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THE OUTER-SPACE DIMENSION OF THE UKRAINE CONFLICT: TOWARD A NEW PARADIGM FOR ORBITS AS A WAR DOMAIN?

Valentina Chabert

Alongside military operations on the battlefield, since the first hours of the outbreak of the conflict in Ukraine, both actors have employed space orbits as a complementary domain in which to conduct deterrence actions, in order to obtain a strategic advantage over the enemy. In this regard, despite outer space already having played a major role in previous conflicts, the Russian-Ukrainian war presents relevant elements of novelty in the use of space orbits as a realm of confrontation. Markedly, the involvement of private space corporations in war marks a significant watershed, opening new scenarios for governments, space agencies, and armies that traditionally own the monopoly of satellites either for civilian or military purposes. By adopting a descriptive methodology, this article investigates the outer space dimension of the conflict in Ukraine and the role of U.S.-based space private entities in support of Kyiv's government, to evaluate whether a tangible possibility for outer space as a prospective military battlefield exists. This article further intends to review the eventuality of a nuclear device deployment in outer space and to depict the possible outcomes of military operations on Earth. For this purpose, an evaluation of the space weaponization trend and the consequent geopolitical competition among major space powers is conducted.

Keywords: Ukraine conflict, war, outer space, Low Earth Orbit, private corporations

INTRODUCTION

Since the beginning of the Russian "Special Military Operation" on Ukrainian soil early on February 24, 2022, outer space was promptly characterized as a rather innovative and invisible domain through which the two opposing military deployments would conduct hostile operations on terrestrial battlefields. Outer space has already played a major role in previous conflicts, both for the retrieval of satellite images (essential to identify the

movements of enemy armies on the ground) and for the correct functioning of intelligence services.¹ Yet the current conflict between Russia and Ukraine presents novel elements in the use of space orbits as a realm of war in which the respective armies confront each other and from which specific destabilization operations are launched. In this regard, former NATO Secretary General and member of the European Space Agency Advisory Group on Human and Robotic Space Exploration, Anders Fogh Rasmussen, recently declared that the war in Ukraine amounts to the first major conflict in which both sides have relied on spatial capabilities, though it will not be the last.² What is more, the involvement in the war of private corporations, specifically space capitalists who have entered the promising new space economy, opens new scenarios for national governments and space agencies that traditionally own the monopoly of satellites, either for civilian or military purposes.³

Against this background, this paper intends to investigate the outer space dimension of the Russian-Ukrainian conflict, in order to assess whether space orbits can be considered an additional domain where military operations are being conducted. This article evaluates whether there is a tangible possibility for outer space to be utilized as a prospective military battlefield, considering the political and strategic implications of such an employment of orbits in future conflicts. First, an extensive analysis of the space operations performed by both armies in the first year of conflict is conducted. More precisely, the support of U.S. private corporations to Ukraine is examined, as well as relevant deterrent actions carried out by the Russian Federation before the war. Then, the practical implications of the eventual utilization of space orbits as a war domain will be investigated in an attempt to review scholars' suppositions of a nuclear device deployment in Low Earth Orbit (LEO) and to consequently depict the possible outcomes of such eventuality on military operations on earth. Finally, through the analysis of previous cases of space operations as part of military conflicts, the paper explores the possibility of future wars with more consistent involvement in the space domain. To this end, the current trend toward the weaponization of space and the geopolitical competition among major space powers will be evaluated.

PRIVATE CORPORATIONS IN THE RUSSIAN-UKRAINIAN WAR: AN OUTER-SPACE PERSPECTIVE

The war between Russia and Ukraine marks a watershed moment for the complete entrance of outer space and space capabilities into military confrontations. Even before the conflict, space technologies became an essential component for the execution of military operations, both at communication

and intelligence levels.⁴ In the months before the Russian invasion, satellite spy systems and global positioning systems (GPS) images collected by U.S.-based private companies were able to detect suspicious buildups of Russian troops on the border with Ukraine, signaling an imminent invasion of the country which materialized on February 24th, 2022. A convoy of Russian military vehicles traveling from Belgorod to Ukraine at that exact time, at around 3:15 am, was captured on camera and published on Google Maps. This convoy was being watched in near real-time by Western intelligence services, as well as by the Kyiv government itself, using surveillance and reconnaissance tools that were easily accessible from U.S. and European commercial suppliers.⁵ Despite the huge financial and military aid promptly granted by the governments of NATO countries, it is in the field of satellite communication and space services provided by private companies that the greatest successes have been recorded in the concrete support of Ukraine. These services proved to be fundamental to ensure Kyiv's survival both on the battlefield and in the information war with public opinion.

