

Space and National Security: Points of Interaction, Opportunities and Issue of Priority

Volodymyr Neskorozenyi

Student Ph.D. in Law, Scientific Institute of Public Law (Kyiv, Ukraine)

E-mail: v.neskorozenyi@gmail.com

<https://orcid.org/0000-0003-0047-3425>

Volodymyr Zakharov

Student Ph.D. in Law, Scientific Institute of Public Law (Kyiv, Ukraine)

E-mail: vova.zakharov5@gmail.com

<https://orcid.org/0000-0003-0286-8535>

Alexander Slyusarenko

Student Ph.D. in Law, Scientific Institute of Public Law (Kyiv, Ukraine)

E-mail: alexwildermmann@gmail.com

<https://orcid.org/0000-0001-8343-3685>

Neskorozenyi, Volodymyr, Volodymyr Zakharov, and Alexander Slyusarenko (2024) Space and National Security: Points of interaction, Opportunities and Issue of Priority. *Advanced Space Law*, Volume 13, 96-105. <https://doi.org/10.29202/asl/13/9>

The article reveals the importance of space for national security. The points of interaction between space activities and national security are identified, which reflect the growing importance of outer space for ensuring the security of States and emergency management, the growth of international cooperation in the field of space technologies. The newest possibilities of space to ensure national security (warning and military intelligence systems; communication systems and means of coordination; systems of space monitoring of the environment and resource management; systems of border and maritime surveillance; development of other technologies; development of global cooperation) are revealed. The problems of ensuring the priority of national security in the use of space resources have been formed, with the formation of a global strategy that geopolitical stability and prevention of the militarization of space should become key aspects for ensuring the national security of any State.

Keywords: military intelligence, geopolitical stability, state, space resources, space technology, space, international cooperation, national security, surveillance, satellites.

© Neskorozenyi, Volodymyr, 2024

© Zakharov, Volodymyr, 2024

© Slyusarenko, Alexander, 2024

Received: 24 April 2024 / Accepted: 23 May 2024 / Published: 1 July 2024

Introduction

The modern world is characterized by the dynamic development of technologies and scientific research, among which the space industry occupies one of the leading places. Space is becoming an increasingly important factor affecting the national security of States, creating new opportunities and challenges. The interaction of space technologies with national security determines the need for an integrated approach to the study of this topic, taking into account both technical aspects and legal, administrative and geopolitical issues.

Above all, space technology plays a key role in ensuring national security through the development of satellite communication, navigation and surveillance systems. Satellite communication systems provide stable and uninterrupted transmission of information, which is critically important for military and civilian structures during crisis situations. Navigational satellites, such as GPS, provide the ability to accurately determine location, which is essential for both military operations and the operation of critical infrastructure. Satellite observation allows monitoring of the earth's surface, which is important for reconnaissance, emergency forecasting and environmental monitoring.

Space is increasingly recognized as a critical area for national security and global stability. Thus, failure to adopt space technologies poses significant risks, from strategic disadvantage and global isolation to increased vulnerability and economic stagnation. In addressing these challenges, countries must balance the development of local capacity with active participation in international space cooperation and governance. The future of national security is inextricably linked to space, and only by recognizing and acting on the imperative of space technology can countries ensure their security, prosperity and place in the international community (Staveris-Polykalas, 2024).

However, along with opportunities, space technologies also create new threats to national security. Spacecraft can become the target of attacks, which can lead to misinformation or disruption of critical infrastructure. In addition, space activity is becoming an arena of geopolitical competition, which requires the development of new approaches to international cooperation and legal regulation.

In this context, it is important to study the priority of the development of space technologies within the framework of the national security strategy. This includes examining issues of funding, legislative support and international cooperation. It is necessary to determine the optimal ways of integrating space programs into the general system of national security, taking into account both internal opportunities and external challenges.

Thus, the study of the interaction of space and national security is an extremely relevant and multifaceted task that requires an integrated approach and includes technical, legal, administrative and geopolitical aspects. This will not only ensure reliable protection of national interests, but will also contribute to the development of international cooperation and sustainable development of space activities.

