Space Information and Technologies in the Military Activity of Ukraine: Legal Aspect

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The article's relevance is justified by the need to study the current state of organizational and legal support for the use of space information and technology in Ukraine's military activities to identify prospects for its improvement, including through the adaptation of NATO experience. The implementation of scientific research is ensured by the combined use of methodological tools, among which the leading role was played by general scientific methods of analysis and synthesis, deduction and induction, which provided an opportunity to identify general and specific features of the research. The main methods were forecasting and legal modeling, which helped to identify trends in the development of organizational and legal support for the use of space information and technology in the military activities of Ukraine. The study revealed that Ukraine has significant prospects for developing an organizational and legal framework for using space information and technology in military activities. It is crucial to support

and adapt the experience of the troops (forces) of the Armed Forces of NATO member states, which for decades have demonstrated a systematic, balanced and clear approach to the tasks of the supranational level of security. A number of optimization vectors for developing organizational and legal support for using space information and technology in the military activities of Ukraine at both regulatory and institutional levels are proposed.

Keywords: space information, space technologies, space forces, NATO standards, law, military sphere, armed conflicts, legal status.

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Introduction

The rapid development and large-scale introduction of information and space technologies in all spheres of human activity has led to dramatic changes in the military field. As the experience of recent local wars and armed conflicts shows, updated types of weapons and military equipment are gradually appearing. Their most significant features are mobility, high accuracy, and long range. There are processes of globalization in the field of management, intelligence, and fire destruction, their deep integration. On this basis, reconnaissance and strike systems are created, which combine into a single system the forces of ground, surface and underwater, space-based and capable of striking objects at any point on the planet.

The most characteristic features of hostilities were a significant increase in their dynamism, scope, careful planning, a high degree of uncertainty and the need for prompt management. Analysis of the experience of the anti-terrorist operation and the Joint Forces operation in eastern Ukraine and the hostilities with Russia after 24.02.2022 showed that modern wars make additional demands on management systems, the main of which are the sudden emergence of unusual situations and the need to make decisions on any level of the management system. Such changes in military affairs place increased demands on the system of information and analytical support, especially in terms of ensuring the efficiency of solving management tasks in planning operations (combat operations) and supporting decision-making in the event of sudden and unusual situations. Not the least place in the proper information and analytical support of national security and defense management is occupied by space systems, unmanned aerial vehicles, geospatial data and their interaction.

During 2015-2019, the legal framework in the field of national security in general and in the field of information security, in particular, was actively developed and is currently being improved. The Cyber Security Strategy (Cybersecurity, 2016), the Doctrine of Information Security of Ukraine (On the decision, 2017), the Law of Ukraine "On the Basic Principles of Cyber Security of Ukraine" (On the basic, 2017), etc. were adopted. These regulations identify the main actors in the formation and implementation of state security policy in the information sphere, but currently do not provide a high level of efficiency of their interaction (Prav, 2018).

With regard to space information and space technology, the need for their introduction into the system of national security and defense is stated in the "Strategy of Military Security of Ukraine" (2021). It states that along with the introduction of these technologies, it is necessary to automate management processes and digitalization of activities in the defense forces of Ukraine with the appropriate level of protection of processed information. In addition, it is necessary to: 1) develop capabilities to ensure cybersecurity, cyber defense during the

preparation and conduct of a comprehensive defense of Ukraine; 2) expanding the access of the defense forces to information coming from dual-purpose space systems; 3) equipping the defense forces with high-tech weapons, providing modern military and special equipment, in particular with the use of space technology (On the decision, 2021).

All of the above necessitates the study of organizational and legal issues of the use of space information and technology in the military sphere.

Space information and space technology as an object of study

Space is an environment that provides opportunities for both global species and electronic observation of the Earth's surface and surface space and the global transmission of heterogeneous information without violating international law. Space systems of reconnaissance, early warning, navigation, communication and combat control of troops and weapons, and topographic and hydrometeorological support are the basis for creating a global information field that can be equally used by the highest bodies of military and political leadership and commanders directly on the battlefield (Vyporkhaniuk & Kovbasiuk, 2018: 5-6).

