DOI https://doi.org/10.30525/978-9934-26-223-4-23

SPACE INDUSTRY IN THE CONDITIONS OF RUSSIA'S FULL-SCALE INVASION IN UKRAINE

Koshova S. P.

Introduction. The current situation in relations between Russia and Ukraine is unprecedented in the recent history of the two countries, this is a real tragedy with a delayed and unpredictable finale. Since February 2014, the "hybrid" (including economic, energy, ideological, information) war of the Russian Federation against Ukraine has been going on. As a result of Russian aggression, the legal framework of bilateral relations was destroyed, the institutional mechanisms of interstate relations were destroyed, political-diplomatic relations are confrontational and carried out exclusively in a multilateral format.

The Minsk agreements did not stop the conflict in the east of Ukraine. Moscow continues military expansion in the Donbass, uses all available levers to destabilize the situation in Ukraine, the destruction of its statehood. Unfortunately, not now there is no reason to believe that the Kremlin's policy will change for the better in the near future.

One of the most important global factors today is space, the success of which is in fact an indicator of gaining world leadership and subsequent strategic dominance in the twenty first century.

An important segment of the Space Industry is the high-tech market. Each country's space industry is one of the most competitive, as it includes a significant number of high-tech companies representing the country in the global high-tech market.

Problem statement and its relation to important scientific or practical tasks. This article is devoted to forming a fundamentally new understanding of Global security. Space security issues demand the need for joint agreements of all participants in world politics and International relations to develop relevant accepted legal norms and principles.

From its origins in the middle of the last century, the 'space age' has grown in importance and significance. Space has become an important resource and its development an imperative condition for sustainable development and survival of Mankind.

Simultaneously, from the first steps of man in space exploration, this diverse activity has acquired global significance, the consequences of which are of interest to the security and wellbeing of the world.

However, during this period both the structure of International relations in space and in general are subject to significant transformation due to the influence of regional, International and global nature.

Opportunities to ensure National security, to promote scientific and technological development and socio-economic progress are provided by our aerospace industry, therefore successful participation in space exploration is of strategic importance.

Supremacy in space, by any country, means no only exclusive dominance of space but also of the planet.

For example, the US National Space Policy states, "In the new century, prosperity and security will be more accessible to those who use space effectively, and they will have a significant advantage over those who do not."

A similar awareness of the role of aerospace technology has taken place at the political level in other countries.

Thus, if at the dawn of the space age the struggle for leadership in space was only between the USSR and the USA, now more than 120 countries, some of which already have their own national space programs, to some extent participate in space activities and their number is constantly growing. It is also characteristic that the efficiency of the use of outer space in the commercial plan increases, for example, in the world markets of space vehicles, information technologies.

This attracts not only new states to the space industry, but also private assets with their investment mobility.

Identification of previously unresolved matters of the generic problem the article deals with. The increase in the number of participants in space activities, in turn, leads to the emergence of new problems and threats in this area, both the space security of each state individually and global security as a whole.

These include, for example, the lag of the process of creating norms of international law from the modern development of space activities, the threat of weapons in space, its pollution, and others.

Thus, the need for a comprehensive, more detailed study of changes in general political processes under the influence of space security is of paramount importance in the 21st century, which led to the relevance of the chosen topic.

The growing importance of space technology is a factor that reduces the importance of traditional factors that previously determined the success of economic and social development in countries with increasing competition between countries and corporations.

Space systems have already become an integral part of the new information and cognitively determined technological structure to which the transition is tak-

ing place in developed countries and to which the new industrialized countries are striving. Linking the model of sustainable development to a clearly defined strategy of space activities is a natural step for countries to form a paradigm of gaining global (global) economic, political, military, scientific, energy leadership and through it to dominate important world-forming areas.

The market of space technologies is rapidly developing. Participation in the supply of products and services is an important component of scientific and technological development of any country. Implementation of basic space research programs will meet the information needs of scientific schools in the interests of forecasting and operational monitoring of "Space Weather", continue to study the planet and their satellites, expand knowledge about the Earth and the processes occurring on it.

Despite significant achievements and great potential for development, space activities are, currently increasingly losing in effectiveness to other areas. The reasons for this are some of its features, including problems and limitations due to the properties of space projects and technologies.

Most of the countries that are actively involved in space activities have unresolved national and socio-economic problems, but these countries are allocating significant budget funds to space activities. This shows that for them the space industry is a source of technological and scientific progress, as well as a key factor in ensuring national security.

Therefore, further development and use of outer space, is, objectively, connected and depends on the development of civilization.

At present, the topical and timely issue in Ukraine is to ensure the sustainable development of the space industry, which is an important strategic sector for national security and occupies a key place in the economy of each country. Achievements of the state's leading positions in the international space technology market and in the development of outer space are, facilitated by achievements in space activities.

