International Society of Philosophy and Cosmology
Scientific Institute of Public Law

Advanced Space Law

Volume 9

Kyiv, 2022

Advanced Space Law, Volume 9, 2022
Academic Journal

ISSN 2663-3663 (Online); ISSN 2663-3655 (Print)
The State Registration Certificate of the print media KB No 23886-13726P, May 11, 2019
http://asljournal.org
E-mail: info@asljournal.org

Printed according to the resolution of the Scientific Board of International Society of Philosophy and Cosmology (Minutes of meeting No 20, May 15, 2022)

Printed according to the resolution of the Scientific Board of Scientific Institute of Public Law (Minutes of meeting No 6, May 18, 2022)

The Journal is indexed and abstracted:
Central and Eastern European Online Library (CEEOL);
Directory of Open Access Journals (DOAJ); ERIH PLUS; Index Copernicus;
Ulrich's Periodicals Directory; Vernadsky National Library of Ukraine
The Journal included in the List of Scientific Professional Publications of Ukraine,
Category "B." Decision of the Ministry of Education and Science of Ukraine, April 15, 2021.

International Society of Philosophy and Cosmology:
http://www.bazaluk.com/
Scientific Institute of Public Law
http://sipl.com.ua/

Table of Contents

Space Science and Education: Legal Analysis of the Experience of China and Ukraine

Ihor Hlobenko

Ph.D. in Law, Science & Space LLC (Kyiv, Ukraine)
E-mail: globenko@ukr.net
https://orcid.org/0000-0002-3058-521X

Maksym Baryshnikov

Research Institute of Informatics and Law of the National Academy of Legal Sciences of Ukraine (Kyiv, Ukraine)
E-mail: maxlaw@bkb-law.com.ua
https://orcid.org/0000-0001-6592-8529

Anelia Kudin

National University of Life and Environmental Sciences (Kyiv, Ukraine)
E-mail: aneliakudin@gmail.com
https://orcid.org/0000-0002-5236-3140

Alexander Krupytskyi

Research Institute of Public Law (Kyiv, Ukraine)
E-mail: alexanderkrupytskyi@gmail.com
https://orcid.org/0000-0003-0578-5372

Alexander Levenko

General constructor of the Science & Space LLC (Kyiv, Ukraine)
E-mail: alexander.levenko@gmail.com
https://orcid.org/0000-0002-1894-8372

Hlobenko, Ihor, Maksym Baryshnikov, Anelia Kudin, Alexander Krupytskyi, and Alexander Levenko (2022) Space Science and Education: Legal Analysis of the Experience of China and Ukraine. *Advanced Space Law*, Volume 9, 4-14.https://doi.org/10.29202/asl/9/1

The article analyzes the legal experience of space science and education in China and Ukraine. It is proved that the legal and organizational regulation of the space industry of China and Ukraine reflects different trends. China has progressed in space science and education, while Ukraine has stagnated. China has taken the best of Soviet and Western expertise. Ukraine was left with the worst achievements of the Soviet-era public administration and did not introduce the competitive mechanisms of Western society. It is concluded that individual scientists and designers in Ukraine have preserved their outstanding potential in space research. Ukrainian space education has a long and illustrious history.

Keywords: scientist, China, competition, designer, space industry, science, education, legal analysis, public administration, Ukraine

Received: 20 April 2022 / Accepted: 08 May 2022 / Published: 10 June 2022

Introduction

Science and education play an important role in the development of any high-tech field, including the space industry. In recent years, space science and education have begun to progress dynamically. This is primarily due to the active involvement of private space companies and private financial capital in the use of outer space.

China is one of the leading space powers, which, along with the United States, is today at the forefront of the study and usage of space. In turn, Ukraine has a glorious tradition of developing and manufacturing rocket launchers and other space products. Originally, national space actors transferred technology to China. However, in the contemporary world, China has been able to make significant progress in space exploration. This was accomplished by combining Soviet and Western experience in technical, economic and financial support of space science, as well as technology and education development. The Ukrainian space sector has been in decline in recent years, primarily due to legal and organizational miscalculations of the highest state authorities. In today's circumstances, Ukraine's national cosmic industry in general, as well as cosmic science and education, must draw on Chinese expertise.

Why have Chinese space science and education flourished? The legal and organizational causes are highlighted in the following article. What, on the other hand, is the reason for the decline of space science in Ukraine? Simultaneously, the phenomenon of how Ukrainian space education has managed to remain at a good level and continue to develop was described without paying attention to the modest success of national space companies in the field of use and research of outer space.

The article focused on comparing the advantages of the public administration system of China's space industry to insignificant public administration in Ukraine. It is concluded that only the transition to market-based competitive principles, which are based on private ownership and public-private partnership, can improve the state of affairs in the Ukrainian space industry and space science as a whole.

Historical and legal retrospective of space science in Ukraine

Ukrainian scientific schools occupied a leading position in the space industry of the Soviet Union. First and foremost, due consideration was given to the development and production of carrier rockets. Most of the strategic military missiles of the Soviet Empire were designed by the Southern Design Bureau and manufactured at the Southern Machine-Building Plant, located in Dnipro (Ukraine). However, it is worth mentioning that more than two thousand subcontractors from different regions of the Soviet Union were engaged in the supply of components for Pivdenmash (Voight, 2018).

In general, it should be noted that when Ukrainian lands became part of the Soviet empire, the direct involvement of national experts in civil space projects was limited **(**Kukushkin & Levenko, 2018; Kavats et al., 2018; Soroka, 2020). It is natural that in the early years of Ukraine's independence, national space research was based on the traditions and remnants of the potential of the Soviet military-industrial complex (Baklanov, 2013).

From the point of view of public administration, it is necessary to note that the National Space Agency of Ukraine was established on February 29, 1992, based on the need to preserve and further develop the scientific, technical, and production potential of Ukraine's space industry in order to solve socio-economic problems (About creation, 1992). It should be emphasized that at the time, neither the officials of the State Space Agency nor the management of scientific institutions and enterprises had any experience in international civilian space activities. Unfortunately, state space structures in Ukraine have used scientific developments in rocket and space experience from the previous era for more than 30 years. During this time, they created 7 questionable satellites. Zenit military missiles were converted into civilian ones under the commercial name "Zenit-3SL." Certain foreign commercial entities with corrupt ties to high-ranking government officials have long used Soviet-made military ballistic missiles in Ukraine during the Soviet era to convert launches of carrier rockets known as "Dnipro" and "Tsyklon-3." Despite the fact that there was and still is a lot of scientific and design potential, no new launch vehicles or civilian missile systems were developed (Bilenchuk et al., 2022).

For a long time, the space industry has been reforming on the basis of equality of all forms of ownership and the establishment of competition. There are currently state-owned space companies that receive insufficient government funding and state order (Baklanov, 2013).

To avoid bankruptcy, the Cabinet of Ministers intervenes and, through the Parliament of Ukraine, provides subventions to some state-owned enterprises in the space industry to cover their critical accounts payable. For example, the Verkhovna Rada amended the law "On the State Budget of Ukraine for 2020," which provided for the introduction of a new budget program by replenishing the authorized capital of the state enterprise "Production Association Southern Machine-Building Plant named after Alexander Makarov" to repay wage arrears, the only social contribution, certain taxes and budget expenditures with the amount of UAH 2,318.228 million (The Verkhovna, 2020).

Only on January 29, 2020, the Law of Ukraine came into force, allowing private entities to operate in space. After all, according to the document, the subjects of space activities can be enterprises, institutions and organizations of any form of ownership, including international and foreign, which carry out space activities (On amendments, 2019).

Ukraine established space programs after regaining independence. However, allocated public funds and loans secured by state guarantees were not effectively used (Levenko &

Drozdenko, 2021). This is confirmed by the fact that there were space programs, but there was no practical achievement **(**Kuznetsov, 2021).

The participation of individual space firms in foreign commercial companies required state funding without profit for the state. This is how financial debts came into being (The companies, 2021).

As a result, the once powerful design and missile building potential of Ukraine to create new ballistic missiles had been destroyed. Unfortunately, space science gradually declined (Holovinska, 2011). At the same time, some top managers of state space enterprises and research institutions have amassed multimillion-dollar fortunes. For example, the Soyuz Research Institute was completely liquidated (About, 2013).

Despite these unfavorable aspects, it should be emphasized that the high scientific and design potential of Ukrainian scientists is preserved. Alas, the space industry's public administration system is currently one of the worst in the world and is nearly Soviet in nature. The state entities of the space sector are left with essentially no state funding, which is a negative attribute. State-owned space companies and scientific institutions have long operated under artificial administrative monopolies, but have been unable to profit from them. After all, they are deprived of international business self-sufficiency. Moreover, the state not only does not help them develop, but on the contrary, restrains by specialized administrative measures.

Thus, the situation in Ukraine is somewhat paradoxical. Ukrainian scientists and designers have one of the world's best experiences in the development and construction of carrier rockets. However, due to the insignificant system of public administration, they do not have the opportunity to attract financial investment in the space industry. As a result, virtually no new civilian rocket and space complex has been developed in Ukraine since independence.

Legal and organizational experience of science and education in China

China is one of the mightiest space powers, boldly and ambitiously competing with the United States, leaving far behind the once space power – Russia. One of the latest successes of Chinese scientists is the launch into orbit of 5 satellites of the Jilin-1 Gaofen 03D (04-07)/04A series. The launch was conducted on April 30, 2022, by the Long March 11 Haisheyao-3 carrier rocket in the waters of the East China Sea. This is the Chinese version of the sea launch from the floating platform De Bo 3. The satellites will be mainly used for remote sensing of the Earth when planning the construction and reconstruction of cities and monitoring of natural disasters (Jing, 2022).

The Long March series launch vehicle in the solid propellant version was launched for the 418th time; the Jilin-1 orbital group currently contains 46 satellites, allowing to observe everywhere in the world at any time. Due to the application of trends in the development of rocket and space technology in the People's Republic of China, this event is no less significant than the launch of lunar rovers (Levenko, 2019).

Chinese space science and education trends have their own history. The popular perception of ancient Chinese legends and the culture of fireworks has nothing to do with modern space science and education. After all, it was only a millennium ago that the first missile technology was seriously used for military purposes in China. The army of the Republic of China used mortars successfully in the 1920s, much earlier than many other armies around the world. For instance, mortars played a major role in the hostilities of the war between Soviet Russia

and the Chinese army in 1929 for the China-Eastern Railway, which was built in the lands of China by the Russian Empire. Its center was located on Chinese territory in the city of Harbin (Levenko, 2019).

After all, in its technical essence, the mortar is a small prototype of a ballistic missile on solid fuel, which is ejected from the barrel of the mortar during a dynamic fire launch. Decades later, this method of launching military missiles gained much popularity under the same name – "mortar."

In terms of the practical development of modern space science and education in China, famous scientist Chenzhi Li accurately described the first stage (before 1991). He claims that the decision of communist China (1954) to develop nuclear weapons and launch vehicles (1956) was the impetus for the development of space science and education. Thus, rocket cosmic science and education in China emerged solely due to defense missions, and this trend has changed little by 2022. There was a tendency to study, borrow and use foreign experience in order to create their own high-tech developments, rather than to shy away from international experience and to be somewhat cynical in terms of intellectual property rights. Hundreds of scientists and also researchers of Chinese origin with the practical experience from the United States and other Western countries were invited to China. In 1957, the United States was already conducting flight tests of the first model of the Polaris-A1 submarine. Its design took into account both the influence of German specialists who moved to the United States after World War II and the advanced technologies of Americans (Li, 2013).

The desire of the Soviet Union to seize China's sphere of influence in the confrontation with the United States led to the transfer of documentation and technology for the production of a serial R-5 carrier rocket, which was capable of delivering nuclear warheads. The manufacturer of the R-5 was the so-called mailbox 186, located in Dnipro, Ukraine. In order to reduce costs and time to create their own ballistic missile, the R-5 was replicated in China with the increased size of different parts, particularly the liquid rocket engine. The decades of the trial were crowned with the successful adoption of the ultimate program for rocket and space technology development in 1991 (Li, 2013).

The trend of creative borrowing of foreign technologies continues to this day. The Fifth Academy under the Ministry of Defense of the People's Republic of China was established and later modernized several times to develop missiles and production technologies. The Chinese Academy differs from Ukrainian ideas and Western paradigms in general. After all, similar in name, Western categories often acquire the characteristics of anonymity. There are dozens and hundreds of research institutes, organizations, enterprises, and companies in China, the largest of which employ up to 200,000 people. It conducts rocket and cosmic technology research, design and construction, testing, and manufacturing. The Academies collaborate with the National Space Administration of the People's Republic of China, which has the right to openly present space exploration in China and cannot function without the Academies. A huge number of universities have been established in the PRC, some of which have a clearly defined rocket and space orientation in the training of specialists in the implementation of applied research. The academy not only ensures the development of Chinese science, technology and higher education, but also supervises the development and manufacture of rocket engines. In the city of Xi'an, Shaanxi Province, the Northwestern Polytechnic University has been established with 13 institutes, where 1,300 professors and associate professors educate students and conduct research in 52 different specialties (Northwestern, 2022).

Some research institutes and plants have been relocated from Xi'an to Hohhot city of Inner Mongolia Autonomous Region, where the Inner Mongolia University of Technology, with 52 research institutes and dozens of disciplines, provides training, particularly in fuel chemistry. There are 2068 teachers in total, including 705 professors and associate professors (Mongolia, 2022).

Equally interesting are the Northern University of China, Taiyuan City, Shanxi Province (missile weapons and artillery are being developed here), as well as many other higher education institutions of the Ministry of Education. The Harbin Institute of Technology is the main training center for rocket and space technology, operating under the auspices of the Ministry of Industry and Information Technology of the People's Republic of China. There are 23 research schools with many institutes and scientific centers, where 25,000 students get an education (Harbin, 2022).

The educational process of Harbin Institute of Technology is carried out on the basis of: "one school, three districts." The Harbin Institute of Technology has two departments located in Weihai, Shandong Province, on the Shandong Peninsula, which specializes in naval missile research and in Shenzhen City, Guangdong Province in southern China.

Among the many Harbin Institutes of Technology, the Space Environment Simulation Research Infrastructure is particularly well known (Institute, 2022). It specializes in modeling the space environment and conducting research of its impact on space technology and materials. By 2022, it will be a full-fledged, relatively independent center of space science and education. It focuses on the study of fundamental scientific issues in the field of space materials, devices, magnetosphere physics, space environment, etc. The institute owns the most modern systems of analysis and measurement. SESRI's research capabilities cover fundamental categories of scientific problems: the evolution of the structure and characteristics of materials in the integrated space environment; mechanisms of life in the space environment; propagation and evolution of space plasma and the physical mechanism of its interaction with spacecraft. SESRI has various particle accelerators. Accelerator of protons and heavy ions at 300 MeV, which are the main source of radiation, supplies protons at 100-300 MeV and heavy ions at an energy of 7-85 MeV / u to study the interaction of radiation from high-energy space particles with a special device and life support module. To meet the above requirements, the installations use a combination of the electron-cyclotron resonance ion source, linear accelerator injector and synchrotron. The linear accelerator injector delivers heavy ion beams with energy of 1 structure of the linear accelerator RFQ (radio frequency quadrupole) and IH-DTL (accelerator with a drift tube type Interdigital H-mode). The synchrotron accelerates heavy ions to 85 MeV / nucleon and the proton beam to 300 MeV, as well as the third whole resonance and method RF-KO (RF-Knock-Out) (Jiang et al., 2019).

Such specialization of universities in conducting basic research with applied tasks is traditional for China. At the same time, trends in the transfer of military technology to the civilian sector play a key role. The conversion of the defense and missile industry in China began in 1991. A special program for the commercialization of military technology is still in place. However, the administration is under the control of China's military action at all levels of public administration, up to local initiatives. It is critical to include the development of rocket and cosmic technologies in China's five-year plans for socio-economic development. Simultaneously, strict control over the implementation of plans and high responsibility for their non-implementation are applied. These plans concern both China-wide goals and development at the provincial level, including in the field of education. The following activities resulted in the establishment of China's fifth

spaceport – the sea launch. The East China Dongfang Spacecraft Launch Port was founded in Yantai, Shandong Haiyan area. Coastal cities on the Shandong Peninsula are rapidly developing. Yantai is well-known for its research institutes dedicated to the design and production of communications satellites and satellite equipment. Yantai produced 96 percent of all computers on the Chinese space station, 90 percent of the electronics in Chinese space suits Feitian, as well as wireless space communication (Zhang, 2022).

Weihai, which is nearby, has a branch of the Harbin Institute of Technology. Next on the coast is the industrial giant Qingdao, with one of the largest Earth remote sensing centers in China. Such a conglomerate of science, technology, and education in Qingdao and Yantai with a dozen different universities is converting rocket space technology into the private sector through public-private partnerships, leading to the creation of a special industrial zone with China's first maritime spaceport. The full cycle of design, manufacture, launch of satellites and use of space information for remote sensing of the Earth is provided there. Another up-to-date Earth Remote Sensing Center has been set up in Yantai. This is the most powerful achievement of China's space rocket technology in the last 30 years. The first launch of the carrier rocket in the Yellow Sea was performed following a one-stop principle, i.e., integration of the final assembly of the carrier rocket at the plant in Haiyan, the conduct of general tests, a departure from port and launch in the waters of the Yellow Sea (Deng, 2022).

It is planned to produce and launch ten carrier rockets per year at the Haiyan Commercial Solid Fuel Industrial Base. It also intends to establish a research and production base for commercial Galaxy Power solid rockets developed in Beijing by Space Technology Co., Ltd. The total value of the products will exceed 10 billion yuan. The development of Chinese science, technology and education is directly related to the modern space achievements of China (Deng, 2022).

Thus, by borrowing technology from the United States and the Soviet Union, China has been able to become the most developed country in the world in terms of space science and education. This success is based on the public funding of the military, which gradually began to transfer its development to a private business relying on strict public-private partnership control.

Space education in Ukraine: legal and organizational aspects

Space education in Ukraine developed primarily at the Physical and Technical Faculty of Dnipro National University, which was established in 1951. Until 1991, it was the only and secret faculty of higher education that trained personnel for ballistic missile design, construction, testing and mass production.

The training was conducted on the full-time and evening forms. Evening education was provided mainly by leading specialists and scientists from mailbox 86 and mailbox 2289, who already had practical experience, as well as students working in the space industry. The level of professional knowledge was extraordinarily high. The traditional places of employment for the graduates of the faculty were the basic enterprises – State Design Bureau "Southern," "Southern Machine-Building Plant," Institute of Technical Mechanics of the National Academy of Sciences of Ukraine and the State Space Agency of Ukraine, as well as Educational and Research Institute of Mechanical Engineering (Faculty, 2022).

In today's world, the latter has ceased to exist, and other named subjects of practical space activities do not hire graduates of space specialties. The subjects of practical space activities

do not have international legal and administrative-organizational independence because of the unreformed system of public administration. On the other hand, the subjects of practical space activities are not provided with state funding.

During the period of Ukraine's independence, space specialties were approved at the Kyiv Polytechnic Institute, Kharkiv Aviation Institute and the National Aviation University. The only Technical Missile College in Dnipro and Higher Professional College train highly qualified workers in missile specialties.

For example, at the National Technical University of Ukraine, "Igor Sikorsky Kyiv Polytechnic Institute," the Institute of Aerospace Technology with all levels of higher education is successfully operating. In particular, doctors of philosophy are trained in the specialty "Aviation and rocket and space technology." Thereby, trained specialists are able to set and solve complex research problems, in particular, to improve existing and develop new methods of designing rocket, space and aviation equipment and to carry out their scientific testing. At the same time, graduate students have the opportunity to do internships in European universities thanks to the international mobility programs Erasmus and Erasmus Plus. Partner universities: Warsaw University of Technology (Poland), Central School of Nantes (France), University of the Basque Country (Spain), University of Trento (Italy), Czech Technical University (Czech Republic), Budapest University of Technology and Economics (Hungary), Dublin Institute of Technology (Ireland), University of Southampton (UK), Stuttgart Technology University (Germany), Berlin University of Technology (Germany), Northwestern Polytechnic University (China), Dalian Maritime University (China), etc. (Aeronautic, 2020).

Thus, space education traditionally functions and progresses in Ukraine. Most talented graduates of national space universities find employment in developed Western countries.

Legal and organizational factors of the development of modern space science and education in Ukraine

There are a number of negative facts and challenges in the field of space science in Ukraine. From the point of view of public administration, the state space agency is not independent. It functions within the political and public administration of the Ministry of Strategic Industries of Ukraine. The space rocket industry, which produces strategic missile carriers, does not receive adequate funding.

As a result of the full-scale invasion of Ukraine by the Russian Federation, their terrorist forces are destroying military and civilian targets in Ukraine with ballistic and cruise missiles. Unfortunately, the military-political leadership does not have the means to repel the aggressor (Russian, 2022).

After all, Ukraine has not had any practical success in space science or in the production of rocket technologies in the last 30 years. The situation in the world is the opposite, based on public-private partnership with the use of defense tasks as a basic element.

Nowadays, Ukraine has a legislative opportunity to engage private entities in space activities. The State Space Agency, which is supposed to create a mechanism for legal regulation, has not undertaken any action. The agency did not even adjust its documentation to the peculiarities of the legal regulation of private space science and technology. As a result, private initiatives are not supported by the state. In fact, there are private space science initiatives in Ukraine, but they are exported to the United States, Great Britain, France, South Korea and other democracies.

At the same time, state structures, at the level of enterprises, scientific and educational institutions, still do not differ from the structures of the military-industrial complex of Ukraine of the past era – and therefore, cannot be maintained without reform by a modern democratic state with a market economy.

After the abolition of the state monopoly on space activities, numerous private micro design bureaus and companies were formed in Ukraine (Research, 2022). One of them is Science & Space LLC, which already has modern projects of the rocket and space complex and reusable rocket engine on non-toxic and non-cryogenic fuel components (rocket complex and engine patented in Ukraine), as well as several revolutionary technical proposals for launch vehicles, which were reviewed by officials in Ukraine (Mission, 2022).

Therefore, a powerful scientific space potential in the heart of Ukraine is not in high demand today. Scientists and practitioners of the national space industry are implementing their plans in developed Western democracies: Britain, the USA, France, South Korea and others. The space activities are primarily conducted by private research institutions and businesses, which are more mobile and proactive. They are not so burdened by the negative public administration of regulatory bodies.

Conclusions

The legal and organizational regulation of the Chinese and Ukrainian space industries reflects different trends. Ukraine has previously enjoyed great success. However, under the current circumstances, no progress has been made. China, on the other hand, began to actively develop space science and education only in the 1990s. Space science and education flourished in China and withered in Ukraine. Indeed, in terms of public funding and competitive research, China has taken the best from the Soviet empire and Western countries. On the contrary, Ukraine has stuck in the public administration systems of the past era, has not introduced competitive development mechanisms and left the national space industry without funding.

Space science in Ukraine has preserved its high-tech potential at the level of individual scientists and designers. Ukrainian space education is traditionally strong and evolving. However, talented graduates of higher educational institutions of Ukraine usually work in specialized companies in Western democracies. In 2020, space science and education in Ukraine began to develop at the expense of private initiatives. Ukraine's private cosmic industry is focused on Western and Chinese investments and space markets.

🕮 References

About the creation of the National space agency of Ukraine (1992) Decree of the President of Ukraine of February 29, No 117. Available online: https://zakon.rada.gov.ua/laws/show/117/92#Text

About the reorganization of the sovereign enterprise (2013) Decree to the Cabinet of Ministers of Ukraine of April 14, No 598. Available online: https://www.kmu.gov.ua/npas/246616648

Aeronautic and Rocher-Space engineering (2020) National Technical University of Ukraine Igor Sikorsky Kyiv Polytechnic Institute. https://ki.kpi.ua/wp-content/uploads/2021/08/%D0%9E%D0%9D%D0%9F_PhD.pdf

Baklanov, O. (2013) *Domestic military-industrial complex and its historical development*.

Bilenchuk, P., Maliy, M., Svatyuk, M. (2022) *Legal and Scientific Support of Interstellar Flights*. *Electronic Space Universe.* Available online: https://lexinform.com.ua/dumka-eksperta/pravove-i-naukove-zabezpechennya-mizhzoryanyh-polotiv-elektronnyj-kosmichnyj-vsesvit/

Li, Chengzhi (2013) *Development of Chinese space technologies*. Behind the editors Bao Ou, Khan Yihua, Yu. M. Baturina. Nestor-History.

Deng, Yunan (2022) *My country successfully launched Jilin-1 Gaofen 03D (04-07)/04A satellite*. SINA. Available online: https://news.sina.com.cn/c/2022-04-30/doc-imcwiwst4892556.shtml

Kuznetsov, Eduard (2021) Ukraine is corrupted by other People's companions, so that access to Secret Information is open. *Mind*. Available online: https://mind.ua/publications/20213798-eduard-kuznecov-ukrayina-koristuetsya-chuzhimi-suputnikami-tobto-dostup-do-sekretnoyi-informaciyi-vidk

Jiang, H.P., Q.M. Chen, W. Chen, Z.N. Han, H.F. Hao, J. Liu, J. Zhang, and T. Zhang (2019) *SESRI 300 MeV Proton and Heavy Ion Accelerator*. Harbin Institute of Technology. https://doi.org/10.18429/JACoW-IPAC2019-MOPTS060

Faculty of Physics and Technology. Dnipro National University named after Oles Honchar (2022) Official website. Available online: https://www.dnu.dp.ua

Harbin Institute of Technology (2022) Official website. http://hit.edu.cn

Holovinska, Halyna (2011) *"Arsenal": pivkroku to collapse*. Available online: Ekonomichna Pravda. https://www.epravda.com.ua/publications/2011/04/6/281389

Institute of Space Environment and Matter Science (2022) Official website. http://sesri.hit.edu.cn

Kavats, V., Levenko, A., and Pauk, O. (2018) *The Rocket Forces of the Russian Federation as a Nuclear Threat Factor*. Dominanta Print.

Kukushkin, V., and Levenko, A. (2018) *"Cold War" and defenders of the fatherland. Made by Yuzhmash*. Dominanta Print.

Levenko, Alexander (2019) *Crossing the Sungari.* Dominant Print.

Levenko, Alexander, and Drozdenko, Alexander (2021) *Legal analysis of space administration in Ukraine and China*. Dominanta Print.

Mission of the Space and Science company (2022) Science&Space. Available online: http://www.sciencespace.com.ua/about%20us.html

Mongolia Industrial University (2022) Official website. Available online: http://www.imut.edu.cn

Northwestern Polytechnical University (2022) Official website. https://www.nwpu.edu.cn

On amendments to some laws of Ukraine on state regulation of space activities (2019) Law of Ukraine of October 02, No 143-IX. Available online: https://zakon.rada.gov.ua/laws/show/143-20#Text

Research Institute of Maritime and Space Law (2022) Official website. Available online: http://www.imsl.com.ua/news.html

Russian missile strike on Kyiv: journalist killed, 10 injured (2022) *BBC*. Available online: https://www.bbc.com/ukrainian/news-61247837

Soroka, Larysa (2020) General characteristics of the contractual legal framework of Ukrainian-Chinese relations. *Colloquium-journal*, No 8, 177-180. https://doi.org/10.24411/2520-6990-2020-11570

Voight, Sergei (2018) *Ukraine and space. History and commercialization of rocket and space activities*. Dominanta Print.

The companies of Derzhkosmos took over 800 million bitcoins (2021) *Ekonomichna Pravda*. Available online: https://www.epravda.com.ua/news/2021/05/17/673924

The Verkhovna Rada allocated money to Pivdenmash (2020) *Milinan*. Available online: https://mil.in.ua/uk/news/verhovna-rada-vydilyla-groshi-pivdenmashu/

Jing, Yang (2022) *"Jilin-1" Gaofen 03D (04-07)/04A satellite was launched into*. Available online: http://www.jl.gov.cn/zw/yw/jlyw/202205/t20220501_8441167.html

Zhang, Nan (2022) *From "Picking the Stars" to "Lighting up the constellations."* Yantai's aerospace romance. Available online: http://124.133.228.83/articleContent/2205_1006952.html

Earth Observation for the Protection of Human Rights during the Armed Aggression

Ana Hurova

Ph.D. in Law, Koretsky State and Law Institute of the NAS Ukraine (Kyiv, Ukraine)
E-mail: a.m.hurova@gmail.com
https://orcid.org/0000-0003-4134-761X

Hurova, Ana (2022) Earth Observation for the Protection of Human Rights during the Armed Aggression. *Advanced Space Law*, Volume 9, 15-27. https://doi.org/10.29202/asl/9/2

Russia's military aggression against Ukraine has raised a wide range of issues concerning the use of remote sensing data for the protection of human rights and freedoms during armed conflicts. This article looked at how satellite images help prevent violations, reduce violations, and establish evidence to be held responsible. In addition, significant attention is paid to sources of such data from Ukraine, since it does not have its own grouping of satellites for these purposes. The article describes the legal and organizational aspects of data obtained from international institutions, businesses, and other open sources.

Keywords: Earth observation data, russian aggression against Ukraine, OSINT

Received: 08 April 2022 / Accepted: 27 April 2022 / Published: 10 June 2022

Introduction

One of the most famous statements of ancient lawyer Cicero is "inter arma enim silent leges." A lot of time has passed from the ancient epoch where the position of victims was faced with silence, but today the inaction of a witness cannot be actual anymore due to real-time war monitoring by everyone interested in this.

Each person can count on human rights during the act of aggression of one State against another that is enshrined at least in: 1) the Universal Declaration of Human Rights (UDHR) on December 10, 1948; 2) the Geneva Convention Relative to the Protection of Civilian Persons in Time of War on August 12, 1949 (The Geneva, 2010); 3) the Protocol Additional to the Geneva Conventions from August 12, 1949, and relating to the Protection of Victims of International Armed Conflicts (Protocol I) from June 8, 1977, etc.

Since 1960, satellite reconnaissance has played a significant role in providing information

concerning enemy missiles, troop deployments and military positioning using photographic images and finding displaced persons fleeing conflict zones and relocating them to large refugee camps (Al-Doski et al., 2013). The Argentine and British governments to obtain images of the Falkland Islands could have used Landsat images even with a resolution of 80 meters and 24 hours of data processing. NASA gave them only by prior arrangement. (Wynn, 1982). Therefore, the widespread use of satellite imagery starts with the 1991 Gulf War between Iraq and Kuwait. Then, satellite images have played a key role in documenting the widespread burning of ethnic Rohingya villages in Burma, attacks against schools in Syria, and airstrikes in populated neighborhoods of Mosul, Iraq (New, 2017) and other types of harassment. With the full-scaled russian armed intervention into Ukraine, russian government made every effort for the whole world to believe that "inter arma enim silent leges" is absolute truth, but their efforts is broken due to the revealing potential of satellite imagery. Visual evidence, however, has never been so plentiful during an unfolding conflict as during Putin's war in Ukraine (Russia's, 2022).