Depending on the goals, objectives and content of space activities in the military sphere, the composition of space forces, and the means involved in its implementation, the terms "military space activities" and "space activities in the field of defense" are used. At the same time, the basis for ensuring the solution of national security and defense problems is space information obtained as a result of space activities, and the material and technical basis is the space infrastructure of the state.

Since the concept of "space information" consists of the basic concept of "information," which has a multifaceted nature, and the logic of theoretical views is methodologically interpreted on the basis of philosophical and cybernetic categories, the problem of determining its nature concerns, first of all, establishing approaches to this concept from positions of its quantitative and qualitative analysis.

As we know, material, energy and information are the basic elements of the world, as well as the three pillars in the evolution of human society, namely: material for agricultural society, energy for industrial society and information for the information society (Thong & Pingmei, 2006: 327).

The first mention of the word "information" dates back to the end of the 14th century, informacion – act of informing, communication of news. From Old French, informacion (enformacion) – "advice, instruction," from Latin (informationem) "outline, concept, idea," noun of action from past participle stem of informare "to train, instruct, educate; shape, give form to" (Information, 2022).

Throughout its existence, the term "information" and its meaning have evolved. Therefore, different authors interpret the term "information" differently. In addition, information and its properties are the subject of research in a number of scientific disciplines, such as information theory (studies the quantitative measurement of information, abstracting from the content of information. According to this theory, information is a set of different events and reports about them (Neumann, 1968; Hartley, 1959); cybernetics (information is a physical quantity that characterizes processes both in natural physical systems and in artificially created ones (Shannon, 1963). Information should be considered as a spatial arrangement of matter organized according to certain rules (Ashby, 1959)); semiotics (a semiotic approach to understanding the nature of information makes it possible to take into account not only the structure but also

the content of the message and, very importantly, the stock of knowledge of the recipient of information. That is, a measure of the semantics of information is established, which allows to establish the level of novelty for the subject and use of the information obtained in management when making the appropriate decision (Mizyuk, 2012: 13)); computer science (information is a set of information (data) that is perceived from the environment (input information), released into the environment (output information) or stored within a system (Computer, 2022)) and others.

The legislative definition of information is provided in the Law of Ukraine "On Information" of 02.10.1992 No 2657-XII and according to which information is any information and/or data that can be stored on physical media or displayed electronically (About information, 1992).

If we generalize all existing definitions of information, we can come to the following – it is a sequence of information, knowledge that is updated (received, transmitted, converted, compressed and/or registered) using some signs (symbolic, figurative, gestural, sound, sensorimotor type) (Kaziev, 2006). Thus, information is statements about an event, activity, development of a certain process, which is considered as a result of the transfer of this information from an object to subject. In our opinion, information is the knowledge that the subject receives as a result of perception and processing of certain information. In turn, all modern technologies for the implementation of generation (collection), transmission, processing and application of information belong to information technology (IT).

The development of information technology is one of the most important factors in the effective defense of the country. This is due to the fact that the technological advantage and increase the information component of operations (combat) is the basis for achieving superiority over the enemy in modern armed conflicts. Therefore, in the Armed Forces of many countries around the world much emphasis is placed on the development and application of space systems, tools and technologies (Vyporkhaniuk & Kovbasiuk, 2018: 15). After the launch of the First Satellite (1957), the achievements of space activities began to be used both in the national economy and in national defense construction, mainly with the help of space information technology.

The most important component of the modern Armed Forces of the leading foreign countries is space information – reconnaissance, meteorological, navigation, topographic, communication and data transmission, etc. A characteristic feature of all types of space information is its coordinate-temporal component, in particular, with information about the location and parameters of the movement of mobile military objects in all geophysical spheres, which is obtained in a time mode close to real (Vyporkhaniuk & Kovbasiuk, 2018: 15-16). In turn, technologies that directly or indirectly use space platforms to receive, transmit, process and use information are called space information technologies (SIT) (Thong & Pingmei, 2006: 237). Space technologies, such as telecommunications, combined with mobile capital are seen as technologies that blur the boundaries of space (Garrett, 2018).