Leading space technology is a guarantor of technological, military, scientific, political and economic benefits, as well as a means of communication and navigation, environmental protection and climate change monitoring.

'Space Technology' undoubtedly, ensures and increases the efficiency of state intelligence. Therefore, investment in the development of the domestic space sector is extremely important and relevant, as this high-tech segment is able to provide prerequisites for long-term strategic growth and technological leadership, especially in the post-war period.

Analysis of recent researches and publications, which have initiated problem solution, the author relies on. The work of domestic scientists, in particular, Yu. Alekseev, M. Bendikova, V. Gorbulin, O. Degtyareva, O. Dzhur, S. Koshova, N. Meshko, V. Prysyazhny, I. Sazonets, O. Safin, A. Cherkasov and others is devoted to the problematic issues of formation and implementation of, the, space industry development strategy in Ukraine.

However taking into account the views of these authors it should be, noted, that in Ukraine there is a significant number of unresolved issues in the development of the domestic space industry as a factor in state security, which determines the relevance of the topic and requires further research and systematization.

Goal statement. The aim of the article is to study the development of the domestic space industry as an effective tool for sustainable development of the state in the postwar period.

Materials and methods: In the work a range of methods are used: content analysis, biblio-semantic, systematic approach, analysis of products of activity, psycho-diagnostic methods.

Presentation of research material with full justification of results. The active development of the space market currently covers almost all countries of the world. In particular, the entry into space activities of new countries and the development of new space programs contribute to stimulating the development of this industry, increasing its commercial potential, opening new areas of implementation of space technologies.

The prestige of the state and its power determines its participation in space activities. The main problem of development of this industry is the infinite need for significant investment, because it requires significant capital, as well as a certain level of technological development of the country.

This, in turn, complicates the entry of underdeveloped countries into the market of space goods and services, while highly developed countries are still in their development[1]. Historically, space activities arose and developed in order to solve major national problems, mainly in conditions of full financial, organizational and administrative responsibility and support of the state.

In the area of International peace and security, the issue of preventing the arms race from spreading into outer space and, more broadly, preventing the use of space for any hostile action is of particular importance.

The Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space, held from, 9 to 21 August 1982 in Vienna, stated in its concluding report: "Preservation of peace and security in outer space is of great importance for international peace and security. Prevention of arms race and hostilities in outer space is one of the main conditions for the development and continuation of international coopera-

[1] Нямещук Г. В. Особливості трансформації економічного потенціалу підприємств космічної галузі України при здійсненні міжнародного науково-технічного співробітництва. *Вісник Дніпропетровського університету*. 2011. № 10/2. С. 63–70.

tion in the field of research and use of outer space for peaceful purposes"[2].

The Soviet Union, who paved the first space routes in 1957, consistently and invariably advocated its use only in the interests of peace and scientific and technological progress.

One of the factors contributing to the prevention of the use of space not for the peaceful coexistence of countries is modern international space law. A set of international principles and norms governing the legal regime of outer space and celestial bodies, establishing the rights and responsibilities of states (Countries) in the process of exploration and use of space.

Much of the credit for the formation and progressive development of this new branch of international law belongs to international legal science. Soviet international legal science went hand in hand with diplomacy. Such Soviet lawyers as EG Vasilevskaya, VS Vereshchetin, GP Zhukov, GP Zadorozhny, and E.P. Kamyanets'ka, FN Kovalyov, EA Korovin, GA Osnytska, AS Piradov, II Cheprov, and others[3].

Today, there is every reason to believe that space serves people. Space activities are not limited to scientific studies of the Earth's environment, planets and interplanetary space. Space technology is widely used to solve practical economic problems. Telephone and telegraph communication via satellites is becoming more reliable and cheaper. The use of navigation satellites by the International Maritime Satellite Organization (INMARSAT) can significantly increase the economic impact of the operation of ships and contributes to the safety of navigation. Remote sensing of the Earth and its environment from satellites provides an opportunity to obtain information needed by geologists, meteorologists, cartographers, specialists in agriculture and forestry, etc.

In 1961, a citizen of the USSR Yuri Gagarin made the first manned space orbit of Earth. In 1975, the USSR and the USA carried out a joint experimental flight of the Soyuz and Apollo spacecraft, ensuring that they docked in orbit and that the astronauts visited both ships. In 1982, a joint Soviet-French flight took place at the Salyut-7 scientific orbital station.

Today, multi-month, manned flights of large orbital complexes, during which fundamental scientific and practical problems are solved have become commonplace. There is also such a thing as an international space crew. More than ten International expeditions have already boarded spacecraft and stations under the Intercosmos program with the participation of astronauts from Czechoslovakia, Poland, the GDR, Bulgaria, Hungary, Vietnam, Cuba, Mongolia and Romania.