Examples of the application of the satellite images for the protection of human rights during the russian aggression

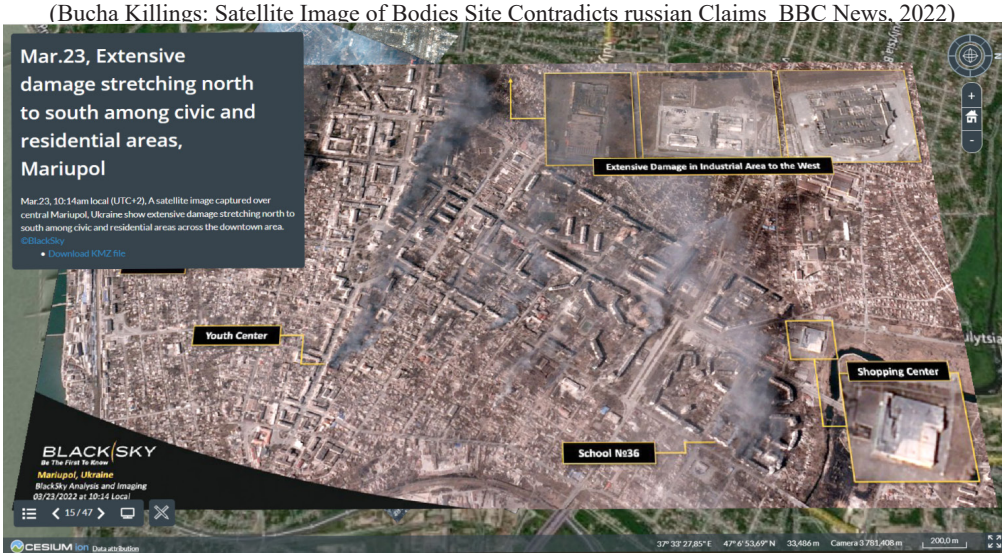
The term "protection of human rights" covers preventing of violations, verifying of international treaties and bringing perpetrators to justice. So, let us see attentively the basic human rights in the light of such aspects.

First is the protection of lives and dignity that is guaranteed in different variations. "Everyone has the right to life, liberty and security of person" (Universal, 1948). "No one shall be subjected to torture or to cruel, inhuman, or degrading treatment or punishment." "Protected persons shall at all times be humanely treated, and shall be protected especially against all acts of violence or threats thereof" (The Geneva, 2010) (art. 27 Geneva Convention 1949 and art. 51 Protocol I). "Prohibition of (…) murder, torture, corporal punishment, mutilation and medical or scientific experiments not necessitated by the medical treatment of a protected person, but also to any other measures of brutality whether applied by civilian or military agents" (art. 31 Geneva Convention 1949) (The Geneva, 2010). The democratic world expects that the prohibition of murder, torture, corporal punishment, mutilation, medical or scientific experiments, and all acts of violence are a solid guarantee of the protection of lives, even during the war. Such confidence might be the route of skepticism to the information from only the one side of the war. Nevertheless, Maxar`s images reveal contrary to the abovementioned proclamations, i.e., the corpses on the street of a Ukrainian town named Bucha and fresh burials during the russian occupation.

The second right we should mention is the protection of property rights. The international treaties proclaim that "Everyone has the right to own property alone as well as in association with others" (art. 17) (Universal, 1948), "facilitate the proper working of all institutions devoted to the care and education of children" (art. 50) (The Geneva, 2010). Furthermore, any destruction by the Occupying Power of real or personal property belonging individually or collectively to private persons, or to the State, or to other public authorities, or to social or co-operative organizations, is prohibited, except where such destruction is rendered absolutely necessary by military operations (art. 27) (The Geneva, 2010). Nevertheless, the Blacksky`s satellite images shows the total destruction of humanitarian infrastructure like as hospitals,

despite to their socially significant role.

(Bucha Killings: Satellite Image of Bodies Site Contradicts russian Claims BBC News, 2022)



(Satellite Images Map of Mariupol. Cesium Stories, 2022)

The next right that we need to highlight at this context is the freedom of movement and residence within the borders of each state, and has the right to leave any country, including his own, and to return to his country (art. 13) (Universal, 1948). Provision that is more specific is revealed in the art. 49 Geneva Convention, i.e., "individual or mass forcible transfers, as well as deportations of protected persons from occupied territory to the territory of the Occupying Power or to that of any other country, occupied or not, are prohibited, regardless of their

motive" (The Geneva, 2010). Trust to guarantee of the freedom of movement, including a return to the state of citizenship, without monitoring of their procuring during the occupation, may lead to falling out of sight-forced relocation as one of the acts of genocide. However,

satellite images help to surveille such relocations.

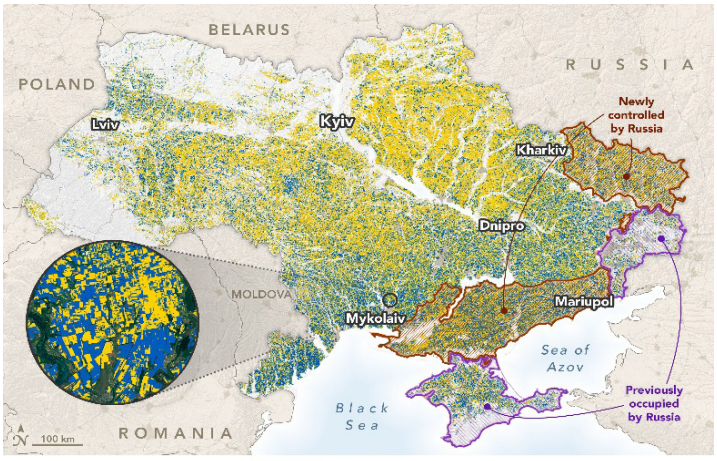
(Sauer, Pjotr (2022) Hundreds of Ukrainians were forcibly deported to Russia, say Mariupol women. The Guardian)

In warfare, care should be taken to protection of the natural environment against widespread, long-term and severe damage. This protection includes a prohibition of the use of methods or means of warfare, which are intended or may be expected to cause such damage to the natural environment and thereby to prejudice the health or survival of the population (art. 55 Protocol). Such characteristics as wide viewing strip and ability to retrieve data regardless of access area helps to evaluate natural and technological disaster far from the jurisdiction of the source of disaster emanated from air pollution, flooding or release of nuclear power. As well as the impact of armed conflict have boundless, unpredictable and long-term harmful consequences, the huge amount of Earth observation data focuses on surveillance of environment of the zone of the conflict, especially if it is concerned the nuclear power plants (The Geneva, 2010). Furthermore, the intended burning of the grain fields by russian military forces on the Eastern and Southern parts of Ukraine leads to the worldwide effect of starvation. As a response, NASA produces the harvest crop data, which flows to several partner organizations, like the U.N. Food and Agriculture Organization, for monitoring and response to emerging food shortages and famines.

Thus, Earth observation data help to gain such aims concerning the protection of human rights:

1. **Prevent their violations** by means of early warning and timely evacuation, to establish logistics networks taking into account the risks in different areas, etc.
2. **Mitigate the violations** by means of medical or humanitarian aid, evacuation, provision of communal services (electricity, water supply), to localize dangerous technological or natural disasters.
3. **Disclosure of the truth about the violations** and bringing to justice.


Heavy firefight incl. tanks
Zaporizhzhia NPP Unit 1
Distance: 150m


BELARUS
RUSSIA
POLAND
Lviv
Kyiv
Kharkiv
Newly controlled by Russia
Dnipro
MOLDOVA
Mykolaiv
Mariupol
Sea of Azov
Black Sea
Previously occupied by Russia
ROMANIA
100 km
Winter Planted Crops
Potential Spring Crops

(Power Lost at the Zaporizhzhia NPP (2022) Energy industry review)

(Voiland, Adam (2022) Measuring War's Effect on a Global Breadbasket. NASA Earth Observatory)

(Maxar's WeatherDesk Predicts a Significant Decline in Ukrainian Crop Harvests (2022) Maxar Technologies)

Sources of obtaining the Earth Observation data during the armed aggression

Today Ukraine has only one functional Ukrainian Earth observation satellite Sich 2-30 launched on 13 January 2022 (A Stable, 2022). Furthermore, according to the Copernicus Space Component Technical Operating Arrangement (TOA), 2018, ESA and State Space Agency of Ukraine (SSAU) are committed to the principle of full, free, and open access to the European Sentinel and certain Ukrainian Earth observation satellite data (Sich – 2-2, Sich 2-M planned to put into orbit by 2025) and information, subject to applicable restriction. (Ukraine, 2018) Sentinel data access contains the reproduction, distribution, communication to the public, adaptation, modification and combination with other data and information (Legal, 2018). In addition, the E.U. has approved an agreement with Ukraine that will allow sharing classified information, including satellite images (Bloomberg, 2022).

Therefore, even with Sentinel capabilities, Ukraine cannot provide the 24/7 data from the Earth observation constellation of satellites with synthetic aperture radars and 24/7 analysis of E.O. Data with photometric mapping and 3D visualizing in addition of the aerial intelligence data which is indispensable for the effective protection of rights during the armed aggression.

According to the fact that Ukraine faced with a shortage of Earth observation data, we can highlight such types of additional sources of Earth observation data:

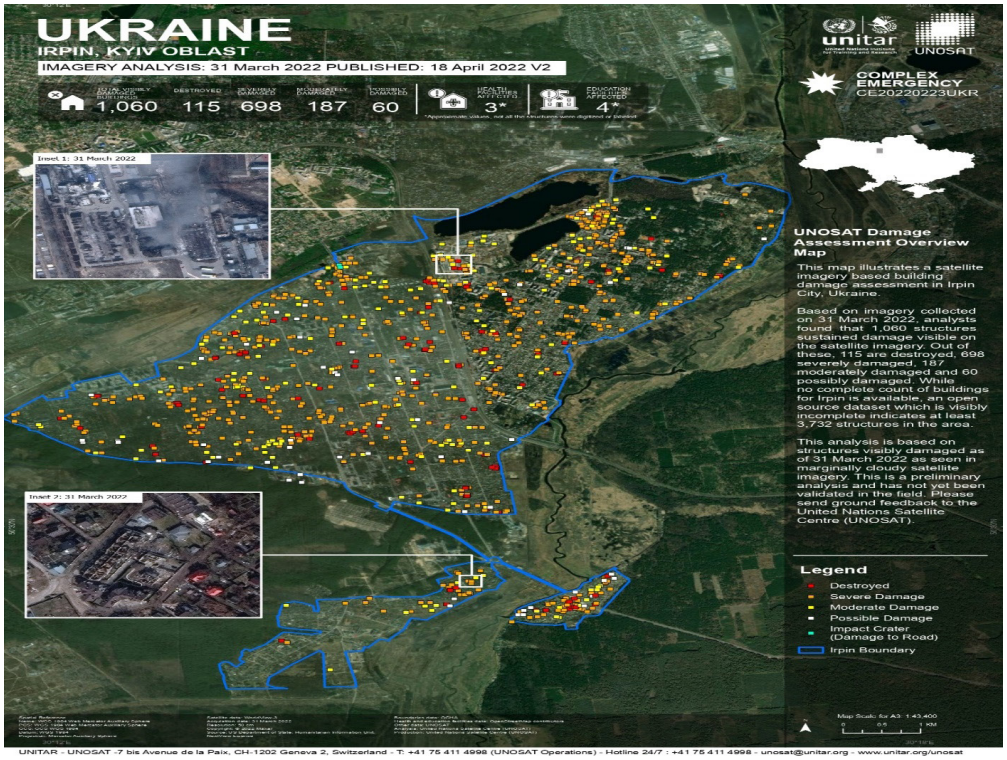
a) intergovernmental open sources;
b) business to open government sources;
c) business social projects for the open-source intelligence;
d) intergovernmental limited access data.

Let us consider the first three types in more detail. The fourth type is out of our research according to their regime of limited access. We can only estimate them according to some indirect data. For instance, David Gauthier, the director of commercial and business operations at the National Geospatial-Intelligence Agency, stated that the U.S. government more than doubled its purchase of commercial low-Earth orbit imagery over Ukraine from companies like Maxar, BlackSky, and Planet, which quickly shared with officials in U.S. European Command, NATO, and Ukraine (Nichols, 2022).

The first type to consider is intergovernmental open sources of Earth observation data. One of the principles of the UN Charter requires from all Members to give the United Nations every assistance in any action it takes in accordance with the present Charter (Art. 2.5 (UN Charter, 2022)). Such norm was more detail reflected in the Declaration on Principles of International Law concerning Friendly Relations and Cooperation among States in accordance with the Charter of the United Nations with proclaiming the duty of States to cooperate (Declaration, 1970). Promotion of international cooperation and understanding for maintaining peace and security is reflected in art. 3 (Treaty, 1966). Thus, there is a solid legal basis to procure satellite data by all States for the common interest, which was realized within the Operational Satellite Applications Programme (UNOSAT) under the U.N. Institute for Training and Research. Their mandate is to provide United Nations funds, programmes and specialized agencies with

satellite analysis, as well as to continue supporting the Member States with satellite imagery analysis over their respective territories. In case of natural hazards, complex emergency situations, or conflict crises, the services involve the very rapid acquisition and processing of satellite imagery to generate geospatial information and analytical reports in addition to GIS layers in support of humanitarian relief agencies (UNOSAT, 2011).

To obtain such images, UNOSAT cooperates with space agencies according to the Charter on Cooperation to Achieve the Coordinated Use of Space Facilities in the event of Natural or Technological Disasters (Text, 2000). The International Charter aims at providing a unified



system of space data acquisition and delivery to those affected by natural or man-made disasters through authorized users. Each member agency has committed resources to support the provisions of the Charter and thus is helping to mitigate the effects of disasters on human life and property. The authorities and bodies concerned in a country affected by a disaster (beneficiary bodies) should request the intervention of the parties either directly through the rescue and civil protection, defense, and security bodies of the country to which one of the parties belongs or of a State belonging to international organizations that are parties to the Charter (associated bodies) or where appropriate via a cooperating body acting in partnership with an associated body. Remarkably, Ukrainian bodies did not activate the information request according to this Charter. The reason may lay in the membership of the russian federation in this Charter, but this fact cannot prevent from the use all evaluable measures for gathering

evidences of its crimes.

The one more public initiative is E.U. Agency for Space programs initiative called EUSpace4Ukraine. This platform offers ten solutions from innovators in the following categories: uncrewed solutions for transport and delivery of goods, safety and rescue, integration of displaced people in a new country, applications to help understand and inventory damage in Ukraine, safe, timely and accurate navigation for population migration (#EUSpace4Ukraine, 2022). Such initiative gathers applications and solutions that leverage freely accessible data from Galileo and Copernicus, two components of the E.U. Space program to enhance humanitarian support for the Ukrainian people. Galileo provides positioning and navigation services and Copernicus supplies Earth observation data and information. The applications and solutions published on this platform cover a wide range of uses, from supporting NGOs delivering medical goods via drones, to practical solutions to support the integration in E.U. countries of people fleeing the war (E.U., 2022).

Based on imagery collected on 31 March 2022 by the U.S. Department of State, Humanitarian Information Unit, NextView License UNOSAT provided building damage assessment in Irpin, Vorzel, Hostomel, Northeast Kharkiv, etc. (Ukraine, 2022). Such information hasn`t operative feature and cannot prevent or mitigate violations because it grounded on the analytical assessment of open data provided by States to U.N. institution, but it is valuable for disclosing the truth about violations.

(Ukraine, 2022)

According to Rule 69(4) in the Rome Statute of the ICC, the Court may rule on the relevance or admissibility of any evidence, taking into account, inter alia, the probative value of the evidence (Rome, 1998). For instance, the satellite images were used as evidences at the case of Prosecutor v. Alfred Yekatom and Patrice-Edouard Ngaïsson (Yekatom, 2021).

The ICC has limited in-house capacity and expertise to conduct satellite imagery analysis, so it uses third parties capabilities. Nevertheless, non-real-time images complemented by aerial intelligence, geo-positioning, photogrammetry, etc., provide evidence of atrocities within blocked to get and over large geographic areas. Noticeably, analytical material prepared within one of the U.N. programs on the base of satellite images looks like the trustworthy source of evidence at the international juridical process.

The second source of obtaining the Earth observation data is private operators. Few years ago, SSAU suggested to the Parliament of Ukraine the Law about State Regulation of the Remote Sensing of the Earth (Law, 2019). Its main disadvantage was focusing only on the state sector of such type of space service and not counting their private segment. As a result, there is no legal basis for exchanging remote sensing data between the government and private sector. However, extraordinary challenges require creative solutions. As was mentioned, Ukraine does not have a satellite fleet of their own, but their needs in Earth observation data match with the needs of private satellite operators to improve their technologies and share their abilities. For instance, SAR is very useful for monitoring small areas, in short, response times, with more transparency – as it is weather agnostic – and high-uality information (Change, 2022). Thus, the brutal conflict in Ukraine is undoubtedly pivotal for rapid acceleration in interest and support for the commercial space sector (Russia's, 2022).

According to such tendency, the Ministry of Digital Transformation of Ukraine, in the letter № 1-05\1-08 (01.03/2022), called the E.O. satellite operators to provide Earth observation data Timmermans, 2022). The representative for obtaining was determined the private EO

Analysis Company, i.e., EOS Data Analytics. According to the Decree of the Cabinet of Ministers of Ukraine No 856 (18.09.2019), the Ministry has the authority to involve civil society representatives in the implementation of open data policy (Issues 2019). Nevertheless, the cooperation between this Ministry and the National Space Facilities Control and Testing Centre was unclear. The last one is the main institution in Ukraine responsible for and receiving information, documents and materials reception, processing, storage and analysis of scientific and special information from space vehicles, including for the purpose of operative prevention of sources of danger that threaten national security. Both of them have the authority to exchange information, so we can assume that such exchange was organized, but there is still a lack of regulation to the operation of some sensitive information between such public institutions and third persons that should be regulated in the near future (Regulations, 2016).

It should also be noted that the representation of governmental agencies by EOS Data Analytics had the risk of compromentation. The matter is that the owner of the Noosphere Venture Partners was added in December to the U.S. government list of individuals and organizations not permitted to receive federal contracts or assistance (Werner, 2022). At the same time, we should be far from illusions that some operators do not sell satellite data to russia or their partners who help to avoid sanctions. The positive news in this context is that due to U. S. Code para. 2279 any data should not transmit by any private entity to russia (7 U.S, 2019). With the recognition of russia as a state sponsor of terrorism, restrictions on the provision of such data will become even tighter and stricter.

There is another type of open sources, named open-source intelligence or OSINT. OSINT is publicly verifiable and can be proven or disproven without revealing government intelligence sources or methods (Hanham, 2021). OSINT reveals the truth in the hard information war that has an influence on the political and social reactions, aimed at deterrence of violence, and provides fast check the evidence for justice. There are many OSINT sources, such as photos and videos made by troops and civilians, data from drones, etc., but they are within the conflict and can be compromised. Satellite images, getting from different sources, are out of conflict and could be dispassionate.

The Maxar News Bureau has access to radar satellite imagery from MDA and advanced analytic capabilities from Radiant Solution, and from 2017 provided as high-resolution satellite imagery and analytics (Maxar, 2018). The Open Data Program Capella releases high-quality SAR imagery products for major humanitarian crisis events and natural disasters in a timely manner (Capella, 2022). BlackSky shares geospatial imagery and analytics from Ukraine to help show to the world the seriousness of the situation and be moved to help (BlackSky, 2022). The company is offering assistance to humanitarian groups, aid workers, customers and the media to understand the events on the ground as they unfold in order to assist in providing support to the people of Ukraine. Sattelogic Ukraine Observer is a platform that streamlines access and analysis for organizations to make timely decisions, like identifying safe transportation routes and monitoring critical infrastructure, monitor border to coordinate the safe evacuation, and identifying enemy-occupied areas and assets. Each 7-day all-region and near real-time updates for all data for free. Satellogic is working directly with the Ukrainian government and partner nations (Astraea, 2022). The application to obtain the data is approved through a simplified and is vetted to ensure compliance with export controls. One more of actual example of OSINT with added value information is the Watanave maps project that includes satellite multispectral imaging to map fire in near real-time, identifying the exact location and map it on a browser-based mapping platform, named Cesium (Thompson, 2022).

Conclusions

Strong international support for Ukraine in its fight against russian aggression and flexible approaches to obtaining data by the Ministry of Digital Transformation in cooperation with business representatives compensated the lack of data in Ukraine remote sensing of land at a critical moment of attack. However, in order to ensure stable data received in the future for a confident confrontation with russian imperial vision need to do at least a few such steps. First, the key role will play the adoption of the law on Earth observation data service, which regulates the regime of data exchange related to national security, the compression of the development of the private segment of the market of these services, as well as the interaction of various state bodies in this sphere. Secondly, it is necessary to expand international cooperation with foreign partners and international organizations. Particular attention should be paid to the European Union's cyber and space business infrastructure.

🕮 References

7 U.S. Code § 2279 – Farming opportunities training and outreach (2019) Legal Information Institute. Available online: https://www.law.cornell.edu/uscode/text/7/2279

A stable connection has been set on with the Ukrainian satellite Sich-2-30 (2022) *Militarnyi*. Available online: https://mil.in.ua/en/news/a-stable-connection-has-been-set-on-with-the-ukrainian-satellite-sich-2-30/

Al-doski, Jwan, Shattri B. Mansor, and Helmi Zulhaidi Mohd Shafri (2013) War Impacts Studies Using Remote Sensing. *IOSR Journal of Applied Geology and Geophysics*. Volume 1, Issue 2, 11–15. Available online: https://iosrjournals.org/iosr-jagg/papers/vol1-issue2/B0121115.pdf

Astraea and Satellogic Launch Ukraine Observer (2022) *GlobeNewswire*. Available online: https://www.globenewswire.com/en/news-release/2022/03/14/2402343/0/en/Astraea-and-Satellogic-Launch-Ukraine-Observer.html

BlackSky Ukraine Conflict Statement (2022) BlackSky. Available online: https://www.blacksky.com/ukraine-statement/

Bloomberg: E.U. agrees to share classified information with Ukraine (2022) *BLACKSEA* CASPIA. Available online: http://www.blacksea-caspia.eu/en/bloomberg-eu-agrees-share-classified-information-ukraine

Bucha killings: Satellite image of bodies site contradicts Russian claims (2022) *BBC News*. Available online: https://www.bbc.com/news/60981238

Capella Space Publishes SAR Imagery of The Ukraine-Russia Crisis (2022) *SatNews*. Available online: https://news.satnews.com/2022/02/28/capella-space-publishes-sar-imagery-of-the-ukraine-russia-crisis/

Change Detection in Cities Using SAR Images (2022) *Groundstation*. Available online: https://www.groundstation.space/change-detection-in-cities-using-sar-images/

Declaration on Principles of International Law concerning Friendly Relations and Cooperation among States in Accordance with the Charter of the United Nations (1970) *United Nations*. Available online: https://legal.un.org/avl/ha/dpilfrcscun/dpilfrcscun.html

Issues of the Ministry of Digital Transformation (2019) Resolution of the Cabinet of Ministers of Ukraine of September 18, No 856. Available online: https://zakon.rada.gov.ua/laws/

show/856-2019-%D0%BF#Text

Hanham, Melissa (2021) Using Open-Source Intelligence to Verify a Future Agreement With North Korea – New Approaches to Verifying and Monitoring North Korea's Nuclear Arsenal. Carnegie Endowment for International Peace. Available online: https://carnegieendowment.org/2021/07/27/using-open-source-intelligence-to-verify-future-agreement-with-north-korea-pub-85006

E.U. space tool at the service of the Ukrainian people, helping tech solutions from drone deliveries to the integration of refugees (2022) EU NEIGHBOURS east. Available online: https://euneighbourseast.eu/news/latest-news/eu-space-tool-at-the-service-of-the-ukrainian-people-helping-tech-solutions-from-drone-deliveries-to-the-integration-of-refugees/

#EUSpace4Ukraine humanitarian help (2022) E.U. Agency for the Space Programme. Available online: https://www.euspa.europa.eu/euspace4ukraine-humanitarian-help-1

Law about State Regulation of the Remote Sensing of the Earth (2019) State Space Agency of Ukraine. Available online: http://www.drs.gov.ua/wp-content/uploads/2019/10/10262.pdf [in Ukrainian]

Legal notice on the use of Copernicus Sentinel Data and Service Information (2018) Available online: https://sentinel.esa.int/documents/247904/690755/sentinel_data_legal_notice

Maxar Technologies' DigitalGlobe Celebrates First Year of Its News Bureau Initiative, Applying Space-Based Insights to Enhance Global Transparency (2018) Maxar. Available online: https://investor.maxar.com/investor-news/press-release-details/2018/Maxar-Technologies-DigitalGlobe-Celebrates-First-Year-of-Its-News-Bureau-Initiative-Applying-Space-Based-Insights-to-Enhance-Global-Transparency/default.aspx

Maxar's WeatherDesk Predicts a Significant Decline in Ukrainian Crop Harvests (2022) Maxar Technologies. Available online: https://blog.maxar.com/earth-intelligence/2022/maxars-weatherdesk-predicts-a-significant-decline-in-ukrainian-crop-harvests

New Satellite Imagery Partnership (2017) Human Rights Watch. Available online: https://www.hrw.org/news/2017/11/30/new-satellite-imagery-partnership

Nichols, Martin (2022) David Gauthier: NGA More Than Doubles E.O. Imagery Purchases to Help Ukraine. *Executivegov*. Available online: https://executivegov.com/2022/04/david-gauthier-nga-more-than-doubles-eo-imagery-purchases-to-help-ukraine/

Power Lost at the Zaporizhzhia NPP (2022) E*nergy industry review*. Available online: https://energyindustryreview.com/power/power-lost-at-the-zaporizhzhia-npp/

Regulations on national space facilities control and testing center (2016) Order State Space Agency of Ukraine of October 27, No 197. Available online: http://spacecenter.gov.ua/contents/uploads/2014/12/POLOZHENNYA-NTSUVKZ.pdf [in Ukrainian]

Rome Statute of the International Criminal Court (1998) *International Criminal Court*. Available online: https://www.icc-cpi.int/sites/default/files/RS-Eng.pdf

Russia's War In Ukraine Will Turbocharge The Commercial Space Industry (2022) *ValueWalk*. Available online: https://www.valuewalk.com/russias-war-in-ukraine-will-turbocharge-the-commercial-space-industry/

Satellite Images Map of Mariupol (2022) *Cesium Stories*. Available online: https://cesium.com/ion/stories/viewer/?id=ac46c90c-6460-4a80-825d-9f1ef14016c4

Sauer, Pjotr (2022) Hundreds of Ukrainians forcibly deported to Russia, say Mariupol women.

The Guardian. Available online: https://www.theguardian.com/world/2022/apr/04/hundreds-of-ukrainians-forcibly-deported-to-russia-say-mariupol-women

Timmermans, Remco (2022) Support Ukraine's Defence from Space. *Groundstation*. Available online: https://www.groundstation.space/support-ukraines-defence-from-space/

Text of the Charter (2000) International Disasters Charter. Available online: https://disasterscharter.org/web/guest/text-of-the-charter

Thompson, Nevin (2022) Satellite mapping project tracks damage to Ukrainian communities. *Global Voices*. Available online: https://globalvoices.org/2022/04/07/satellite-mapping-project-tracks-damage-to-ukrainian-communities/

The Geneva Conventions of 1949 and their Additional Protocols (2010) *ICRC*. Available online: https://www.icrc.org/en/doc/war-and-law/treaties-customary-law/geneva-conventions/overview-geneva-conventions.htm

Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (1966) *United Nations.* Available online: https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introouterspacetreaty.html

Ukraine: UNOSAT Irpin Building Damage Assessment Overview Map (2022) *Assessment & Analysis Knowledge Management Platform.* Available online: https://assessments.hpc.tools/assessment/ukraine-unosat-irpin-building-damage-assessment-overview-map

Ukraine-ESA-SSAU-TOA (2018) *Sentinel*. Available online: https://sentinel.esa.int/documents/247904/4068596/Ukraine-ESA-SSAU-TOA.pdf

UN Charter (2022) United Nations. Available online: https://www.un.org/en/about-us/un-charter

Universal Declaration of Human Rights (1948) United Nations. Available online: https://www.un.org/en/about-us/universal-declaration-of-human-rights

UNOSAT Brief Satellite Applications for Human Security (2011) *UNITAR*. Available online: https://www.unitar.org/sites/default/files/UNOSAT_Brief_Sat_App_for_Human_Sec_2011.pdf

Werner, Debra (2022) EOS Data Analytics issues urgent plea for imagery of Ukraine. *SpaceNews*. Available online: https://spacenews.com/eos-plea-for-imagery-of-ukraine/

Wynn, J. (1982). Remote sensing: What war use? *Nature*, 297(5865), 352–352. https://doi.org/10.1038/297352a0

Voiland, Adam (2022) Measuring War's Effect on a Global Breadbasket. *NASA Earth Observatory*. Available online: https://earthobservatory.nasa.gov/images/150025/measuring-wars-effect-on-a-global-breadbasket

Yekatom and Ngaïssona (2021) International Criminal Court. Available online: https://www.icc-cpi.int/carII/yekatom-nga%C3%AFssona

Decentralized Regulation of Space Activities in the Aspect of European Integration and National Security of Ukraine

Inesa Kostenko

Ph.D. in Law, Centre for European Law and Internationalisation (CELI)
and Leicester Law School (Leicester, United Kingdom)
E-mail: kostenko.inesa@outlook.com
https://orcid.org/0000-0002-8784-5422

Kostenko, Inesa (2022) Decentralized Regulation of Space Activities in the Aspect of European Integration and National Security of Ukraine. *Advanced Space Law*, Volume 9, 28-38. https://doi.org/10.29202/asl/9/3

The article explores the nature and architecture of space governance and how it has evolved and will continue to evolve without a global government or supreme authority. Understanding how the principles and rules applicable to these activities are established, implemented, and reformed is fundamental. The paper highlights the emergence and development of global administration and the evolution of its study. This article is accompanied by an analysis of the space governance structure and a review of decentralized governance theories to propose a feasible, efficient and dynamic space governance model that will ensure its continuous evolution. The article highlights the importance of implementing decentralization of administration in space activities for Ukraine during the martial time and in the conditions of European integration.

Keywords: decentralization, administration of space activities, national security, European integration

Received: 08 May 2022 / Accepted: 28 May 2022 / Published: 10 June 2022

Introduction

Today in Ukraine, there is a considerable gap between the needs of space practice and its normative and legal consolidation, which determines the need to reform the national space legislation, in particular, to improve the tools of the system of state-legal regulation of activities in the field of research and use of outer space. One of the tools is the introduction of decentralization of regulation in the field of space activities. Thus, at the beginning of the

90s, a large number of enterprises and scientific centers in the field of space activities could not function and fell into decline. The impossibility of conducting a horizontal policy in the sphere of space activity became one of the reasons for its decline and suspension. The lack of decentralization and certain independence of individual structures in the space industry led to the decline of the space industry heritage. Over the past few years, Ukraine has taken specific steps and intensified the process of space activity; Ukraine has become one of the countries that signed the Artemis Agreement, and the leading task has become European integration in the aspect of space activity and in particular the approach to the European Space Agency.

The topicality of the work increased with the beginning of the war in Ukraine, so currently, all forces are focused on supporting the Armed Forces of Ukraine. However, it is now essential to support the space industry by implementing decentralization, providing independence to individual departments and sectors, introducing the possibility of continuing active space activities, and searching for profitable cooperation and support from European countries. It is now essential to carry out work according to the strategic plan because the space sphere needs a large concentration of forces to start its activities.

The history of space governance

The first step in the established principles in the space law field was the General Assembly's adoption in 1963 of the Declaration of Legal Principles Governing the Activities of States in the Field of Research and Use of Outer Space (Declaration, 1963). As a result, we established that the exploration and use of outer space would be carried out for the benefit and in the interests of all humanity and that outer space and celestial bodies are free for exploration and use by all states. According to the provisions of the 1963 Declaration, outer space and celestial bodies cannot be subject to national appropriation, and states must bear international responsibility for national activities in space carried out by governmental institutions or non-governmental structures and ensure the implementation of the principles set out in the 1963 Declaration (Declaration, 1963). The principle of responsibility is the implementation of state control over objects launched into space to ensure order during this launch, and in the event of unexpected consequences, the state must compensate for damage caused by its object. Declaration of 1963 unequivocally established the international consensus that the exploration and use of outer space are carried out "following international law" – a fundamental principle later reiterated in the Outer Space Treaty of 1967 (Treaty, 1967). At the time of their adoption, the 1963 Declaration and the 1967 Outer Space Treaty were filled with great power and significance based on previous experience and established principles. New ideas for regulating legal relations in the space sector are required today. It is important to note that the current general principles do not require radical changes but only new clarifications under the conditions and challenges of today.