The satellite communication system of Starlink, operated by the company SpaceX and owned by the billionaire space capitalist Elon Musk, has provided the greatest tactical-strategic advantage to Ukrainian political and military decision-makers.⁶ Notably, thanks to a system of satellites positioned in Low Earth Orbit and terminals installed in Ukrainian territory, SpaceX's Starlink has allowed and currently continues to permit the exchange of military information in different theaters of combat, as well as Ukrainian President Volodymyr Zelensky's communications to the nation, in the European Parliament and social media posts in support of the Ukrainian cause.⁷ Markedly, Elon Musk's decision to send its Starlink terminals to Ukraine was followed by a tweet posted by Deputy Prime Minister and Minister of Digital Transformation Mykhailo Fedorov two days after the Russian invasion, in which the billionaire's intervention was expressly requested to counter Russian attacks on cable communication systems, through which 90 percent of communication flows and which are consequently recognized as easy military targets. Notably, as soon as Elon Musk announced the supply of Starlink communication systems and the concomitant positioning of satellites in orbit, the United States government immediately distanced itself from the SpaceX CEO's actions.

More precisely, as explained in a press conference by Pentagon spokesman John Kirby, such supportive conduct cannot be exclusively attributed to the action of a private corporation and no direct involvement of the U.S. army is to be conceived.⁸ If the modality through which SpaceX received the request for satellite modems is exceptional and unusual (as underlined, no formal demand has been sent either from the government or from the Ministry, headed by Fedorov), even more remarkable is the ground-breaking

transformation jump-started by Starlink, which profoundly impacted the modality of communication and execution of military operations during conflicts.⁹ Indeed, Elon Musk has de facto geographically moved tactical communication from the Earth to the orbits, thus concentrating satellites and space systems, which have traditionally and merely been in the hands of governments and armed forces, in the hands of private corporations. It appears to be a reasonable affirmation that the security of backup communications will likely mark the life of any modern military engagement. Simultaneously, the contribution of private actors such as Elon Musk will most certainly mark a profound turning point while providing a key tactical advantage to armies through the direct sale of communication systems and satellite imagery obtained through high-performing satellites, which can be comparable to those available to military apparatuses.

If at an operational level, Ukraine has resorted to space technologies and the Starlink satellite communication system only after the outbreak of the war, the Russian Federation conversely undertook a series of space deterrence actions and cyberattacks against Western satellite systems as early as the end of 2021.¹⁰ For example, in November 2021, the Russian Ministry of Defense carried out a rocket launch aimed at demolishing a decommissioned Soviet-era satellite, later identified as Kosmos 1408.¹¹ The action raised vigorous protests at the international level, as a cloud of over 1,000 scattered debris spread around the entire Low Earth Orbit. Remarkably, the destruction of Kosmos 1408, unequivocally interpreted as an act of military deterrence, put the entire security system and Starlink's technical department on alert.¹² Continuous maneuvers have since been implemented for months to avoid a possible collision of SpaceX satellites with orbiting debris, and a considerable quantity of propellant has consequently been consumed to keep satellites in orbit, thereby inevitably reducing the quality of services offered by the company.¹³ The Russian Federation, which already intended to ban Elon Musk's satellites throughout its territory for national security reasons, had to also defend itself against international accusations, according to which the destruction of Kosmos 1408 seriously endangered the International Space Station. Astronauts were promptly requested to perform emergency procedures by entrenching in the Soyuz and Crew Dragon capsules leaving for Earth in case of impact.¹⁴

Within this context, a further critical tipping point is to be remarked upon. It should be noted that before the conflict in Ukraine, space powers limited themselves to hitting rival satellites through cyberattacks and electromagnetic interference signals, commonly referred to as "jamming." An example took place shortly before the Russian invasion with the hacker attack on the geostationary satellite Ka-Sat of the U.S. company Viasat, which broadcast in Europe by renting numerous channels' transmissions to

Ukraine.¹⁵ However, the increasingly complex network of satellites in low orbit and the ineffectiveness of cybernetic operations appear to push military deterrence operations in the direction of disabling (or even destroying) the satellites themselves, with extraordinarily dangerous consequences especially for the existing power relations among U.S. private space companies, the U.S. government, and national governments owning in-orbit satellites for military purposes.¹⁶