The importance of space for national security

Security has been humanity's top priority throughout history, and national security is still a major concern for modern nations. In the past, security mainly meant protecting nations from

military attacks. As a rule, wars were fought between regular armies, but in the 21st century it became clear that not only regular armies could be a threat, but also disorganized, unpredictable, uncontrollable criminals (Özyildirim, 2023).

Threats can be classified as man-made and natural hazards, intentional or unintentional. Unexpected threats always arise for countries. Therefore, countries should continue to monitor not only the borders, but also be prepared for possible threats coming from within the country. In this context, security issues seem to be most relevant to the air, land and sea domains, but continuous surveillance from space brings benefits and complements other domains (Özyildirim, 2023).

Historically, national security has meant protection against external military threats, particularly attacks by regular armies. Modern threats can come not only from state armies, but also from irregular private military formations or criminal groups that can operate within countries. In addition to the above, security challenges include not only traditional military threats, but also man-made and natural disasters, which can be both intentional and accidental. Because of this, States must be prepared for such threats that may arise from outside, as well as from within the country. Thus, effective monitoring and control of internal and external threats become critically important.

One of the most important aspects of modern security is the integration of surveillance technologies. Traditionally, countries have focused on security in the air, land and sea spheres. However, in modern conditions, the importance of space technologies is growing. Continuous surveillance from space provides an opportunity to receive detailed and timely information about potential threats, which significantly complements traditional methods of ensuring national security.

A new space ecosystem is emerging, which has serious implications for global security and economic development. The speed at which commercial space companies are launching thousands and soon tens of thousands of satellites into orbit creates unique challenges for space security as well as military deployments. Also, according to experts, congestion in certain orbits is increasing, competition for communication bandwidth is increasing, new types of space operations are appearing, all this leads to a change in the paradigm of threats. Competition in this changing environment will require States to make significant changes in the processes of creating or acquiring modern means to strengthen their defense capabilities, adopted investment strategies, as well as in the regulatory environment of commercial space (Eftimiades, 2022).

Space technologies help countries control their borders both on land and at sea, monitor the environment, and respond in a timely manner to various crisis situations. Space-based vehicles with Earth monitoring services provide critical information for early warning, response and mitigation actions (Özyildirim, 2023). Therefore, it can be argued that countries that do not develop their own space capabilities often find themselves dependent on other countries or commercial organizations. This dependence can jeopardize national sovereignty, as access to data and services can be limited by the geopolitical interests of the provider. In addition, such trust exposes countries to the risk of espionage and manipulation, as control over the flow and integrity of information remains with an external organization (Özyildirim, 2024).

Neglecting space technologies not only affects military and strategic potential, but also hinders economic and technological development. The space industry drives innovation in many sectors, including telecommunications, navigation and Earth observation, making a significant contribution to the national economy. Failure to invest in space technology means missing out on the benefits of this fast-growing sector, including job creation, technological advancement and economic diversification (Özyildirim, 2024).

Therefore, space plays an extremely important role in ensuring national security, integrating technological achievements and strategic capabilities of the State in the modern world. One of the key aspects is the ability of the space infrastructure to provide surveillance of borders and maritime spaces. This is critical for preventing external threats and detecting illegal activities such as smuggling or illegal border crossing. Thanks to modern satellite technologies, states can quickly monitor the movements of potentially dangerous objects and respond to any challenges related to national security.

Satellite environmental monitoring systems also play an important role in rapid response to emergency situations. For example, during natural disasters such as earthquakes, hurricanes or floods, satellites provide operational information that helps organize effective rescue operations and humanitarian aid. This allows to reduce the loss of human lives and material damage, which ultimately strengthens national security and the state's resilience to emergency situations. In this regard, there is a need to manage outer space and ensure its safety against possible threats, such as the collision of satellites or intentional interference with their work.

Space technology is also an important driver of economic and technological development, which has a direct impact on national security. Innovations in the field of telecommunications, navigation and Earth observation contribute to the development of the economy and the creation of new jobs. The lack of investment in space technologies can lead to the loss of competitive advantages and a decrease in the state's technological potential. Thus, the development of space capabilities is an important component of the strategy of ensuring national security and sustainable development of the state.