The Moon, Mars, Venus and other planets of the solar system are, systematically studied with the help of space technology. Hundreds of countries around the world enjoy the practical results of astronautics. We can say that astronautics is truly global[4].

The Soviet Union has made a significant contribution to the development of cooperation between states in the study and use of outer space, including within the UN and other international organizations. He was the initiator of the creation of the international space organization "Intersatellite", became the first country to launch a satellite in the international experiment COSPAS – SARSAT, designed to early detect and pinpoint the location of ships and aircraft in distress.

The USSR actively participated in the activities of INMARSAT, regularly held seminars for specialists from developing countries under the UN Space Technology Program, launched satellites from a number of countries (India, Sweden, etc.) from its spaceports, and transmitted data from the World Meteorological Organization. Their meteorological satellites, exchanged with many countries scientific information obtained in the process of studying outer space and celestial bodies.

The Soviet Union played a leading role in the development of International space law, designed to ensure the development of space in accordance with generally accepted principles of relations between states, were also at the root of preventing the use of space technology to the detriment of all peoples.

Advocating for peaceful space, so that the sky always remained clear, the USSR submitted to the United Nations (U.N) in 1976 a proposal for a World Treaty on the Non-Use of Force in International Relations, promoted the extension of this principle to space, and in 1981 a draft Treaty on Prohibition placement in space of weapons of any kind. At a meeting with voters in the Kuibyshev constituency of Moscow on March 2, 1984, General Secretary of the CPSU Central Committee KU Chernenko reaffirmed that the Soviet Union had long proposed an agreement to renounce the militarization of space.

Struggling to preserve peace and expand interstate cooperation, the CPSU, the Soviet government tried to care for the fate of all Mankind.

In the process of evolution of astronautics, the urgency of such tasks as:

• Reducing the cost of space programs;

• Use of space systems to solve applied problems of public problems;

• Implementation of space industry results in other industries;

• Providing access to space technology for all stakeholders and individuals.

[2] Док. ООН A/C0NF.101/10. P. 7. https://undocs.org/pdf?symbol=ru/A/48/305

[3] Пирадов А. За мирное использование космоса. *Международная жизнь*. 1983. № 6. С. 39–46.

[4] Док. ООН A/5109 и Corr.l; A/AC.105/PV./12. https://undocs.org/pdf?symbol=ru/A/9001(SUPP)

For a long time, the openness of space activities and the availability of space technology was, objectively hampered by a number of factors, the most important of which was the involvement of astronautics in solving national defense problems. Other deterrents include:

• High cost of life cycle of space systems, including their development;

• Increased level of risk in the long term of space projects, their complexity and uniqueness, the need for high concentration of technological and intellectual resources, high complexity.

However, in the mid-1960s, the world began to commercialize space activities, first in the field of satellite communications and meteorology, and later supplemented by services to launch payloads.

There is a steady trend towards increasing the importance of the benefits of space services. The most important reasons for the growing interest in services and goods of the 'Space Market', can be considered:

• Information of all aspects of modern society;

• Globalization of the world economy;

• Growing environmental problems;

• Development of international contracts, transport, tourism, etc.

In fig. 1 shows the key areas of world space activities.

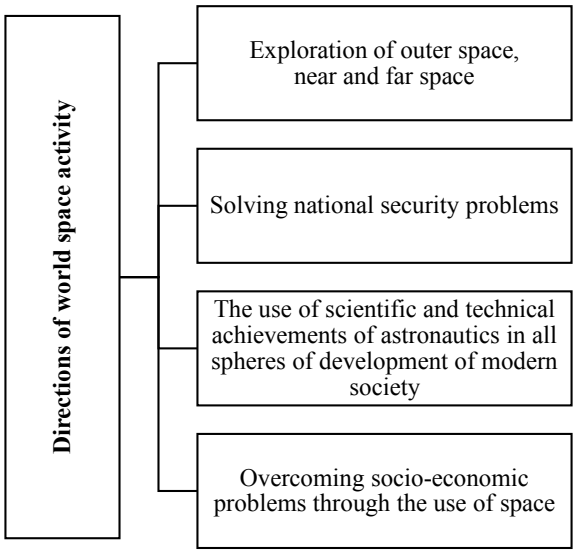

Fig. 1. Areas of world space activities

Source: [5]

One of the areas of development of the space industry is what most countries are currently doing, the creation of "clouds", a group of small spacecraft that fly low enough (at an altitude of 300-400 km) and create a network for the Internet. This is the world's open Internet, which can be, used by, everyone, regardless of location. There are a number of satellites, regulating this process. Quite a large number of satellites launched by OneWeb (UK), Elon Musk has launched about 90 small spacecraft that should perform such functions. Experts predict that in four to five years, countries will somehow use this "cloud" of satellites to provide various services to the population, including the Internet.