The history of space governance begins with the adoption of space law treaties and institution building: the UN Committee on the Peaceful Uses of Outer Space (UN-COPUOS), founded in 1959, adopted the Basic Principles and then the Constitutional Treaty, the 1967 Space Treaty (Treaty, 1967). Subsequently, regulations on the rescue of astronauts and spacecraft, responsibilities, and the registration of space objects were developed and implemented. We should also note the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (Agreement, 1979). From this, we can see that the UN-COPUOS is the center of decision-making in space activities, and space management has a reasonably monocentric

system. The international system is decentralized, lacking a sovereign and developing international law in a horizontal rather than vertical manner. The monocentric system of space governance is thus a part of the decentralized global governance system, which may explain its deficiencies (Tepper, 2019).

A decentralized form of government is becoming increasingly important and necessary in global affairs. A complex, monocentric government will not produce the desired results in space activities. There are numerous benefits to decentralized governance. It is adaptable and flexible, which is especially important in the face of rapid technological development. Decentralized governance allows for the participation of more stakeholders and experts. This system enables us to cover and explore a broader range of space. Due to various intergovernmental space organizations (European Space Agency, Intelsat, Inmarsat, Intersatellite, ARABSAT) engaging an essential role in the advancement of the space industry and the further improvement of "space" legislation, the range of subjects of international space law has significantly expanded.

In the early 1990s, 130 rocket and space industry enterprises were on Ukrainian territory (design bureaus, research institutes, production associations, and test centers). Unfortunately, this scientific and technological potential is largely untapped. Initially, independent Ukraine found itself in a difficult economic situation as a result of the collapse of the USSR. Inflation was rapidly increasing, eventually leading to hyperinflation. Furthermore, decades-long production ties had been severed, and final, with the moment of secession, the level of production sharply decreased and, as a result, the number of tax revenues to the budget and theonomy stagnated, causing all other spheres of state life to stagnate (Okladna & Korchevskaya, 2021: 87).

As we can see, Ukraine's enormous potential was gradually eroded by government changes and economic crises. In the context of state transformations, space activity reduced its activity. Unfortunately, the lack of decentralization and the possibility of specific agencies and institutions interested in the development of this area resulted in a weakening of the space state's forces. However, many space enterprises and scientific institutes are concentrated in the Ukrainian SSR. The Russian Federation has invaded Ukraine, and the primary forces and expenditures are devoted to military support. However, we must not forget to support space activities so that our adversary does not pause. For example, despite a slew of sanctions, the Russian Federation maintains its space activities and maintains contacts with European and American representatives in the international community. In these challenging times for the country, preserving and expanding what we have is critical. That is why it is essential to continue working on decentralizing space governance.

Towards decentralized regulation of space activities

It is critical today to study and comprehend the evolution of space administration from its inception to the present. Furthermore, decentralization in space activities and the destruction of the monocentric structure of space management are required. Today, we see that space activity administration is at a crossroads; the attempt to establish centralized administration of space activities has many flaws that prevent proper development in space activities. Today, it is crucial to identify and implement a governance model allowing space administration's evolution and rapid development within the international system.

As we witness the disastrous consequences of Russia's invasion of Ukraine, it is more important than ever to establish a clear framework, rules, principles in space activities, and sanctions for noncompliance. Today, we believe that the ability to prevent specific offenses is

the most important. Any errors in space activities can have catastrophic consequences. Today, scientists, lawyers, and government officials must consider space management from a global perspective. From the late 1950s to the mid-1970s, there was a period of successful space governance, including institution building and space law treaties, but the space governance developed by these institutions remained largely stagnant. This prolonged stagnation results from a decline in major institutions' rule-making capacity compared to the general trend in global affairs. The decline in rule-making capacity is partly caused by a lack of interest, political intention, or a shift in state attitudes, as well as structural issues in space governance. As a result, even the most pressing issues, such as space debris, militarization, and the use of space natural resources, remain unresolved. In our opinion, scientists, lawyers, and government officials' primary task is to implement an effective, dynamic model of space governance that will allow further development in this field. The only way to achieve remarkable success in administration is to make space governance polycentric, allowing for a decentralized, gradual evolution of space governance. In our opinion, each area of space activity requires its own experts and active stakeholders. Polycentric governance is distinguished by flexibility and adaptability, which are critical given the anticipated changes and disruptions in technologies and commercial models. We must not fight against and correct their monocentric system. It is critical to promote decentralization in space, i.e., rely on the work of separate governance centers; and redirect governance-building efforts (Tepper, 2019). Decentralized governance has numerous advantages. The first and foremost is the feasibility of achieving governance under anarchy. It enables incremental evolution of governance by introducing partial regimes – partial in terms of the issues they cover and the parties to the formation of the regimes. Over time and in the aggregate, they cover larger swaths of space governance and actors. Decentralized governance is flexible and adaptable, especially when rapid technological developments are concerned. Significantly, decentralized governance, and polycentric governance, in particular, enable meaningful participation of stakeholders and experts in governance, which, as empirical studies have demonstrated, results in rules that better match the circumstances and conditions of what they apply to and greater adherence to those rules. Decentralized governance has adverse effects, which include redundancy and inconsistency. It raises concerns of regulatory oversight deficit and questions about participation, accountability, and bias toward powerful states and other actors. Nevertheless, the multiplicity of actors participating in decentralized governance provides balance. Furthermore, the advantages of decentralized governance can be maximized, and its adverse effects can be mitigated if governance centers meet Ostrom's "design principles for effective institutions, if institutional deference is practiced, and possibly if the standards of "global administrative law" (GAL) or the law of global governance are applied. In actuality, polycentric space governance entails that rather than top-down, issue-specific forums (such as one on militarization) led by stakeholders (the active actors/users thereof) and experts (as part of epistemic communities), who would establish rules for that issue, space governance will develop bottom-up, through numerous, issue-specific forums. Adopting polycentric governance entails promoting and supporting the development of distinct governance centers in each sub-issue area: one for weaponization and militarization, one for space debris, one for the use of space's natural resources, and a fourth for space traffic control. The basis of polycentric governance is the users' self-governance, or the ability to create, change, and perhaps enforce the rules themselves. Users tend to follow their own rules more closely than those imposed above since they are more tailored to their circumstances and requirements. In space governance, the parties concerned with a particular problem will take

the initiative in developing the necessary regulations. The experience with space governance demonstrates that despite the failure of the attempt to develop a generally agreed code of conduct, rules on the mitigation of space debris were adopted by an inter-agency forum of stakeholders, whose progress should be tracked over time. There are high possibilities to establish a governance system that is continuously evolving and meeting the changing needs if space governance is divided into sub-issue-areas and has a forum that is predominate with users/stakeholders, who have a vested interest in establishing some rules and have relevant knowledge of the issue area, and with experts (Tepper, 2019).

According to the Plan of Priority Actions of the Government for 2021, approved by the Decree of the Cabinet of Ministers of Ukraine dated 24.03.2021 No. 276, paragraph 133 states the need to develop and submit to the Cabinet of Ministers of Ukraine a draft law on the transformation of state unitary enterprises of the space industry into joint-stock companies. Such corporatization, as the transformation of state unitary enterprises into joint-stock companies, is not a method of privatization. Corporatization helps to change the organizational and legal form of the business entity, but the form of ownership does not change. As a result of corporatization, state property is transferred to the created company. At the same time, the state has corporate rights regarding this company and the ability to manage and receive dividends from the company's activities.

The purpose of corporatization is the reorganization of the state enterprise aimed at increasing the efficiency of its activities as a result of improving the management system (Bondarenko et al., 2020). Taking such steps makes sense because, under the conditions of European integration, the joint-stock form of entrepreneurship is a powerful means of building an economic system based on non-state forms of social responsibility. At the same time, the comprehensive development of shareholder forms contributes to the approval of the fair nature of appropriation of the means and results of production, namely, the alienation of direct employees of enterprises from ownership is overcome (Semenyuk, 2018). In transforming state unitary enterprises of the space industry into joint-stock companies, we will receive an update on the economic system, creating an innovative environment, destroying non-working structures, and opening the way to essential transformations.

Conducting space activities in the interest of national security and of Ukraine

The beginning of the space age was similar to the competition between the Soviet Union and the United States in the scientific and military spheres. Already over time, both states realized that their interests and the ability to explore and use space required cooperation and some generally accepted rules, resulting in the Treaty on the Prohibition of Nuclear Weapons Tests in the Atmosphere, in Outer Space and Under Water adopted. Tests of nuclear and ballistic missiles in the 1950s and early 1960s demonstrated the detrimental impact of such military activities on the functioning of satellites and the safety of space flights, primarily due to the resulting debris and electromagnetic pulses (Cheng, 1997: 224-225). Satellite imagery technology allowed both nations to observe each other's military operations on the ground and later proved essential in providing intelligence and as a technical means of verifying compliance with arms control treaties. However, the fear that another state will gain a military monopoly on space as a new "height" and the desire to maintain safe access to space for civilian purposes forced the two Cold War superpowers to agree on the importance of the

international rule of law for governance, and in many ways to limit activities, in particular, military activity in space. Guiding principles for the peaceful use of outer space were adopted through the multilateral forum of the UN Committee on the Peaceful Uses of Outer Space. The general role of the rule of law is emphasized in Article III of the Outer Space Treaty, according to which all space activities must be conducted "following international law, including the Charter of the United Nations." Following the provisions of Article IV of the Outer Space Treaty, the States Parties to the Treaty undertake not to place in orbit around the Earth any objects carrying nuclear weapons or any other types of weapons of mass destruction, to install such weapons on celestial bodies or to place such weapons in space by any other means. The Moon and other celestial bodies must be used by all States parties to the Treaty exclusively for peaceful purposes. The creation of military bases, installations, and fortifications, the testing of any weapons, and the conduct of military maneuvers on celestial bodies are prohibited. The use of military personnel for scientific research or other peaceful purposes is not prohibited. The use of any equipment necessary for the peaceful exploration of the Moon and other celestial bodies is also not prohibited. Therefore, legal disputes about whether open space can use a military component for its peaceful purposes have long since reached a consensus about the impossibility of using aggressive military measures. However, there are many non-aggressive military uses of space for which clear rules must be established, especially given the pace at which new space technologies and programs are developing.

The space industry is significant in the world. Today, as Ukraine suffers heavy losses due to the Russian Federation's invasion, many reforms in the public administration sector are underway. At the forefront of the state is the provision of the military, and most other sectors receive only a minimal supply. Regarding space activities, some scientists have begun to write about the need to develop this sector in the postwar period. For example, S.P. Koshova, in her work "Peculiarities of the space industry in the postwar period of Ukraine," notes that the critical issue for further development of the space industry in Ukraine is to build an effective management structure of enterprises in this industry and the formation and implementation of state-space policy. The author argues that in recent years there has been development in Ukraine's space sector; therefore, after the war, the Ukrainian government must create all possible conditions for developing private space business (Koshova, 2022). Definitely yes. However, we cannot make any pause in ensuring the activities of the space sector. Any gaps would relegate Ukraine to the space industry for decades. Today, it is essential to fight corruption with all our might and allocate funds to support the space industry.

The market for space technologies is developing rapidly. Participation in the supply of products and services is a crucial component of any country's scientific and technological development. However, we must understand that space activities cannot be compared in effectiveness despite the considerable potential for development. This is due to the large scale of financial costs and efforts required to implement such an industry. Therefore, it is essential not to stop the development of the space industry during the hostilities in Ukraine. A short break of one to two years will have painful consequences for the state.

Nevertheless, it is essential to preserve Ukrainian space. Given the migration issues that arose during the Russian invasion of Ukraine, it is also important to provide jobs, working conditions, and earnings for Ukrainian scientists and researchers in the space area. Because the inability of the state to pay wages and keep the space industry in working order will lead to the loss of Ukrainian brains. Along with the problem of the difficult start and launch of space activities, in the event of a temporary cessation, there will be a problem of a lack of

scientists and experts in space. Since space power continues to operate at high speed, minor pauses will have serious consequences. It should also be noted that, despite the significant number of sanctions, the Russian Federation continues its space activities and continues in the international community with European and American representatives.

Today, the prestige of a state and its power determine its participation in space activities. The main problem with the development of this industry is the need for significant investment because it requires high costs and a certain level of technological development in the country. This, in turn, complicates the entry of underdeveloped countries into the space goods and services market while highly developed countries are still developing (Nemeschuk, 2011). Historically, space activities arose and developed to solve major national problems, mainly in full financial, organizational, and administrative responsibility and with state support. In the process of the evolution of astronautics, the urgency of such tasks as:

- Reducing the cost of space programs;
- The use of space systems to solve applied tasks of public tasks;
- Implementation of space industry results in other industries;
- Providing access to space technologies for all interested organizations and individuals. For a long time, the openness of space activities and the availability of space technologies were objectively hampered by several factors, the main of which was the involvement of astronautics in solving national defense problems. The space industry is vital in Europe and has new perspectives and projects, such as new rocket technologies, new fuel, new engines, and launch vehicles; technologies of minimization, processing of waste, garbage, cleaning the environment; non-jet, non-rocket flight technologies, space travel on new physical principles; silent aircraft; the clean, complete life cycle of space technology and activities; fundamentally new technologies to ensure human life and safety in space; solar space power plants (Koshova, 2022).

In the leading space governments, the space industry has a rather complex structure, including peaceful, commercial, and military space activities. Military and space activities are related to access to space in the interests of defense and military security (Atamanenko & Fedonyuk, 2014). The key directions of the military-space state are:

- Orders and works related to the development of military rockets and space technology,
- Space infrastructure facilities,
- Eployment and maintenance of orbital groups of space systems and communication complexes in proper composition and working condition, and
- Solving specific tasks of combating aggression in space and from space in the event of a threat to national interests.

Following the national target scientific and technical space program of Ukraine for 2021–2025, the set tasks include: conducting space activities in the interests of national security and defense; creating space observation systems of the Earth and its constituent parts; introducing space technologies into the market of services; creation of rocket and space technology; basic and applied space research; legal, scientific and technical information support of the program activities. The program provides three options for solving the tasks: maintaining the previous (pre-war) approaches and reducing funding with the subsequent collapse of the space industry; conducting space activities on a commercial basis with an exclusively regulatory function of the state; and the third option (optimal) is to create conditions to ensure the realization of state

interests at the national and international levels (The National, 2021). Thus, implementing the third and best option will allow for the completion of priority state tasks, the development of innovative technologies, and expanding international cooperation. During these difficult times when the invasion of Russian troops into Ukraine is actively continuing, space activities must survive and intensify with the help of international projects. Moreover, at this time, European countries are opening their doors to Ukraine, actively implementing programs for the development of Ukrainian startups (ESA Business Incubator for Ukrainian space startups, for example) (ESA, 2014), and providing every opportunity for joint space projects.

Integration of Ukraine into the European Space Agency

The Ministry for Strategic Industries of Ukraine, taking into account the proposals submitted by the State Space Agency of Ukraine, has developed and submitted for approval to the concerned state bodies a draft order of the Cabinet of Ministers of Ukraine "On approval of the Action Plan for Ukraine's integration into the European Space Agency." An Action Plan for Ukraine's integration into the European Space Agency of Ukraine aims at implementing all components of ESA membership, namely the following tasks: ensuring the negotiation process with ESA to expand cooperation at this stage; building the image of Ukraine as an active partner of ESA, the E.U. and the Member States and States associated with ESA in the implementation of projects in the field of space activities; approximation of Ukrainian and E.U. legislation in the field of space activities and project implementation procedures; preparation for the conclusion of the Agreement of the state cooperating with ESA; preparation for Ukraine's membership in ESA (The National, 2021).

Following paragraph 135 of the Government's Priority Action Plan for 2021, the development of an action plan for Ukraine's integration into the European Space Agency is indicated. The ultimate goal of these actions is to determine Ukraine's full membership in the European Space Agency. According to the Plan, The Ministry for Strategic Industries of Ukraine is responsible for implementing this step. A corresponding decision of the Cabinet of Ministers of Ukraine on such a plan should be adopted in December 2021. According to the Plan, the expected results state the use of the E.U.'s "space" potential in the interests of Ukraine's economy and security; access to the tender system of the European Space Agency, and full participation in the implementation of large-scale European space projects and research programs; access to advanced European space technologies to improve domestic rocket and space technology further; deepening the process of Ukraine's integration into the E.U. economy and promoting Ukraine's political integration into the E.U.

The European Space Agency (ESA) is an international intergovernmental organization of 22 Member States and a model of international cooperation in exploring and using outer space. States cooperate through ESA, and ESA cooperates with other partners. In the first case, ESA can be considered a mechanism of international cooperation between its Member States. In the second case, ESA is an actor in international cooperation (The European, 2018).

In ESA, around 2,200 employees from all the Member States work. These are scientists, engineers, information technology, and administrative staff. These individuals are in an employment relationship with ESA. Public administration of ESA is carried out by collective (ESA Council, assisted by the Bureau of the Agency Council) and individual (Director-General and staff members) subjects. Aside, experts, who are not directly members of ESA, but perform certain functions, have specific administrative rights and responsibilities that

should be distinguished (Dolanská & Halunko, 2019).

The activities of the Agency include mandatory activities, in which all Member States participate, and optional activities, in which all Member States participate apart from those that formally declare themselves not interested in participating. The foundation of will and the exercise of assigned competencies of an IGO materialize through at least one organ, traditionally two: an executive organ and a collegial department. ESA has its parts in the Member States, namely: the European Astronauts Centre in Germany; the European Space Astronomy Centre (Spain); the European Space Operations Centre (Germany), the Centre for Earth Observation (Italy), the European Space Research and Technology Centre (Netherlands), the European Centre for Space Applications and Telecommunications (U.K.), the European Space Security and Education Centre (Belgium), as well as liaison offices in Belgium, USA, and Russia. ESA's main object is a launch base in French Guiana and ground/tracking stations in various parts of the world. (ESA, 2019). ESA is a mechanism of international cooperation in outer space activities, taking the form of an international intergovernmental organization with an international legal personality recognized by its Member States and many other States of the international community. The ESA system allows for the necessary flexibility of taking into account the particular interests of its Member States while at the same time guaranteeing the necessary stability of a core European space program. Therefore, the leading form of management in the European Space Agency is horizontal. Therefore, striving to achieve the status of a member of the European Union and to integrate into the European Space Agency, Ukraine must comply with the outlined forms of government and management principles in space activities.

Conclusions

The paper examines the decentralization of public administration in space activities. We investigated historical aspects of space administration and noted the importance and necessity of decentralization in space activities in the conditions of the martial time. Support for space activities during wartime should be on par with support for the Armed Forces of Ukraine because such an industry requires much effort to start-up and work. In no case can we suspend such activity. The suspension or inconsistency of the plan of strategic actions in space activities can worsen Ukraine's national security state. In martial law conditions, all efforts should be directed to developing the space industry, technology, and space weapons within the framework of international legislation and implementing legislative acts that will protect the state from invasions by enemy forces. The introduction of decentralization, a horizontal form of government, will help maintain the space industry in a state of war.

In addition, within the decentralization framework, the reform of outdated forms of government is taking place, which is extremely important in the integration issue into the European Space Agency. Today, this topic is even more relevant when Ukraine is a candidate for membership in the European Union. Thus, we can reorganize the state enterprise when implementing, for example, corporatization. Such reorganization is aimed at increasing the efficiency of its activities as a result of improving the management system. Under the conditions of European integration, the joint-stock form of entrepreneurship is a powerful means of building an economic system based on non-state forms of social responsibility. In the case of the transformation of state unitary enterprises of the space industry into joint-stock

companies, we can get an update on the economic system and the creation of an innovative environment. Such an update is essential in integrating the State Space Agency into the European Space Agency.

🕮 References

Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (adopted 18 December 1979, entered into force 11 July 1984) (1984) UNOOSA. Available online: https://www.unoosa.org

Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space RES 2345 (XXII) (1968) UNOOSA. Available online: https://www.unoosa.org/oosa/oosadoc/data/resolutions/1967/general_assembly_22nd_session/res_2345_xxii.html

Artemis Accords. Principles for Cooperation in the Civil Exploration and Use of the Moon, Mars, Comets, and Asteroids for Peaceful Purposes Cited (2020) NASA. Available online: https://www.nasa.gov/specials/artemis-accords/img/Artemis-Accords-signed-13Oct2020.pdf

Atamanenko, B. A., Fedonyuk R.V. (2014) International cooperation as a tool for participation in global space projects. *Space science and technology*, No 3, 3-13.

Bondarenko, C., Polishchuk A., and Mosin M. (2020). Peredumovy korporatyzatsii ta tendentsii rozvytku pidpryiemstv oboronno-promyslovoho kompleksu Ukrainy. *Journal of Scientific Papers "Social Development and Security."* Vol. 10, issue 6. Available online: http://www.paperssds.eu/index.php/JSPSDS/article/download/127/264

Cheng, Bin (1997) *Studies in International Space Law*. Oxford University Press. https://doi.org/10.1093/acprof:oso/9780198257301.001.0001

Committee on the Peaceful Uses of Outer Space (COPUOS) (2020) International Partnerships Copuos – UNOOSA. Available online: https://www.unoosa.org/documents/pdf/WSF/2020/Presentations/Exploration/Presentation_2.pdf

Convention on International Liability for Damage Caused by Space Objects (1971) UNOOSA. Available online: https://www.unoosa.org/pdf/gares/ARES_26_2777E.pdf

Convention on Registration of Objects Launched into Outer Space (1975) UNOOSA. Available online: https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introregistration-convention.html

Declaration of Legal Principles Governing the Activities of of States in the Exploration and Use of Outer Space (1963) UN General Assembly Resolution, adopted on December 13. Available online: https://digitallibrary.un.org/record/203965

Dolanská, Renáta, and Vira Halunko (2011) Legal Status of the European Space Agency. *Advanced Space Law*, Volume 3, 5-17. https://doi.org/10.29202/asl/2019/3/1

ESA business incubator opens in Portugal (2014) ESA. Available online: https://www.esa.int/Applications/Technology_Transfer/ESA_business_incubator_opens_in_Portugal

Koshova, S. P. (2022) Peculiarities of the space industry in the postwar period of Ukraine. *Investments: practice and experience*, No 9-10, 96-102. Available online: http://www.investplan.com.ua/pdf/9-10_2022/17.pdf

Konyukhov, Stanislav (2012) Land and sea launch. Mirror of the week. *ZN.UA*. Available online: https://zn.ua/SOCIUM/nazemnye_i_morskie_starty_stanislava_konyuhova__k__75-letiyu_so_dnya_rozhdeniya.html

Nemeschuk, G. (2011) Features of the Transformation of the Economic Potential of the Enterprises of the Space Branch of Ukraine in the Realization of International Scientific and Technical Cooperation. *Dnipropetrovsk University Bulletin*, No 10/2, 63–70.

Okladna, M., and Korchevska A. (2021) The Problem of Space Law Development in Ukraine. *History and Modernity, Law and Innovation Society*, No 1 (16), 85-91. Available online: https://apir.org.ua/wp-content/uploads/2021/06/Okladnaya-Korchevskaya16.pdf

Semenyuk, Yu. S. (2018) Development of joint stock companies in Ukraine in the context of European integration. *Collection of scientific works of young scientists and students*, No 1, 82-85. Available online: https://fbs.khnu.km.ua/fs/5/2-41.pdf

Space Transportation (2022) ESA. Available online: https://www.esa.int/Enabling_Support/Space_Transportation

Tepper, Eytan (2019) The Big Bang of Space Governance: Towards Decentralized Regulation of Space Activities. *Faculty of Law, Institute of Air and Space Law, McGill University*.

The European Space Agency as a mechanism and an actor of international cooperation A/AC.105/C.2/2018/CRP.20 (2018) Committee on the Peaceful Uses of Outer Space Legal Subcommittee Fifty-seventh session of April 9–20. UNOOSA. Available online: https://www.unoosa.org/res/oosadoc/data/documents/2018/aac_105c_22018crp/aac_105c_22018crp_20_0_html/AC105_C2_2018_CRP20E.pdf

The National Targeted Scientific and Technical Space Program of Ukraine for 2021-2025 (2021) Order of the Cabinet Ministers of Ukraine of January 13, No 15. Available online: https://zakon.rada.gov.ua/laws/show/15-2021-%D1%80#Text

Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies 2222 (XXI) (1967) UNOOSA. Available online: https://www.unoosa.org/pdf/publications/STSPACE11E.pdf

The Legal Aspect of Sanctions Against Russia and the Development of the Space Industry

Olena Mkhmurova-Dyshliuk

Ph.D. in Law, Doctor Student of the Scientific and Research Institute of Public Law (Kyiv, Ukraine)
E-mail: mdl_1986@ukr.net
https://orcid.org/0000-0002-0969-8797

Oleksandr Zubov

Ph.D. in Law, Doctor Student of the Scientific and Research Institute of Public Law (Kyiv, Ukraine)
E-mail: olstava@ukr.net

Liudmyla Domuschi

Student of the Scientific and Research Institute of Public Law (Kyiv, Ukraine)
E-mail: domuschilv@ukr.net
https://orcid.org/0000-0002-3264-2804

Mkhmurova-Dyshliuk, Olena, Oleksandr Zubov, and Liudmyla Domuschi (2022) The Legal Aspect of Sanctions Against Russia and the Development of the Space Industry. *Advanced Space Law*, Volume 9, 39-47. https://doi.org/10.29202/asl/9/4

The article reveals the legal basis for sanctioning Russia in response to a large-scale military invasion of Ukraine on February 24, 2022. Detailed attention is devoted to the impact of sanctions on the development of the world and Russian space industries. It has been proved that sanctions are an important auxiliary factor in the victory of the anti-Putin coalition. Sanctions are being introduced as a form of international coercion on the Russian government to comply with international law. It is concluded that sanctioning Russia's space industry significantly accelerates its degradation. Russia will not be able to manufacture, launch and upgrade military satellites. It is demonstrated that imposing sanctions on Russia has no significant influence on the world community's an exploration and use of outer space.

Keywords: aggression, anti-Putin coalition, war, space industry, oil embargo, Russia, sanctions, Ukraine, law.

Received: 17 April 2022 / Accepted: 08 May 2022 / Published: 10 June 2022

Introduction

On February 24, 2022, the Russian-Ukrainian war entered a new phase with the invasion of Ukraine by more than 100,000 Russian soldiers. In a short time, the world found itself in a new paradigm – the Great European War. The Armed Forces of Ukraine are defending the Fatherland and the whole of Europe from Russian terrorist troops. According to US President J. Biden, the current events in Ukraine are changing the history of the XXI century (Kuleba, 2022; Biden says, 2022).

It is not easy for Ukraine to wage war because the Russian terrorist forces do not comply with the norms of international humanitarian law. They are employing a tried-and-true method of capturing cities in Grozny (Republic of Ichkeria) and Aleppo (Syria) by destroying all buildings with missiles, artillery and bombs, as well as killing civilians. It is a proven fact that the capital of Ichkeria, Grozny, was completely demolished by Putin's personal order. Thousands of innocent people were killed as a result of these tragic events. The dictator claimed that his soldiers had finished their mission (Myre, 2022).

The world community has not prosecuted Putin for committing crimes and has not imposed sanctions on Russia. Tolerating evil leads only to more evil. As a result, unpunished crimes multiply exponentially. Several Ukrainian cities, notably Mykolaiv, Popasne, Rubizhne, Lymanske, Severodonets, and Kurakhove, are currently in a horrible situation (Results, 2022).

Prior to that, the cities of Mariupol, Volnovakha, Bucha, Irpin, Hostomel, and Borodyanka were almost completely ruined. Thousands of citizens were killed or seriously injured in Kyiv, Kharkiv, Chernihiv, Vasylkiv, Sumy, etc. Civilian objects in practically every region of Ukraine, including Lviv, Odesa, Kyiv, Vinnytsia, Rivne, Zhytomyr, Kropyvnytskyi, Ternopil, and others, are continuously targeted by rockets. What is more, the world's largest Zaporizhzhya Nuclear Power Plant was subject to constant shelling and bombing. The Chornobyl Exclusion Zone was seized and looted.

Russian terrorist troops are responsible for the worst humanitarian disaster in Mariupol, a metropolis of half a million people. For more than two months, the regional center of Donbas has been under siege. The Armed Forces of Ukraine do not have the ability to unblock it under the current circumstances. Consequently, Russian soldiers are carrying out mass killings of civilians, which have all the hallmarks of crimes against humanity.

In the context of hostilities, national legislation does not work well. That is why the world community was established in the late XIX and improved during the XX century, international humanitarian law. However, the Putin regime does not comply with its provisions. Domestic and international humanitarian organizations carry out a number of measures to provide assistance to the needy. Politicians are negotiating to resolve the humanitarian catastrophe. Unfortunately, Russian dictator Putin does not agree to take any steps to abide by the basic provisions of humanitarian law. Thus, international sanctions are applied fairly and legitimately to the Putin regime.

The problem of establishing a link between sanctions imposed on Russia and the development of the space sector is both scientific and practical. After all, Europe is facing the threat of a major conflict on its territory for the first time since World War II. Putin, who wields full totalitarian control over the world's greatest space and nuclear weapons, violates international law with military force, and Russian occupants carry out crimes against humanity on his orders on the territory of a sovereign European state – Ukraine (Kharchenko, 2022). All of this necessitates the latest scientific analyses and practical proposals to stop Putin's military machine. The very existence of Russia's space forces poses a nuclear missile threat to the whole humanity. Sanctions are one of the most essential and effective measures for the localization and subsequent degradation of defense forces.

The legal nature of sanctions imposed on Russia in the context of Russian terrorist aggression against Ukraine

International law employs a variety of tools to influence states that violate the law. According to Dutch government specialists, sanctions can be used by the international community to change the behavior of a country/regime that breaches human rights or threatens world peace and security. Sanctions vary by country and situation and may include arms embargoes, imports and/or exports of certain goods, software and technology. The embargo may also cover goods that bring money to the leaders of the sanctioned country. In addition, they may restrict the issuance of loans and credits to individuals/companies of such a country, freeze the assets of certain individuals and corporations, as well as impose visa restrictions. Sanctions may be imposed by the UN Security Council, the European Union and individual states (Sanctions, 2022). For its aggressive actions against Ukraine, Russia has faced virtually all of the sanctions listed above.

Sanctions are a subset of a larger category known as "economic war" – employing or threatening to use economic tactics against a country in an attempt to weaken its economy and thus reduce its political and military power. Economic warfare also entails using economic measures to force the enemy to change his policies and behavior or to undermine his ability to maintain ongoing relations with other countries. Some common means of economic warfare include trade embargoes, boycotts, sanctions, expropriation, tariff discrimination, aid suspension, the freezing of capital assets, the ban on investment and other capital flows (Shambaugh, 2022a).

In today's world, the aggressive and inhumane actions of the Russian terrorist forces in Ukraine have elicited a strong and widespread negative response.

Another key category that has to be disclosed is the "embargo" – a legal ban of a government against a certain country prohibiting the movement of commerce ships into or out of its ports to induce compliance with legal obligations and requirements. The notion of "embargo" can be wide and narrow. A trade embargo, for example, is a ban on exports to one or more countries, although the term is often used to denote a ban on any kind of trade. In contrast, the strategic embargo restricts only the sale of goods that make a direct and concrete contribution to the country's military power. For instance, the oil embargo only prohibits oil exports. Embargo, in a broad sense, often allows the continued export of certain goods (such as medicines or food) for humanitarian purposes, and most multilateral embargoes include disclaimers that specify a restricted range of criteria under which exporters can be exempted from their bans (Shambaugh, 2022b).