SPACE ORBITS AS A WAR DOMAIN? PRESUMING NUCLEAR WEAPONS DEPLOYMENT IN OUTER SPACE

Between 1996 and 1999, Chinese air force colonels Qiao Liang and Wang Xiangsui wrote and later published *Unrestricted Warfare*, a volume which began with an accurate analysis of the Gulf War and continued on with an examination of the changes that concern conflicts “in the tools, in the technology, in the modalities and the forms.”¹⁷ Accord to their analysis, the new dimensions in which traditional wars are fought (cyberspace and outer space) would question traditional models and the logic of war itself. From this perspective, the conflict in Ukraine is no exception. Indeed, as examined in the previous section, the use of new space technologies during military operations no longer appears to be an exclusive prerogative of the armed forces, which similarly maintains a heightened risk of an extension of the war to the cosmos. Remarkably, a corresponding menace is what likely happened during one of the moments of greatest tension in the conflict, at which time Russian President Vladimir Putin publicly declared promptness to employ even nuclear weapons to defend Russia’s national security.¹⁸

Against this backdrop, the possibility to consider Low Earth Orbits as plausible theaters in which the detonation of a nuclear device could occur started to emerge among scholars and political scientists.¹⁹ Most notably, the scholarly community warned of disastrous consequences, as the orbital belt currently appears to be exceedingly crowded.²⁰ It is at those altitudes, between 540 and 570 kilometers above the earth’s surface, that most satellites are located, including the Starlink system.²¹ At the same time, the electromagnetic pulse unleashed by a nuclear detonation would cause an instantaneous interruption of all radio signals.²²

The launch of nuclear devices into space is not a prerogative of the twenty-first century. In the early years of the Cold War, both superpowers conducted such experiments in low space orbit. For instance, Starfish Prime was a nuclear test carried out on July 9, 1962 within the wider Fishbowl Operation and directed by the Atomic Energy Commission and the Military Atomic Defense Agency of the United States.²³ Markedly, according to British Intelligence reports released by the BBC fifty years later,²⁴ the

nuclear explosion 400 kilometers away from the Pacific Ocean (equal to 1.4 megatons, as compared to the 15 kilotons of the bomb dropped on Hiroshima in 1945) caused an interruption of electricity supplies in Hawaii, located over a thousand kilometers away from the detonation. At the same time, the U.S. test was accused of knocking out of action Ariel 1, the United Kingdom's first artificial satellite, which was launched into orbit later that year. Meanwhile, over the same period, the Soviet Union carried out more than 31 nuclear tests in outer space, the last of which was the 1961 explosion of the 50-megaton "Tsar Bomb," detonated 4,000 meters above the Arctic Circle.²⁵

With the progressive détente of relations between the two ideological poles and the success of negotiations in the field of nuclear disarmament, similar experiments in space have not occurred since the 1970s. This may also be attributed in part by the entry into force, in 1967, of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and other Celestial Bodies,²⁶ better known as the Outer Space Treaty (OST). Hence, any deployment of nuclear weapons, as well as any other type of weapon of mass destruction in space, is prohibited under the OST, with the broader objective of free access, use, and exploration of space for peaceful purposes only. Nonetheless, the possible detonation of a nuclear weapon in Low Earth Orbit in the context of the Russian-Ukrainian conflict would undoubtedly open new scenarios also from a legal angle, as it would be characterized as an offensive and deterrent act without being directed against any specific nation, in accordance with the prohibition of appropriation by claims of the sovereignty of orbits, outer space, and celestial bodies by individual states.

WEAPONIZING SPACE: FROM THE HIGH SEAS TO THE ORBITS

It was not unusual for students who attended the U.S. Naval War College during the last decades of the 19th century to learn how the ability to control trade routes across the open seas and, at the same time, enjoy a geographical position to supervise national coasts were fundamental attributes to obtain a strategic advantage over adversaries. These assumptions were the subject of the lessons taught by Admiral Alfred Thayer Mahan, which later merged into research for *The Influence of Sea Power upon History*, in which Mahan was able to demonstrate that no state can avail itself of the title of great power if it fails to command the seas and its coasts.²⁷ This is a lesson that U.S. strategists understood 50 years later in the context of World War II, when the Imperial Japanese Navy hit U.S. military installations on the island of Oahu in the Hawaiian archipelago. The attack on Pearl Harbor, later defined as the "day of infamy" by President Roosevelt during his subsequent address to the nation, marked a watershed in contemporary military

history as a result of the changes in the rules of war itself.

Despite both warring powers' possession of aircraft carriers, their technological accuracy level was not analogous to the importance that American and Japanese armies attributed to these instruments. Japanese forces were able to bring a profound innovation to combat by exploiting the advantage of aircraft over ships and by developing military tactics around aircraft carriers.²⁸ Although at an operational level, Japanese actions resulted in the near destruction of the U.S. Pacific fleet, from a strategic standpoint, the U.S. army greatly underestimated the potential of waging war from aircraft carriers. The result was therefore the abandonment of the warship as a key instrument for the control of the seas, entrusting this latter task to the air command.