Currently the 'Internet' is, provided, through stations located on Earth, but, with the transition to the space industry, this issue is becoming more global. Businesses will access the Internet through wireless technology, eliminating the need to build stations. This, in turn, will have a positive impact on the environment. The same satellite systems can be, used to transmit television signals, meteorological data, etc.

An important component of Europe's economy is the space industry, which employs more than 200,000 professionals and has an annual turnover of more than € 45 billion, with EU investment exceeding € 15 billion over the last 5 years.

The European Union's space industry includes 'world-class' space systems developed as part of the Copernicus and Galileo programs [6].

New promising environmental space technologies and projects in Europe include:

• New rocket technologies: new fuel (non-toxic, nano-fuel), new engines and launch vehicles;

• Technologies of minimization, processing of waste, garbage, cleaning of the environment;

• Non-reactive, non-rocket flight technologies, space travel on new physical principles, in the future – based on gravitational, quantum and other effects;

• Silent aircraft;

• Clean full life cycle of space technology and activities;

• Fundamentally new technologies to ensure the livelihood and safety of people in space;

• Solar space power plants, etc.[7]

Successful implementation of these space exploration projects is possible only with the transition to a new technological system, fundamentally new efficient and clean technologies.

In the leading space powers, the space industry has a rather complex structure and belongs to the highest state priority.

This approach to the classification of space activities, is shown in Fig. 2.

Ukraine's space industry is one of the leading and most competitive in the domestic economy, it concentrates a number of high-tech enterprises that worthily represent Ukraine in the world market.

The space services market has prospects in terms of breakthrough technologies and innovations that will increase production efficiency. However, the lack of

[5] Нямещук Г. В. Особливості трансформації економічного потенціалу підприємств космічної галузі України при здійснені міжнародного науково-технічного співробітництва. *Вісник Дніпропетровського університету*. 2011. № 10/2. С. 63–70.

[6] European Space Policy Institute (2022). URL: https://espi.or.at/publications/espi-public-reports

[7] The European Space Agency (2022). URL: https://www.esa.int

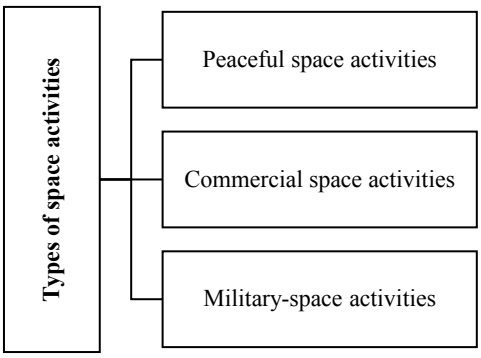

Fig. 2. Classification of space activities

Source: [8]

renewal of material and technical base, suspended the introduction of new technologies, severe underfunding of the industry, loss of highly qualified personnel, led to the fact that every second enterprise in the space industry became unprofitable, material base – worn out and does not meet modern production needs.

It should, be noted that the space industry is capital-intensive, with low payback periods for new projects, which creates certain problems in its financing. As for Ukraine's space programs, due to their unsatisfactory funding over the past five years (less than 30% of the planned), they can be called space development programs rather than development programs.

The rocket and space industry occupies a special place among the strategic science-intensive industries of Ukraine. It forms the image of Ukraine on the world stage as a technologically advanced state, which has in its arsenal the intellectual potential inaccessible to many countries. Ukraine is a member of the club of space powers of the world, which includes no more than 10 countries, including the United States, Japan, China, Russia and European Union (E.U) countries, Israel, India, Iran, Kazakhstan and others.

The issues of choosing the directions of co-operation between Ukraine and other states, but also the tasks of development of international activities of the Ukrainian rocket and space industry in a broader sense, implementation of international legal programs, improvement of theoretical concepts and modern international space law on legal support of air delimitation are relevant to outer space[9].

Today, the rocket and space industry of Ukraine faces two priority state tasks.

1.Creation and implementation of space and rocket and space projects in accordance with the "National Targeted Scientific and Technical Space Program of Ukraine", aimed at solving economic problems and increasing economic benefits from space products (satellite information received from national Earth observation devices, satellite communications, telecommunications, navigation services, research and experiments)

2. Creation of modern missile weapons for the needs of the Armed Forces of Ukraine with a focus on ensuring the return on public investment through possible subsequent exports[10].

Solving these problems, given the chronic lack of budgeted funds and forecast data on the economic development of the state in the near and future with the traditional approach is quite problematic.

A possible way out of this situation is to expand international commercial co-operation of organizations and enterprises in the industry with foreign companies. This approach, firstly, corresponds to the adopted foreign policy (in accordance with the new National Security Strategy of Ukraine, (Paragraph 4.2.2) and the new Military Doctrine of Ukraine, Chapter 4, paragraph 23, paragraph 8, where one of the priority areas of state training in defence "… Creation of high-tech military and dual-use products, taking into account the need to ensure a rational balance between international cooperation, arms exports and the state defence order…")[11].