In Ukraine, as in many other countries, there is no legal definition of the term "space information," which in our opinion, hinders the use of space information and its technologies in the military sphere. Although the use of space information in some regulations in recent years has been identified as an important factor in ensuring national security. As an example, on January 13, 2021, by order of the Cabinet of Ministers of Ukraine No 15-r, the Concept of the National Targeted Scientific and Technical Space Program of Ukraine for 2021-2025 was approved (About the Concept, 2021). Within the framework of this document, it is noted that ensuring the effective use of space potential and increasing its impact on the solution

of urgent tasks to ensure the realization of the interests of the state in the field of national security and defense is extremely important. To achieve this goal, it is proposed, inter alia: to create and ensure the development of the internal market of space technologies, information and services; implementation of measures for the introduction of space technologies, services and information in government and industry programs; gradual creation of a national space observation system based on domestic and foreign orbital means and information technologies (About the Concept, 2021). However, the definition of the term "space information" and the mechanism for implementing its use in this Concept is missing.

Therefore, we propose to supplement the Law of Ukraine of 15.11.1996 No 502/96-VR "On space activities" with a norm-definition in the following form: "space information – a set of information obtained using space technologies that ensure the functioning of the modern information space of the state and performance of tasks of tactical and technical purpose."

The legal status of entities providing space activities in the field of defense and national security of Ukraine

The basics of space activities in the field of defense and national security of Ukraine are established by Section VI "Space activities in the field of defense and security of Ukraine" of the Law of Ukraine "On Space Activities" (About, 1996) of 15.11.1996 No 502/96-VR. Article 26 of this law stipulates that "space activities in the field of defense and national security are carried out by the Ministry of Defense of Ukraine, intelligence agencies of Ukraine, which together with the relevant ministries and other central executive bodies are responsible for implementing the National Targeted Space Science Program of Ukraine in part concerning the creation and use of military and dual-purpose space technology" (About, 1996).

Regulations on the Ministry of Defense of Ukraine (hereinafter – MDU) as amended by the Resolution of the Cabinet of Ministers of Ukraine (hereinafter – CMU) dated 19.10.2016 No 730 determines that the Ministry is the main body in the system of central executive bodies that ensures the formation and implementation of state policy on issues of national security in the military sphere, the sphere of defense and military construction in peacetime and special periods (On Amendments, 2016). This normative legal act defines the function according to which the MDU "conducts space activities in the field of defense and national security of Ukraine in accordance with the law" (On Amendments, 2016).

Resolution of the Cabinet of Ministers of Ukraine of 14.05.2015 No 281, the central space body of executive power, which ensures the formation and implementation of state policy in the field of space activities, determined the State Space Agency of Ukraine (hereinafter – SSA of Ukraine). The main tasks of the SSA of Ukraine are: ensuring the formation and implementation of state policy in the field of space activities; providing support in the preparation and implementation of international projects in the field of space exploration and use (On Approval, 2015).

SSA of Ukraine in accordance with the tasks assigned to it (On Approval, 2015):

a) Provides legal regulation in the field of space activities, determines the priority areas of space activities according to the interests of the national economy;
b) Develops conceptual bases of state policy in the field of research and use of outer space for peaceful purposes and in the interests of state security, develops together with ministries, other central executive bodies, and the National Academy of Sciences the National Targeted Scientific and Technical Space Program and other

strategic, program documents in the field of space activities and ensures their implementation;

c) Is the state general customer of research work on the study and use of outer space, research and development work on the design, manufacture and testing of space technology, including international space projects;
d) Provides the creation and operation of terrestrial and space segments of satellite communication systems, broadcasting and remote sensing of the Earth, control and analysis of the space situation, coordinate time and navigation support;
e) Takes measures to promptly identify sources of danger and contributes within its powers to achieve the appropriate level of reliability and efficiency of public administration systems in a special period;
f) Organizes and carries out international cooperation of Ukraine with other states and international organizations in the space industry, as well as ensures the preservation and development of existing international relations in the field of space activities;
g) Provides guidance in the field of management and coordination of enterprises, institutions and organizations of space and related industries, provides, together with ministries and other central executive bodies, the operation, support and improvement of space facilities;
h) Provides training and retraining of personnel of space objects, submits proposals to the draft state order for the training of specialists in the field of space activities;
i) issues licenses for the right to conduct space activities, maintains a license register, monitors compliance with license conditions;
j) Maintains the State Register of unique objects of space activity, carries out the state supervision over their condition and use, takes measures for their support, and carries out registration of space equipment;
k) Monitors and maintains a database of geophysical observations and ensures its interaction with the National Data Center of the system of seismic observations and improving the safety of the population in seismic regions;
l) Monitors compliance with the requirements of international agreements of Ukraine on the restriction and prohibition of nuclear weapons tests, nuclear weapons tests at foreign test sites and the implementation of nuclear explosions for peaceful purposes;
m) Organizes scientific, scientific and technical, investment, information, publishing activities, promotion of achievements and best practices, promotes the creation and implementation of modern information technologies and computer networks in the field of space activities; exercises other powers specified by law.

