure" could become a legitimate target for retaliatory actions because it serves military purposes. Such considerations have spread beyond the Ukrainian conflict, with Iranian speakers considering that Starlink and other constellation companies represent a threat to the national sovereignty and territorial integrity of their country.[18]

This situation and these statements raise questions. First, it can be debated whether attacking commercial spacecraft would really be legitimate. Indeed, even though they support military missions, these systems also provide services to civilians. In this context, would an attack against them respect the proportionality criterion of the International Humanitarian Law? Second, beyond the potential indemnification previously mentioned, it becomes necessary for states to reflect on the measures they could/should take to protect commercial spacecraft supporting their operations during a conflict. Recent attacks against commercial satellites have been limited to the cyber realm and have not triggered any official reaction, but one can wonder what would happen should these attacks reach another level or change their nature (e.g., becoming destructive). Although they will likely not be defended as much as governmental/military satellites, states and the operators themselves will have to design appropriate arrangements to preserve the integrity of commercial satellites.[19] For private actors, this is the main consequence of meddling with international politics.

17 Erwin 2023a; Copp 2023.

18 Hainaut 2023.

19 See for instance the comments of General Saltzmann, Chief of Space Operations, in Clark 2023.

Towards new ASAT systems?

The current situation in Ukraine also has an impact on the reflection related to anti-satellite (ASAT) systems. So far, the only known measures against space systems have taken the shape of cyberattacks and electronic warfare (in particular, the jamming of signals). Indeed, while Russia has the capacity to conduct destructive anti-satellite operations and had demonstrated it a few months before the start of the conflict, it nonetheless decided not to employ it when targeting the KA-SAT satellite. This seems to confirm that destructive ASAT attacks against foreign satellites will remain unlikely, due to the debris they create and the threats it would cause to the space systems of the attacker. The development of anti-satellite systems will therefore likely focus on non-kinetic or non-destructive systems, which will also impact the countermeasures to be taken (e.g., reinforcement of the spacecraft' cyber defence or strengthening of the signals).

But the use of constellations to replace a lost capability has also caught the attention of some countries, which now aim at adapting their ASAT capabilities to the new "threats". For instance, reports suggest that there is an increasing interest of China in developing capabilities able to disrupt commercial communications constellations. Chinese researchers have indeed called for a way to disrupt Starlink (through hard and soft kills) given its military applications[20], thus raising once more the stakes of finding appropriate methods to protect these systems.

Impact on the narrative of easier access to space data

Finally, the involvement of commercial actors, in particular Earth observation companies and the multiple types of sensors that they own, also provide opportunities to get more data and intelligence on the situation in the field, at a more frequent pace. This easier access to remote sensing data happens in parallel with a trend towards the declassification of such data by some countries, in particular the United States. The goal of this declassification movement is in part to improve the ability to share data from satellites with allies and partners. Therefore, the combination of these two approaches could lead to more (or, at least, easier) cooperation between militaries, especially related to the analysis and interpretation of these data, and facilitate the emergence of common views, including at strategic level. Indeed, the months preceding the war in Ukraine saw disagreement among Western countries on the interpretation of the situation, in particular because they did not rely all on the same sources of information.

Satellite images were instrumental for some Western countries (especially the United States) to convince that an invasion was imminent and, once the conflict started, to document potential war crimes. Therefore, this technology is used to feed communication and a specific narrative about the conflict. This is a practice whose strengths and weaknesses should be thoroughly analysed. Indeed, rivals (e.g., China)

20 Chen 2022.

are also developing their commercial space sector; in the future, they could therefore use the same tools to propagate their own vision of a conflict in which Western forces could be involved. Satellite images from private actors could therefore become an integral part of the propaganda/disinformation warfare of the future.[21]

A game-changing conflict for the space sector?

Finally, beyond the specific consequences stemming from an increased involvement of private actors in the conduct of military operations, the war in Ukraine contributed to highlight the general added value of space for defence. This will have consequences on the investments of states in space defence but will also increase requirements to anticipate the future.

Growing investment in space defence

Many states are currently witnessing the situation in Ukraine and drawing lessons for their future operations, including related to space. In the wake of the war, several states have been quick in announcing measures to increase their expenditures in the military space domain. It does not mean that all these spendings are a direct consequence of the war (some may have been planned before) but the conflict has undoubtedly accelerated the pace in which these investments are done, in particular in Europe.