Secondly, the expansion of international co-operation will reduce the budget burden on the country in the implementation of domestic and international projects. Experience in creating rocket and space complexes in international cooperation.

Given the global trends in the development of the rocket and space sector and the limited capacity of the state budget of Ukraine, it is advisable to take the following measures to intensify the international activities of the industry and increase its competitiveness.

The basis of Ukraine's state policy in the field of rocket and space activities should be the expansion of international co-operation with the world's leading space and rocket companies and the implementation of priority economically viable national projects within possible financial support.

Provide modernization of the existing and preparation and creation of a new technological, experimental-industrial and production base of the industry. Ensure timely receipt of funds provided by the state budget, prevention of reduction of real funding, as well as continuity of funding, eliminating the practice of receiving funds at the end of the year.

Provide state support for the implementation of international space and space projects by providing state guarantees for the necessary investments. Provide an increase in government orders to higher specialized educational institutions in the field of rocket and space.

[8] Атаманенко Б. А., Федонюк Р. В. Міжнародне співробітництво як інструмент участі в глобальних космічних проектах. *Космічна наука і технологія*. 2014. № 3. С. 3–13

[9] Горбулін В.П. Майбутнє країни – в руках інженерів *Газета "2000"* [Электронный ресурс]. 2017. № 49 (845). С. 6-7. Режим доступу: https:/ /www.2000.ua/modules/pages/files/ 49845F8F14FdekabrjaF2017Fg_723005_1.pdf

[10] Закон України про космічну діяльність 5 грудня 1996 року зі змінами та доповненнями. *Верховна рада України.* Офіц. вид. Київ: Парламентське видавництво.1996. № 503/ 96ВР. 249 с.

[11] Там само.

In today's space industry, a key trend is the interest of state defence structures in participating in commercial projects to launch groups of satellites, because they are ideal for the implementation of space priorities of the state. Thus, the Cabinet of Ministers of Ukraine in 2019 approved the Law of Ukraine "On Amendments to Certain Laws of Ukraine on State Regulation of Space Activities", which provides state support for the commercialization of space activities and which determines that the subjects of space activities can be enterprises any organizational and legal forms of ownership[12].

This will improve the investment attractiveness of the space industry and create a competitive environment. The presence of private business in the space sector can make it easier for the state to fulfill the tasks of strategic planning of space activities. Some of the tasks in space the state can delegate to private business, especially those related to the area of already explored space near the Earth.

As a result, the state will be able to focus its activities on solving more complex, tasks such as, space research, design of fundamentally new spacecraft, and others.

Secondly, the tasks of space activities will not, be undertaken at the expense of taxes collected from the population, but at the expense of the assets of entrepreneurs.

In addition, public budget resources, placed in private firms through orders will be, returned to circulation, contributing to the further development in the country of such areas as private astronautics[13].

The presence of private business in one of the space segments can stimulate the development of related segments of space activities, and like the domino effect creates favorable conditions for the emergence of private initiative.

Military-space activity means activity related to access to space in the interests of defense and military security of the state[14].

The key areas of military and space activities, are shown in Fig. 3.

The beginning of domestic space activities began on February 29, 1992, when President of Ukraine L. Kravchuk signed a decree establishing the National Space Agency of Ukraine, which in 2010 was renamed the State Space Agency of Ukraine[15], which was, given the status of central executive body. Currently, Ukraine is a member of the "club of space powers", which includes 13 countries.

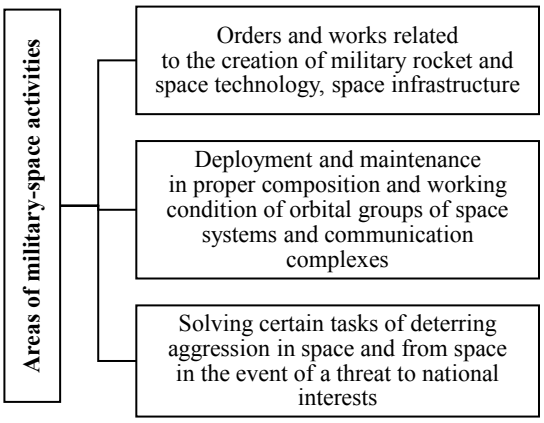

Fig. 3. Areas of military-space activities
Source: [16]

Regulatory regulation of the space industry of Ukraine at the national level is carried out in accordance with the Law of Ukraine "On Space Activities" and the Law of Ukraine "On State Support of Space Activities", as well as resolutions of the Cabinet of Ministers and decrees of the President of Ukraine.