For the agreed solution of issues within the competence of the SCA of Ukraine, discussion of the most important areas of its activities and development of the space industry in the SSA of Ukraine, the Board of the SSA of Ukraine is formed (Regulations on the Board, 2016). To consider scientific recommendations and other proposals on the main directions of development of science and technology, discussion of the most important programs and other issues in the SCA of Ukraine, a scientific and technical council is created from among scientists and highly qualified specialists (Regulations on the Scientific, 2016).

Certain mechanisms of space activities in the field of defense are defined in the "Temporary procedure for cooperation between the Ministry of Defense of Ukraine and the National Space

Agency of Ukraine during space activities," approved by the Cabinet of Ministers of Ukraine dated 15.07.1997 No 788 (On the temporary, 1997), but for 20 years since its implementation the document is hopelessly outdated – its provisions cannot be applied to the current delimitation of tasks, functions and powers of the MDU and the General Staff of the Armed Forces of Ukraine (hereinafter the Armed Forces). The draft "Regulations on the interaction of the Ministry of Defense of Ukraine and the State Administration of Ukraine in space activities" developed in 2016 at the beginning of 2022 remains unapproved.

Direct execution of tasks of operation, maintenance and improvement of space activities in the SCA of Ukraine is carried out by the National Center for Space Management and Testing, which was established on the basis of the liquidated 1272nd Main Center for Space Testing and Application MDU in accordance with the Decree of the President of Ukraine from 12.08.1996 No 698/96 (On the National, 1996). According to the official website of the National Center for Space Management and Testing, its mission is to participate in the implementation of state-targeted scientific and technical programs of research, development in the field of space rocketry, special equipment in the interests of national security and defense, economic development of Ukraine, as well as the implementation of certain research projects and research aimed at improving the functioning of the National Center for Space Management and Testing (National, 2021). The purpose of the National Center for Space Management and Testing is to ensure the comprehensive development of the space industry of Ukraine, implementation of the National Targeted Scientific and Technical Space Program of Ukraine and other state-targeted scientific and technical programs for which the SSA of Ukraine is responsible, in the interests of national security and defense, the state economy and population needs (National, 2021).

The legal status, tasks and legal basis of the National Center for Space Management and Testing activity are determined by the "Regulations on the National Center for Space Management and Testing," approved by order of the SSA of Ukraine dated 27.10.2016 № 197 (On approval, 2016).

Decree of the President of Ukraine "On the List of Positions Replaced by Servicemen of the Armed Forces of Ukraine, Other Military Formations, Law Enforcement Bodies of Special Purpose in State Bodies, Enterprises, Institutions, Organizations, and State and Municipal Educational Institutions, and Border Military Ranks in These Positions" dated 03.05.2017 No 126/2017 (About the List, 2017), 471 staff units of servicemen have been established for the SSA of Ukraine, including 93 positions in the representative offices of the General Customer – the SSA of Ukraine and 378 positions in the National Center for Space Management and Testing. Thus, the total number of staff units of servicemen (officers) of the State Tax Administration of Ukraine, compared to the number of staff according to the Passport of the budget program for 2017 (About the statement, 2017), increased by 176 positions (59.66%), and National Center for Space Management and Testing, taking into account the separation of the general customer, – in 83 positions (28.1%) (Vyporkhaniuk & Kovbasiuk, 2018). This indicates the relevance of staffing by relevant specialists of the Armed Forces.