Despite all the actions of the international community, the violation of humanitarian law by Russian terrorist forces continues. Accordingly, new and new packages of sanctions are being applied to Russia. The main ones are the oil and gas embargo. The following sanctions are applied by individual states and their associations. After all, it is impossible to use the UN security mechanism since Russia is a permanent member of the UN Security Council (Ilchenko, 2022).

Many countries placed sanctions on Russia in response to a large-scale invasion of Ukraine on February 24, 2022. The United States, Britain, Canada, the European Union and other states have imposed sanctions on companies, officials and some influential people in Russia. In particular, Britain has sanctioned more than 100 individuals and enterprises. US President Joe Biden limited the ability of Russian companies to settle in dollars, euros, pounds and yen (Biden says, 2022)

In total, more than 900 people were included in the sanctions lists. Each list contains a different number of individuals and legal entities subject to sanctions, depending on the country that imposed them. Mostly, they are citizens of Russia, current and former deputies of the State Duma, and members of the Council of the Russian Federation. From February 24 to March 11, 2022, the sanctions lists of the EU, Canada, Australia and Great Britain included more than 300 deputies of the State Duma of Russia who voted for the recognition of the DPR and LPR. On March 9, 2022, the EU added another 146 members of the Russian Federation Council to the sanctions list, who ratified the "Agreements on Friendship, Cooperation, and Mutual Assistance between the Russian Federation and the DPR and between the Russian Federation and the LPR."

Personal sanctions have also been imposed on Putin, his spokesman Dmitry Peskov, Russian Foreign Minister Sergey Lavrov, and the Minister of Defence Sergei Shoigu. In addition to Russian government figures, the sanctions list covers such oligarchs as Mikhail Fridman, Alisher Usmanov, Alexei Mordashov, Oleg Deripaska, Roman Abramovich and Putin's inner circle: brothers Arkadiy and Boris Rotenbergs, Yuri Kovalchuk, Gennady Timchenko, Yevgeniy Prigozhyn. President of Belarus Alexander Lukashenko, his sons Dmitry and Viktor, as well as Chechen Republic leader Ramzan Kadyrov were named on the sanctions list. The sanctions lists also included TV presenter on Rossiya 1 TV channel Vladimir Solovyov, RT editor-in-chief Margarita Simonyan, head of the NewFront propaganda news agency Konstantin Knirik, director general of Channel One Russia Konstantin Ernst (Hloba, 2022).

Also, more than 300 Russian banks, including Rossiya, Promsvyazbank, Genbank, Industrial Savings Bank, Novikombank, VTB Bank, and the corporation WEB.RF, were sanctioned. The freezing of legal entities' assets is the most common type of restrictive measure on all lists examined. Furthermore, US sanctions against PJSC Gazprom have been increased. In addition to a freeze on the company's assets, a restriction on transactions, financing, and other activities with debt was introduced. The United Kingdom, Canada, and Australia have all sanctioned Alexei Miller, the Chairman of the Board of PJSC Gazprom.

On March 10, 2022, the Canadian government added about 30 Russian companies operating in the field of mechanical engineering, including aircraft manufacturing, as well as the Ministry of Defence and the Russian Foreign Intelligence Service, to the sanctions list, in addition to the banking sector companies.

The European Union imposed sanctions on roughly 90 Russian firms on March 15, 2022, including a prohibition on all commercial links with ten key Russian defense companies, as well as oil and gas corporations. Nevertheless, the wording allows purchasing oil and gas if

there is a critical need. Restrictions on other listed companies apply to the prohibition of direct or indirect sales, supply, transfer, or export of dual-use items and technologies (Hloba, 2022).

However, as the decades-long experience of North Korea, Iran, and Venezuela has shown, even the toughest sanctions do not bring the desired result, because they must be backed by military force. Unfortunately, no matter how long and strong the US aircraft bomb terrorists in Afghanistan, they cannot be destroyed without a ground-based assault operation.

In our opinion, sanctions against Russia have a security purpose. They must not allow the Russian military machine to restore its military potential. Thus, sanctions without military coercion against the aggressor's country are ineffective. Moreover, they are, in most cases, useless and do considerable damage to the democracies that impose them. International sanctions applied by the democratic community are a means of supporting the Ukrainian military who fight against the aggressor country that grossly violates the norms of international law and (or) is a sponsor of international terrorism.

In order to accelerate the supply of military weapons to Ukraine and to counter Russia's full-scale invasion, a summit of NATO member nations and Allies was held on April 26, 2022, at the US Air Base in Ramstein, Germany. More than 40 countries participated in this unprecedented forum: 1) Australia 2) Albania, 3) Belgium, 4) Bulgaria, 5) Great Britain, 6) Greece, 7) Denmark, 8) Estonia, 9) Israel, 10) Iceland, 11) Spain, 12) Italy, 13) Jordan, 14) Canada, 15) Qatar, 16) Kenya, 17) Latvia, 18) Lithuania, 19) Liberia, 20) Luxembourg, 21) Morocco, 22) Netherlands, 23) Germany, 24) New Zealand, 25) Norway, 26) South Korea, 27) Poland, 28) Portugal, 29) Northern Macedonia, 30) Romania, 31) Slovakia, 32) Slovenia, 33) USA, 34) Tunisia, 35) Turkey, 36) Hungary, 37) Ukraine, 38) Finland, 39) France, 40) Croatia, 41) Czech Republic, 42) Montenegro, 43) Sweden, 44) Japan.

According to Volodymyr Yelchenko, the meeting at Ramstein Air Base (2022) actually marked the formation of an anti-Putin coalition. In his view, this is reminiscent of the historical circumstances surrounding the creation of an anti-Hitler coalition at the 1943 Tehran Conference (Yelchenko, 2022).

Thus, the imposed sanctions are measures of international economic, financial and organizational coercion applied to Russian individuals and legal entities for participation (directly or indirectly) in the implementation of armed aggression and violation of humanitarian law by Russian terrorist forces in Ukraine.

Sanctions are applied by democracies individually (USA, UK, Poland, Lithuania, Latvia, Estonia, Slovakia, Romania, Japan, Australia, France, Germany, etc.) and by the EU-NATO community as a whole. The goal is to prevent the restoration of Russia's military potential, which is being destroyed by the Armed Forces of Ukraine. Following Ukraine's victory in the war against Russia, the sanctions will be aimed at forcing the Russian government to fulfill all obligations to demilitarize Russia, pay reparations to Ukraine, individuals and legal entities affected by Russian terrorist aggression, release all Ukrainian prisoners of war and implement democratic reforms in Russia.

Sanctions against Russia's space industry

According to US President Joe Biden, the application of sanctions will result in significant losses for the Russian economy and will prevent Russia from modernizing its military power in the near future (Biden, 2022). The sanctions will also affect the aerospace industry, including Russia's space program, as they block more than half of high-tech imports. For example, the

European Union has imposed sanctions against the Progress Rocket Space Centre, and the European Space Agency ruled out the launch of a Russian-European mission to explore Mars ExoMars. The European Space Agency intends to launch satellites into orbit using European rockets rather than Russian ones (Zvyagin, 2022).

Also, in the context of the latest sanctions against Russia, the Council of the European Space Agency (ESA) has decided to refuse to cooperate with Russia on the monthly programs Luna-25, Luna-26 and Luna-27. Since the Russian aggression against Ukraine and the imposed sanctions make such cooperation impossible (No 16–2022, 2022).

The sanctions have a significant impact, as evidenced by Roscosmos chairman Rogozin's statement urging Western countries to lift sanctions imposed in response to Russia's large-scale invasion of Ukraine. Otherwise, Russia will suspend its International Space Station cooperation with Western countries. He believes that sanctions are intended to kill the Russian economy, drive the Russian people to despair and hunger, and bring the country to its knees. The political circles of the countries that imposed sanctions on Russia did not react to the blackmail of a Russian politician and the head of the national space industry. The US National Aeronautics and Space Administration has begun implementing ways to keep the International Space Station in orbit without the assistance of Russia (Sanctions have, 2022).

For example, Russia cannot launch a satellite into orbit, since the necessary number of chips cannot be delivered due to Western sanctions. Consequently, the launch of satellites into space orbit is significantly complicated by the lack of chips (Russia, 2022).

It should be understood that the United States and some other Western nations did not want Russia's space cooperation to end completely. However, Roscosmos is severing ties with global partners on its own initiative in response to restrictions on its side. Russia has announced the cessation of sales of US rocket engines. Indeed, since the 1990s, Russia has supplied 122 RD-180 engines to the United States. In particular, they were used on Atlas launch vehicles. However, it should be noted that the RD-180 is a "repainted" RD-170 engine developed in the late 1970s and early 1980s by Soviet scientists of Ukrainian origin Valentyn Glushko. Unfortunately, the engine is already obsolete. Accordingly, analogs and more advanced products are available in the rocket engine markets, both in the United States and in other countries, including South Korea.

Similarly, Western cosmic agencies did not want to completely terminate ISS service contracts. US analysts confirm that the problem of the International Space Station exists. After all, the ISS has been a joint effort of the United States and Russia from the very beginning. It was created during the period of improving relations between the enemies of the Cold War, after the fall of the Berlin Wall and the end of the space race. After the failure of the US space shuttle, Russia's Soyuz rockets were the only means of sending astronauts into orbit and back, at least until SpaceX. In fact, six of the station's sixteen housing modules were supplied by Russia and eight by the United States (the rest were provided by Japan and the European Space Agency). However, according to the US Secretary of Commerce Gina Raimondo, Russia's actions pose an immediate threat to Ukrainians. They also pose a serious threat to global democracy. Thus, the United States will continue to act decisively in close coordination with allies and partners and will not tolerate Russia's aggression against Ukraine's democratically elected government (Tarantola, 2022).

Elon Max rightly responded to Russia's blackmail to stop serving the ISS. He suggested involving SpaceX in keeping the ISS in orbit. SpaceX can keep the ISS afloat without the hassle of Falcon 9 equipment by taking over delivery flights (Tarantola, 2022).

As a result of the so-called counter-sanctions, the Russian space agency is isolating itself. This hastens the demise of Russia's cosmic industry, which has long relied on the developments and achievements of Soviet scientists and designers from the 1960s and 1980s.

Thus, sanctions imposed on Russia's space industry for its military aggression against Ukraine, as well as Roscosmos' subsequent self-isolation and refusal to cooperate on long-term contracts, contribute to Russia's gradual decline as a great space power. After all, the Russian space industry has been stagnant for a long time, and it is becoming increasingly difficult to capitalize on the 1960s and 1980s developments. The generous infusions into Russia's cosmic industry could be halted with comprehensive sanctions and an oil embargo. This will result in a significant reduction in Russia's space industry, which is unreformed and operates according to the patterns of the previous era's planned economy.

The impact of sanctions against Russia on the world space industry

For a long time, Russia's space industry has been a world leader. Along with US space achievements, it dominated the world. This was especially true during the Soviet era. Despite all the criticism of that system, the first launch of an artificial satellite of the Earth and the first manned space flight was conducted by the Soviet empire.

As a result, following Russia's declaration of independence from the Soviet Union on June 12, 1990 (Day, 2018) and the subsequent cessation of its existence, Russia inherited a significant scientific and theological advance of the space industry compared to other states. However, the authoritarian, corrupt system of public administration, selection, and appointment to senior positions in the space industry based on personal devotion to Putin rather than professional qualifications led to stagnation and loss of Russia's previous epoch achievements. The facts of a failed launch at the Vostochny Cosmodrome due to an error in entering the launch coordinates are known to the world space community. The "specialists" mistakenly entered the coordinates of the Baikonur Cosmodrome's launch site into the launch system. Although the Russian state commission has officially released the version that after the separation of the head part from the launch vehicle, the process of spatial orientation of the upper stage began, and during this period, telemetry tools recorded the abnormal angular position of the booster (Agamalova, 2017). On October 18, 2018, the cosmic spacecraft "Union 10" crew was rescued in an emergency for the first time in many years. The crash of the Soyuz-FG missile on the active part of the trajectory revealed the vulnerabilities of the so-called modern Russian technologies (Pervushin, 2018).

Thus, long before February 24, 2022, both cargo and manned spaceflight in Russia began to decline. It does not currently hold a leading position alongside the United States, China, and the European Union. After the imposition of sanctions, Russia has the opportunity to launch a carrier rocket, but it is impossible to produce satellites on its own.

The only temporary problem for the world space community in the face of sanctions against Russia is certain potential challenges associated with the continued operation of the ISS. Eventually, the negative impact of sanctions imposed on Russia on the global space industry is minimal. In the face of self-isolation, international sanctions, corruption, and poor personnel policies, Russia's space sector is doomed to rapid degradation.

Conclusions

Therefore, after the beginning of February 24, 2022, full-scale Russian invasion of Ukraine, the world community has moved into a new international paradigm – the war of good and evil. Correspondingly, more than 42 democracies, led by Ukraine, are directly on the side of good. Russia is a country-aggressor, with only four state marginals supporting it. God has entrusted the mission of destroying Russia's military power on the Ukrainian people. This is given to Ukraine at the expense of significant civilian casualties and economic hardship. More than 140 sovereign member states of the United Nations have directly supported Ukraine in this military struggle.

The anti-Putin coalition's members have agreed to provide the Ukrainian army with weaponry and everything necessary to combat Russia's military forces. In addition, they provide financial support to Ukraine through international financial institutions.

Sanctions imposed by democracies on Russia are an important factor in the victory of the anti-Putin coalition. The sanctions aim to compel Russia's government to reimburse Ukraine, compensate other legal entities and individuals, surrender nuclear weapons for disposal, and free all hostages and political prisoners. Russia should be weakened to the degree where it is unable to restore its military power.

The restrictions imposed on Russia's space sector are effective because they accelerate the industry's degradation. Russia is losing its ability to develop and launch military satellites, as well as modernize military missile systems. At the same time, the negative impact of sanctions on the world market for space exploration and use is minimal. Other developed space powers of the world will significantly contribute to the space industry in a short period of time.

🕮 References

Agamalova, Anastasia (2017) Roskosmos named the reasons for the unsuccessful launch of the Soyuz from Vostochny. *Vedomosti*. Available online: https://www.vedomosti.ru/politics/articles/2017/12/12/744951-prichini-zapuska

Biden has signed laws on additional sanctions against Russia and Belarus (2022) *Radio Free Europe*. Available online: https://www.radiosvoboda.org/a/news-ssha-rosia-sanktsii/31794550.html

Biden says EU leaders agree to impose a devastating sanctions package on Russia (2022) *BIZ*. Available online: https://biz.nv.ua/ukr/economics/bayden-anonsuvav-nishchivni-sankciji-proti-rosiji-ostanni-novini-50219772.html

Day of Russia's withdrawal from the USSR (2018) *LIVEJOURNAL*. https://amfora.livejournal.com/629015.html

Hloba, Danilo (2022) Nearly 1,000 people and more than 300 Russian companies are under sanctions. *Ekonomichna pravda*. Available online: https://www.epravda.com.ua/columns/2022/03/19/684320/

Ilchenko, Vladimir (2022) Is Russia an impostor in the UN Security Council. *Ukrinform*. Available online: https://www.ukrinform.ua/rubric-world/3380839-rosia-samozvanec-u-radi-bezpeki-oon.html

Kharchenko, Igor (2022) The Bucha massacre is a crime against humanity that will not have a statute of limitations. *Espreso*. Available online: https://espreso.tv/buchanska-rizanina-tse-zlochin-proti-lyudyanosti-yakiy-ne-matime-terminu-davnosti-diplomat

Kuleba told what he and Reznikov had agreed on at a meeting with Biden (2022) *ICTV*. Available online: https://www.youtube.com/watch?v=RlQUeJBpDAo

Myre, Greg (2022) Russia's wars in Chechnya offer a grim warning of what could be in Ukraine. *NPR*. 2022. Available online: https://www.npr.org/2022/03/12/1085861999/russias-wars-in-chechnya-offer-a-grim-warning-of-what-could-be-in-ukraine

Pervushin, Anton (2018) Emergency Rescue System: A Brief Historical Sketch. *COSMOS*. No 265. Available online: https://trv-science.ru/2018/10/las-history/#lightbox-gallery-0/3/

Results of the 66th day of the war (2022) *ZAXID*. Available online: https://zaxid.net/statti_tag50974/

Russia cannot launch satellites into space due to sanctions (2022) *Censor*. Available online: https://censor.net/ua/n3269941

Sanctions have reached space: Russia refuses international cooperation on the ISS (2022) *TSN*. Available online: https://tsn.ua/svit/sankciyi-syagnuli-do-kosmosu-rosiya-vidmovlyayetsya-vid-mizhnarodnoyi-spivpraci-na-mks-2027542.html

Sanctions (2022) *Government Netherlands*. Available online: https://www.government.nl/topics/international-peace-and-security/compliance-with-international-sanctions

Shambaugh, George (2022a) Economic warfare. *Encyclopedia Britannica*. Available online: https://www.britannica.com/topic/economic-warfare

Shambaugh, George (2022b) Embargo. *Encyclopedia Britannica*. Available online: https://www.britannica.com/topic/embargo-international-law

Tarantola, Andrew (2022) What economic sanctions mean for Russia's space program. *Engadget*. Available online: https://www.engadget.com/what-economic-sanctions-mean-for-russias-space-program-170003960.html

Yelchenko, Volodymyr (2022) The Ramstein meeting marked the creation of an anti-Putin coalition? *Ukrinform*. Available online: https://www.ukrinform.ua/rubric-polytics/3468789-zustric-u-ramstajni-zasvidcila-stvorenna-antiputinskoi-koalicii-elcenko.html

Zvyagin, Jean (2022) Rogozin told how Roscosmos will respond to the sanctions. *Parliamentary NEWSPAPER*. Available online: https://www.pnp.ru/economics/rogozin-rasskazal-kak-roskosmos-otvetit-na-sankcii.html

No 16–2022. Redirecting ESA programmes in response to geopolitical crisis (2022) *ESA*. Available online: https://www.esa.int/Newsroom/Press_Releases/Redirecting_ESA_programmes_in_response_to_geopolitical_crisis

“Policy” and “Administration” in the Context of Regulating Ukraine’s Space Activities

Vitaliy Oksin

Doctor of Law, Senior Researche, Izmail State Humanitarian University (Izmail, Ukraine)
E-mail: 6222410@ukr.net
https://orcid.org/0000-0001-6080-7752

Anna Danylenko

Ph.D. in Law, Researcher, Information Analysis Center for Aerospace Law (Kyiv, Ukraine)
E-mail: a_danilenko07@ukr.net
https://orcid.org/0000-0001-8263-1364

Artem Zubko

Ph.D. in Law, Scientific Institute of Public Law (Kyiv, Ukraine)
E-mail: Zubko18@gmail.com
https://orcid.org/0000-0003-2025-0202

Oksin, Vitaliy, Anna Danylenko, and Artem Zubko (2022) “Policy” and “Administration” in the Context of Regulating Ukraine’s Space Activities. *Advanced Space Law*, Volume 9, 48-57. https://doi.org/10.29202/asl/9/5

Updating the state policy of Ukraine in the field of space exploration and use of outer space and optimizing the administration of the space sector is an urgent task concerning the existing disparity between the possibilities and practical application of space potential in Ukraine. Taking into account the specifics of space activities, the specifics of international and national regulation of its implementation, it is relevant to study the concept of “policy – administration” in the context of regulating space activities in Ukraine. Providing such an opportunity is based on the combined use of methodological tools of scientific activity, combining general theoretical and special legal methodology of conducting scientific research. Thus, the dialectical method became the basis for revealing the philosophical foundations of the content and essence of the categories “politicy” and “administration,” and the formally logical method made it possible to search for their common and distinctive features. As a result, we conclude that there is no clear correlation between the terms “politicy” and “administration” in the context of domestic scientific thought and normative doctrine. Methods of comparison, analysis and synthesis provided an opportunity to find out the characteristic features of the domestic concept of “policy –

administration" in the context of regulating the space activities of Ukraine. In particular, the necessity of normative rejection of domestic political and administrative subjects from Soviet approaches to the settlement of space relations, the transition to the concept of "Public Administration" with the understanding that although administration and politics are different spheres, they cannot be completely separated. In turn, with the assistance of the formal legal method, as well as methods of system analysis and generalization, it is concluded that public policy should be perceived as a tool for ensuring the legitimacy of actions, decisions and inaction of public administration and a guarantee of transparency and clarity of the established rules and conditions for the study and use of outer space. At the same time, public administration should ensure the existence of a legal regime for the implementation of space activities and the effectiveness, expediency and effectiveness of its existence.

Keywords: administration, policy, global space management, state policy, regulatory policy, public administration, space activities of Ukraine.

Received: 1 March 2022 / Accepted: 27 April 2022 / Published: 10 June 2022

Introduction

Space activities ensure the implementation of national interests in the field of national security and defense, industries that determine economic development, the general scientific, technical and technological level, ensuring sustainable development, and also contribute to improving the quality of life of Ukrainian citizens (On the, 2021). Therefore, improving the efficiency of using space potential is the main strategic task of Ukraine, because now there is a significant disparity between the level of space potential and its impact on solving current national and public tasks (On the, 2011).

The solution to this problem provides for updating the state policy of Ukraine in the field of space exploration and use and optimizing the administration of the space sector. And in order for the reforms to be effective, it is necessary to create a theoretical basis and, first of all, this concerns the differentiation of the concepts of "politicy" and "administration," which still have a "Soviet connotation" in Ukraine.

For quite a long time, it has been considered that there should be a clear distinction between "politicy" and "administration" – making political decisions and implementing them. Therefore, the administration is outside the political sphere. This justification for the distribution of state functions was provided by Wilson in 1887 and received further scientific development within the sociological, political, and managerial branches of scientific knowledge. Probably, this idea originates from the fundamental principle of separation of power, which is the basis for organizing the state mechanism of many modern states. According to this principle, the institutions of legislative, executive and judicial power are independent and separate from each other. Such distribution ensures the proper protection of citizens' rights, freedoms and interests, protecting them from tyranny and monopolistic uncontrolled concentration of power.

However, historical development has proved the fallacy of absolutizing such a view. Therefore, the evolution of views on the essence of political and administrative interaction ranged from the complete opposition of these two phenomena to the consideration of them as different components of one system (Conceptual, 2010: 82), because in the structure of the state and society they are closely related.

In general, the policy-administration dichotomy is based on a functional-structural view of the government's powers, which divide them between elected and administrative positions in

functional areas. Thus, the executive institute has two areas of implementation of state functions: policy and administration (Tansu, 2009: 505). Therefore, in this context, it is important to find out the essence of the domestic understanding of the concept of "policy – administration" and the study of its features regarding the regulation of Ukraine's space activities, because this area is now able to better ensure the implementation of Ukraine's national interests.

General foundations of a theoretical and normative understanding of policy and administration in Ukraine

The term "policy" is ambiguous. In the legislation of Ukraine, the term "policy" refers to: 1) a set of documented decisions that are made for a specific purpose and a specific direction; 2) a set of goals, rules of conduct, as well as requirements that are collectively developed to achieve a certain goal; 3) basic principles and approaches that should be guided to achieve something; 4) a system of general approaches, principles and methods of forming managerial decisions; 5) a fundamental approach that should be taken to manage something; 6) approach, requirements, rules, restrictions, recommendations regulating the procedure for implementing something; 7) a set of documented provisions, rules and practices that define the goals and procedure for ensuring something; 8) general intentions, obligations and direction of actions; 9) a tool that contributes to the achievement of specific goals.

In general, this is an activity that involves a certain impact. Relatively speaking, this is a certain strategy for making and practically implementing mandatory decisions on a particular issue (Conceptual*,* 2010: 10).

The central actor of political life is the state. There is no legal definition of the term (state policy) in the legislation of Ukraine. Analyzing its branch varieties, such as state customs, maritime, industrial, regional, regulatory, technical policy, as well as state policy in the field of education, culture, and entrepreneurship, we can generalize that this is: 1) a system of principles and directions of state activity; 2) a set of goals, measures, means and coordinated actions of authorized state entities; 3) a system of regulated external and internal public relations; 4) certain activities of the Government with a clear direction; 5) directing and regulating activities of the state; 6) legal, regulatory (administrative, economic, financial) and public activities of state authorities and local self-government bodies; 7) purposeful legislative system of organizational-economic and legal measures; 8) activities aimed at achieving optimal regulation.

In fact, state policy is a way of exercising power at the strategic and tactical levels. In a general sense, an authorized entity, performing its direct duties (analyzing the current state of a particular problem, assessing future prospects and forming an action plan, public discussion, etc.), forms (in specific cases and implements) an action plan necessary to solve problems of public significance.

At the same time, an authorized entity cannot simply issue regulatory and legislative acts. He needs to convince the public of the necessity of their adoption and compliance with the established rules. To ensure this opportunity, citizens are given wide access to participate in management issues (Danylenko, 2019: 224), educational activities are carried out, and in the context of the space sphere, space technologies are also actively involved in the daily life of humanity.

In the scientific literature, there are at least two characteristics that public policy should meet: on the one hand, it should reflect the interests of broad social groups and contribute

to solving significant social problems (for example, ensuring security, stability, sustainable growth, etc.), and on the other – contribute to the formation of a strong and capable government that makes effective and fair decisions.

As for the term "administration," there is no legal definition of it in Ukraine. Scientists have also not yet come to an agreement on its interpretation. The variability of scientific opinions can be easily explained – the lack of an official (legislative) interpretation of it and the subjectivism of the scientist when interpreting the hypercomplex of features that this process is endowed with.

In general, "administration" as a method of organizing public relations by authorized state entities with authority is a precursor to the modern legal structure of "public administration," which over time has changed and acquired qualitatively new features and has changed its focus on the public (and not the state) well-being. Within the framework of domestic administrative and legal science, it is more acceptable to assume that public administration, as a category, has split into two independent parts, one of which remains with the same name, and the other is called "public administration." What has always been called public administration abroad was state administration in Ukraine and is only now beginning to adapt to international standards as the cooperation of efforts of subjects of administrative-legal relations, expressed by joint activities to achieve public goals (Danylenko, 2020: 3).

In a narrow sense, public administration is associated with the executive branch of government and is considered as a professional activity of civil servants and persons working in the social sphere, in non-governmental organizations, institutions and organizations that have budget funding and exist on sponsorship funds in order to ensure the life of the country at the level of state, regional, local administration and carry out the study, development and implementation of public policy (Amosov, 2014: 12).

Public administration, in a broad sense, is associated with the functioning of all branches of government: legislative, executive, and judicial (Amosov, 2014: 12). Therefore, its content identifies state-administrative management with the process of carrying out relevant activities, that is, with a broad interpretation of Public Administration as a special and independent type of activity of state bodies, including executive authorities. The administrative aspect of administration is also directly related to this point (Pylypyshyn, 2015: 67).

Accordingly, domestic scientific thought and normative doctrine do not provide a clear correlation between the terms "policy" and "administration."

Policy for regulating the implementation of space activities

In general, space policy can be defined as a system of laws, standards, regulatory measures, directions of action and funding priorities (Kilpatrick, 2000) aimed at improving the efficiency of using space potential and supporting national interests (Office, 2020; Soroka, 2020a: 45). In fact, its essence is represented through its managerial nature. That is, the authorized subject reacts to the problem, looks for optimal ways to solve it, which ensures the stability of the development of space activities.

It is reasonable to say that the policy of regulating the implementation of space activities concerns the national level. In other words, we should talk about state policy in the field of space activities, because, in our opinion, the international level of regulation of space legal relations is objectified within the framework of global space management. It is represented by a set of international, regional or national laws, as well as regulatory institutions and actions,

methods and processes for managing or regulating affairs or activities related to the space sphere. Global space governance also includes tools, institutions, and mechanisms; national laws, regulations, technical standards and procedures; codes of conduct and confidence-building measures among actors working in space; all of which are discussed, formulated and implemented at different levels of government. Taken together, these measures allow us to formulate, monitor compliance and ensure the implementation of space activities (Goguichvili et al., 2021). We are not considering their effectiveness now.

Currently, global space governance is based on quasi-legal tools for ensuring global law and order in this area. On the one hand, there are mandatory or regulatory documents, and on the other – the voluntary achievement of an international consensus. The basic document representing its foundations is the Treaty on the principles of state activities for the exploration and use of outer space, including the Moon and other celestial bodies (the Treaty on space) (Treaty, 1967). Details and methods of its implementation are specified in other UN thematic documents.

A special feature of global space management is its focus – the regulation of relations between all actors in space activities. This means that states that, by signing the Space Treaty and other UN thematic documents, undertake to develop (implement) standards and rules in the national policy for regulating the implementation of space activities that are the same for everyone. However, most of these rules and standards are either generalized, outdated or not applicable in modern conditions, or do not provide for specific mechanisms necessary for the settlement of international space relations due to the lack of strict instruments of influence on space actors who are not parties to the treaty process. As an example, today the current problems are the regulation of space ecology and the extraction of space minerals. Currently, only voluntary, non-binding standards and guidelines developed by the UN ICC, the International Organization for Standardization (ISO) and the International Telecommunication Union (ITU) apply to activities with space objects and the prevention of space debris formation (Kosenkov & Shtodina, 2016: 24).

In our view, at the international level, it is necessary to adopt a normative legal act, for example, in the form of a convention, which should regulate the commercial space activities of countries and their private corporations. It also needs to define a number of legal definitions such as outer space, national space interests and global space interests, commercial space activities, and the principles of such activities.

The national policy of regulating the implementation of space activities differs from the global management of space by the ability of an authorized entity to establish those rules, legal regimes and priorities for its implementation that correspond to the national interests of a particular state. But at the same time, the national interests of a particular state in the space sphere should not encroach on global space interests. After all, space is the "global heritage" of humanity.

The national policy of regulating the implementation of space activities in Ukraine is presented as the state policy of Ukraine in the field of space exploration and use. It is characterized by evolutionary development and consistent reform. Its main principles are established by the parliament. Detailed information is provided by other regulatory legal acts. Currently, the state policy of Ukraine in the field of space exploration and use is aimed at:

- Ensuring the development of space technologies and their integration into the real sector of the national economy and the sphere of national security and defense;

- Obtaining new knowledge, increasing the scientific and technical potential of the state and the educational level of its citizens;
- Improvement of rocket and space technology and technologies for its creation;
- Implementation of an effective industrial policy and modernization of production;
- Ensuring the commercialization of space activities;
- Deepening international cooperation in the field of space activities (Concept, 2011).

Analyzing the components of the organization of space activities in Ukraine, it is worth noting that the state has taken on a significant share of ensuring the development of the industry through two interrelated processes: state support and investment attractiveness of space activities (Shestakovska, 2019).

The essence of public administration in the field of space activities in Ukraine

Under the public administration of the sphere of space activities in Ukraine, it is necessary to understand the varieties of organizational power, providing, security and other influence of public administration on socio-economic processes, consisting in the introduction of a set of measures aimed at 1) providing new opportunities for space activities; 2) the development of modern space technologies and the implementation of scientific space research; 3) effective use of space potential for further development of outer space based on the priority of environmental safety and economic interests; 4) formation of a system of target-oriented activities of subjects implementing space programs; 5) ensuring technological renewal of the national economy (Soroka, 2020b: 225).

From this definition, it can be concluded that public administration should translate into reality the guidelines and directions of state policy in the field of space exploration and use.