In particular, the Law of Ukraine "On Space Activities"[17] defines the terminology and basic concepts of the space industry. According to the law, space activities are scientific space research, use of outer space, development, production, repair and maintenance of space objects (including their units and components), as well as their testing, operation, provision and management launch and return of spacecraft, their components from outer space to earth.

According to the Law № 502/96-ВР[18] "Space activities, scientific space research, creation and application of space technology, use of outer space". The objects of this activity include material objects that are, exploited both in outer space and on the Earth's surface, which means the development of terrestrial infrastructure.

This law also defines the areas of state regulation of the industry.

Legislative definition of the principles of operation, rules, regulations; development of public policy concepts in the interests of security, implementation of the target scientific and technical space program, financing, planning of the aerospace industry, activities of organizations of various forms of ownership, attracting various sources of funding, targeted training of labour resources from the state budget, licensing of space activities.

One of the main strategic documents is the Strategy

[12] Державне космічне агентство України (2021). URL: https://www.nkau.gov.ua/

[13] The Annual Compendium of Commercial Space Transportation (2018). URL: https://www.faa.gov/

[14] Атаманенко Б. А., Федонюк Р. В. Міжнародне співробітництво як інструмент участі в глобальних космічних проектах. *Космічна наука і технологія*. 2014. № 3. С. 3–13

[15] Державне космічне агентство України (2021). URL: https://www.nkau.gov.ua

[16] Атаманенко Б. А., Федонюк Р. В. Міжнародне співробітництво як інструмент участі в глобальних космічних проектах. *Космічна наука і технологія*. 2014. № 3. С. 3–13

[17] Про космічну діяльність [Електронний ресурс]: Закон України від 15.11.1996 р. № 502/96-ВР. URL : https://zakon.rada.gov.ua/laws/show/502/96-%D0%B2%D1%80#Text

[18] Про космічну діяльність Закон України від 15.11.1996 р. № 502/96-ВР. URL : https://zakon.rada.gov.ua/laws/show/502/96-%D0%B2%D1%80#Text

of space activities of Ukraine for the period up to 2022 (hereinafter the Strategy)[19].

The document identifies the main problems, including, the activities of enterprises based on the principles of the USSR,

Preservation of production traditions for more than 20 years due to international space projects, completion of previous models and modifications, slow pace of technology implementation, lack of cooperation between departments and ministries, private enterprises and research institutions, focus on state budget funding, state guarantees as a form credit.

Trends in the development of state regulatory mechanisms in 2014–2020 provide solutions to such problems, including the development of modern space systems for national security and defence, science and education, stimulating high-tech development, legislative changes and expanding economic ties (especially in 2017–2020), introduction of modern technologies of infrastructure analysis. In the context of national security, the integration of space technologies and information systems (remote sensing services for geographic information systems for various purposes, navigation and satellite systems) are, carried out[20].

The concept of implementation of state policy in the field of space activities for the period up to 2032[21] determines the main expected results of the development of state regulation in accordance with the Action Plan.

The development of space technology is a priority for national security and defense. The following measures have been, identified within this area[22]:

1. Ensuring systematic acquisition of data from the domestic space system of Earth observation and geophysical monitoring “SICH”, as well as foreign spacecraft (in the framework of joint international programs and agreements) with the space segment.

2. Establishment of a, National geo-information system and monitoring of emergencies as part of the European Global Monitoring for Environment and Security (GMES) and the Global Earth Survey (GEOSS) to create an internal market for space data, development and implementation of metrological technologies. Creation of regulatory framework, development of international co-operation and ensuring the operation of interested users of its information services.

3. Creation and operation of national digital satellite telecommunication infrastructure for delivery of national television and radio programs to terrestrial digital television and radio broadcasters of Ukraine using geostationary space communications and broadcasting "Lybid".

4. Creation of a system of coordinate-time and navigation support of Ukraine using information obtained from global navigation satellite systems of different countries (USA, Canada, EU countries, China).

5. Creation of an integrated multifunctional system of control and analysis of outer space with control of low-orbit space objects and support of their catalog.

6. Provision, at the request of state bodies exercising powers in the field of national security and defence. Provision of satellite communication and data retransmission services, co-ordinate time and navigation support, control and analysis of the space situation, guaranteed and prompt provision of information received from remote sensing satellites and technical support for the creation of modern technologies for its special use, creation of multifunctional technical means".

SCA implements state regulation of the space industry in accordance with the Law of Ukraine "On Principles of State Regulatory Policy in the Sphere of Economic Activity" (hereinafter – Law № 1160-IV) and other regulations on state regulatory policy for systematic, sustainable, consistent decision-making in in the field of state regulation, ensuring transparency, accountability and publicity of policy.

The structure of the domestic space industry includes about 40 companies-developers and independent research laboratories, strategically important of which are:

• SE "Design Bureau" South "them. M. K. Yangel”;

• SOE VO "Southern Machine-Building Plant named after OM Makarov".