The Decree of the President of Ukraine dated 28.02.2015 No 115/2015 put into effect the decision to establish and ensure the functioning of the Main Situational Center of Ukraine as a software and hardware complex for collecting, accumulating and processing information necessary for preparation and decision-making in the field of national security and defense, defined its tasks (On the decision, 2015). According to this document, the SCA of Ukraine must provide in the prescribed manner to the Main Situation Center of Ukraine processed,

decrypted and analyzed information of high and ultra-high resolution from modern space platforms, which is necessary for the operation of the Main Situation Center of Ukraine.

It should be noted that the modern world is experiencing a process of explosive growth of information, which is characterized by a certain duality. On the one hand, information exists everywhere, and IT is applicable everywhere. On the other hand, this pervasive ability of information and IT creates a problem of its criticality and security. Hacker attacks by the Russian Federation on Ukrainian information systems and infrastructure have shown the need to strengthen cyber resilience.

In order to counteract violations in the cybersphere, the Decree of the President of Ukraine dated 07.06.2016 No 242 established the National Coordination Center for Cyber Security, which is a working body of the National Security and Defense Council of Ukraine (About the National, 2017). Its main tasks are coordination activities; control over the activities of security and defense sector entities that provide cybersecurity; participation in information-analytical and law-making activities.

Also, the Situational Center for Cyber Security was established at the Security Service of Ukraine. In the first quarter of 2021, cyber specialists of the Security Service of Ukraine localized almost 350 potential threats to the information security of our country. Thirty-five hackers and hostile propagandists were prosecuted, 14 criminals were convicted. Also, the Security Service of Ukraine cyber specialists has blocked 220 web resources used for criminal purposes since the beginning of the year (Situational, 2022).

In addition to this center, the Law of Ukraine "On the State Service for Special Communications and Information Protection of Ukraine" dated 23.02.2006 No 3475-IV (About the State, 2006) established the State Service for Special Communications and Information Protection of Ukraine (State Special Communications). Which is a specialized body of central executive power in the field of special communication and information protection, a subject of the defense and security sector, the main subject of the national cybersecurity system, which coordinates the activities of cybersecurity entities in the field of cyber security, and a communications administrator. The State Special Communications Service performs 93 tasks and functions and forms state policy in 16 spheres. To summarize, the functions of the State Special Communications are: protection of government communications, which also includes courier service, information protection, and cyber defense. The Service is managed by the State Special Communications Administration.

The sphere of management of the State Special Communications Administration includes territorial subdivisions, state enterprises, institutions and organizations whose activities are related to ensuring the implementation of the tasks assigned to the Service. More than 11,000 servicemen, civil servants and employees work in the staff of the State Special Communications Service and enterprises belonging to the sphere of management of the Service (About the State, 2022).

In order to provide unified reports on the results of the analysis of data on cyber incidents; interaction with Ukrainian teams to respond to computer emergencies, as well as other enterprises, institutions and organizations, regardless of ownership, that carry out activities related to the security of cyberspace; transfer of information on cyber incidents from citizens regarding cyber defense objects – National Coordination Center for Cyber Security under the National Security and Defense Council of Ukraine (Minutes No 18 meeting of the National Coordination Center for Cyber Security under the National Security and Defense Council of Ukraine from 25.10.2021 / 320 / 21dsk)) approved Rules developed on the basis of the General Rules for the Exchange of Information on Cyber Incidents (TLP Protocol) (Rules, 2021).

Representatives of many countries stressed the need for close cooperation between Ukrainian and international structures in combating cyberterrorism. For example, an official statement (Russian, 2022) on behalf of the 27 EU member states, as well as international partners – the United States, Canada, the United Kingdom, Australia, and others – said that cyberattacks targeting Ukraine and the country's critical infrastructure could spread to others countries and cause systemic consequences. All this threatens the security of European citizens. "The European Union, working closely with its partners, is considering further steps to prevent, discourage, deter and respond to such malicious behavior in cyberspace. The European Union will continue to provide coordinated political, financial and material support to Ukraine to strengthen its cyber resilience" (Russian, 2022) the document states.

In our opinion, the same close cooperation should be in the field of space activities for the needs of national security and defense. Like NATO practice (which will be discussed later in our study).