The Ministry of strategic industries of Ukraine is responsible for ensuring the formation and implementation of the state policy of Ukraine in the field of space exploration and use. This is the central executive authority, whose activities are directed and coordinated by the Cabinet of Ministers of Ukraine (Some, 2020). The Ministry of strategic industries of Ukraine was established by resolution No 624 of the Cabinet of Ministers of Ukraine, dated July 22, 2020. According to the regulation on the Ministry of strategic industries of Ukraine, approved by resolution of the Cabinet of Ministers of Ukraine No 819 of September 7, 2020, its main powers are concentrated within the framework of rule-making, coordination, conciliatory, control, representative and organizational actions.

So exclusively in the field of research, the Ministry of strategic industries of Ukraine: 1) develops the conceptual framework of the state policy in the field of research and use of outer space for peaceful purposes and in the interests of state security, coordinates their implementation; 2) coordinates the development of the conceptual framework of the state policy in the field of research and use of outer space for peaceful purposes and in the interests of state security, coordinates their implementation; 3) coordinates together with ministries, other central executive authorities and the National Academy of Sciences the implementation by the relevant subjects of the measures of the national target, scientific and technical, space program and ensures its implementation; 4) is a state customer of research works on the research and use of outer space, research and development works on the design, manufacture and testing of space technology, in particular international space projects; 5) organizes the provision of subjects of space activities in Ukraine with the necessary regulatory documentation;

6) organizes 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 and participates in the preparation of international treaties of Ukraine in the field of space activities; 7) approves the procedure for the activities of the customer's representative offices-SCA for quality control and acceptance of space technology and other products; 8) provides support in the preparation and implementation of international projects in the field of space exploration and use; 9) takes measures aimed at improving Ukraine's foreign economic relations with other states in the field of space activities (Some, 2020).

Another central executive authority that implements the state policy of Ukraine in the field of space exploration and use is the state Space Agency of Ukraine. Its activities are directed and coordinated by the Cabinet of Ministers of Ukraine through the Vice Prime Minister of Ukraine-Minister for strategic industries (On the, 2015).

Due to the introduction of amendments to the law of Ukraine "On space activities" in 2012, the state Space Agency of Ukraine lost its position as the only competent state body that ensured the formation and implementation of space policy (Bogatyuk et al., 2021: 136).

Currently, the state Space Agency of Ukraine has conciliatory, analytical, technical, organizational, registration, monitoring, supervisory and other powers. As an example, the State Space Agency of Ukraine carries out measures for the development and operation of the certification system of space technology of Ukraine (Ukrsct), provides subjects of space activities in Ukraine with the necessary regulatory documentation or maintains a State Register of unique objects of space activity, carries out state supervision of their condition and use, takes measures to support them or registers space technology (On the, 2015).

A set of special powers in the field of space activities belongs to the Ministry of Defense of Ukraine, which, in particular, within its competence, develops the conceptual framework of the state policy of Ukraine in the field of research and use of outer space and the national target scientific and technical space program of Ukraine in terms of related to the creation and use of military space technology. Together with the state Space Agency of Ukraine, the Ministry of foreign affairs of Ukraine is responsible for the implementation of the association agreement between Ukraine and the EU in terms of the implementation of international norms and cooperation in the field of space activities (Bogatyuk et al., 2021: 136-137).

Consequently, public administration is a process that ensures the functionality of public policy in the field of space exploration and use, which involves the use of the necessary tools by authorized entities to influence a specific range of space relations in a variety of ways.

Conclusions

The political and administrative components of the state are more unique, because each state has passed its own path of formation and development. For quite a long time, the domestic doctrine appealed to outdated terms and legal categories, which have now exhausted their need for the application to describe legal processes and phenomena. By choosing a course toward European integration, Ukraine actually recognized the need for a radical restructuring of the established model of public affairs management. This is how the category of "public administration" appeared, which gradually changed the idea of political and managerial functions of the state.

Interpreting this to the sphere of space activities, we can note that even now the law of Ukraine "On space activities" appeals to the concept of "state regulation and management in

the field of space activities." This concept combines with its content the implementation by authorized persons of the political and administrative function of the state by:

- Legislative establishment of the basic principles, norms and rules of space activities;
- Development of a conceptual framework for state policy in the field of exploration and use of outer space for peaceful purposes and in the interests of State Security;
- Formation of the National target scientific and technical space program of Ukraine;
- Planning and financing of space activities at the expense of the state budget of Ukraine, as well as assistance in attracting other sources of financing that are not prohibited by the current legislation of Ukraine;
- Targeted training of personnel at the expense of the state budget of Ukraine; introduction of the declaration on the implementation of economic activities in the field of space activities;
- Introduction of permits for the right to carry out certain types of space activities and ensuring control over the implementation of such activities;
- Control over the implementation of foreign economic activity by subjects of space activity (On Space, 1996).

This indicates the lack of clarity in the domestic understanding of the concept of "policy – administration" in the context of regulating Ukraine's space activities and, therefore, their inseparability.

In our opinion, the state policy of Ukraine in the field of space exploration and use and public administration in the field of space activities relate to each other as two independent legal phenomena. The state policy of Ukraine in the field of space exploration and use is more of a strategic phenomenon that sets guidelines and directions for the development of this industry, and public administration in the field of space activities is designed to ensure all the processes of its functionality by responding to the current state of affairs in this area.

However, these two legal phenomena cannot exist in isolation from each other or even singly. Without development vectors and strategic planning, as well as without organizational power, providing security and other influence of public administration, it is impossible to improve the efficiency of using space potential.

Therefore, it is necessary for domestic political and administrative entities to abandon Soviet approaches to the settlement of space relations, to switch to the concept of "Public Administration" with the understanding that although administration and politics are different spheres, they cannot be completely separated. Public policy should be perceived as a tool for ensuring the legitimacy of actions, decisions and omissions of the public administration and a guarantee of transparency and clarity of the established rules and conditions for the exploration and use of outer space. In turn, public administration should ensure the existence of a legal regime for the implementation of space activities and the effectiveness, expediency and efficiency of its existence.

🕮 References

Amosov, O. (2014) Public administration: methodological context. Public administration of the 21st century: from social dialogue to public consensus. *XIV International of science congress*, Kharkiv.

Bogatiuk, I. G., Lisnyak D. V., and Yatsenko D. E. (2021) Bodies of state regulation of space activity in Ukraine. Aero-2021. *Air and Space Law.* All-Ukrainian conference of young scientists and students. National Aviation University. Kyiv, Volume 1, 135-137.

Conceptual foundations of the interaction of politics and management (2010) Under the general editorship of V.A. Rebkala. National Academy of Public Administration.

Danylenko, Anna (2019). The main factors influencing the administrative efficiency and effectiveness of public administration. *Comparative and Analytical Law*. No 6, 224-226.

Danylenko, Anna (2020) *Principles of public administration in Ukraine*. Research Institute of Public Law.

Goguichvili, Sophie, Alan Linenberger, and Amber Gillette (2021) The Global Legal Landscape of Space: Who Writes the Rules on the Final Frontier? *Wilson Center*. Available online: https://www.wilsoncenter.org/article/global-legal-landscape-space-who-writes-rules-final-frontier

Kilpatrick, Dean G. (2000) Definitions of Public Policy and the Law. *National Violence Against Women Prevention Research Cente*. Available online: https://mainweb-v.musc.edu/vawprevention/policy/definition.shtml

Kosenkov, I. A., and Shtodina I. Yu. (2016) International legal regime for combating space pollution. *Journal of International Law*. No 1, 19–34. [in Russian]

Office of Space Commerce (2020) National Space Policy. Available online: https://www.space.commerce.gov/policy/national-space-policy/

On Space Activities (1996) Law of Ukraine of November 15, No 502/96-VR. Available online: https://zakon.rada.gov.ua/laws/show/502/96-%D0%B2%D1%80#Text [

On the approval of the Regulation on the State Space Agency of Ukraine (2015) Decree of the Cabinet of Ministers of Ukraine of May 14, No 281. Available online: https://zakon.rada.gov.ua/laws/show/281-2015-%D0%BF#Text

On the approval of the Concept of implementation of the state policy in the field of space activities for the period until 2032 (2011) Decree of the Cabinet of Ministers of Ukraine of March 30, No 238-p. Available online: https://zakon.rada.gov.ua/laws/show/238-2011-%D1%80#Text

On the Approval of the Concept of the National Targeted Scientific and Technical Space Program of Ukraine for 2021-2025 (2021) Order of the Cabinet of Ministers of Ukraine of January 13, No 15. Available online:https://zakon.rada.gov.ua/laws/show/15-2021-%D1%80#Text

Pylypyshyn V. (2015) Administrative aspect of public administration. *Scientific notes of the Institute of Legislation of the Verkhovna Rada of Ukraine*. No 6, 68–71.

Soroka, Larysa (2020a) Space Doctrine and Guidelines for Long-Term Sustainability of Outer Space Activities as Basis for Sustainable Earth Development. *Philosophy and Cosmology*, Volume 25, 43-56. https://doi.org/10.29202/phil-cosm/25/4

Soroka, Larysa (2020b) Bodies of public administration of space activities of Ukraine. *Comparative and Analytical Law*, No 1, 286-288.

Shestakovska, T. (2019) Strategic vectors of state policy on the use of space potential in the interests of national security. *State Administration: Improvement and Development*. Vol. 9. https://doi.org/10.32702/2307-2156-2019.9.22

Some issues of the Ministry of Strategic Industries of Ukraine (2020) Decree to the Cabinet of Ministers of Ukraine of September 7, No 819. Available online: https://zakon.rada.gov.ua/laws/show/819-2020-%D0%BF#n9

Tansu, Demir (2009) Politics and Administration: a Review of Research and Some Suggestions. *Administrative Theory & Praxis*. Vol. 31, No 4, 503-532.

Treaty on the principles of activities of states in the exploration and use of outer space, including the Moon and other celestial bodies (1967) International document of January 27. UN. Available online: https://zakon.rada.gov.ua/laws/show/995_480#Text

Legal Regime of On-orbit Interactions of Spacecraft from Different Jurisdictions

Yevgen Rokytsky

Chairman of the Supervisory Board, Science and Space LLC (Kyiv, Ukraine)
Email: tristar.ua@gmail.com
https://orcid.org/0000-0002-4832-0754

Rokytsky, Yevgen (2022) Legal Regime of On-orbit Interactions of Spacecraft from Different Jurisdictions. *Advanced Space Law*, Volume 9, 58-65. https://doi.org/10.29202/asl/9/6

The article is devoted to the analysis of the legal mechanisms of managing the orbital interactions of spacecraft that are pivotal for the development of space (orbital) systems. Scientific-theoretical research methods: abstraction, idealization, construction of hypotheses and models, documentary analysis and synthesis, objective truth, cognitive-analytical, etc. Results: the origin and contemporary genesis of constituent elements of the legal mechanisms of the management of orbital interactions of spacecraft and the problems of adapting these mechanisms to the trends of the "new space," are analyzed. The scientific aim is to contribute to the development of an adequate and integrated legal regime of the management of space systems and to improve the effectiveness of its institutional framework. Discussion: the evolution of the legal framework of international orbital interactions is analyzed on the background of the contemporary international space activities. The management of space systems needs comprehensive legal regulation and its harmonization with the respective regime of the leading space-faring nations. The inconsistency of international law with the practice of on-orbit interactions of spacecraft under the jurisdiction of different states, creates a risk of international conflict. The article formulates recommendations for improving the legal regime of orbital interactions arising from servicing spacecraft and de-orbiting them, in particular the licensing of such activities, their supervision, and the formation of institutional mechanisms for space systems management.

Keywords: on-orbit servicing, on-orbit interactions, space system, rescue mode, spacecraft, space object, launching state, space-faring state, legal regulation, International Space Station, international space law, national space law.

Received: 12 April 2022 / Accepted: 14 May 2022 / Published: 10 June 2022

Introduction

Current and future projects of the deployment, creation, and operation of complex artificial space objects and/or their groups, such as the Artemis program (NASA, 2014), are significant

in scale, and level of technological challenges. These space objects can serve the purposes of: 1) supply (e.g., solar power plants), 2) industrial manufacturing in 0-gravity, and 3) tourism (Hawking, 2001). Space objects, in particular spacecraft, and their constellations, together with the terrestrial control infrastructure and data interchange with them, form "space (orbital) systems."

The space systems take humanity to a new stage of development, but few space agencies or private companies are able to do it on their own. International cooperation of actors of different levels in the creation and management of such systems aimed at achieving not only economic benefits but also the UN Sustainable Development Goals (Sustainable, 2018), poses new challenges to the regulation of international space activities, among which we highlight:

1) risks of harm to humanity and material valuesin space and on Earth due to the density of pollution of outer space with "space debris" (fragments of launch vehicle stages, boosters and artificial satellites and rocket fuel combustion products); of which approx. 25 thousand objects larger than 10 cm are tracked, while the number of artificial objects of all sizes exceeds hundreds of millions (Search, 2022);

2) irrational financing of space missions with the predominant "one-time" use of launch vehicles and spacecraft; and

3) limited availability of slots in geostationary (GEO) and low Earth (LEO) orbits.

The effective functioning of the present and future space systems also requires the development of space activities for the inspection, maintenance, repair, modernization, refueling, and de-orbiting of spacecraft ("SC") and other space objects ("SO"), often named jointly "space assets" (Waltz, 1993). In the course of these activities, also named "on-orbit servicing" spacecraft interact, namely, meet and can be connected to each other rigidly – for repair, modernization or refueling, or flexibly – when taken out of orbit. Such on-orbit interactions between the spacecraft and other space objects include (1) life extension of the spacecraft in its original design, (2) upgrading the spacecraft (measures aimed at providing functionality to better achieve the mission's objectives) and (3) modification – making changes to the spacecraft to achieve new mission objectives (Saleh et al., 2002).

In space systems, interactions between "cooperating" (actively monitored or providing feedback) and "non-cooperating" space objects are possible. Most modern spacecraft is not designed for orbital maintenance, and do not have docking ports or access panels to the serviced subsystems. In the future, if humanity seeks to ensure the ecology of outer space, it is expected to move to the creation and use of "interoperable" spacecraft, including by adopting appropriate mandatory rules. So, let us examine the legal relations that arise in connection with the interactions between the SC and other SO, both cooperating and not.

It should be noted that the space-faring community, in particular the relevant UN body – the Committee on Peaceful Uses of Outer Space (COPUOS) – is currently improving the existing international legal framework for the interaction of space assets in orbit, including developing guidelines for regulating in-orbit services, but does not keep up with technological progress. However, significant legal issues pertaining to in-orbit interactions of spacecraft under different jurisdictions, remain unresolved, in particular: (1) coordination of orbital maintenance, inspection of spacecraft, etc., (2) distribution of liability for damage caused by interactions in orbit, including the mutual disclaimer, (3) special protection of property and non-property rights to the spacecraft. Therefore, in our article, we will analyze the current problems of legal regulation of the interaction of space objects in orbital systems and, based on it, will suggest improving this regulation.

Problems of modern legal regulation of the interaction of space objects under different jurisdictions

Gaps and inconsistencies in the legal regulation of spacecraft interactions in orbit hinder the development of space systems. The works of domestic (Halunko et al., 2021; Shemshychenko & Semenyaka, 2019) and foreign (International, 2018; Ferrazani & Farand, 2014) academicians were devoted to their research and development of ways to eliminate them.

Throughout the array of regulations governing interactions in the orbit of CAs belonging to different jurisdictions, we highlight their following levels:

1) international multilateral space treaties, in particular the Outer Space Treaty ("OST"), the Convention on International Liability for Damage to Space Objects ("CL"), Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (Agreement, 1968) and the Convention on the Registration of Outer Space Objects (Convention, 1974), which laid the foundations of the regime of the interaction of objects in space systems, however, having been signed long before the «new space» era, they no longer cover important organizational and technological aspects of space activities;

2) intergovernmental multilateral and multilateral agreements, which establish the basic principles of cooperation in space systems, mutual rights and obligations of partners, in particular, define clear parameters of responsibility of states in case of accidents in orbit and contain mandatory rules on jurisdiction and control of space assets, opportunities for access to and ownership of them, as well as intellectual property – which is important for commercial activities and the avoidance of threats to international security;

3) international technical norms, which are mostly optional, directly define technical standards for the interaction of "space assets" in orbit, for example, (1) International Standard ISO 24113 "Space Systems – Prevention of Space Debris" adopted on 10.02.2012 by the European Space Standardization Coordination (ECSS) as a standard ECSS-U-AS-10C (ECSS-U-AS-10C, 2012), which sets out requirements for minimizing the impact of space operations on the orbital environment and relates to the ESA purchase of space systems (launchers, satellites, manned or robotic spacecraft) vehicles) and/or operations of any space system under the responsibility of ESA, and therefore does not apply to space technology outside ESA programs, even in its Member States, and (2) CONFERS Guiding Principles (CONFERS, 2021);

4) national space law of states that play a key role in space activities, primarily the USA (US Commercial, 2015), which is often applied extraterritorially;

5) private-law agreements between the participants of international cooperation on cooperation in space systems, regulating the rights and obligations of participants, their use of assets in orbit, the distribution of financial costs, and liability for damage; the provisions of which should not contradict the norms of multilateral international space treaties, although the latter were adopted at a time when private space activities were not carried out.

Based on the analysis of the above-mentioned legal acts, it can be stated that the current state of legal regulation of the on-orbit interaction of space objects in space systems needs to be modernized. Thus, according to Article VIII of the CL, the state in the register of which is an object launched into outer space, retains jurisdiction and control over such an object... as long as it is in outer space or on a celestial body (Treaty, 1967). This requires the consent of the state registering the space object for operations with it, including "rescue" (refueling, repair, etc.) or removal, as it controls it almost always, despite the possible private ownership over

the object. To resolve collisions related to the on-orbit interactions of spacecraft in cases where one of them can cause irreparable damage to other spacecraft, aircraft or objects on Earth, we think it is justified to construct the current non-existent spacecraft rescue mode similar to the rescue mode according to United Nations Convention on the Law of the Sea (1982).

The issue of the state's liability for damage caused with a spacecraft during on-orbit servicing of a spacecraft registered in another state and for damage caused on the Earth with a space object being actively de-orbited has not been fully resolved. Articles II, III, and V of the CL state that (a) launching States shall be absolutely liable for any damage caused to the Earth's surface, aircraft, or space object of another State; (b) in the case of "damage, caused (…) to a space object of one state (…) by a space object of another, as well as to the infliction of damage to a third state (…) the first two states will be jointly liable," only if the damage was caused through fault, (c) the state of the spacecraft being launched from orbit may not be liable for damage outside the Earth's surface (Convention, 1972). With the independent de-orbting of the spacecraft, such responsibility seems justified; however, it is questionable if pursued with a "foreign" spacecraft, especially on the basis of a contract, with the consent of the owner of the de-orbited spacecraft.

In view of the above, we consider it possible and appropriate to settle such liability through a separate international or private law agreement, subject to the adjustment of the norm of the CL. This will manage the de-orbitation sponsoring state risks of financial liability to third parties. After all, if the damage is caused in outer space, it is necessary to prove guilt under Art. III of the CL, which stipulates that one launching state is liable for damage caused to a space object, property, persons of another launching state only if the damage was caused through fault.

There is also a lack of protection of intellectual property rights and military secrets. The OST does not prohibit spacecraft owners from remotely inspecting other spacecraft and creating their images, including 3-dimensional models; therefore, with the consent of the owner of the spacecraft, an open "inspection" is possible, and without the consent – hidden. One of the first such inspections was carried out in 2005 by the US Air Force microsatellite XSS-11 (David, 2005). The lack of legal regulation of the inspection of space objects under the jurisdiction of different states creates a risk of international conflicts, including military ones, and the transfer of global confrontation between states in outer space.

Issues of protection of property and non-property rights in space objects under different jurisdictions and their interaction may be resolved with the adoption of an international treaty and the establishment, for example, at the UN level, of an authoritative international institutional mechanism authorized to regulate and supervise relevant activities. However, the inability to adopt new binding international agreements governing space activities in recent decades, differences of political opinion and the need for consensual decision-making in COPUOS, as well as the growing number of its members, make it difficult to overcome the legal problems of modern space missions.

Whereas the establishment of international legal and institutional mechanisms is likely to be complex and lengthy, and given the effective actions of the US FAA in regulating commercial space activities (Rathz, 2015), we consider it appropriate to establish appropriate, effective regulation and institutional arrangements at the level of States and/or their unions. In this context, we also consider it appropriate to use the "bottom-up" approach when agreements between private partners for the implementation of international orbital missions encourage states to implement rules into national law and update international law. This rule-making is

outside the scope of public law and does not depend on it, and it is created and managed by private individuals. It follows the growth of international innovation. It is not hampered by the absence or ineffectiveness of special rules in international or national law.

Analysis of the legal regulation of interaction on the International Space Station

Players of the "new space" widely use the "bottom-up" approach, providing arbitration mechanisms for resolving disputes over cooperation in orbital systems with the interaction of spacecraft in orbit, and the application of arbitral tribunals not only international customary law but also national (Graham & Kingston, 2015).

To improve the legal regulation of orbital services, it seems possible to use the method of analogy with the legal regime of the International Space Station (ISS), which is a complex space object created from modules in orbit (rather than launched directly from the Earth's surface). This regime is determined by a set of international agreements governing the ownership of ISS elements and the jurisdiction of partner countries during the flight, the main of which is the Intergovernmental Agreement on Cooperation in the International Space Station (Agreement, 1998).

The legal mechanism of cooperation on the ISS is based on the principle of hierarchy necessary to ensure the implementation of the basic obligations of Partner States, enshrined in both the IAC and the extensive system of supporting documents adopted at both bilateral (memoranda of understanding) and multilateral levels. agreements on the implementation of agreements) (Aslanova, 2012). Despite the unified technical regime of the ISS, as a set of docked space objects, and the homogeneity of the legal regime of its segments, partner countries register their orbital elements separately and extend their jurisdiction over them (territorial principle). States have the right to dispose of the rights of ownership and use of ISS elements in the form of their transfer, sale, or exchange. The IGA equates orbital elements to the territory of the state for the purposes of applying national intellectual property law, extending such a right to the orbital elements of the ISS, which is recognized as a common view in the doctrine that the application of such a right to space activities requires a direct reference to it in national or international law.

According to the CL, the issues of contractual and tortious liability for damage should be resolved depending on the following conditions: 1) if the damage is caused by partners to each other or their individuals and legal entities in connection with "protected" space operations, cross-waiver of liability against each other; 2) in all other cases, when the damage is caused to third states or their persons, the norms of the CL apply, i.e., each of the states will be independently responsible for the damage caused by the SO registered therein (Losekamm et al., 2015).

The IAC, as a legal instrument tested in the creation and operation of the ISS, can be considered a successful model of international regulation of activities in complex space systems. Unlike the universally binding treaty, which must be agreed and ratified by all leading space member states of COPUOS, special multilateral agreements apply only to member states of specific programs or missions and contain their specially agreed parameters (administrative, program, etc.).

Conclusions

Based on the above, we propose to optimize the legal regime of interactions in space systems of objects under different jurisdictions as follows:

1) Improve national regulation of the in-orbit servicing and removal of space debris, as well as its oversight by national or supranational bodies of leading space powers, to ensure management of liability for damage to space systems;

2) Taking into account the multilateral nature of cooperation in space systems when spacecraft built in one state are launched by another and serviced by a third one, provide for redistribution of liability for space damage to the serviced facility or other assets by: (a) contractual disclaimer (similar to the ISS regime) within the orbital ecosystem; (b) joint and several liability for damage caused by partners to third countries in orbital interactions; and (c) replacing modifying the concept of "launching State" in the CL to extend it to in-orbit interactions;

3) Establish a balance between compromising space missions with interactions of spacecraft (e.g., spacecraft inspections) and maintaining the possibility of conducting space activities not prohibited by international law in the interests of national security;

4) Increase the investment attractiveness of space systems by creating effective international and national financial and legal mechanisms to stimulate demand for in-orbit services, in particular: active missions to "manage" space debris (prevention of its formation and decommissioning of existing ones), and give imperative force to restrictions on the formation of space debris and encourage its removal;

5) Establish institutional mechanisms to ensure the fulfillment of obligations by participants in space systems, based on the principle of general (consensus, similar to the ISS) or qualified consent in decision-making, which will form a balance of interests of stakeholders, depending on the role in the project and/or the magnitude of the financial and technical contribution to it (partner parity or subordination in the relationship), and the mode of interaction of space objects may differ from the one established by IGA.

6) Finally, it should be noted that international political factors can have a more radical impact on the projects of the "new space" than their legal regulation. Thus, as a result of the beginning of the Russian war against Ukraine in February 2022, most international space projects with the participation of the former were sharply slowed down or stopped (Kot, 2022). From 2023, the US Department of Defense is prohibited from purchasing services from satellites launched by Russian missiles or missiles with Russian components. At the same time, Ukrainian participants in orbital systems development projects gain a chance to propose the replacement of Russian space technology, such as RD-180 rocket engines, Frigate-M and Brig accelerators.

🕮 References

Agreement among the Government of Canada, Governments of Member States of the European Space Agency, the Government of Japan, the Government of the Russian Federation, and the Government of the United States of America Concerning Cooperation on the Civil International Space Station (1998) Available online: https://www.state.gov/wp-content/uploads/2019/02/12927-Multilateral-Space-Space-Station-1.29.1998.pdf

Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (1968). Available online: https://zakon.rada.gov.ua/laws/show/995_483#Text

Aslanova, D. Z. (2012) Legal status of ISS. *Contemporary problems of aviation and cosmonautics*, 328-329.

CONFERS Guiding Principles (2021) *CONFERS*. Available online: https://www.satelliteconfers.org/wp-content/uploads/2021/11/CONFERS-Guiding-Principles_Revised-Oct-21.pdf

Convention on International Liability for Damage Caused by Space Objects (1972) UN Office for Outer Space Affairs 961 U.N.T.S. 187. Available online: https://www.unoosa.org/pdf/gares/ARES_26_2777E.pdf

Convention on Registation of Objects Launched into Outer Space (1974) UN. Available online: https://www.un.org/ru/documents/decl_conv/conventions/objects_registration.shtml

David, Leonard (2005) Military Micro-Sat Explores Space Inspection, Servicing Technologies. *Space.com.* Available online: https://www.space.com/1336-military-micro-sat-explores-space-inspection-servicing-technologies.html

ECSS-U-AS-10C – Adoption Notice of ISO 24113: Space systems – Space debris mitigation requirements (2012) *European Cooperation for Space Standardization*. Available online: https://ecss.nl/standard/ecss-u-as-10c-adoption-notice-of-iso-24113-space-systems-space-debris-mitigation-requirements/

Ferrazzani, Marco, and André Farand (2014) A European Perspective on Lessons Learned from the Intergovernmental Agreement (IGA) on International Space Station (ISS) Cooperation. *International Institute of Space Law*. Issue 3, 293-307. Available online: https://www.elevenjournals.com/tijdschrift/iisl/2014/3%20The%20ISS%20IGA:%20Lessons%20Learned%20and%20Looking%20to%20the%20Future/IISL_2014_057_003_001.pdf

Graham, Andrew Robert, and Jennifer Kingston (2015) Assessment of the commercial viability of selected options for on-orbit servicing. *Acta Astronautica*. Vol. 117, 38–48. Available online: https://doi.org/10.1016/j.actaastro.2015.07.023

International Space Law (2018) Edited by Frans G. von der Dunk, Harvey and Susan Perlman Alumni. Edward Elgar.

Halunko, Valentyn, Oleksii Padun, and Yevgen Rokytsky (2021) Space Islands in Orbit Around the Sun. *Future Human Image*, Volume 15, 24-38. Available online: https://doi.org/10.29202/fhi/15/3

Hawking, Stephen (2001) *The Universe in a Nutshell.* Bantam Spectra. Available online: https://www.goodreads.com/book/show/2095.The_Universe_in_a_Nutshell

Losekamm, Martin J., Jacob Hacker, Nikita Sardesai, and Anja Nakarada Pecujlic (2015) Legal and Political Implications of Future On-Orbit Servicing Missions. *Conference: 66th International Astronautical CongressAt: Jerusalem, Israel*. Available online: https://doi.org/10.13140/RG.2.1.1850.3127

NASA Artemis Program (2014) *NASA*. Available online: https://www.nasa.gov/artemisprogram

Rathz, James (2015) Law Provides New Regulatory Framework for Space Commerce. *Theregreview*. Available online: https://www.theregreview.org/2015/12/31/rathz-space-commerce-regulation/

Saleh, Joseph H., Elisabeth Lamassoure and Daniel E. Hastings (2002) Space Systems Flexibility Provided by On-Orbit Servicing. *Journal of Spacecraft and Rockets*. Vol. 39, Number 4, 551-560. Available online: https://doi.org/10.2514/2.3844

Search Satellite Database (2022) *N2YO.com*. Available online: https://www.n2yo.com/database

Shemshuchenko, Yuri, and Vasyl Semenyaka (2019) Current status and necessity of reforming space legislation of Ukraine. *Chasopys Kyivskoho universytetu prava*, 2, 9-16. Available online: https://doi.org/10.36695/2219-5521.2.2019.01 [in Ukrainian]

Sustainable Development Goals (2018) UN. Available online: https://sdgs.un.org/goals

Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (1967) *UNOOSA*. Available online: https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introouterspacetreaty.html

US Commercial Space Launch Competitiveness Act (2015) Congress the United States of America. Available online: https://www.congress.gov/114/plaws/publ90/PLAW-114publ90.pdf

Waltz, Elgar D. M. (1993) *On-Orbit Servicing of Space Systems*. Krieger, 1st ed.

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

Maksym Sokiran

Ph.D. in Law, lawyer (Kyiv, Ukraine)
E-mail: maxim.sokiran@gmail.com
https://orcid.org/0000-0002-1682-2012

Oksana Zubko

Ph.D. in Law, Senior Researcher, Scientific and Research Institute of Public Law (Kyiv, Ukraine)
E-mail: oksanazubko2018@gmail.com
https://orcid.org/0000-0003-4682-6468

Diana Levchenko

Ph.D. in Law, researcher, Information Analysis Center for Aerospace Law (Kyiv, Ukraine)
E-mail: diana.levchenko5@gmail.com
https://orcid.org/0000-0001-8343-2260

Sokiran, Maksym, Oksana Zubko, and Diana Levchenko (2022) Space Information and Technologies in the Military Activity of Ukraine: Legal Aspect. *Advanced Space Law*, Volume 9, 66-80. https://doi.org/10.29202/asl/9/7

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.

Received: 1 March 2022 / Accepted: 27 April 2022 / Published: 10 June 2022

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.

🕮 References

About information (1992) Law of Ukraine of October 2, No 2657-XII. Available online: https://zakon.rada.gov.ua/laws/show/2657-12#Text

About the Concept of the National target scientific and technical space program of Ukraine for 2021-2025 (2021) Order of the Cabinet of Ministers of Ukraine of January 13, No 15-r. Available online: https://zakon.rada.gov.ua/laws/show/15-2021-%D1%80#Text

About Space Activities (1996) Law of Ukraine of November 15, No 502/96-VR (as amended). Available online: https://zakon.rada.gov.ua/laws/show/502/96-%D0%B2%D1%80#Text

About the List of positions replaced by servicemen of the Armed Forces of Ukraine, other military formations, law enforcement agencies of special purpose in state bodies, enterprises, institutions, organizations, as well as state and municipal educational institutions, and border military ranks in these positions (2017) Decree of the President of Ukraine of May 3, No 126/2017. Available online: https://zakon.rada.gov.ua/laws/show/126/2017#Text

About the statement of the passport of the budgetary program for 2017 (2017) Order of the State Space Agency of Ukraine and the Ministry of Finance of Ukraine of February 16, No 24/227. Available online: https://ips.ligazakon.net/document/REG7368

About the National Cyber Security Coordination Center (2016) Decree of the President of Ukraine of June 7, No 242. Available online: https://zakon.rada.gov.ua/laws/show/242/2016#Text

About the State Service for Special Communications and Information Protection of Ukraine (2006) Law of Ukraine of February 23, No 3475-IV. Available online: https://zakon.rada.gov.ua/laws/show/3475-15#Text

About the State Special Communications (2022) Official site. Available online: https://cip.gov.ua/ua/statics/pro-derszhpeczv-yazku

Ashby, U. R. (1959) *Introduction to cybernetics*. Peace.