Points of interaction between space activities and national security

The use of space technology for intelligence gathering and surveillance dates back to the Cold War era. The space race between the United States and the Soviet Union led to the development of satellite technology. That made it possible to monitor military activity and the early warning system. Since then, the development of satellite and sensor technologies has made the collection of space information and observation increasingly efficient. And one of the interesting things is that these technologies are designed for military use. But over time, they become available to the general public (Singh, 2023).

In the 21st century, as the concepts of threat and security change with the development of technology, the use of integrated space communication/navigation/surveillance technology and infrastructure is becoming more common for forecasting and early detection of emergencies and public warning. As expected, thanks to communication technologies such as 5G, the world is becoming more connected (Özyildirim, 2023). Therefore, countries should continue to improve their domestic space potential and international cooperation. States should soon be ready to agree on a common security and defense policy to deal with new threats to space security. All countries must agree on the peaceful uses of outer space and must develop a common approach to fill existing gaps in international agreements (Soroka, 2023). Specific links between space, security and defense are vital to the security of nations. Undoubtedly, space technology will continue to provide enormous opportunities to combat security threats on a large scale (Özyildirim, 2023).

International norms and agreements remain the main instrument for regulating space activities, which play a crucial role in ensuring that space remains a safe and sustainable environment for all. By engaging in diplomatic efforts to promote responsible behavior in space,

countries can contribute to global stability and security even as they work to develop their own space capabilities (Staveris-Polykalas, 2024).

Therefore, the interaction between space activities and national security is characterised by a number of trends that reflect the growing importance of outer space for ensuring the security of States. The trend toward integration of space technologies with other security systems is one key feature of the interaction between space activities and national security. In particular, the combination of satellite communication systems with terrestrial networks, such as 5G, allows creating reliable and high-speed data transmission channels. This ensures effective communication and coordination during emergencies and military operations. Integration also applies to navigation systems used not only for military purposes but also for civilian applications such as aviation and navigation. The innovativeness and high technological level of space systems should be highlighted separately. Modern satellites are equipped with advanced sensors and instruments that allow obtaining detailed images and data in real-time. This is crucial for gathering intelligence, monitoring military facilities, and predicting potential threats. The use of high-precision satellite images allows detecting even minor changes on the earth's surface, which facilitates timely response to potential threats. In general, space technologies have become an integral part of modern security systems, providing wide opportunities for monitoring, communication, navigation and forecasting.

Also, an important point of interaction between space activities and national security is the growth of international cooperation in the field of space technologies. States realize that effective use of space is possible only with joint efforts and concerted actions. International cooperation also promotes the exchange of technology and knowledge, which allows countries to increase their space potential and ensure national security at the highest level.

Another important trend is the expansion of space technologies for forecasting and emergency management. Weather satellites, equipped with modern sensors, make it possible to accurately predict weather conditions and natural disasters such as hurricanes, floods, or earthquakes. This makes it possible to warn the population in advance and take measures to minimize losses. Satellite monitoring also helps detect and quickly respond to fires, leaks of hazardous substances and other emergency events.

After all, space technologies contribute to increasing the level of global security and stability. Thanks to advanced data collection and monitoring technologies, states have the opportunity to detect and respond to threats in time, ensuring the protection of their citizens and territories. The integration of space systems with other security systems and international cooperation makes it possible to create a more reliable and effective defense system that meets modern challenges and threats. Thus, space technologies play a critical role in ensuring national and global security.

Opportunities of space to ensure national security

In an era where the last frontier has become the next frontier in global military dynamics, the strategic importance of space technology for national security and defense cannot be overstated. As countries increasingly rely on space to enhance their military and strategic capabilities, those who do not know how to use space technology face multifaceted dangers (Staveris-Polykalas, 2024).