The space complex of Ukraine includes:

• Launch vehicles;

• Spacecraft;

• Ground complexes[23].

The main tasks of the development of the domestic space sector are:

• Creation and implementation of state space policy;

• Finding ways to preserve and develop the space industry;

• Formation of the management structure of enterprises in the high-tech sector.

The problems of the space industry of Ukraine are systemic and related to the need to restore scientific, technical, technological potential, insufficient state support, for space activities, fierce, competition in the global space launch market, which forces providers of this type of services to seek cost reduction.

The strategic direction of the space industry of Ukraine is the creation and improvement of models of

[19] Про космічну діяльність Закон України від 15.11.1996 р. № 502/96-ВР. URL : https://zakon.rada.gov.ua/laws/show/502/96-%D0%B2%D1%80#Text

[20] Державне Космічне Агенство. Стратегія космічної діяльності України на період до 2022 року. URL: https://www.nkau.gov.ua/ua/activity/stratehiia-do-2022-roku

[21] Державне Космічне Агенство. Концепція реалізації державної політики усфері космічної діяльності на період до 2032 року. URL: https://www.nkau.gov.ua/ua/activity/kontseptsiia-do-2032-roku

[22] Там само.

[23] Державне космічне агентство України (2021). URL: https://www.nkau.gov.ua

rocket and space technology, to combine the latest technologies for the creation of space technology and reduce the budget burden with the help of commercial launch services.

In recent years, the domestic space industry has taken the vector of its development in International cooperation with the European Space Agency and NASA. Ukraine closely co-operates with many countries around the world (Fig. 4), concludes international agreements and participates in international space organizations.

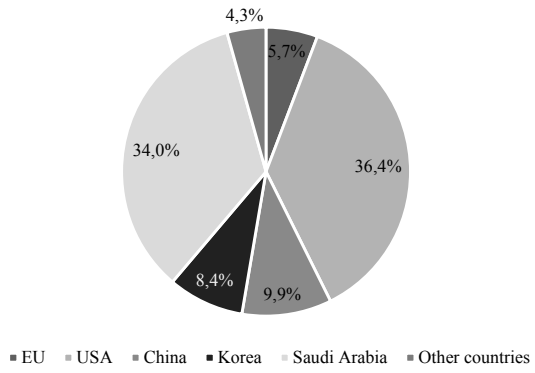

Fig. 4. Cooperation of Ukraine with the countries of the world in the field of export of products of the domestic space industry in 2020

Source: [24,25]

The Law of Ukraine "On Space Activities" states that space activities are carried out in accordance with the National Targeted Scientific and Technical Program of Ukraine, approved by the Verkhovna Rada of Ukraine for a period of five years. Five space programs adopted between 1993 and 2017 were unable to, be fully implemented, due to lack of financial support.

At the meeting of the Cabinet of Ministers of Ukraine in autumn 2021, the draft Law of Ukraine "On approval of the National Targeted Scientific and Technical Space Program of Ukraine for 2021–2025" was approved[26].

The first step in the implementation of the state space program was the launch into orbit in January 2022 of the Ukrainian satellite "Sich-2-30".

This satellite is part of the European satellite program for Earth observation Copernicus, with which Ukraine has an agreement and receives images from space free. Co-operation within the Copernicus program has already allowed the implementation of a thermal anomaly project in Ukraine to identify and prevent forest fires.

Since independence, Ukraine has created and launched seven spacecraft into orbit. Among them in 2007 was a successful commercial project – the satellite, EgyptSat-1 for Egypt. In 2014 and 2017, the Poly-ITAN-1 and PolyITAN-2-SAU nanosatellites, were launched, and are still operational.

On February 24, 2022, Russia launched a direct full-scale invasion of Ukraine, which directly affects the domestic space sector. Rocket attacks in the Dnipropetrovsk region have forced leading space companies to reduce their work capacity on projects.

Ukraine's space sector has grown in recent years, so after the war the Ukrainian government must create all possible conditions for the development of private space business. Experts are confident that after the end of the war, the domestic space industry will significantly strengthen ties with European partner countries. Ukraine's application to join the European Union should also contribute to this in the coming years.

A striking example of the recovery of economic sectors in the midst of a protracted military conflict is Israel, a country that has been able to build a modern, prosperous state in the desert. The main factors that allow Israel to be a prosperous country are the following:

• External and internal threats encourage the survival of the economy and become more efficient;

• Effective combination of security, education, science and business systems, which provides a breakthrough in defense technology and training of highly qualified specialists;

• High support for innovation by the state, because it is innovation that helps to have a strong economy and high-tech exports[27].