For instance, in France, a new Law on Military Programming (LPM) was triggered as a result of the war. Indeed, the law that was applicable at the start of the conflict was supposed to end in 2025 but it was decided to immediately develop a new document in order to adapt to changes of the geopolitical environment. This new LPM, which covers the period 2024–2030, dedicates €6 billion to space, in particular to invest in new constellations[22] (which have proved their usefulness for ubiquitous communications and geospatial intelligence while being resilient during operations in Ukraine). The previous LPM dedicated only €4.3 billion to this domain, hence an increase of almost 40%.

Similarly, in Germany, the start of the conflict led to the announcement of a special fund for defence to be provided with €100 billion. This represents a major step for Germany and a significant growth of its military spending. Interestingly, this fund fully integrates the space dimension as a portion is expected to finance the development of early warning (Twister project) and satellite communications capabilities.[23]

In the same period, Poland purchased two Earth observation satellites from Airbus, based on the Pléiades Neo constellation on which the French military also partly relies. The satellites will provide very high-resolution to Polish armed forces

21 A risk that could even be reinforced by the modification of existing images or the creation of fake satellite images generated with the help of artificial intelligence.

22 France Info 2023.

23 Hofmann 2022.

and decision-makers and are expected to be delivered in 2027.[24] This investment demonstrates the interest of a neighbouring country of Ukraine in developing its military space capabilities, proving that these capabilities are perceived as a key factor to ensure the security and integrity of a country.

Finally, beyond Europe, Taiwan also demonstrated its will to support the development of indigenous satellite communications providers, in the perspective of a potential future invasion by China. The government has already allocated $18 million to high-tech companies to deploy their own communication satellites in high and medium orbits[25] and has organised massive experimentations, with non-geostationary satellite receivers being tested in 700 locations around the island.[26] Moreover, although it is not yet clear whether Starlink will be available in Taiwan, local companies are already negotiating with foreign operators to provide satellite communication services[27] and, therefore, ensure the continuous ability to communicate in case of crisis.

Improving recruitment and training

But if states are willing to develop their hardware capabilities in the military space realm, they also need to make sure that these capabilities can actually be used and exploited by their armed forces. To this end, it is crucial for them to develop the skills associated with these missions. Indeed, a lack of competence within the military can have major consequences on the field. For instance, General Saltzmann, the Chief of Space Operations (i.e., the head of the U.S. Space Force), clearly asserted that this situation played a role in the conflict in Ukraine. According to him, while Russia had theoretically much better capacities than Ukraine, it appeared that either Russian forces did not use them properly, or that these capacities were not well integrated into the overall military effort. Therefore, Saltzmann concluded that there is a need for the United States to make sure that *"not only do we have the systems to do the mission, but that our operators have the training and the experience, and we have validated tactics that actually enable those capabilities."* [28] This remark is valid for all countries having integrated space into their military capacity.

To respond to this challenge, two key aspects must be considered. First, it is crucial to attract people (a challenge that the United States and Europe are currently facing, especially regarding engineers and technicians) and convince them to stay and make a career in the space field and, more specifically, in the military space domain. This is why some countries, such as Luxembourg, have clearly integrated this need into their strategic objectives for space defence.[29] Second, once recruited, it is important to ensure an adequate training for military space operators. This can be

24 Airbus 2023.

25 Alaieva 2022.

26 Chen 2023

27 Alaieva 2022.

28 Hitchens 2023.

29 Indeed, the fourth Strategic Objective of the Luxembourg Defence Space Strategy, released in February 2022, is to "Attract and secure a skilled and motivated workforce".

done through exercises that aim at preparing the forces to an actual conflict in space or involving space. Several exercises and wargames already exist in the United States (e.g., Schriever wargame), in Europe (e.g., AsterX organised by the French Space Command and involving the participation of other countries' entities; the EU Space Threat Response Architecture) or at NATO level. However, one can expect a growth of the number and variety of these exercises in the future, which could involve an increasing number of nations with and without space capabilities and be based on actual scenarios (e.g., a scenario mimicking the situation in Ukraine, with a cyberattack taking down a key satellite at the immediate start of the conflict and, then, continuous cyberattacks against the systems deployed to replace it).

Conclusion

The war in Ukraine represents a game-changer for many states and will have long-lasting consequences on international politics. Since the beginning, this conflict has had an inherent space dimension, which has been highly visible in the past months. The most significant element is the major involvement of private actors in providing support to Ukraine through the delivery of remote sensing data and communications, which raises new questions and concerns on the influence these actors can gain but also the measures to be taken by governments to protect commercial assets. Best practices can also be drawn from the way space is used in the Ukrainian concept and there is no doubt that the current situation will feed reflection on the evolution of doctrines and tactics for military space operations in many states.

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