From air to space, the step was short: protecting the North American continent from space became a priority for subsequent American administrations—as well as for the Soviet Union, which during the first years of the Cold War devoted itself to building a missile force in addition to the launch of the first artificial satellite, Sputnik I, into the Low Earth Orbit. If the concept of Mutual Assured Destruction (MAD) prevented a nuclear war,²⁹ of equal importance was the exploration of space to monitor adversary capabilities and the oceans as well as to detect potential missiles through spy satellites capable of observing opposing military bases.

The war in Ukraine has not been immune from a from-above perspective, in which the use of precision weapons, more specifically referred to as precision-guided munitions, has again altered the structure of the war thanks to the involvement of the space dimension. Far beyond the technological sphere, these munitions indeed require intelligence information that can no longer be provided by traditional systems, shifting the center of gravity of conflicts into space, which has become essential for waging war using precision missiles.³⁰ Within this framework, just two decades later, political scientist George Friedman maintained that “humanity is going into space to wage war more efficiently.”³¹ Shortly after, the United States established its Space Force and reactivated the Space Command, a fighting command based in Colorado, far from the decision-making centers of Washington.³²

A clear sign of how space has assumed a strong strategic connotation over the years is the 2018 acknowledgment by NATO leaders of the rapid evolutionary process affecting the space environment from a military point of view and, subsequently, the adoption of the Space Policy in Brussels that recognized space as the fifth operational domain of the Alliance after land, sea, air, and cyber.³³ Eventually, even though no certainties around the ability to conduct future conflicts entirely in space exist,³⁴ a thorough consideration of military confrontations in the past allows a reasonable assumption that the use of space domination will be consolidated through deter-

rence actions against opposing espionage and intelligence networks using missiles, anti-satellite systems, and possibly nuclear propulsion weapons capable of disabling the entirety of satellites that continuously proliferate in the Earth's Low Orbit.³⁵ This could conceivably manifest itself through the multiplication of space powers, no longer limited to the United States and the Russian Federation as in the era of bipolar confrontation, but enriched by the advent of several medium-sized regional powers whose space programs are very promising.³⁶ Among these, the Chinese were recently able to position a craft at both one of the strategic Lagrange points (where spacecraft remain stationary) and on the far side of the Moon.³⁷ It is in this sense, therefore, that the relaunch of the NASA Artemis lunar program could be interpreted as a strong civil and scientific value with a particularly evident military substratum.

CONCLUSION

Since February 24, 2022, the military clashes that marked the outbreak of the conflict in Ukraine have been followed by a series of events of military and deterrent nature occurring in space, precisely in the orbital belt between 540 and 570 km, where numerous satellites for civil and military purposes are present. Specifically, not only do these satellites belong to states and armed forces but also to a new class of private corporations which, on the wave of the growth of the new space economy sector, have launched satellites into terrestrial orbits.

This article aimed to investigate the spatial dimension of the conflict in Ukraine and to explore the possibility that space orbits could become theaters of war in future conflicts. The exceptional nature of the Ukraine conflict, due to the entry of private corporations as effective supporters of one of the belligerents, underlines the implications of such involvement, both for the current conflict and for possible replication of this phenomenon in future wars. Within this context, the support activities of the U.S.-based private company SpaceX to the Ukrainian government, through the supply of satellite communication systems, and the space deterrence operations carried out by Russia demonstrate how space orbits are increasingly becoming a complementary domain, wherein operations are conducted with clear military purposes and in support of war operations conducted on terrestrial battlefields.

The profound strategic nature of space orbits for intelligence, espionage, and monitoring activities of opposing armies operating on Earth must be noted. It appears plausible to conclude that nuclear device deployment in space is not completely improbable, since there exists historical evidence of the detonation of a nuclear device in space in the past, albeit for testing purposes. Nonetheless, the existence of a corpus of international space law

is a relevant element to consider, considering that the Outer Space Treaty has led to a commitment by the international community to guarantee the use of outer space for mere peaceful purposes. Eventually, to answer the question of whether space orbits could assume an even more predominant relevance as a domain of war in the years to come, the article has investigated the role of space orbits in conflicts that occurred before February 24, 2022. Low Earth Orbits have proven fundamental for the conduct of warfare on Earth. Against this background, it is reasonable to conclude that the conflict in Ukraine has represented a landmark in this sense. Though it is not possible to state with certainty that future conflicts will be fought in space, there will certainly be a greater involvement of space orbits through actions of deterrence to destabilize the enemy's terrestrial forces. ¹⁶

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