In previous years Ukraine, was, considered as a "strategic pause". As a period of new technological opportunities and ideas. However, the currently Ukraine, should, be considered, as a "strategic bifurcation zone", a radical revision of the main criteria for space activities and, at the same time the future of the space industry, which will largely determine the transition of the domestic economy to a qualitatively new state. The military component will also be of great importance in this.

In order to maintain the existing domestic technological and research base in the post-war period, Ukraine, must be, integrated into global space systems.

In particular, the space industry is currently manufacturing the Cyclone-4M rocket carrier for launch in 2023 from a spaceport located in Canada.

Given the current situation in Ukraine, it can, therefore be, concluded that it is necessary to form a comprehensive strategy for space activities as part of a deep structural modernization of the entire political, economic and military mechanism that carries out space activities or uses its results.

The development of private business in the domestic

[24] Державне космічне агентство України (2021). URL: https://www.nkau.gov.ua

[25] Державне космічне агентство України (2021). Підсумковий звіт про результати реалізації Загальнодержавної цільової науково-технічної програми України на 2013–2017. URL: www.nkau.gov.ua

[26] Державне космічне агентство України (2021). URL: https://www.nkau.gov.ua

[27] Атаманенко Б. А., Федонюк Р. В. Міжнародне співробітництво як інструмент участі в глобальних космічних проектах. *Космічна наука і технологія*. 2014. № 3. С. 3–13.

space industry will be able to play a significant role in resolving the systemic crisis of the post-war period in this area. After all, private companies are really turning space activities into a competitive product[28].

Private business is able to work effectively in most segments of space activities and show results to consumers. Private companies are transforming space activities, making them standardized and accessible to both government agencies and individuals with the potential to transform them into a service close in nature to the mass consumer service. In addition, the development of commercial space activities allows the state to focus on solving new complex problems that contribute to scientific and technological progress.

In order to develop the private component of the space industry, using the world experience, the following measures, can be, proposed to develop the participation of the private sector in the space industry:

• Active integration of efforts of public and private companies to, effectively achieve, overall results;

• Improving the regulatory framework for the formation of infrastructure and the implementation of launches for commercial and public purposes by private companies;

• Formation of a favorable investment climate, created by attractive motives for potential investors[29].

Countries that have a defined strategy for the development of the space industry and the rocket and space industry are rising to a new level of development.

After all, in the military-industrial complex, the space industry occupies a key place and is a significant stimulus and instrument of socio-economic, scientific, technical and military potential, as well as an effective factor in ensuring national security.

Conclusions

Ukraine has suffered enormous human, territorial and economic losses, society received a huge "traumatic experience". The attitude of Ukrainian citizens towards the Russian Federation has significantly deteriorated. There was a deep alienation between the citizens of Ukraine and Russia.

Obviously, this humanitarian, or rather the mental component of the Russian-Ukrainian conflict will determine the nature, atmosphere and specifics of relations between Kyiv and Moscow for a long time.

Today, the space industry has become an industry, such as shipbuilding, automotive or aerospace, which has its own standards of profitability, depreciation and profit. All current and future space programs must be, viewed through the prism of profitability.

In the post-war period, in order to ensure the national security of the state, Ukraine needs the comprehensive development of the domestic space industry, capable of developing 'World-class' space technologies in all traditional and promising areas of space activities.

The formation and development of the state and commercial sectors of domestic space activities are in Ukraine's strategic interests. The state will be, left with a research complex, solving targets in the interests of ensuring the country's defense and security, research and development of outer space. The state needs to encourage innovation-oriented entrepreneurship in the provision of services using the results of space activities, as well as the consistent development of opportunities for the commercial creation of space communications, television and radio and remote sensing of the Earth.

As a result, during the ongoing Russian-Ukrainian conflict, positions have changed radically citizens' assessments of Russia, its policy towards Ukraine, the nature and prospects of cooperation. The watershed of distrust and alienation to the aggressor country has deepened. So, there is reason to predict that changes in the public consciousness of the citizens of Ukraine will be deep and long-term in nature considering the following factors.

[28] Start-Up Space: Updated on Investment in Commercial Space Ventures (2020). URL: https://brycetech.com/reports/report-documents/Bryce_Start_Up_Space_2020.pdf.

[29] Кошова С. П. Розвиток космічної галузі в Україні. *Інвестиції: практика та досвід*. 2022. № 3. С. 81–87.

Information about the author:

Koshova Svitlana Petrivna,

Candidate of Science in Public Administration,

Associate Professor at the Department of Healthcare Management and Public Administration

Shupyk National Healthcare University of Ukraine

9, Dorogozhytska str., Kyiv, 04112, Ukraine

Інформація про автора:

Кошова Світлана Петрівна,

кандидат з державного управління, доцент,

доцент кафедри управління охороною здоров'я та публічного адміністрування

Національний університет охорони здоров'я України імені П.Л. Шупика

9, вул. Дорогожицька, Київ, 04112, Україна