Space-based capabilities such as satellite communications, intelligence, and warning systems offer unparalleled advantages in terms of information dominance, situational awareness, and global reach. Without these capabilities, countries are not only blind to the actions of potential

adversaries, but also to the dynamics of global crises that may affect national security. As alliances and partnerships increasingly depend on shared space capabilities and data, countries lacking space technology find themselves excluded from critical security coalitions. This isolation undermines their ability to influence international security policies and participate in collective defense mechanisms, making them vulnerable to external threats (Staveris-Polykalas, 2024).

When it comes to real-time defense decision-making, space intelligence is a tool that stands out, allowing decision-makers to see, understand and anticipate changes as they happen. Global trends underscore the need for rapid intelligence and swift action, as regional conflicts become global threats, timely situational awareness is critical. Therefore, Governments are increasing spending on intelligence, surveillance and reconnaissance (ISR) assets for activities within and beyond their borders (Space-based, 2024). Military and strategic intelligence are two of the most important uses of space assets for intelligence gathering and surveillance. Satellites and sensors can track military activity, such as troop movements and missile launches, providing critical information for military operations. Early warning systems can also be configured to detect missile launches and warn countries of future attacks. And at best we can intercept these missiles in the sky so they do not harm any person or structure (Singh, 2023)

It should be noted that satellites have become the main space resource used not only for intelligence gathering and surveillance, but also for obtaining various monitoring data and images of the Earth (Singh, 2023). Indeed, satellites have become an integral part of society around the world: from telecommunications to global navigation systems, they are used for both commercial and scientific purposes. However, satellites also have non-peaceful uses. Since the Cold War, military satellites have been used to provide secure communication links, for the maneuverability and coordination of military forces (i.e., the Global Positioning System (GPS)), and even for missile targeting. However, there is another use of satellites that is not directly related to military operations: the so-called ISR (Intelligence, Surveillance, Reconnaissance) (Danilo, 2023).

But it should be noted that Earth observation satellites are capable of tracking the movement of troops and equipment, space radars are used to track aircraft and sea vessels, for example, US satellites to study the sources of X-ray radiation and solar activity, such as the SOLRAD (Solar Radiation) series are capable of intercepting radio waves. Scientific and commercial satellites can sell their services to the military, thus providing them with data without being under direct military control (Danilo, 2023).

In all these applications, satellites indirectly become instruments of war. However, they are not used as military platforms, as this would be a violation of the current international consensus against the militarization of outer space. Although the provisions of the 1967 Outer Space Treaty, which expressly prohibit the deployment of weapons of mass destruction and the construction of military facilities, do not provide for the use of satellites as “indirect” instruments of war. Therefore, any attempt to regulate their use in military operations must take into account the dual nature of satellite data (Danilo, 2023; Treaty, 1966).

As such, space systems provide the most up-to-date information on current events, troop movements and evolving scenarios, and play a key role in improving situational awareness and strategic decision-making in a wide range of applications. This real-time awareness transforms the reactive process into a proactive, anticipatory one, providing an unprecedented advantage in the face of dynamic threats (Space-based, 2024).

As it is already clear from the above, space technologies can be used to collect intelligence information and surveillance in the military sphere without violating space legislation, namely by carrying out:

- Monitoring of the environment and natural resources;
- Border and maritime surveillance (Singh, 2023).

In addition, it should be noted that the rockets used to launch a satellite into space may also carry a nuclear warhead or other offensive military device. To prevent the proliferation of this technology, an attempt to create international regulation for missiles was implemented through the Missile Technology Control Regime (MTCR), proposed by the G7 in 1987. However, it has a significant limitation that is important to note in order to understand how difficult it would be to implement such a solution for satellites. RKRT is not legally binding and is not a contract. It's actually an informal agreement that could be useful in persuading countries that don't have space launch capabilities, rather than avoiding countries that build rockets for military purposes, to sell them. Compliance with the RKRT depends on the State (Danilo, 2023).

Since it will be impossible to prevent a state that has space launch vehicles and satellites from using them without its approval, the best solution is to work on two levels. If a state wants to "blind" its adversary, it will target its satellites. Anti-satellite weapons will affect other satellites of States that are not parties to the conflict. Thus, a first step could be to create "soft law" and principles that would make it unacceptable to destroy satellites because of the potential collateral damage caused by space debris. If this principle is accepted, it will be easier to gradually extend satellite protection to other forms of non-kinetic attacks (Danilo, 2023).