Thus, the system of entities providing space activities in the military sphere and in the sphere of defense and national security of Ukraine is extensive and has a significant number of authorities responsible for this area of state activity. The main problem is the lack of a special authority that would take care of space activities in these areas. We propose to establish a National Coordination Center for Space Activities under the National Security and Defense Council. It should have similar powers to the National Cyber Security Coordination Center. It is also necessary to establish the "Center for Prevention and Counteraction to Aerospace Hazards."

NATO's experience in the use of space information and technology in military operations

The first experience of large-scale practical use of space systems during hostilities was the operation of coalition forces, which were based on groups of troops (forces) of the Armed Forces of NATO member states (USA, UK, France, Canada, Italy, Spain, Belgium, Greece), against Iraq (August 1990 – February 1991). "Desert Storm," said Chief of Space Operations Gen. Jay Raymond, "is the first time that we integrated strategic space capabilities into the theater for operational advantage" (Pope, 2021).

This operation was considered the first real "space war," which used GPS, high-precision weapons and satellite communications. These technologies and tools have been central and important to success. The main tasks for the application of space information and technology in the conflict area were space reconnaissance, satellite communications, space information planning and assessment of the results of enemy targets, navigation, and topographic and meteorological support of coalition forces. More than 100 reconnaissance, communications and navigation vehicles were used to prepare and conduct the operation (Vyporkhaniuk & Kovbasiuk, 2018; Negoda et al., 2005; Van Hoof, 2010).

A similar experience was used in Yugoslavia. Where under the Commander-in-Chief of the NATO Armed Forces in Europe, a special unit for the use of spacecraft was established to coordinate the actions of various intelligence tools, as well as to optimize the information received. About 20 mobile task forces were sent to the area of hostilities to provide space information to the commanders of the tactical units of aviation and naval groups. Large-scale use of space systems in the Balkans has significantly increased the combat effectiveness of all types of weapons, efficiency of planning and operations, and experience in the use of space has

finally confirmed the need and high efficiency of space support groups (SSG) created in various levels of government. Space systems have made significant contributions to reconnaissance, communications, radio navigation and meteorological tasks during the anti-terrorist operation "Unwavering Freedom" in Afghanistan (2001) against the Islamic Taliban. During the operation, Allied forces used about 150 spacecraft with the leading role of the United States (ISAF's, 2022; Sari & Nasu, 2021; Vyporkhaniuk & Kovbasiuk, 2018: 49; Negoda et al., 2005; Chuparis, 2002).

One of the main current NATO regulations on space activities is the NATO Standardization Agreement STANAG 3700 (Standardization, 2016), which introduces the next version of the NATO standard AJP-3.3 "Allied Joint Doctrine for Air and Space Operations" (NATO Standard, 2016). The purpose of the NATO STANAG 3700 standardization agreement is to respond to the following prerequisites for operational cooperation: to provide NATO forces with a single doctrine setting out standard procedures for the use of air and space capabilities in joint air operations (combat operations); optimizing the use and operational interaction of NATO air resources in joint air operations (combat operations) and improving the effectiveness of operational planning.

Implementation of the STANAG 3700 Agreement is carried out after the publication of the necessary national orders (instructions), which provide guidance on the effective application of the content set out in the AJP-3.3 standard in military practice. The STANAG 3700 is subject to review every three years. The result of the revision is entered into the NATO Standardization Documents database. NATO countries and institutions may at any time submit proposals for changes in accordance with standard procedures to the task authority, where the proposals will be processed during the revision of the standardization agreement. Control over the standardization agreement is carried out by: Military Committee Joint Standardization Board, (MCJSB); Air Operations Working Group (AOWG). Requirements for the preparation and conduct of NATO space operations are defined in Chapter 5 Space Support to Nato Operations standard AJP-3.3. In NATO, space capabilities involved in planning and conducting operations at all levels are provided by the government, military, civilian and commercial providers. AJP-3.3 states that NATO does not currently have its own spacecraft in orbit, and that the Alliance owns and operates a sufficient number of ground facilities (e.g., base stations and satellite terminals). The absence of its own spacecraft in orbit, in this case, should be understood as the absence of common orbital means for all NATO member countries, as individual NATO member countries have orbital groups of existing spacecraft for various purposes (NATO Standard, 2016).