Chuparis. V. (2002) The use of the US space group during the operation in Afghanistan. *Foreign Military Review*, No 8, 30–31.

Computer science is what it is, why it is needed and what it studies (2022) *Termin.in.ua*. Available online: https://termin.in.ua/informatyka/ [in Ukrainian]

Cybersecurity strategy of Ukraine (2016) Decree of the President of Ukraine of March 15, No 96/2016. Available online: https://zakon.rada.gov.ua/laws/show/96/2016#n11 [in Ukrainian]

Garrett, Allison D. (2018) The Corporation as Sovereign. *Maine Law Review*. Available online: https://core.ac.uk/download/pdf/234110848.pdf

Hartley, R.V. (1959) Information transfer. Information theory and its applications. *Foreign Literature Publishing House.*

Information (2022) Online Etymology Dictionary. Available online: https://www.etymonline.com/word/information

ISAF's mission in Afghanistan (2001-2014) (2022) NATO. Available online: https://www.nato.int/cps/en/natolive/topics_69366.htm

Kaziev, Valeriy (2006) Introduction to systems analysis and modeling. Internet un-y inform. *Technologies*. Available online: http://bigc.ru/theory/books/kvisam/glava3.php

Messerotti, Mauro (2014) Space Domain Support to NATO Operations. "The Multi-functional Nature of the Aerospace Domain: a European Approach" Istituto Scienze Militari Aeronautiche 23 October 2014, Florence, Italy. Available online: http://www.meteoam.it/sites/default/files/documents/Messerotti.pdf

Mizyuk, B. M. (2012) Information nature of management. *Economy and State*, No 2, 8-13. Available online: http://www.economy.in.ua/pdf/2_2012/4.pdf [in Ukrainian]

Moon, Madeleine (2017) The space domain and allied defence nato parliamentary assembly. *Defence and security committee*. Available online: https://www.nato-pa.int/download-file?filename=/sites/default/files/2017-11/2017%20-%20162%20DSCFC%2017%20E%20rev%201%20fin%20-%20SPACE%20-%20MOON%20REPORT.pdf

NATO Standard AJP-3.3 (2016) Allied joint doctrine for air and space operations. Edition B Version 1. NATO Standardization Office (NSO). Available online: https://www.coemed.org/files/stanags/01_AJP/AJP-3.3_EDB_V1_E_3700.pdf

NATO Space Handbook (2013) NATO. Available online: https://www.japcc.org/wp-content/uploads/20131220-NU-BI-SCSpace-Handbook-2013.pdf

NATO Space Capability Preservation – A Day without Space (AC/323(SCI-238)TP/544) (2014) NATO. Available online. https://www.sto.nato.int/publications/_layouts/mobile/dispform.aspx?List=62dc4d2b%2Dc8d4%2D4866%2Db79d%2Da0fa26e-3c8de&View=fab2bc2d%2D044d%2D4b81%2D9016%2D063075c62b9e&ID=21

National Space Management and Testing Center (2021) Official Website. Available online: http://www.spacecenter.gov.ua

Negoda, O.O., Tolubko, V. B., and Mosov, S. P. (2005) Foreign systems for remote sensing of the Earth from space for dual use. History of creation, principles of action, application and prospects of development. NAOU.

Neumann, U. (1968) *Introductory course in probability theory and mathematical statistics*. Science.

On Amendments to the Regulations on the Ministry of Defense of Ukraine (2016) Resolution of the Cabinet of Ministers of Ukraine of October 19, No 730. Available online: https://zakon.rada.gov.ua/laws/show/730-2016-%D0%BF#Text

On Approval of the Regulations on the State Space Agency of Ukraine (2015) Resolution of the Cabinet of Ministers of Ukraine of May 14, No 281. Available online: https://zakon.rada.gov.ua/laws/show/281-2015-%D0%BF#Text

On the decision of the National Security and Defense Council of Ukraine of December 29, 2016 "On the Doctrine of Information Security of Ukraine" (2017) Decree of the President of Ukraine of February 25, No 47/2017. Available online: https://zakon.rada.gov.ua/laws/show/47/2017

On the basic principles of cybersecurity in Ukraine (2017) Law of Ukraine of July 08, No 2163-VIII. Available online: https://zakon.rada.gov.ua/laws/show/2163-19/conv

On the temporary procedure for cooperation between the Ministry of Defense and the National Space Agency during space activities (1997) Resolution of the Cabinet of Ministers of Ukraine of July 15, No 788. Available online: https://zakon.rada.gov.ua/laws/show/788-97-%D0%BF#Text

On the National Space Management and Testing Center (1996) Decree of the President of Ukraine of August 12, No 698/96. Available online: http://zakon.rada.gov.ua

On approval of the Regulations on institutions (2016) Order of the State Space Agency of Ukraine of October 27, No 197. Available online: http://spacecenter.gov.ua.

On the decision of the National Security and Defense Council of Ukraine of January 25, 2015 "On the establishment and operation of the Main Situation Center of Ukraine (2015) Decree of the President of Ukraine of February 28, No 115/2015. Available online: https://www.president.gov.ua/documents/1152015-18567

On the decision of the National Security and Defense Council of Ukraine of March 25, 2021 "On the Strategy of Military Security of Ukraine" (2021) Decree of the President Of Ukraine of March 25, No 121 / 2021 Available online: https://www.president.gov.ua/documents/1212021-37661

Pope, Charles (2021) 30 years later, Desert Storm remains a powerful influence on Air, Space Forces. Air Force. Available online: https://www.af.mil/News/Article-Display/Article/2512938/30-years-later-desert-storm-remains-a-powerful-influence-on-air-space-forces/

Prav, U. (2018) Activity of Subjects of Formation and Implementation Politics. *Electronic magazine "Public Administration: Improvement and Development,"* No 9. Available online: http://www.dy.nayka.com.ua/pdf/9_2018/103.pdf

Regulations on the Board of the State Space Agency of Ukraine (2016) Order of the State Space Agency of Ukraine of September 30, No 187. Available online: https://www.kmu.gov.ua

Regulations on the Scientific and Technical Council of the State Space Agency of Ukraine (2016) Order of the State Space Agency of Ukraine of September 30, No 187. Available online: https://www.kmu.gov.ua

Rules for exchanging information about cyber incidents (2021) Computer Emergency Response Team of Ukraine. Available online: https://cert.gov.ua/recommendation/16894

Russian cyber operations against Ukraine: Declaration by the High Representative on behalf of the European Union (2022) Council of the EU and the European Council. Available online: https://www.consilium.europa.eu/en/press/press-releases/2022/05/10/russian-cyber-operations-against-ukraine-declaration-by-the-high-representative-on-behalf-of-the-european-union/

Sari, Aurel and Hitoshi Nasu (2021) NATO and Collective Defense in Space: Same Mission, New Domain. *Exeter Centre for International Law*. Available online: https://socialsciences.exeter.ac.uk/media/universityofexeter/collegeofsocialsciencesandinternationalstudies/lawimages/research/Sari_and_Nasu_-_NATO_and_Collective_Defence_in_Space_-_ECIL_WP_2021-2.pdf

Scientific and Scientific-Technical in the Armed Forces Activities of Ukraine 2020 (2020). Available online: https://www.mil.gov.ua/content/pdf/sience_note.pdf

Shannon, K.E. (1963) *Works on information theory and cybernetics*. Foreign Literature Publishing House.

Situational center for cybersecurity (2022) Official site of the Security Service of Ukraine. Available online: https://ssu.gov.ua/sytuatsiinyi-tsentr-zabezpechennia-kiberbezpeky

Standardization Agreement STANAG 3700 Allied joint doctrine for air and space operations. EDITION 8, 8 April 2016. NSO (JOINT) 0487 (2016) AO/3700. Published by NATO Standardization Office (NSO). Available online: https://standards.globalspec.com/std/10006247/STANAG%203700

Thong, Shan, and Hou Pingmei (2006) Review of space information technology. *Journal of Systems Engineering and Electronics*, Vol. 17, No. 2, 237-244. Available online: https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=6071330

Tombarge, Paul A. (2014) NATO Space Operations. *George C. Marshall European Center for Security Studies*. Available online: https://www.marshallcenter.org/en/publications/occasional-papers/nato-space-operations-0#toc-the-importance-of-space-capabilities-to-nato

Unal, Beyza (2019) Cybersecurity of NATO's Space-based Strategic Assets. International Security Department. Available online: https://www.chathamhouse.org/sites/default/files/2019-06-27-Space-Cybersecurity-2.pdf

Van Hoof, Jan A. H. (2010) Coalition Space Operations – A NATO Perspective. *High Frontier*, Volume 6, No 2, 7-12. Available online: https://www.afspc.af.mil/Portals/3/documents/HF/AFD-100226-085.pdf

Vyporkhaniuk, Dmitry and Sergey Kovbasiuk (2018) *Basics of Space Situational Awareness. Foreign and domestic experience of space activities in the security sector*. O.O. Evenok. Available online: http://space.znau.edu.ua/images/book/monoghrafija2018.pdf

Ensuring the National Security of Ukraine Through the Standardization of Space Activities

Larysa Soroka

Doctor of Law, Professor, Scientific Institute of Public Law (Kyiv, Ukraine)
E-mail: lsoroka_kw@ukr.net
https://orcid.org/0000-0002-6979-6049

Oleksandr Ovcharenko

Graduate student of the Scientific Institute of Public Law (Kyiv, Ukraine)
E-mail: turnthesun1@gmail.com
https://orcid.org/0000-0002-8197-8021

Soroka, Larysa, and Oleksandr Ovcharenko (2022) Ensuring the National Security of Ukraine Through the Standardization of Space Activities. *Advanced Space Law*, Volume 9, 81-92. https://doi.org/10.29202/asl/9/8

The article analyzes international, including European, and national standards of the process of standardization of space activities. The author reveals the concept of "standard" as one of the main elements of the system of state guarantees of the safety of space activities. Using the method of empirical research, the current state of standardization of space activities in Ukraine was fully and objectively investigated. The comparativist method was used for a comparative analysis of the administrative and legal regulation of space activities in foreign countries and its compliance with international and European standards and principles, which allowed: first, to reveal the level of understanding by the international community of the importance of its processing and legal regulatory settlement; secondly, to form specific methods and initiatives to improve the administrative and legal provision of space activities and the development of the space industry in Ukraine. The article determines that the international aspect of standardization is quite relevant. The activity of standardization entities and the presence of a significant number of standards are proof of that. However, the main problem is their voluntariness. Obligation as a feature of these standards is present only in the case of their national settlement. This indicates the need to revise the paradigm of regulating international relations with the transition to the concept of global space management based on mandatory standards for all participants in space relations. The departure from the contractual paradigm with the further development of global space management will ensure the unity of the standard rules for the implementation of space activities, their obligatory status and the mechanisms of sanctioning influence for violations of the established modes of development and usage of outer space.

Keywords: standards, standardization, space activity, legal regulation, global administration, national security, state guarantees.

Received: 27 February 2022 / Accepted: 18 March 2022 / Published: 10 June 2022

Introduction

At the beginning of its existence, international space legal relations were built on the basis of publicity. At that time, this meant that only the state was responsible for carrying out space activities. However, the scientific development of the private sector far outpaced the space innovations of state institutions, so the change in the nature of space legal relations from state to mixed (public-private) was inevitable and depended only on time. A clear example of such cooperation is the program of NASA Centennial Challenges (NASA's, 2022), which provides $200 000 – $2 000 000 USD to support innovation in areas of interest for the agency, including the support of representatives of the private sector.

Ukraine has a difficult situation of ensuring the development of space activities and its compliance with international standards. Permanent underfunding of space programs (according to the report of the State Space Agency of Ukraine in 2020, UAH 95 000 thousand was planned, and in fact, 70% (Public, 2021) was financed, and in the structure of the market for the sale of products of the industry, the state direct order was 2.1%), providing permission to work in the space industry for private companies only from 2020 (On amendments, 2019) – restrained and restrains the development of space activities. Therefore, it is the state guarantees that should become a "stabilizer" and a guarantee for the development of the space industry on the national and international levels.

Today, space practice shows that effective market mechanisms and self-regulation tools in the implementation of national space activities (for example, certification, verification of compliance with operational suitability requirements, and technical regulations) ensure the safety of space products for an unlimited number of people (Shemshuchenko & Semeniaka, 2019). In this way, the state guarantees safety in processing of space activities.

At the legislative level in Ukraine, it is determined that the purpose of state support for space activities is: the preservation and further development of the scientific, technical, technological and productional potential of the space industry as one of the factors of national security; increasing the export potential of the space industry and the competitiveness of developments (products) of national subjects of space activity; creation of economic conditions and provision of guarantees for attracting investments (including foreign ones) in the development of the space industry (On state, 2000).

As a result, it is quite simple to determine the relevance of the consideration of the problem of the implementation of the standardization of space activities: unambiguity, uniformity and totality of the rules for the procession of space activities, which are practical for use by both private and public participants of space activities – one of the keys to ensuring the global security of mankind. Having revealed the concept of standards and standardization as one of the main elements of the system of state guarantees of the safety of space activities, having researched the current state of standardization of space activities in Ukraine and having analyzed its compliance with international and European standards and principles, we will be able to: first, reveal the level of understanding by the international community of the importance of

the process its implementation; secondly, to form specific methods and initiatives to improve the administrative and legal provision of space activities and the development of the space industry in Ukraine.

The essence of state guarantees of space activity

In legal literature, there is no single approach to understanding the term "guarantee." Hence, due to the ambiguity of the interpretation of the mentioned term, there are disagreements in its understanding at the scientific and doctrinal levels. Thus, in the legal literature, there are various signs that form the basis of the concept of guarantees. Scientists define the guarantee as "conditions," "means," "factors," "measures," "state obligations," "mechanism," etc. Guarantee is a very extensive socio-political and legal phenomenon, which is used in many fields of legal, sociological, philosophical, political science, economics, and other sciences (Kulinich, 2014: 79-80). The explanatory dictionary of the Ukrainian language defines the concept of "guarantee" as a surety in something, provision of something; conditions that ensure the success of something (Bilodid, 1971: 29). The basis of the most common definitions of the general concept of guarantees is the methodological understanding that guarantees are certain means of ensuring the actual possibility to enjoy rights and freedoms. So, with the help of guarantees, the state creates all the conditions for a person to enjoy his rights and freedoms (Soroka, 2020).

Therefore, guarantees are the proper conditions supported by legal norms to ensure certain social relations.

The current legislation of Ukraine actively uses the term "guarantee." In general, its interpretation is reduced to the provisioning process of something, which contains two integral components: implementation and protection. Therefore, today it is urgent to develop such theoretical legal means and conditions, which in practice would be maximally implemented and protected (Kulinich, 2014: 79-80).

Despite the different approaches to the understanding of the term "guarantee," it should be noted that they all have certain similar features, including 1) methods and means considered as a whole; 2) their legislative implementation; 3) they are aimed at achieving one or another goal. To guarantee means to take responsibility for something; to give a promise, a surety in the performance of something (Terekhin, 2001: 43). Each of these conditions and means is directly defined in the Constitution when it comes to guarantees. They are traditionally enshrined in the Basic Law in the form of generalized principles, such as: humanism, justice, legality, expediency, equality, etc. (Constitution, 1996; Yehorova, 2012).

Accordingly, we can determine that the most common definition of the term "guarantees" is the understanding of it as specific means that provides an opportunity to implement a certain action. At the same time, it is more about the fact that the state guarantees that all conditions are created so that people can enjoy their rights and freedoms and authorities can exercise their powers.

Here it is necessary to clarify that, according to our vision, in the space industry, the category of "guarantees" has a slightly different meaning, different from legal guarantees, since by their nature guarantees in the researched field are actually standard rules for the implementation of space activities.

Taking into account the peculiarities of standard legal guarantees and the norms of the current legislation in the space industry, it can be determined that the state guarantees of space

activity should be understood as the rules for the implementation of space activities, which are formed by regulatory and legal acts into a coherent, interdependent system that establishes the procedure for determining the object's compliance of space activity to operational criteria (certification, registration, standardization), features of legalization of subjects of space activity and requirements for such economic activity (licensing, permit system), provision of safety measures (environmental protection in the process of space activity; conducting search, emergency and rescue works in the space industry; official investigation of incidents and extraordinary events, etc.) and other rules for ensuring effective and progressive space activities (control and supervision activities, insurance, etc.).

As a result of the reform of the space industry of Ukraine, the system of state guarantees for the provision of space activities has changed somewhat. The modern principles of space activity, determined by the legislation of Ukraine, seem to be an interconnected area with a system of state guarantees for space activity, which are comprehensively created for the development of the space industry. But the compliance of space activities in Ukraine with international standards is still imperfect. As an example, the standardization of private space activities is currently poorly regulated.

In general, all processes of the development and functioning of space activities in Ukraine (commercialization, investment, reform, scientific and technical development, international cooperation) can be effectively implemented only through state guarantees for the provision of space activities, which must comply with international standards and principles. With the understanding that there have been radical changes in the procedure for carrying out space activities in Ukraine as a result of the adoption of the Law of Ukraine "On Amendments to Certain Laws of Ukraine Regarding State Regulation of Space Activities" dated October 2, 2019 № 143-IX (On amendments, 2019), state guarantees for the development of space activities require a comprehensive study, including the standardization of space activities as a leading condition for the state's guarantee of proper security of such activities.

Standardization and standards of space activity in Ukraine

The process of standardization of space activity as a form of state guarantee of its safety must necessarily meet both established national and international standards.

Back in 1975, David Hemenway, in his work *Industry Wide Voluntary Product Standards*, pointed out that "ironically, standards have not been completely standardized" (Hemenway, 1975). Therefore, the legal definition of any terms and processes is of great importance for jurisprudence and application practice.

The Law of Ukraine dated June 5, 2014 No. 1315-VII "On Standardization" gives the following definition of standardization – it is an activity that consists of establishing provisions for general and repeated use in relation to existing or potential tasks and is aimed at achieving the optimal degree of order in a certain area. Accordingly, a standard is a normative document based on consensus, adopted by a recognized body, establishing for general and repeated use rules, guidelines, or characteristics of activities or their results, and aimed at achieving an optimal degree of order in a certain area (On standardization, 2014).

A similar definition of the term "standardization" is also used in the national legislation of individual countries. For example, in the US Law "National Technology Transfer and Advancement Act of 1995" (National, 1996) determined that this is: "Common and repeated use of rules, conditions, guidelines or characteristics for products or related processes and production methods, and related management systems practices" (Circular, 1998).

Therefore, standardization is necessary and mandatory, although in most cases voluntary, activity in the space sphere, and the standard is a legal basis for such activity.

National standards, codes of established practice and amendments thereto, in accordance with the "Agreement on Technical Barriers to Trade" dated 15.04.1994 (Agreement, 1994), are developed in a manner that does not create technical barriers for trading and allows them to occur and appear.

Depending on the level of the subject of standardization, standards are divided into national standards and codes of established practice adopted by the national standardization body; standards, codes of established practice and technical conditions adopted by enterprises, institutions and organizations carrying out standardization. They are developed on the basis of: 1) international standards, codes of established practice and amendments thereto, if they have already been adopted or are at the final stage of development or their corresponding parts, except in cases where such standards, codes and amendments are ineffective or inappropriate, in particular with due to insufficient level of protection, significant climatic or geographical factors or technological problems; 2) regional standards, codes of established practice and amendments to them or their corresponding parts in the event that international standards, codes of established practice and amendments to them cannot be used for the reasons specified in paragraph one of this part; 3) standards, codes of established practice and amendments to them or their corresponding parts of states that are members of relevant international or regional standardization organizations and with which relevant international agreements of Ukraine on cooperation and carrying out work in the field of standardization have been concluded; 4) scientific achievements, knowledge and practice (On standardization, 2014).

The bodies of the public administration of Ukraine that adopt normative legal acts in the field of standardization are 1) the central body of executive power, which ensures the formation of state policy in the field of standardization; 2) the central body of the executive power, which implements the state policy in the field of standardization; 3) national standardization body; 4) technical standardization committees; 5) enterprises, institutions, and organizations carrying out standardization (On standardization, 2014).

So, depending on the level of the public administration body that adopts regulatory documents in the field of standardization, they are divided into 1) national standards and codes of established practice; 2) local standards, codes of established practice and technical conditions.

It should be noted that in accordance with the Order of the Cabinet of Ukraine "On the definition of a state enterprise that performs the functions of a national standardization body" dated November 26, 2014, No. 1163 (On the definition, 2014), the state enterprise "Ukrainian Research and Training Center for Standardization, Certification and Quality" performs the functions of the national standardization body. On its official website, free of charge (http://uas.gov.ua/), it posts the texts of national standards and codes of established practice no later than 30 calendar days after the official publication of such acts.

National standards and codes of established practice are applied: 1) directly or by reference to them in other documents; 2) on a voluntary basis, except in cases where their application is mandatory established by regulatory and legal acts.

Therefore, the standardization of space activity is the process of formation and establishment by authorized subjects of the rules for the processing of space activities and the operation of space objects in the form of requirements and criteria for multiple uses (of standards) with the aim of streamlining legal relations in this area (in particular, demonopolization of the space

industry and observance of equal trade rules), as well as guaranteeing high-quality and safe space activities.

It should be noted that as of January 1, 2022, the base of national state standards of Ukraine of the State Enterprise "UkrNDNC" included more than 36,000 DSTU (state standards of Ukraine). The search process in the DSTU database (National, 2022) allows obtaining the following results regarding state standards in the field of space activities: DSTU 2795-94 "Spacecraft control systems. On-board cable network. General technical requirements"; DSTU 4415:2006 "Aerospace industry. Non-metallic materials. Textile materials – narrow woven fabrics. Specifications"; DSTU ISO 14620-1:2002 "Space systems. Security requirements. Part 1. System security"; DSTU 4179:2017 "Aerospace series. Qualification and certification of personnel for non-destructive testing"; DSTU 9100:2018 "Quality management systems. Requirements for organizations of the aviation, space and defense industries"; DSTU "1540:2006 Aerospace systems. Characteristics of airborne electrical systems"; DSTU 9300-004:2018 "Aerospace industry. LOTAR. Long-term archiving and retrieval of digital technical documents"; DSTU 10168:2018 "Steel products. Acceptance documents. List of information and description"; DSTU ISO 14222: 2019 "Space environment (natural and artificial). The upper layers of the Earth's atmosphere"; DSTU 4220-2003 "Remote sensing of the Earth from space. Terms and definitions of concepts"; DSTU 4758:2007 "Remote sensing of the Earth from space. Data processing. Terms and definitions of concepts"; DSTU 7307:2013 "Remote sensing of the Earth from space. Terrestrial data on the control of the state of crops and the productivity of agricultural crops. General requirements"; DSTU 7894:2015 "Remote sensing of the Earth from space. Methodology of data processing. The order of development."

Searching the DSTU database for the word "satellite" allows you to get the best result – 36 DSTU. Regarding satellite radio navigation systems, for example, DSTU 2599-94 "Satellite radio navigation network systems. Terms and definitions"; regarding satellite telecommunication systems, for example, DSTU 3560:2007 (IEC 60050-725:1988) "Satellite telecommunication systems. Terms and definitions of concepts"; regarding satellite communication system stations, for example: DSTU 4162:2003 (ETSI EN 301 443 V1.2.1:2001) "Terrestrial satellite communication system stations. Classification. Basic parameters and methods of measurement"; regarding digital television broadcasting, for example, DSTU ETSI EN 302 583:2010 "Digital television broadcasting. Frame structure, channel coding and modulation techniques for satellite broadcasting services to portable receivers in frequency bands below 3 GHz."

The given examples show that one of the actual tasks of the national space industry is the development of technical legal regulation of space activities, in particular, through the implementation of European and international standards. This applies both to space activity in general and to specific types of it.

Therefore, the standardization of space activity is a process that comprehensively establishes the legal relationship of the state between the subjects of space activity in order to exercise legal control over space activity and implement high-quality, safe and progressive space activity in Ukraine that meets international and national standards. And since space activity is mostly regulated by administrative and legal mechanisms modernized under the conditions of European integration and globalization, a wide system of standards is used in the process of standardization in Ukraine, the basis of which is international and European standards, the analysis of which is presented below.

International standards of space activity

In the space sphere, international standards play an almost decisive role in the standardization process. The unifying institutional subject of standardization is the International Organization for Standardization (ISO) (International, 2022). It is an independent non-governmental international organization, which includes 164 national standardization bodies. Through its members, ISO brings together experts to share knowledge and develop voluntary, consensus-based, international standards that support innovation and offer solutions to global challenges. ISO has published more than 20,000 international standards and related documents covering almost every industry, from technology to food safety, agriculture and healthcare.

As for the international standardization of space activities, today ISO has developed over 24338 International Standards, and all are included in the ISO Standards catalog. In chapter 49, "Aircraft and space vehicle engineering" which has subsection 49.140 entitled "Space systems and operations including space data and information transfer systems, and ground support equipment for launch site operations" (Space, 2022) it's placed more than 300 standards which consider the space activities.

In the space industry, Ukraine is also guided by a number of ISO standards, for example, ISO 24113:2011 "Space systems – Space debris mitigation requirements" (this standard has been revised by ISO 24113:2019) (ISO, 20110; ISO/TR 16158:2013 "Space systems – Avoiding collisions with orbiting objects" (ISO / TR, 2013), ISO 20892:2018 "Space systems – Launch complexes modernization process – General requirements" (ISO, 2018), ISO 16126:2014 "Space systems – Assessment of survivability of unmanned spacecraft against space debris and meteoroid impacts to ensure successful post-mission disposal" (ISO, 2014).

As can be seen from the quantitative ratio of existing international standards and standards used in Ukraine, it can be stated that the process of bringing the domestic space industry closer to the level of the leading space states is still ongoing.

The next body that develops and implements international standards in the space sphere is the International Telecommunication Union (ITU). ITU is a specialized agency of the United Nations in the field of information and communication technologies (ICT). Founded in 1865 to facilitate international connectivity in communications networks, the ITU allocates global radio spectrum and satellite orbits, develops technical standards that ensure seamless interoperability of networks and technologies, and directs efforts to expand access to ICTs in the world's underserved (About, 2022).

The main instrument used by the ITU in creating a regulatory and legal environment, policy formation, and dissemination of best practices in the specified sphere is the public-private partnership of its members. Because now, as never before, all ITU participants realize that the path to sustainable development can be found in close cooperation with state bodies, academic organizations and other interested parties. And such cooperation should be within the framework of joint efforts to implement appropriate norms and standards that would promote investment, innovation, and wide opportunities for joint use (About, 2022) of both ICT in general and space technologies in particular.

Thus, the ITU structure includes The Space Services Department (SSD), which is responsible for coordination and recording procedures for space systems and earth stations (Space Services, 2022). It consists of Space Publication and Registration Division (SPR), Space Systems Coordination Division (SSC), and Space Notification and Plans Division (SNP).

Specialists of the said Department are engaged in the collection, processing and publication of data, as well as verifying frequency assignment notifications submitted by administrations for inclusion in official coordination procedures or recording in the Main International Frequency Register (MIFR). The Department is also responsible for managing the procedures for ISS space assignment or allocation plans and assisting administrations in all of the above matters (Space Services, 2022). ITU also regularly publishes Weekly Information Circulars and International Frequency Information Circulars for Space Services containing Parts and Special Sections publications with information on the frequency assignments for space stations, Earth stations or radioastronomy stations submitted to the Radiocommunication Bureau by ITU Member State administrations (BR, 2021).

It should be noted that the current problem of international standardization of space activities is in the fact that the adoption of standards is voluntary because they do not have the weight of international treaties. So, for example, at the legislative level of the USA in NIST Circular A-119 in the market, the use of international standards is a voluntary consensus (Circular, 1998). And such wording is also placed in the legal acts of other countries. And as some authors rightly determine (Spencer, 2010), due to the inability of states to reach any agreement on the binding nature of international norms in space activities, the development of space law has slowed down. Its existence in the form of "soft law" in which principles, guidelines and codes of conduct are represented, has resulted that its non-compliance has no legal consequences because it is not binding. All of the above also applies to international standards used in the space sphere. Even though each state regulates space activities taking into account national interests, the most important reason and one common basis for state regulation, and therefore compliance with international standards, is the international responsibility of the state for national activities in outer space, as stated in several international space treaties and other documents.

EU standards

It should be noted that in accordance with Chapter 8 of Section V of the Association Agreement between Ukraine and the EU, the parties agreed to promote the development of mutually beneficial cooperation in the field of civil space research and use of outer space, in particular, in the following areas: 1) global navigation satellite systems; 2) Earth observation and global monitoring; 3) space science and research; 3) applied space technologies, in particular launch technologies and rocket engine technologies (Association, 2014). Such cooperation may include the exchange of experience in the field of management of space research and scientific institutions, as well as the creation of favorable conditions for conducting research and the introduction of new technologies and the proper protection of relevant intellectual, industrial and commercial property rights.

The main goal of the modern space policy of Ukraine in the European direction is active cooperation with the European Commission (EC), the European Space Agency (ESA), EU member states and their space agencies, as well as participation in the AURORA program (Interplanetary Missions Program), GALILEO projects (European Global Navigation Satellite System), GMES (Global Monitoring for Security and Environment) and FLPP (Future Spacecraft Training Program) and gradual acquisition of membership in the European Space Agency (ESA). In order to promote cooperation with the European Commission, ESA created a mechanism for such cooperation – the Joint Working Group on Cooperation of Ukraine with

the EU in the field of Space Research and the Use of Space for Peaceful Purposes within the framework of the Ukraine-EU Committee on Cooperation (Brussels, March 2003) (Report, 2022; International, 2021).

Since the process of European integration is underway in Ukraine, particularly in the space industry, the ESA of Ukraine tries to cooperate with the ESA closely; therefore, in the field of improving the space industry, European standards must also be taken into account. Thus, The European Space Agency created the European Cooperation for Space Standardization (ECSS) (Latest, 2022), which is a platform for the development of a coherent, single set of user-friendly standards used by all European space activities.

Examples of European space standards are ECSS-E-AS-50-26C-DIR1 "Space engineering – Adoption Notice of CCSDS 232.1-B-2, Communications Operation Procedure-1, Issue 2, September 2010," ECSS-E-AS- 50-25C-DIR1 "Space engineering – Adoption Notice of CCSDS 232.0-B-3, TC Space Data Link Protocol, Issue 3, September 2015," ECSS-E-ST-50C-Rev.1-DIR1 "Space engineering – Communications," ECSS-E-ST-32-01C Rev.2 DIR1 "Fracture control": Public Review (9 December 2019 – 14 February 2020), ECSS-Q-ST-70-16C-DIR2 "Space product assurance – Adhesive bonding for spacecraft and launcher applications," etc.

Therefore, the goal of the national space policy of Ukraine is the activation of scientific research and technological innovations, as well as raising the scientific and technical levels to EU standards. Cooperation with the EU in the field of science and technology (especially in the space field) is considered in Ukraine as a decisive factor for achieving economic development based on innovation.

Conclusions

Security guarantees are a complex and multifaceted phenomenon. Their specificity is due to the multi-disciplinary direction. The development of space technologies and products cannot be considered separately from the processes of innovative development, scientific and technological progress, or ensuring the ecological, national, and information security of mankind. However, space safety guarantees themselves are a specific type of legal guarantee, as they are standard rules for the implementation of space activities.