Therefore, space provides unique opportunities for ensuring national security, which makes it a strategically important area for any country. The use of space technologies allows countries not only to improve their defence capabilities, but also to respond more effectively to modern threats.

Among the main capabilities of space to ensure national security and defence, the following can be distinguished:

1. Warning and military intelligence systems. Satellites play a key role in early warning systems that are capable of detecting missile launches, troop movements, and other potential threats. This allows military forces to respond to threats in a timely manner and make informed decisions, which significantly increases the effectiveness of defence operations.
2. Communication systems and means of coordination. Space technologies provide reliable and secure communication between various military units, which is critical for the coordination of military operations. Communication satellites allow data to be transmitted in real-time, which significantly improves the maneuverability and efficiency of military operations. In addition, global navigation systems such as GPS provide precise positioning and routing, which is indispensable for military logistics and operational planning.
3. Space-based environmental monitoring and resource management systems can provide important information about climate change, natural disasters, and other natural phenomena. This allows us to provide protection against natural disasters and manage natural resources such as water and minerals more efficiently. Timely information about weather conditions is also important for planning operations, as it allows you to avoid adverse conditions and reduce risks.
4. Border and maritime surveillance systems provide law enforcement agencies with the opportunity to respond to violations in a timely manner and increase the security of the country. Satellites can also provide continuous surveillance of strategically important sea lanes, which is critical for ensuring economic security and stability.

5. The use of space technologies promotes the development of scientific research and innovation, which positively impacts national security.
6. The development of global cooperation can significantly increase the efficiency of the use of space resources. Joint programs and data sharing between countries allow for the creation of global surveillance and response systems that contribute to global security.

Thus, space provides unprecedented opportunities for national security, combining technological innovation, international cooperation and strategic advantages that can significantly increase the defence capability and stability of any country.

The issue of priority of national security in the use of space resources

Despite the advantages of space-based intelligence gathering and surveillance, there are several challenges and risks. Dependence on space assets is a significant risk because countries rely on these assets to obtain critical information. Space debris and collisions can also pose a risk as the amount of space debris in orbit continues to increase. Finally, geopolitical tensions and the militarization of space are growing concerns as countries seek to gain an edge in space technology (Singh, 2023).

As private actors become increasingly relevant to space activities, it would be useful to prevent satellite firms and operators from sharing data with states that might use it in a way that violates the UN charter. For this, it is possible to proceed from the existing consensus regarding the criminal liability of persons involved in the commission of international crimes. Private space companies should avoid doing business with states that may use satellite data for war crimes or other violations of humanitarian law. The sooner a consensus is reached on the use of satellites for non-peaceful purposes, the better it will be for all countries and for peaceful activities in space (Danilo, 2023).

Cyber security threats are another concern as space systems can be vulnerable to hacking and cyber attacks (Singh, 2023). Thanks to modern digital technologies, worldwide communication and information networks have fundamentally changed the models of international trade, finance and global communication in general. These patterns affect not only economic relations, but also political and social relations. Because of the interdependencies created by these new models, even authoritarian regimes cannot sustain the closed autarkic economies of the past (Derek, 2012: 3).

In its short history, individuals and companies have used space and cyberspace to create new industries, a vibrant social space, and a new realm of economics that are intertwined with our daily lives. At the same time, individuals, subnational groups, and governments use cyberspace to advance interests through malicious activities. Terrorist groups recruit, train and target over the Internet, organized crime enterprises use financial data to generate profits that exceed drug trafficking, and intelligence agencies steal secrets. Today, people tend to pose the greatest threat in cyberspace, but non-State actors, intelligence agencies, and the military are increasingly penetrating information technology networks for espionage and influence. This is likely to continue in the future as governments seek new ways and means to protect their interests in cyberspace and develop their own offensive capabilities to compete in cyberspace (Derek, 2012: 3).