In addition to regulating the use of space information and technology, NATO regularly publishes methodological and analytical materials. For example, the introduction to the NATO Space Handbook notes that a study of NATO's experience of operations in recent years has helped to identify the Alliance's dependence on space capabilities and the support of professionals, agencies, and countries that administer and operate systems. NATO commanders, staff, and forces must continue to gain knowledge and experience of space support operations (combat operations) (Vyporkhaniuk & Kovbasiuk, 2018: 66; Messerotti, 2014; NATO Space Handbook, 2013; Moon, 2017).

A number of published methodological and analytical documents, such as: The Space Domain and Allied Defence (Moon, 2017), Cybersecurity of NATO's Space-based Strategic Assets (Unal, 2019) and others, also testify to the implementation of systematic and purposeful development of NATO military activities.

NATO has determined that space assets provide such "a critical (and integrating) infrastructure and capability ... essential to day-to-day NATO operations" that "NATO ACT has defined Space Capability Preservation (SCP) as one of [its] Long Term Capability Requirements (LTCR) " (NATO Space, 2014). NATO focuses not only on the importance of space capabilities, but also on space operations in general. By providing space information and technology to member countries, integrating these tools into NATO's plans, as well as NATO's ability to coordinate and control space forces to support NATO operations (Tombarge, 2014).

Thus, the organization of the development of outer space and its further effective use in the interests of information support for the training and use of troops (forces) of NATO member countries is based on the study of the state of the space situation and the space environment. To obtain this knowledge, space information and technologies are used, which include appropriate tools – radar, optical, optoelectronic and radio technical means of space monitoring. In addition, NATO is constantly improving its regulatory framework for the use of space products and services, as well as conducting ongoing training using methodological and analytical materials, as well as the experience of military campaigns.

Conclusions

Modern threats in the military sphere of Ukraine and the task of ensuring the state's defense capabilities require accelerated development of space information technologies and determine the urgent need to improve the organization of the use of space information and technologies in the Armed Forces – the creation of necessary organizational structures, deployment of modern software and space processing, organization of high-speed communication lines and data transmission, training of military specialists in the areas of application (use) of spacecraft, etc.

The war between Russia and Ukraine has made significant adjustments in the development of space activities in general and in the use of space information and technology in particular. Many units that were part of the state space system of Ukraine were destroyed. The main of lost structural subdivisions (institutions) are the National Center for Space Management and Testing Department (Evpatoria) and the ground infrastructure of the space system "Sich-2" created on its basis, which included: 1) the ground control complex of the spacecraft, which included the space control center, S-band spacecraft control stations, main information hall; 2) terrestrial information complex, which included the operator center, X-band information reception stations, information processing and archiving complexes; Space Control Center (Evpatoria), which directly solved the tasks of spacecraft management in the framework of national and international space programs, reception of spacecraft and processing of scientific and special information, control and analysis of the space situation, testing of promising spacecraft. It included subdivisions of operation of ground means of the National Center for Space Management and Testing Department, located on sites No 1 (village Vitino), No 2 (village Zaozerne) and No 3 (village Molochne) west of Evpatoria. The main ones were the operational units of radio engineering and quantum optical means, the Center for Control and Analysis of the Space Situation (CCASS) and; the Southern Center for Radio Engineering Surveillance (Sevastopol). And from February 24, 2022, Ukraine's losses became more significant.

However, Ukrainian experts, together with NATO experts, are working to improve the regulatory framework for the use of space information and technology in the military. Thus, the following draft documents have been developed to date: Military standard "Space support of operations of the Armed Forces of Ukraine. Terms and definitions"; Military standard

"Space situational awareness. Terms and definitions"; "Space activities in the field of defense. Substantive provisions." In 2020, a series of R&D (2017-2020) aimed at deep modernization of the 5H86 radar station was continued as part of the improvement of the domestic space situation monitoring and analysis system (Scientific, 2020).

Thus, Ukraine has significant prospects for developing an organizational and legal framework for using space information and technology in military activities. It is crucial to support and adapt the experience of the troops of the Armed Forces of NATO member states, which for decades have demonstrated a systematic, balanced and clear approach to the tasks of the supranational level of security.

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