The presence of a permit procedure, standards and a standardization process is a guarantee that binds states to implement their obligations under the 1975 Liability Convention. The provisions of which indicate that the state that launched the space object bears absolute responsibility for the damage caused by such activity. At the same time, mixed space relations in this aspect do not have a sufficient normative basis for development. The standardization system in the field of private sector activity is insufficient.

Within the framework of this study, we needed to provide an answer to two main questions: the attitude of the international community to the importance of the process of standardization of space activities and what necessary actions should be taken by the public administration to improve the implementation of administrative and legal support for space activities and the development of the space industry in Ukraine.

Thus, we discovered that the international aspect of standardization is quite relevant. The activity of standardization subjects and the presence of a significant number of standards are proof of that. However, the main problem is their voluntariness. Obligation as a feature of these standards is present only in the case of their national consolidation. This indicates the

need to revise the paradigm of regulating international relations with the transition to the concept of global space management based on mandatory standards for all participants in space relations. The departure from the contractual paradigm with the further development of global space management will ensure the unity of the standard rules for the implementation of space activities, their obligation and the mechanisms of sanctioning influence for violations of the established modes of development and use of outer space.

We also discovered that Ukraine has a rather difficult situation regarding compliance with international standards of space activity. One of the urgent tasks of the domestic space industry is the development of technical regulatory regulation of space activities, in particular, through the implementation of European and international standards. This applies both to space activity in general and to specific types of it. The specified activity is cumbersome, but necessary in the conditions of the declared development vectors of Ukraine.

🕮 References

About International Telecommunication Union (2022) *ITU*. Official website. Available online: https://www.itu.int/ru/about/Pages/default.aspx

Agreement on technical barriers to trade (1994) of April 15, No 981_008. Available online: https://zakon.rada.gov.ua/laws/show/981_008#Text

Association Agreement between Ukraine, on the one hand, and the European Union, the European Atomic Energy Community and their member states, on the other hand (2014) The agreement was ratified with a statement by the Law of September 16, No 1678-VII. Available online: https://zakon.rada.gov.ua/laws/show/984_011

Circular No. A-119 Revised (1998) Memorandum for Heads of Executive Departments and Agencies. White House. Available online: https://www.whitehouse.gov/wp-content/uploads/2017/11/Circular-119-1.pdf

Constitution of Ukraine (1996) Law of Ukraine of June 28, No 254k/96-BP. Available online: https://zakon.rada.gov.ua/laws/show/254%D0%BA/96-%D0%B2%D1%80#Text

Bilodid, I.K. (1971) *Dictionary of the Ukrainian language: in 11 volumes*. Volume 2. Scientific thought, 1970-1980.

BR Space Services WIC/IFIC – Annual Collection (2021) *ITU*. https://www.itu.int/pub/R-SP-LN.IW

Hemenway, David (1975) *Industrywide voluntary product standards*. Cambridge, MA: Ballinger Publishing Company.

International Organization for Standardization (2022) *ISO*. Official website. Available online: https://www.iso.org/about-us.html

International Contractual Base of Ukraine in the Aerospace Sphere. Cooperation With the Usa and EU (2021) Information and Research Center at the Verkhovna Rada of Ukraine. Available online: https://pdf.usaid.gov/pdf_docs/PA00XDB1.pdf

ISO/TR 16158:2013 "Space systems – Avoiding collisions with orbiting objects" (2013) ISO. Official website. Available online: https://www.iso.org/standard/55739.html

ISO 24113:2011 "Space systems – Space debris mitigation requirements" (2011) *ISO*. Official website. Available online: https://www.iso.org/standard/57239.html

ISO 20892:2018 "Space systems – Launch complexes modernization process – General requirements" (2018) *ISO*. Official website. https://www.iso.org/standard/69376.html

ISO 16126:2014 "Space systems – Assessment of survivability of unmanned spacecraft against space debris and meteoroid impacts to ensure successful post-mission disposal (2014) *ISO*. Official website. Available online: https://www.iso.org/standard/55720.html

Kulinich, O. (2014) Guarantees of the constitutional right to education: concepts and signs. *Scientific Bulletin of the Dnipropetrovsk State University of Internal Affairs*, No 1, 78-84.

Latest published documents (2022) European Cooperation for Space Standardization. Available online: https://ecss.nl/

NASA's Centennial Challenges Overview (2022) NASA. Available online: ttps://www.nasa.gov/directorates/spacetech/centennial_challenges/overview.html

National Technology Transfer and Advancement Act of 1995 (1996) White House. Available online: https://www.govinfo.gov/content/pkg/PLAW-104publ113/html/PLAW-104publ113.htm

National standards to which there are references in regulatory and legal acts (2022) State Enterprise "Ukrainian Research and Training Center for Problems of Standardization, Certification and Quality." Available online: http://uas.org.ua/ua/services/standartizatsiya/109-2/

On amendments to some laws of Ukraine regarding state regulation of space activities (2019) Law of Ukraine of October 2, No 143-IX. *Verkhovna Rada information*, No 46. Art. 300.

On state support of space activities (2000) Law of Ukraine of March 16, No 1559-III. Available online: https://zakon.rada.gov.ua/laws/card/1559-14

On standardization (2014) Law of Ukraine dated June 5, No 1315-VII. *Bulletin of the Verkhovna Rada*, No 31. Art. 1058.

On the definition of a state enterprise that performs the functions of a national standardization body (2014) Order of the Cabinet of Ministers of Ukraine of November 26, No 1163-r. Available online: https://zakon.rada.gov.ua/laws/show/1163-2014-%D1%80

Public report of the Head of the State Space Agency of Ukraine for 2020 (2021) State Space Agency of Ukraine. Available online: https://www.kmu.gov.ua/storage/app/sites/1/17-civik-2018/zvit2020/kosmos-zvit-2020.pdf

Report on the implementation of the association agreement between Ukraine and the European Union for 2021 (2022) Cabinet of Ministers of Ukraine. Available online: https://eu-ua.kmu.gov.ua/sites/default/files/inline/files/euua_report_2021_ukr-2.pdf

Shemshuchenko, Yukhry, and Vasyl Semeniaka (2019) The current state and the need to reform space legislation. *Journal of the Kyiv University of Law*, No 2, 9-16. Available online: http://nbuv.gov.ua/UJRN/Chkup_2019_2_3

Space systems and operations including space data and information transfer systems, and ground support equipment for launch site operations 49.140 (2022) *ISO*. Official website. Available online: https://www.iso.org/ics/49.140/x/

Space Services Department (SSD) (2022) ITU. Official website. Available online: https://www.itu.int/ITU-R/go/space/en

Soroka, Larysa (2020) Space Doctrine and Guidelines for Long-Term Sustainability of Outer Space Activities as Basis for Sustainable Earth Development. *Philosophy and Cosmology*, Volume 25, 43-56. https://doi.org/10.29202/phil-cosm/25/4

Spencer, Ronald L. (2010). International Space Law: A Basis for National Regulation. In: Jakhu, R. (eds) *National Regulation of Space Activities. Space Regulations Library Series*, vol 5. Springer, Dordrecht. https://doi.org/10.1007/978-90-481-9008-9_1

Terekhin V.A. (2001) Judicial independence and independence of judges as a guarantee of citizens' rights. *State and Law*, No. 8, 42–50.

Yehorova, V.S. (2012) Guarantees of activities of judges of courts of general jurisdiction. *Bulletin of the National Technical University of Ukraine "Kyiv Polytechnic Institute" Political Science. Sociology. Law*, No. 1(13). https://doi.org/10.20535/2308-5053.2012.1(13).123433

Comments Section

Putin's Nuclear Blackmail

Valentyn Halunko

Doctor of Law, Professor, Head of the Academy of Administrative and Legal Sciences (Kyiv, Ukraine)
E-mail: scinspace@gmail.com
https://orcid.org/0000-0003-1619-5028

Iurii Buglak

Doctor of Law, Scientific Institute of Public Law (Kyiv, Ukraine)
E-mail: buglack@gmail.com
https://orcid.org/0000-0002-0428-0121

Viacheslav Boiko

Ph.D. in Law, Scientific Institute of Public Law (Kyiv, Ukraine)
E-mail: boikoviacheslav1@gmail.com
https://orcid.org/0000-0002-3505-4530

Halunko, Valentyn, Iurii Buglak, and Viacheslav Boiko (2022) Putin's Nuclear Blackmail. Blackmail. *Advanced Space Law*, Volume 9, 93-107. https://doi.org/10.29202/asl/9/9

The article revealed the scientific nature of Putin's nuclear blackmail. It has been proven that the democratic world community cannot succumb to Putin's nuclear blackmail. In fact, he carries it out not for the purpose of actual use, but as a means of further aggressive actions to intimidate politicians and people around the world. It has been stated that the measures to prevent Putin's nuclear blackmail are

the maximum defeat of the Russian terrorist forces by the Armed Forces of Ukraine and the introduction of an oil and gas export embargo so that Russia cannot restore its military potential for decades. The conduct of legal measures to ensure that those involved in the entire synchronous chain of nuclear weapon activation, deliberately fail to comply with Putin's criminal fatal order to use nuclear weapons.

Keywords: aggression, military potential, democratic community, application, crimes against humanity, Putin, blackmail, nuclear weapon; US instruments of deterrence.

Received: 07 April 2022 / Accepted: 08 May 2022 / Published: 10 June 2022

Introduction

Paradoxically, the rapid development of humanity and social progress lead to the advent of new challenges and exacerbation of the old ones. The following problems are becoming more and more relevant – overpopulation of the planet, increasement of the greenhouse effect, global warming, floods, malnutrition and famine caused by the reduction of agricultural land area.

It is worthy to take the stagnation in fundamental discoveries in physics and chemistry into consideration. Practically, in today's conditions, mankind uses technologies that were developed on the basis of natural laws discovered in the XVI-XX centuries, i.e., the laws of thermodynamics, electricity and electronics. The breakthroughs of the XX century include the DNA discovery by famous biologists, the development of electronics and humanity's reach into Space. Furthermore, the formation and rapid development of progressive social humanitarian theories led to the establishment of the United Nations, the creation of dozens of sovereign states (former colonies of large countries), as well as the prosperity of the European Union.

The first category of challenges cannot be solved without the colonization of outer space on space objects adapted to terrestrial life (Musk, 2020) or (and) on artificial space islands. In order for the cradle of humanity – the planet Earth, to become a green-blue oasis, a place for pilgrims from all corners of the space mastered by humans. Primarily, all harmful production must be removed from the planet Earth (Halunko et al., 2021). These processes require legal regulation of space law.

It has already been mentioned that a bright future awaits humanity if scientists offer humankind new materials with properties that are often superior to modern ones. However, the main breakthrough will be made only when theorists of mathematics and physics reveal the latest mathematical formula, different from the classical Einstein E = mc2 equation (Stan, 2021). However, all these scientific dreams will remain only dreams if humanity destroys itself as a result of nuclear war. In this respect, another question arises: would it be equitably fair that primitive dinosaurs ruled the planet Earth for more than 160 million years and Homo Sapiens less than 200 thousand years?

Nowadays, the main threat to humanity comes from practically one person – Putin (Cowen, 2022), who is supposed to be supported by the majority of the Russian population. Thus, as of March 24, 2022, after the start of Russia's large-scale war in Ukraine (Russia's, 2022), the approval of the activities of the President of Russia increased significantly up to 83%. The share of those who believe that things in the country are going in the right direction has increased. The rating of Putin's United Russia party reached 54% (Approval, 2022).

Based on the current state of affairs, it should be emphasized that:

1. Putin's mental health is a matter of concern to the world community (House, 2022). Since 2008, he has been making political decisions that not only harm Russia, but also threaten the possibility of its continued existence (Fried & Volker, 2022);
2. In accordance with Russian law, the president decides on the use of nuclear weapons. According to the Military Doctrine, the Russian Federation reserves the right to use nuclear weapons in response to the use of nuclear and other weapons of mass destruction against it and (or) its allies, as well as in the case of aggression against the Russian Federation with the use of conventional weapons, when the very existence of the state is threatened. However, the same doctrine states that the prevention of nuclear military conflict, like any other military conflict, is the basis of the military policy of the Russian Federation. However, there is no trust in the following document. After all, according to the same document, the decision to use nuclear weapons is made by the President of the Russian Federation alone (Military, 2014). It is horrible that one mentally unstable person with the anti-human values of the "Russian world," with all the dictatorial power within the state (Klimentyev, 2022) has the opportunity to start a nuclear war.

Thus, in today's conditions (April 2022), the main threat to humanity is not objective. Surprisingly, it is not global warming, which may lead to adverse consequences for humanity in a few decades. The main threat to humanity is subjective – the leadership of a dictator (Putin) in the nuclear state with the largest number of nuclear warheads (Russia). He fragrantly violates international law, blackmails the world community, and threatens with the use of nuclear weapons, not to mention the fact that his mental health raises suspicions in the international community.

One part of the world community mistakenly believes that the catalyst for Putin's use of nuclear weapons is the victorious war of the Ukrainian people with Russian terrorist forces. For example, on April 15, 2022, CIA Director William Burns warned about a high risk of a Russian nuclear strike due to failures in the war against Ukraine (The head, 2022).

Nevertheless, this is not the case, because the theory of the imperial expansion of the "Russian peace" is directed not only against the people of Ukraine. Its real and potential victims are Japan, Ichkeria, Azerbaijan, Moldova, Syria, Belarus, Kazakhstan, Estonia, Lithuania, Latvia, Finland, Poland and Romania. Through the agents of influence: Germany, France, Slovenia, Bulgaria, Croatia, Montenegro, Slovakia and others. What is more, Putin is not to blame for the imperial expansion of the "Russian peace." The majority of the Russian people are accountable. The deep-seated Russian, who lives in poverty and is humiliated by internal police terror, has a psychological need to remove the accumulated aggression. He cannot remove it on the territory of Russia. The Putin regime gave him the opportunity to do so in Georgia (2008), in Ukraine (2014) and in Syria (2015). If the Ukrainian people do not stop Putin's Russian terrorist forces on their territory, nuclear blackmail of the EU's eastern member states, Kazakhstan, Finland, Sweden, Turkey, and so on to the English Channel and the Mediterranean will begin. This deep psychological understanding of his role in the world order is expressed by the profound Russian in the slogans "We can repeat" and "To Berlin," implying the occupation of more than half of European states by Soviet Russia in 1945.

Citizens of the EU and other democracies need to know that the rude Russian tourists they have encountered are Russia's elite, so to say, "cultural figures." In fact, more than 70% of

Russian citizens do not have foreign passports, which means that they have never been abroad. The degree of propaganda prevailing in their minds and decision-making mechanisms is much higher than that of Russians who have visited Europe at least once in their lives. Exactly the following stratum of modern Russian society is joining the army. As absurd as it may sound in the 21st century. However, the dream of looting rich European cities, raping European women and heroic returning home with looted property is the main meaning of their lives. The vast majority of Russians are brainwashed servants of their leader that Ukrainians were called upon to stop and protect the European democratic community.

Thus, Ukraine's victory is not a catalyst for Putin's use of nuclear weapons. On the contrary, Ukraine is a subject of international law that bravely protects the democratic world from Putin's exploratory nuclear blackmail and occupation of other democracies. As long as sovereign Ukraine keeps repulsing Putin's attack on its territory, other nations are safe and sound. Hypothetically, imagine that such a large and powerful state as Ukraine would not exist. Initially, Putin would occupy Estonia, Lithuania, and Latvia, and the armed hostilities would now occur in Poland. The world community must develop a technical, organizational and legal mechanism to reduce the possibility of Putin's use of nuclear weapons to zero. The following article is devoted to the analysis of the last two factors.

Russia's war in Ukraine and Putin's nuclear blackmail

Practically, in February 2014, with the annexation of the Autonomous Republic of Crimea by the Russian Federation, the Russian-Ukrainian War began, which in Ukrainian legal literature was called the Patriotic (People's) War of the Ukrainian people (Halunko, 2022b).

However, much earlier, in 2007, Putin officially declared a hybrid war on the Western world and neighboring countries in his speech delivered at the Munich Conference on Security Policy. Putin's essential statement included the following points: 1) the liberal international order led by the United States, also known as the "Free World," is of no interest or value to Russia; 2) the collapse of the Soviet Union was the greatest geopolitical catastrophe of the twentieth century. Putin's speech came as a shock to those who have made significant efforts to connect Russia to the post-Cold War global stability system. According to Kurt Volker, it was misleading to assume that despite Putin's unequivocally stated imperial values and Russia's numerous practical actions over 15 years, the West could somehow cooperate with Putin's Russia. In fact, the West has provided significant financial and technical assistance to Russia. Therefore, the European countries, the United States, Canada and Russia have signed numerous agreements that had to comply with key principles, including refraining from the threat or use of force (Fried & Volker, 2022).

Nevertheless, on August 8, 2008, the Putin regime launched armed aggression against small sovereign Georgia, marking the beginning of the first war in 21st century Europe. The conflict itself ended in a few days, but the consequences of the Russian-Georgian war continue to affect the present, forming a broader geopolitical environment. The international response to Russia's military campaign in Georgia has been extremely weak. Unfortunately, Russia has faced minor negative consequences for the committed crimes. On the contrary, EU leaders have called for a ceasefire that favors Russia's interests. Moreover, under the Obama Administration, the United States disclosed a clear interest in "resetting" U.S.-Kremlin relations. Moscow interpreted the West's accommodating approach as an informal invitation to further acts of aggression. According to Peter Dickinson, the ceasefire, mediated by French President Nicolas Sarkozy,

was in Moscow's favor. In the meantime, Georgia was accused of the first shot in the EU report on the five-day war. It is assumed that six years after the Russian-Georgian war, Russia launched a much larger military campaign against Ukraine, where Putin occupied Crimea and large areas of Eastern Ukraine, such as Donbas (Dickinson, 2021).

In other words, the West's indulgence in Putin's aggression in Georgia led to the logical annexation of the Autonomous Republic of Crimea and the Russian-Ukrainian War, which began in early 2014.

Today (as of May 17, 2022), the difficult battle for the Ukrainian Donbas continues. The Armed Forces of Ukraine are repelling numerous attacks by Russian terrorist forces (Mason et al., 2022). Nevertheless, according to US Secretary of Defense Lloyd Austin, Russia lost the battle for Kyiv. He argues that Russia is losing the battle for Ukraine as a whole. The USA claims that Ukraine has a great chance to win if there is essential equipment and timely support. The United States will do everything in its power to bring Ukraine closer to victory. The US wants to see Russia weakened to the point that it cannot commit crimes and bring calamity anymore. Russia has already lost significant military capabilities; therefore, the world community has to make sure that the aggressor country will not be able to quickly and easily restore its military potential (Piontkovsky, 2022).

However, amid the good news about Kyiv, Putin's nuclear blackmail is intensifying. The nuclear issue must concern everyone on a global basis. Because, in the absence of effective international law and relevant UN security institutions, every country needs a nuclear umbrella. The reason for this is that the largest nuclear state in terms of the number of warheads – Russia is blackmailing its use. Putin and his entourage are ready to use nuclear weapons under certain circumstances (Hill, 2022).

Russia's public nuclear blackmail began in 2014, when the propagandist of the federal state news agency with strict censorship, "Russia 1" Dmitry Kiselyov, argued that Russia is the only country in the world powerful enough to turn the United States into radioactive ash. Indeed, he is one of the Kremlin's most odious mouthpieces, responsible for propagating Putin's official opinion (Shepelin, 2014). Later, indirect threats to use nuclear weapons were voiced by many Russian politicians. Hence, the head of "Roscosmos" Rogozin, publicly highlights that Russia has a powerful nuclear strategic potential: intercontinental ballistic missiles, medium-range combat missile systems, operational and tactical means. He proclaims that the Russian Federation is capable of physically destroying anyone at any distance in minutes (Rogozin, 2022).

In essence, the official vocabulary of Russian politicians does not explicitly call for the use of nuclear weapons. Nonetheless, they denied the possibility of a large-scale military invasion on the territory of Ukraine until it actually happened. Therefore, the signals about the use of nuclear weapons, which the Russian government promotes through its associated speakers and the media, should be taken seriously. In his interview with India Today television channel on April 19, 2022, Russian Foreign Minister Lavrov stated that the risks of nuclear war are quite significant. He was asked whether Russia was considering using tactical nuclear weapons against Ukraine. Although the Russian minister replied that Russia was always against nuclear war, he did not say outright that Russia would not use tactical nuclear weapons against Ukraine under any circumstances. Similarly, in 2021, Putin refused to say that his country would not launch a large-scale military attack on Ukraine under any circumstances (Yizak, 2022).

Thus, in the context of full-scale Russian terrorist aggression, Putin, along with his propagandists and politicians, has never directly assured the world community that there

is no risk of Russia initiating a nuclear war. Putin's experience of adhering to international agreements is not credible. There is no trust and confidence in any assertions he makes. In particular, Russia blatantly violated the Memorandum on Security Assurances in connection with Ukraine's accession to the Treaty on the Non-Proliferation of Nuclear Weapons (Memorandum, 1994); the concentration of Russian troops on the border with Ukraine is "nothing more than military exercises." Consequently, Putin's fruitless promises and words should not be taken into account. The order to use nuclear weapons is unlikely, but potentially possible.

Characteristics of Russia's nuclear potential

In terms of the number of warheads, Russia's nuclear potential is the greatest of all nuclear powers. According to the Federation of American Scientists, Russia has 5,977 nuclear warheads, i.e., devices that cause a nuclear explosion. Nevertheless, this figure includes about one and a half thousand warheads that have already been written off and are subject to disposal. The majority of 4,500 remaining warheads are considered strategic nuclear weapons, i.e., ballistic missiles that can deliver nuclear warheads over long distances. The smallest percentage includes less destructive tactical nuclear weapons for use on the battlefield. In addition, experts estimate that about 1,500 Russian nuclear warheads are stationed at bases, airfields, or submarines (How many, 2022).

Russia's nuclear capability consists of five components: 1) Strategic Rocket Forces; 2) strategic aviation; 3) naval missile carriers; 4) tactical nuclear weapons; 5) nuclear warheads in arsenals.

Strategic Rocket Forces (RVSN) play a key role in Russia's nuclear blackmail. They account for more than 60% of missile carriers and nuclear warheads. Historically, there have been two versions of missile systems in the Strategic Rocket Forces: stationary and mobile. Stationary systems incorporate silo-based missiles, and mobile grouping comprises ground missile complexes. Stationary and mobile groups of missile systems have approximately the same number of missile carriers. Stationary systems allow missiles to be launched in a shorter period of time due to their higher readiness. However, the coordinates of all silo-based missiles are known, what makes them the target of a pre-emptive strike. At the same time, mobile complexes may be more invisible. At the end of 2021, Russia's Strategic Missile Forces were equipped with stationary silo-based missile systems: Avangard, Voyevoda, Stiletto, Topol-M, Yars and mobile ground missile complexes: Topol, Topol-M, and Yars. Russia was planning to gradually rearm all of its missile formations with the latest Sarmat missile complex (Vasiliev, 2022). Yet, according to US military analyst Yuri Shvets, the "new" Sarmat ballistic missile is a "repainted" copy of the SS-18 Satan, developed in Ukraine by the Design Bureau "South" (Pivdenne) and manufactured at the Southern Machine-Building Plant named after Alexander Makarov back in the 70s of the 20th century (Shvets, 2022). In 2004, Pivdenmash, by a joint decision of the governments of Ukraine and Russia, transferred all documentation for the production of R-36M2 Voevoda (SS-18 Satan) to the Russian state missile center named after Makeev.

Most of the other missile carriers in Russia's service were also developed in the 1970s and 1980s by the Ukrainian designers at Pivdenmash, who played an important role in the program to extend the life of these missiles before the annexation of Crimea. The fact is that in 2022 the guaranteed 20-year term of safe operation of Poplar and Voevoda ends. However,

in 2014, all programs of military cooperation between Ukraine and Russia were suspended. The Russians handed over the task of extending the resource to the Makeyev Rocket Design Bureau, which specializes in ballistic missiles for submarines and has neither sufficient experience nor qualified specialists, without the consent of the Ukrainian side. Therefore, in recent years, life extension of missiles has been carried out by launching only one missile. After that, the Russian "commission" formally decides to extend the service life of all missiles of the appropriate type, practically without suitability testing (Zhirokhov, 2017).

The navy and aviation account for one-third of the Russian nuclear potential. As of the beginning of 2015, the Russian Navy comprised 11 strategic missile carriers of three types, and only eight of them had ballistic missiles on board. Missiles deployed in 128 naval-based ballistic missile launchers can carry 512 nuclear warheads. All naval-based missile systems are developed at the Makeyev Rocket Design Bureau. At the same time, at least two types of R-29 missiles are obsolete, as they were developed in the 70-80s of the 20th century. A new naval-based missile system, known as the R-30 Bulava, has been under development since 1998. Although the missile is largely unified with the Topol-M mobile ground missile, by the end of 2016, 10 of the 30 launches had failed. In fact, it took two decades to create Bulava, but alas, a third of the missiles did not reach the target. It was planned to transfer to the Russian fleet eight nuclear Borei-class submarines and eight new multi-purpose nuclear submarines "Ash," capable of striking long-range cruise missiles, though not all was proceeding smoothly. As a result, the Russian fleet received only three boats of the eight Borey-class submarines. Yuri Dolgoruky and Alexander Nevsky submarines were ready in 2011, but were not accepted into combat service due to problems with the main armament – a solid propellant ballistic missile Bulava (Zhirokhov, 2017).

The strategic aviation component of Russia's nuclear triad is more than sixty Tu-160, Tu-95 and Tu-22M bombers that can carry about 200 long-range cruise missiles. The most modern is the Tu-160, which was produced from 1984-1992 (1999, serial production resumed). Its main weapon is 12 X-55 long-range cruise missiles with a range of up to 2,500 km. Moreover, although these missiles were developed at the Raduga Design Bureau in the Moscow region, they were produced by the Kharkiv Aviation Plant, and the engines were produced by Zaporizhzhya Motor Sich. Russia also has its own cruise missile, known as the X-101, which should replace the X-55. However, its production is too slow to say that it will soon become the main one (Zhirokhov, 2017). In addition, it should be noted that the analysis of the remains of X-101 missiles, which were launched at facilities in Ukraine, showed that they were equipped with electronics of the 1960s (The latest, 2022).

In the context of the full-scale armed conflict that Russia unleashed on February 24 in Ukraine, the Russian aviation nuclear component is used to bomb civilian objects in Ukraine with non-nuclear munitions. For example, on April 23, 2022, Russian strategic aircraft from the Caspian Sea region launched a missile strike on Odesa. Although two missiles were neutralized by the Ukrainian air defense, five cruise missiles hit a peaceful city and destroyed an ordinary apartment building. Unfortunately, more than fifteen civilians were killed, including a three-month-old infant. President of Ukraine Volodymyr Zelenskyy assured that all those responsible for Russia's missile terror, everyone who gives orders and who carries out the orders to kill civilians, will be responsible for each and every murder they commit.

Dual-use items can carry both conventional and nuclear warheads. This is a major concern, since it is difficult to determine the form of a strike (nuclear or conventional) until the warhead explodes (Piddubny, 2022). For example, strategic bomber forces and other military specialists

are accustomed to using missiles that can carry nuclear weapons. At a critical moment, they can automatically carry out a fatal criminal order to launch missiles with nuclear warheads. The world community must unequivocally prohibit even the potential use of the same type of nuclear and conventional ammunition. The whole chain of nuclear weapons and their means of delivery must be specialized, not of universal character.

In addition, according to the International Commission on Nuclear Non-Proliferation and Disarmament, Russia has about 2,000 tactical nuclear munitions (Zhirokhov, 2017). A tactical warhead is smaller in power, but can cause significant damage and mass deaths. In fact, some of its types have variable power, which allows to calibrate their explosive power for a particular attack; others, known as "neutron bombs," were designed to emit radiation at a minimum force of explosion (Piddubny, 2022). Tactical nuclear warheads are multidisciplinary. They are made as warheads of tactical missiles, aircraft bombs, artillery shells, nuclear torpedoes and mines.

In the meantime, corrupt Russia is collapsing in all directions, including its nuclear potential. According to expert assessment, there are a number of factors that reduce the combat effectiveness of Russia's nuclear forces, in particular the aging of nuclear warheads and strategic carriers (80% of missiles have reached the designated service period). Russia does not have the technical capability to observe the water area of the Atlantic and most of the Pacific oceans. Russia's strategic bombers are located on two bases, what makes them vulnerable to preventive destruction. Moreover, the mobility of nuclear submarines with missiles on board is reduced, since only two of them can conduct combat patrol at the same time (General, 2012).

Formally, the Russian Federation has the largest nuclear potential in the world. However, almost all nuclear weapons were manufactured seventy to thirty years ago, and the small number of "new" nuclear munitions that Russia could potentially own has not been tested. According to experts, the smaller the power of a nuclear warhead, the more likely it is that it will not work due to irreversible aging processes. It should also be emphasized that most of the means of nuclear weapon delivery were elaborated more than thirty years ago. Whereas "modern" means of delivery are developed on the basis of mid-twentieth century technologies. Experience has shown that during the full-scale Russian invasion of Ukraine, which began on February 24, 2022, more than 30% of military equipment did not perform its functions for technical reasons, and another 30% of military assets were destroyed by the Ukrainian Air Force. Specialists believe that out of 10 nuclear warheads launched by Russia, 7-9 of them can be neutralized by the time the nuclear ammunition is activated (Rustamzade, 2022). In other words, at least one in ten warheads can hit a democratic state. In order to prevent this, it is necessary to use organizational and legal measures in parallel with technical and military means to restrain the use of tactical and strategic weapons by Putin.

World community response to the possibility of Putin's use of nuclear weapons

As stated above, Western nations have long been subject to Putin's nuclear pressure. In particular, this led to the failure to provide Georgia in 2008 and Ukraine from 2014 to 2022 with adequate assistance to protect against Russian terrorist aggression. The leading negative role was played by French President Nicolas Sarkozy and German Chancellor Angela Merkel. First of all, owing to these European political leaders, Ukraine and Georgia did not receive an action plan for NATO membership at the NATO summit (2008). Even after the annexation of Crimea in 2014, Merkel's government ruled out arms supply to Ukraine. The construction

of the Nord Stream-2 gas pipeline was approved afterward. Therefore, Putin took the forced shifting of borders for granted (Hasselbach, 2022).

The situation has changed significantly after the Western media uncovered non-human atrocities by Russian terrorist forces in Bucha and other settlements in Ukraine that were temporarily occupied by Russia. On April 2, 2022, when the cities of Bucha, Irpin, Gostomel and others were completely liberated, Ukrainian soldiers, journalists, and in a short time, the world community were shocked by the horrible damage caused by Russian terrorists. Here are the words of journalists from Agence France-Presse and Reuters describing the events on March 3, 2022: "About 20 bodies of people in civilian clothes were seen on one of the streets of Bucha; the man's hands were tied behind his back with a piece of white cloth; three bodies were laying close to a stack of building materials and wooden pallets." Bucha Mayor A. Fedoruk said that 280 people were buried in mass graves. Locals told Reuters that all these innocent people died as a result of Russian troops (After, 2022). Numerous mass graves, rapes, including children, hundreds of civilians killed in chaotic shelling of residential areas and a number of deaths due to a lack of assistance to people trapped in basements after the bombings were identified in Kyiv Oblast (New mass, 2022). Tragically, this is only the beginning of recording criminal activities committed by Russian soldiers in Ukraine. There is reliable information that most of these crimes were committed in eastern Ukraine, where Russian terrorist forces murdered thousands of civilians and completely destroyed such cities as Volnovakha and Mariupol. The number of tortured and killed civilians, as well as those who died from hunger and disease in basement traps after the destruction of houses by shelling, exceeds twenty thousand citizens. In addition to that, countless deaths of prisoners of war and those who once took part in hostilities. In fact, much attention must be drawn to such a criminal phenomenon as "safari" – hunting of servicemen of the Russian terrorist forces for civilians with firearms, or crushing the cars of Ukrainian citizens with tanks (Designed, 2022).