In general, in our opinion, the priority of national security in the use of space resources is a conditional concept that forms a strategic approach to ensuring state stability and protecting national interests through the effective management of space activities, as well as the development

of own space programs and international cooperation to prevent the militarization of space and support of geopolitical stability.

Each state forms its own terms of national security priority when using space resources. However, in this area, it is important to maintain a balance, on the one hand, security is the greatest value of the state, therefore, any state seeks to protect itself, regardless of threats. This happens, and theoretically, it can happen when using space resources. That is, the state puts its own interests first if it is concerned with issues of its own security. Such activity, in the sphere of the use of space resources, can protect the state and, at the same time, create inevitable consequences for the planet. Accordingly, geopolitical stability and prevention of the militarization of space should become key aspects for ensuring the national security of any state. In the context of geopolitical competition, space resources are becoming important, and the use of space for military purposes can lead to increased tensions between states. It is necessary to develop international law and agreements aimed at preventing the militarization of space, including measures to prohibit the placement of weapons in space and establish mechanisms to control the use of space resources.

Conclusions

Space technologies play a critical role in ensuring national security, providing unique capabilities for monitoring, intelligence and prompt response to threats. Thanks to satellite systems, states can effectively control their borders, monitor maritime spaces and detect illegal activities, which provides an additional level of protection against external threats and strengthens the country's security infrastructure.

However, along with opportunities, space technology creates new threats, including the possibility of cyberattacks and attacks on spacecraft, which can lead to disinformation and disruption of critical infrastructure. Growing geopolitical competition in outer space requires the development of new approaches to international cooperation and global legal regulation.

Accordingly, the development of space technologies affects the models that ensure the national security of each country. To ensure national security when using space resources, a comprehensive approach is required, which includes proper and legal intelligence, cyber security, preventing the militarization of space, and development of national space programs. Currently, it is important to form a global approach to the conditional priority of national security of each state, which, first of all, should be built on the principles of geopolitical stability and prevention of the militarization of space.

References

- Staveris-Polykalas, Athanassios (2024) The Perils of Ignoring Space Technologies in National Security and Defense. Bridging Innovation & Strategy. Available online: <https://www.linkedin.com/pulse/perils-ignoring-space-technologies-national-security-athanassios-qz2if/>
- Danilo delle Fave (2023) The Challenges of Dual-Use Space Technologies: the Non-Peaceful Use of Satellites. The Space Generation Advisory Council. Available online: <https://spacegeneration.org/the-challenges-of-dual-use-space-technologies-the-non-peaceful-use-of-satellites>
- Derek, S. (2012) Cyberspace and national security: threats, opportunities, and power in a virtual world. Georgetown University Press. 256 p.

- Eftimiades, Nicholas (2022) Small satellites: the implications for national security. Atlantic Council. Available online: https://www.atlanticcouncil.org/wp-content/uploads/2022/05/Small_satellites-Implications_for_national_security.pdf
- Özyıldırım, Alime (2023) Space From Perspective of National Security. *Özyıldırım, Savunma Bilimleri Dergisi*, 43(2): 384-397. Available online: <https://dergipark.org.tr/en/download/article-file/2796748>
- Singh, Aniket (2023) The Impact of Space on Global Security: Intelligence Gathering and Surveillance. Global Growth Forum. Available online: <https://globalgrowthforum.com/the-impact-of-space-on-global-security-intelligence-gathering-and-surveillance/>
- Soroka, Larysa (2023) Modern Views on Criminal Liability for Crimes in Outer Space. *Philosophy and Cosmology*, Volume 30, 64-76. <https://doi.org/10.29202/phil-cosm/30/6>
- Space-based intelligence: providing next-generation tactical access for defense applications (2024) Blacksky. Available online: <https://www.blacksky.com/space-based-intelligence-providing-next-generation-tactical-access-for-defense-applications/>
- Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (1966) General Assembly 21st session. United Nations Office for Outer Space Affairs. Available online: https://www.unoosa.org/oosa/oosadoc/data/resolutions/1966/general_assembly_21st_session/res_2222_xxi.html