The same cases are recorded in Kherson and Zaporizhia regions, which are also under partial temporary occupation. However, unlike Bucha and other liberated settlements in Kyiv, Chernihiv and Sumy oblasts, it is difficult to record these crimes. After all, the Russian occupation authorities do not cooperate with Ukrainian or international investigators. In the east and south of Ukraine, intense military action and the commission of war crimes and crimes against humanity by the Russian terrorist forces continue, because the following actions are encouraged by the Russian military and political leadership as a means of breaking the Ukrainian resistance to the occupiers. After the discovery of such horrible facts, the whole Western world realized that Putin was a murderer (Chernova et al., 2021). What is more, none of the decent politicians want to deal with him anymore. Western leaders and most democracies understand that if Putin is not stopped by Ukraine, his hordes will continue their aggression further to the West.

The culmination of the fact that Western politicians stopped fearing Putin's nuclear blackmail was a meeting of the Advisory Group for the Defense of Ukraine, organized at the initiative of the United States at Ramstein American Air Base in Germany on April 26, 2022. It was attended by representatives of the defense agencies of more than 40 NATO countries and US partners. The Minister of Defense of Ukraine, Oleksii Reznikov, also took part in the meeting. In his speech, US Secretary of Defense Lloyd Austin called the summit historic, noting that its goal was to help Ukraine win the war, resist the Russian invasion and prepare Ukraine's defense capabilities for future challenges. The Minister of the Armed Forces of the United Kingdom, James Gippi, stated that Ukraine could legitimately strike at enemy

territory, attack its logistics lines, ammunition depots, fuel supplies and use weapons provided by the United Kingdom. The conference received a commitment from the allies to support the Ukrainian military during the next phase of the war and beyond (Secretary, 2022).

Another indirect factor that the West is not afraid of Putin is the Nuclear Posture and Missile Defense Reviews conducted by the USA. According to President Biden, as long as nuclear weapons exist, the fundamental role of US nuclear weapons is to deter nuclear attack on the United States, its allies, and partners. The United States would only consider the use of nuclear weapons in extreme circumstances to defend the vital interests of the USA or its allies and partners (Bertuca, 2022).

In our opinion, all non-NATO countries, which were invited by the United States to a meeting of the Advisory Group for the Defense of Ukraine, clearly belong to the US partner countries as entities that can count on the US nuclear umbrella along with NATO countries. Naturally, Ukraine belongs to this group of US partners and is practically under US nuclear protection in the event of Russia's attempts to use tactical nuclear weapons or other weapons of mass destruction against Ukraine.

Thus, the West's policy to prevent the possibility of Putin's use of nuclear weapons is active and strong. It lies in the fact that there is no need to be afraid of Putin. The United States and Britain have made it clear to Putin that in the event of the use of tactical or other nuclear weapons, the bunkers in which the Russian dictator is hiding will be destroyed in the first place.

Organizational and legal factors in neutralizing Putin's nuclear blackmail

By his actions, which contain all the elements of crimes against humanity and genocide against the Ukrainian people, Putin has managed to unite virtually the entire civilized world against himself. On February 8, 2022, the UN General Assembly adopted a resolution on "Aggression against Ukraine," condemning Russia's invasion of Ukraine. It states that Russia must immediately withdraw its troops from the Ukrainian land. The decision was made by an unprecedented number of votes – 141 countries voted for, 5 against and 35 abstained. Russia, Belarus, North Korea, Eritrea, and Syria voted against it. The UN General Assembly condemned the decision of the Security Council of the Russian Federation of February 24, 2022, "On conducting a special military operation" in Ukraine. The General Assembly expressed serious concern at reports of attacks on civilian objects such as housing, schools and hospitals, as well as casualties, including the most vulnerable civilians – women, the elderly, the disabled, and children (The UN, 2022).

Thus, the first factor in neutralizing Putin's nuclear blackmail is virtually UN support, which condemns Russia's invasion of Ukraine and urges Russia to immediately withdraw its troops from the territory of Ukraine.

Nevertheless, the decision of the UN General Assembly in terms of international law is of a recommendatory nature. It is clear that Putin will not do it without coercion. According to the theory of law, disposition without the sanction in most cases is powerless. Respectively, in order for Putin to implement the following resolution, the practice of international coercion must be enforced.

The subject of the use of military coercion in the current conditions is exclusively the Armed Forces of Ukraine, which is now courageously resisting the Russian terrorist forces

in Donbas and southern Ukraine. Fortunately, the modern high-tech weapons needed to repel Putin's terrorist aggression are already coming to Ukraine from most democratic states. The American Lend-Lease Program was created during World War II is a revolutionary decision to provide the Ukrainian army with high-tech weapons and equipment needed to defeat Russia in its attempt to counteract the democratic world. Western partners have already provided Ukraine with a significant number of weapons that help destroy enemy equipment on the ground, in the sky, and soon in the sea. According to the chairman of the Joint Chiefs of Staff General Milley, Ukraine has already received 60,000 anti-tank units and 25,000 anti-aircraft weapons. On top of that, under the Lend-Lease Program, Ukraine will receive much more powerful weapons. Hopefully, significant foreign aid can play a pivotal role in the war against Russian aggression, as eight decades ago during World War II. The bravery of the Ukrainian army and powerful Western weapons will help Ukraine not only to repel the attack but also to win the war (Vyatrovich, 2022).

Thus, the main factor in neutralizing Putin's nuclear blackmail is Ukraine's military victory in repelling Russian aggression. Consequently, the Russian army must be weakened to such conditions that Russia's militarized forces will no longer be able to restore combat capability. This can be accomplished, provided that courageous Ukrainian people receive heavy offensive and high-tech weapons. The United States, Britain, as well as other US allies and partners have begun to render appropriate assistance and support to Ukraine, through individual and collective military programs.

Putin's attempts to use tactical and strategic nuclear weapons would be a completely irrational step. After all, such actions will lead to his immediate death, as well as the dissolution of the Russian Federation. However, given his mental state, it is impossible to rule out an attempt to use nuclear weapons. Accordingly, the Western world community must ensure that the order to use nuclear weapons given by Putin cannot be executed. Although the President of Russia can legally decide to use nuclear weapons alone, it is known from open sources that the necessary active actions of the Defense Minister and the Chief of the General Staff are required as well. In general, it should be noted that the implementation of the decision to use nuclear weapons is a system of synchronous and consistent actions of many decision-makers and actors.

There are 5 to 7 stages in which people must simultaneously carry out the orders to use nuclear weapons given by the President of Russia. It should also be emphasized that nuclear weapons must be at the highest level of combat readiness to be launched for certain purposes. Most of the workers who maintain combat readiness have the opportunity to create artificial barriers in the mechanism, without which the launch of a nuclear weapon will not be performed. For instance, a mechanic-driver of a self-propelled launcher can create mechanical obstacles, restraining the start of the internal combustion engine and the launch of a nuclear weapon itself. Specific barriers directed at the consistent system of launching nuclear warheads can be created by other specialists involved in the launch of missile carriers and other means of delivery of nuclear munitions.

That is to say, hundreds and sometimes thousands of intelligent and rational people take part in all stages of the launch of nuclear weapons. What is more, most of them have the opportunity to interrupt and deter Putin's criminal order.

The passive actions of the people involved in the launch of nuclear weapons should be encouraged to prevent the explosion. Those who do not comply with Putin's criminal order

must be physically and financially protected by the legal and organizational measures of the guarantor countries.

It is necessary to cooperate with all Russian officers, rocket scientists (nuclear system engineers), submarine officers, and strategic bombers. They are highly educated people who know better than average citizens what terrible consequences and damage this nuclear war will cause to their families and loved ones. Everyone who is willing to cooperate with the democratic forces of the anti-nuclear war must be provided with security, high financial support at the expense of the international community and the opportunity to live in the chosen democratic country under their own name or legend (Halunko, 2022a).

Another factor for preventing Putin's nuclear blackmail is weakening Russia's economy and public finances with sanctions to such an extent that:

Firstly, most Russians who support Putin have realized that their poverty is directly linked to their leader's aggressive foreign policy;

Secondly, the Ministry of Defense of the Russian Armed Forces will not have the financial means to maintain the combat readiness of the nuclear triad and tactical weapons at the appropriate level.

This will be possible only if the oil and gas embargo is imposed to Russia. In our view, these sanctions are of primary importance.

Conclusions

Putin's nuclear blackmail is a system of political, organizational, international, and legal, psychological means used by the Russian dictator to spread the influence of the "Russian Peace."

The democratic world community cannot succumb to Putin's provocations and allow to occupy any small, medium, or large state. After all, an independent Ukrainian state became a victim of open and unprovoked aggression conducted by the Russian Federation after the events in Georgia.

If Ukraine does not win the war against Russian terrorist forces, Putin's next victims will be Moldova, Kazakhstan, Lithuania, Latvia, Estonia, Finland, Poland, Slovakia, the Czech Republic, Romania, Bulgaria, and so on, including the English Channel and the Mediterranean. At the same time, Putin's nuclear blackmail will grow exponentially with the capture of each new sovereign state.

Putin's aggressive actions and blackmail are part of his strategy of psychological intimidation of politicians and nations aimed at paralyzing their will to resist.

Based on these considerations, it was concluded that the victorious war of the Ukrainian people with Russian terrorist forces was not the catalyst for Putin's use of nuclear weapons. Conversely, it is an effective means of preventing nuclear war.

It has been proven that Putin is unlikely to use tactical or strategic nuclear weapons. The state of nuclear suitability for the use of nuclear weapons is unsatisfactory. The US allies' and partners' nuclear deterrence and missile defense systems are at a high level.

Nevertheless, the world community must respond to Putin's nuclear threats through a deterrence policy. The smallest miscalculation in this area can eventually cause a huge number of casualties.

Measures to prevent Putin's nuclear blackmail include:

1. Providing Ukraine with the latest weapons to repel the aggression of the Russian Armed Forces so that they will not be able to restore their combat capabilities and continue aggressive actions towards other democracies for a long time.

2. Imposing tough sanctions on Russia, mainly on oil and gas exports, thereby restricting the reinstatement of Russian military potential. At the same time, sanctions can be lifted only if Russia declares non-nuclear status and begins the process of disposing of nuclear weapons under the control of the international community.

3. Implementing legal measures to ensure that those involved in the entire synchronous chain of nuclear weapon activation, deliberately fail to comply with Putin's criminal fatal order to use nuclear weapons.

🕮 References

After the liberation of Bucha and Irpen from Russian troops in the Kyiv region, the military, government officials and journalists saw the horrific consequences of the invasion: completely destroyed streets and dozens of people killed (2022) BBC. Available online: https://www.bbc.com/ukrainian/features-60971663

Approval of Institutions Ratings of Parties and Politics (2022) Levada Center. Available online: https://www.levada.ru/tag/putin/

Bertuca, Tony (2022) DOD sends Congress classified Nuclear Posture and Missile Defense reviews. *INSIDE DEFENSE*. Available online: https://insidedefense.com/insider/dod-sends-congress-classified-nuclear-posture-and-missile-defense-reviews

Cowen, Tyler (2022) Putin's Nuclear Threat Makes Armageddon Thinkable. *Washington Post*. Available online: https://www.washingtonpost.com/business/energy/putins-nuclear-threat-makes-armageddon-thinkable/2022/04/20/d40b8fe2-c0cc-11ec-b5df-1fba61a66c75_story.html

Chernova, Anna, Zahra Ullah, and Rob Picheta (2021) Russia reacts angrily after Biden calls Putin a "killer." *CNN*. Available online: https://edition.cnn.com/2021/03/18/europe/biden-putin-killer-comment-russia-reaction-intl/index.html

Dickinson, Peter (2021) The 2008 Russo-Georgian War: Putin's green light. *Atlantic Council*. Available online: https://www.atlanticcouncil.org/blogs/ukrainealert/the-2008-russo-georgian-war-putins-green-light/

Designed for the stupid, – Tsimbalyuk explained why Putin explosions in Belgorod (2022) 24 Channel. Youtube. Available online: https://www.youtube.com/watch?v=bbpIzz94jUA

Fried, Daniel, and Kurt Volker (2022) In his 2007 Munich address, the Russian leader firmly rejected the post-Cold War system he's still trying to torpedo. *Politico*. Available online: https://www.politico.com/news/magazine/2022/02/18/putin-speech-wake-up-call-post-cold-war-order-liberal-2007-00009918

General characteristics of Russia's nuclear forces (2012) *PIR*-Center. Available online: https://www.pircenter.org/static/obschaya-harakteristika-yadernyh-sil-rossii

Halunko, Valentyn (2022a) Guerra popular del pueblo Ucraniano con la agresión rusa del 2022: factores de la administración pública. *Academy of Administrative and Legal Sciences*. Available online: http://www.ssaals.com.ua/?p=8659

Halunko, Valentyn (2022b) Patriotic (people's) war of the Ukrainian people 2014-years. *Academy of Administrative and Legal Sciences*. Available online: http://www.ssaals.com.ua/?p=8678

Halunko, Valentyn, Oleksii Padun, and Yevgen Rokytsky (2021) Space Islands in Orbit Around the Sun. *Future Human Image*. Available online: http://www.fhijournal.org/15-3/

Hasselbach, Christoph (2022) The war in Ukraine is a disgrace to German foreign policy. *DW*. Available online: https://www.dw.com/uk/vijna-v-ukraini-sorom-nimetskoi-zovnishnoi-polityky/a-6141073

Hill, Fiona (2022) Putin's actions increase the demand for nuclear weapons in the world. *Youtube*. Available online: https://www.youtube.com/watch?v=smSiK9HLjgo

House, Allan (2022) Mad or bad? A deep dive into Putin's psyche. *Guardian*. Available online: https://www.theguardian.com/world/2022/mar/08/mad-or-bad-a-deep-dive-into-putins-psyche

How many nuclear weapons does Russia have and should it be feared? (2022) *BBC*. Available online: https://www.bbc.com/russian/features-60565445

Klimentyev, Mikhail (2022) Is Vladimir Putin seriously ill? *THE WEEK STAFF*. Available online: https://www.theweek.co.uk/news/world-news/956120/is-vladimir-putin-ill

Mason, Clark, George Barros, and Kateryna Stepanenko (2022) Russian offensive campaign assessment. *ISW*. Available online: https://www.understandingwar.org/backgrounder/russian-offensive-campaign-assessment-april-28

Military Doctrine of the Russian Federation (2014) Approved by Decree of the President of Russia on December 25, No 2976. Government of the Russian Federation (GRF). Available online: https://docs.cntd.ru/document/420246589

Memorandum on security guarantees in connection with Ukraine's accession to the Treaty on the Non-Proliferation of Nuclear Weapons (1994) Verkhovna Rada of Ukraine of December 05, No 998_158. Available online: https://zakon.rada.gov.ua/laws/show/998_158#Text

Musk, Elon (2020) WHY MARS? Mars & Beyond. The Road to Making Humanity Multiplanetary. *SpaceX*. https://www.spacex.com/human-spaceflight/mars

New mass burial in Kyiv region (2022) *Ukrinform*. Available online: https://www.ukrinform.ua/rubric-regions/3455441-nove-masove-pohovanna-na-kiivsini-ssa-dopomozut-zadokumentuvati-voenni-zlocini-rosii.html

Piddubny, Mykola (2022) Putin's game is dangerous. How does tactical nuclear weapons differ from strategic ones and is Russia ready to use them? *NV*. Available online: https://nv.ua/ukr/world/geopolitics/yaderna-zbroya-rosiji-taktichne-ta-strategichne-ozbroyennya-chi-putin-zastosuye-boyegolovki-50229687.html

Piontkovsky, Andrey (2022) About the collapse of Putin's nuclear blackmail, lend-lease and the decisive words of Lloyd Austin. Youtube. Available online: https://www.youtube.com/watch?v=387Z6LmKsiY [in Russian]

Rogozin called the nuclear shield a guarantee of Russia's security (2022). *INTERFAX*. Available online: http://interfax.az/view/862656

Russia's invasion of Ukraine (2022) *DW*. Available online: https://www.dw.com/en/russias-invasion-of-ukraine/t-60931789

Rustamzade, Agil (2022) The Russian army has exhausted itself. *Radio Maria of Ukraine*. Youtube. Available online: https://www.youtube.com/watch?v=9gQAl7Rsbac

Shepelin, Elijah (2014) Russia has threatened to turn the United States into "radioactive ash." *REPUBLIC*. Available online: https://republic.ru/posts/39009

Shvets, Yuri (2022) US official position: Putin cannot win the war against Ukraine. Youtube. Available online: https://www.youtube.com/watch?v=wB391jDeOBY

Secretary of Defense Lloyd J. Austin III Holds a News Conference Following Ukraine Defense Consultative Group Meeting, Ramstein Air Base, Germany (2022) Transcript. An official website of the United States Government. Available online: https://www.defense.gov/News/Transcripts/Transcript/Article/3011263/secretary-of-defense-lloyd-j-austin-iii-holds-a-news-conference-following-ukrai/

Stan, Vitsky (2021) Einstein Theory of Special Relativity. *Space*.com. Available online: https://www.space.com/36273-theory-special-relativity.html

The head of the CIA warned of the risk of a nuclear strike by Russia due to failures in the war against Ukraine (2022) BBC. Available online: https://www.bbc.com/russian/news-61102546

The latest high-precision Russian X-101 missiles are equipped with electronics from the 1960s (2022) *MixNews*. Youtube. Available online: https://www.youtube.com/watch?v=KjqtxamNqLQ

The UN General Assembly demanded that Russia "immediately" withdraw its troops from Ukraine (2022) *UN*. Available online: https://news.un.org/ru/story/2022/03/1419092

Vasiliev, Vladimir (2021) Russia's nuclear shield is being improved at an accelerated pace. Available online: https://regnum.ru/news/polit/3462661.html

Vyatrovich, Vladimir (2022) Vote in the US Congress on the bill About Lend-Lease Act to protect democracy in Ukraine draws on historical parallels. *Ukrinform*. Available online: https://www.ukrinform.ua/rubric-ato/3462494-ukraina-skoristaetsa-iz-lendlizu.html

Yizak, Alex (2022) Russia's nuclear blackmail: what Putin is ready for and what Ukraine needs to know. Available online: https://zn.ua/ukr/international/jadernij-shantazh-rosiji-do-choho-hotovij-putin-i-shcho-potribno-znati-ukrajini.html

Zhirokhov, Mikhail (2017) Rust and dust: what is the state of Russia's nuclear arsenal. *Mind*. Available online: https://mind.ua/ru/openmind/20175339-rzhavchina-i-pyl-v-kakom-sostoyanii-yadernyj-arsenal-rossii

AUTHORS

Maksym Baryshnikov is a Research Fellow. Research interests are a theory of law and space law. She is the author of over 10 scientific papers. Currently, Baryshnikov is a graduate student of the Research Institute of Informatics and Law of the National Academy of Legal Sciences of Ukraine. Kyiv (Ukraine).
E-mail: maxlaw@bkb-law.com.ua
https//orcid.org/0000-0001-6592-8529

Viacheslav Boiko is a Ph.D. in Law, Research Fellow. Research interests are a theory of administrative law and space law. He is the author of over 50 scientific papers. Currently, Dr. Boiko a Doctor Student at the Scientific and Research Institute of Public Law. Kyiv (Ukraine)
E-mail: boikoviacheslav1@gmail.com
https://orcid.org/0000-0002-3505-4530

Iurii Buglak is a Doctor of Law, and Research Fellow. Research interests are a theory of administrative law and space law. He is the author of over 100 scientific papers. Currently, Dr. Buglak is a member of the Central Election Commission of Ukraine. Kyiv (Ukraine).
E-mail: buglack@gmail.com
https://orcid.org/0000-0002-0428-0121

Anna Danylenko is a Ph.D. in Law, Researcher at the Analysis Center of Air and Space Law. The sphereof scientific interests is an administrative policy in various spheres, the administrativełegal status of subjects of public administration, and global administrative law. She is the author of more than 15 scientific works. Kyiv (Ukraine).
E-mail: danilenko07@bigmir.net
https//orcid.org/0000-0001-8263-1364

Liudmyla Domuschi is a Research Fellow. Research interests are a theory of administrative law and space law. She is the author of over 10 scientific papers. She is the author of over 10 scientific papers. Currently, Domuschi is a graduate student at the Research Institute of Public Law. Kyiv (Ukraine).
E-mail: liudmyladomuschi@gmail.com
ORCID: 0000-0002-3264-2804

Valentyn Halunko is a Doctor of Law, Professor, and Academician of the Academy of Sciences of the Ukrainian Higher Education. Editor-in-Chief of the Scientific Law Journals "Advanced Space Law" and "Scientific Bulletin of Public and Private Law "President of Company "Science and Space." Currently, he is the founder and director of the Private Institution "Scientific Board of Scientific Institute of Maritime and Space Law." The

writer of over 120 scientific works.The sphere of scientific interests is space law, the theory of the State of economically active citizens, and administrative law. Kyiv (Ukraine).
E-mail:halunko@i.ua
https://orcid.org/0000-0003-1619-5028

Ihor Hlobenko is a Ph.D. in Law. Senior Researcher Scientific Institute of Maritime and Space Law. The sphereof scientific interests is an administrative policy in various spheres, the administrative-legal status of subjects of public administration, and global administrative law. He is the author of more than 15 scientific works. Kherson (Ukraine)
E-mail: globenko@ukr.net
https://orcid.org/0000-0002-3058-521X

Anna Hurova is a Ph.D. in Law, and Research Fellow. Research interests are space law, legal regulation of space debris mitigation, space security, and cyber security of space activity. She is the author of over 50 scientific papers, a member of IISL and MVA, and an invited researcher at CRIDEAU and UNIDROIT. Currently, Dr. Hurova is a research fellow at the department of environmental law, land law, agricultural law and space law of Koretsky Institute of State and Law of NAS of Ukraine. Kyiv (Ukraine) E-mail: a.m.hurova@gmail.com
https://orcid.org/0000-0003-4134-761X

Inessa Kostenko is a Ph.D. in Law, Associate Professor. Sphere of science interests: administrative policy in various spheres, the administrative-legal status of subjects of public administration, European administrative law. She is the author of more than 40 scientific works. Currently the Fellow at the Center for European Love and Internationalization (CELE) and Leicester Love Shul. Leicester (United Kingdom)
E-mail: inessakostenko2014@gmail.com
https//orcid.org/0000-0002-8784-5422

Anelia Kudin is a Research Fellow. Research interests are a theory of law and space law. She is the author of over 10 scientific papers. Currently, Kudin is a graduate student at the National University of Life and Environmental Sciences. Kyiv (Ukraine).
E-mail: aneliakudin@gmail.com
https//orcid.org/0000-0002-5236-3140

Alexander Krupytskyi is a Research Fellow. Research interests are the theory of administrative law and space law. He is the author of over 10 scientific papers. Currently, Krupytskyi is a graduate student for the Research Institute of Public Law. Kyiv (Ukraine)
E-mail: alexanderkrupytskyi@gmail.com
https//orcid.org/0000-0003-0578-5372

Diana Levchenko is a Ph.D. in Law, Researcher Information Analysis Center for Aerospace Law. The sphereof scientific interests is an administrative policy in various spheres, the administrative-legal status of subjects of public administration, and global administrative law. She is the author of more than 15 scientific works. Kyiv (Ukraine).

E-mail: diana.levchenko5@gmail.com
https//orcid.org/0000-0001-8343-2260

Alexander Levenko is an engineer, director of the Ukrainian office Research Institute of Space Industrialization (ISI), Dnipro, Ukraine; co-founder, chief constructor Spanish-Ukrainian Aerospace Team (SUAT), Madrid, Spain; and co-founder, the chief constructor of the Science & Space LLC, Kyiv, Ukraine. He is the author of 100 scientific and technical publications, 45 books and monographs, 11 patents of Ukraine, and 3 inventions of the USSR. The scientific interests are rocket and space research, and administrative law. Dnipro (Ukraine).
E-mail: alexander.levenko@gmail.com
https://orcid.org/0000-0002-1894-8372

Olena Mkhmurova-Dyshliuk is a Ph.D. in Law, Research Fellow. Research interests are a theory of administrative law and space law. She is the author of over 80 scientific papers. Currently, Dr. Mkhmurova-Dyshliuk a Doctor Student at the Scientific and Research Institute of Public Law. Kyiv (Ukraine)
E-mail: mdl_1986@ukr.net
https://orcid/org/0000-0002-0969-8797

Vitaliy Oksin is a Doctor of Law, and Senior Researcher. Sphere of science interests: administrative policy in various spheres, the administrative-legal status of subjects of public administration, European administrative law, counteracting corruption. He is the author of more than 50 scientific works. Currently, he works a Professor in the Department of Law and Social Work, Izmail State Humanitarian University. Izmail (Ukraine).
E-mail: 6222410@ukr.net
https://orcid.org/0000-0001-6080-7752

Oleksandr Ovcharenko is a Researcher. Research interests are space law, legal regulation of space activities, and space security. He is the author of several scientific publications. He was a practicing attorney. Currently is a research fellow at the Scientific-Research Institute of Public Law. Kyiv (Ukraine).
E-mail: turnthesun1@gmail.com
https://orcid.org/0000-0002-8197-8021

Yevgen Rokytskyi is a Ph.D., Research Fellow. Research interests are space law, legal regulation of space debris mitigation, space security, and cyber security of space activity. He is the author of over 25 scientific papers, 5 academic courses and 2 textbooks. He was an associate professor at European Humanities University (the EU) and National Aviation University (Ukraine). Currently, Dr. Rokytskyi is a research fellow at the Scientific-Research Institute of Public Law. Kyiv (Ukraine).
E-mail: tristar.ua@gmail.com
https://orcid.org/0000-0002-4832-0754

Maksym Sokiran is a Ph.D. in Law, and a candidate for a doctor's degree in Scientific and Research Institute of Public Law. The major research interests include space law, ad-

ministrative policy in various spheres, the administrative and legal status of subjects of public administration, and European administrative law. He has written over 30 scientific works. Kyiv (Ukraine).
E-mail: maxim.sokiran@gmail.com
https://orcid.org/0000-0002-1682-2012

Larysa Soroka is a Doctor of Law, Professor. Sphere of science interests: space law, administrative policy in various spheres, the administrative and legal status of subjects of public administration, European administrative law. She is the author of more than 80 scientific works. Currently, she works as the Deputy Director of Research at the Scientific Institute of Public Law. Kyiv (Ukraine).
E-mail: lsoroka_kw@ukr.net
https://orcid.org/0000-0002-6979-6049

Artem Zubko is a Ph.D. in Law, Doctoral Student, the Scientific Institute of Public Law. Researcher Information Analysis Center for Aerospace Law. The sphere of scientific interests is an administrative policy in various spheres, the administrative-legal status of subjects of public administration, and global administrative law. He is the author of more than 25 scientific works. Kyiv (Ukraine).
E-mail: Zubko18@gmail.com
https://orcid.org/0000-0003-2025-0202

Oksana Zubko is a Ph.D. in Law, Doctoral Student at the Scientific Institute of Public Law. The sphere of scientific interests is an administrative policy in various spheres, the administrative-legal status of subjects of public administration, and global administrative law. She is the author of more than 15 scientific works. Kyiv (Ukraine).
E-mail: oksanazubko2018@gmail.com
https://orcid.org/0000-0003-4682-6468

Oleksandr Zubov is a Ph.D., Research Fellow. Research interests are a theory of administrative law and space law. He is the author of over 70 scientific papers. Currently a Doctor Student of the Scientific and Research Institute of Public Law. Kyiv (Ukraine).
E-mail: olstava@ukr.net

Information for Authors

- ✓ The articles that are submitted to the *Advanced Space Law* follow a double blind peer-review procedure.
- ✓ Submitted papers must be clearly written in English. The mixture of American and British usage of English is not allowed whereas the both usages of English are accepted.

- ✓ The preferred mode of submission is as MS Word (.doc, docx) by email attachment to info@asljournal.org
- ✓ The target length for an article is 5,000-7,000 words. If your article is longer than this, please contact the editorial office.
- ✓ The style (e.g. fonts, font size, spaces, margins, etc.) is adjusted by editors.

- ✓ It is suggested that figures, tables and formulae should be displayed with features of your software package (e.g. MS Word tools).
- ✓ The list of References (Bibliography) should appear at the end of the main text, and be listed in alphabetical order by author's name.
- ✓ References to publications within the text should be as follows: [Zsizsek, 2002: 26],

  [Encyclopaedia of Philosophy, 1983: 220], [Zsizsek, 2008a: 26], [Zsizsek, 2008b: 75]. There must be a strict one-to-one correspondence between the names and years in the text and those in the list of references.

- ✓ Footnotes should be kept to a minimum and indicated by consecutive superscript numbers.
- ✓ Information about the author should include: author name, honorary or other degree(s) (if any); affiliation. Provide also the full postal address, including the country name, e-mail address and, if available, phone numbers (with country and area code). Contact details must be kept up to date by the corresponding author.

- ✓ The abstract should state briefly the purpose of the research, the principal results and major conclusions. The abstract should not be less than 250 words.
- ✓ The abstract should also contain a short list of carefully chosen Keywords or content indicators (5-10 words).
- ✓ Acceptance of manuscripts is based on originality and importance to the field as assessed by the Editors. Manuscripts are reviewed by the Editorial Board with ad hoc assistance of external reviewers (blind peer review). Publication decisions are made by the Editorial Board. Based on editorial judgment, some submissions are rejected initially without external review.

Review procedure

Advanced Space Law considers for publication the articles on conditions that the articles are your own original works and are not copies of any other previously published works, including your own previously published work. The article has been given only for *Advanced Space Law*. The article should not be under consideration or peer-review or accepted for publication elsewhere.
All articles should be presented in accordance with the journal's publication guidelines. Articles not adhering strictly to journal guidelines will be returned to authors without scientific evaluation within a month. Submitted articles adhering to the journal's guidelines are reviewed by the Chief Editor or the Editor, who will assign them to reviewers. The articles that are published in *Advanced Space Law* follow a double blind reviewing procedure.

The article does not contain anything that is disrespectful, demeaning, libellous, obscene, fraudulent, or illegal. The use of general descriptive names, trade names, trademarks, and so forth in the publication, even if not specifically identified, does not imply that these names are not protected by the relevant laws and regulations.

Please note that *Advanced Space Law* uses text-matching software UNPLAG and some web-services to check your articles for plagiarism. By submitting your articles to the journal, you agree that your articles are checked for originality and have to undergo the peer-review and publication procedures. If the reviewers suspect plagiarism, fabricated data, conflict of interest, redundant (duplicate) publication etc., they follow the COPE Flowcharts for resolving such cases.

We aim to complete the review process, from submission date to decision date, within ten weeks. If this process takes longer than the given period, the authors will be informed additionally about the reasons of the timeline changes. The Chief Editor prepares a decision letter according to the reviewers' comments, which is sent to the author of article. If necessary, the author should edit your article according to the reviewers' recommendations within two weeks.

Advanced Space Law, **Volume 9, 2022**

Academic Journal

Advanced Space Law, **Том 9, 2022**

Науковий журнал

Коректура — Лариса Сорока
Комп'ютерне верстання — Неля Панченко
Макет обкладинки — Неля Панченко