

## PROSPECTS FOR EXPANDING COOPERATION BETWEEN UKRAINE AND THE EUROPEAN UNION IN THE SPACE INDUSTRY

***Summary.** This article considers the issues of co-operation and expansion of prospects of partnership between Ukraine and the European Union in the development and use of outer space. Space systems have become an integral part of the new information and cognitively determined technological system to which the transition is taking place in developed countries and to which the newly industrialized countries are striving. The leading trend of world space activity is the intensification and increasing importance of international co-operation in the development and use of outer space. Close co-operation between the European Union and Ukraine in the field of space projects began in 2003 after the formation of the Joint Working Group on Ukraine's co-operation with the European Union in space research and peaceful uses of space within the EU-Ukraine Co-operation Committee. Ukraine has all the necessary pre-requisites in the field of space technology to ensure that its co-operation with the European Union in the space sphere is mutually beneficial and promising. The main directions of co-operation between Ukraine and the European Union, in space, exploration are, outlined. In particular, in the programs of Earth research, environmental monitoring, meteorology, aeronomy, geodesy, disaster prevention; in the development and use of the terrestrial segment of the space industry; in the production of launch vehicles; in the exchange of specialists to participate in research and promote educational activities in the field of space sciences and technologies. New directions of international co-operation in the field of space allows to, establish ties, to unite the potentials of countries to achieve significant results.*

***Key words:** space, space industry, international co-operation, European Space Agency, European Union.*

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## ПЕРСПЕКТИВИ РОЗШИРЕННЯ СПІВПРАЦІ УКРАЇНИ ТА ЄВРОПЕЙСЬКОГО СОЮЗУ В КОСМІЧНІЙ ГАЛУЗІ

***Анотація.** У статті розглянуто питання співробітництва та розширення перспектив партнерства України та Європейського Союзу в освоєнні й використанні космічного простору. Уже сьогодні космічні системи стали невід'ємними елементами нового інформаційно та когнітивно детермінованого технологічного устрою, до якого відбувається перехід у розвинених країнах та до якого прагнуть нові індустриальні країни. Доведено, що провідною тенденцією світової космічної діяльності є активізація та підвищення значення міжнародної співпраці в освоєнні й використанні космічного простору. Зазначено, що тісна співпраця Європейського Союзу та України у сфері космічних проектів розпочалася у 2003 році після формування Спільної робочої групи з питань співробітництва України з Європейським Союзом у сфері космічних досліджень та використання космосу в мирних цілях у межах Комітету Україна – ЄС з питань співробітництва. Доведено, що Україна має всі необхідні передумови в галузі космічних технологій для того, щоб її співпраця з Європейським Союзом у космічній сфері була взаємовигідною та перспективною. Окреслено основні напрями співпраці України та Європейського Союзу в освоєнні космосу, зокрема програмах дослідження Землі, моніторингу довкілля, метеорології, аеронавтики, геодезії, запобігання стихійним лихам; у розробленні та використанні наземного сегмента космічної галузі; у виробництві ракет-носіїв; в обміні фахівцями для участі в дослідженнях та сприянні освітній діяльності у сфері космічних наук і технологій. Доведено, що нові напрями міжнародної взаємодії в галузі космосу дають можливість налагодити зв'язки, об'єднати потенціали країн для досягнення значних результатів.*

***Ключові слова:** космос, космічна галузь, міжнародна співпраця, Європейське космічне агентство, Європейський Союз.*

**Introduction.** An important aspect in the activities of the space sector of Ukraine is the development of International co-operation. The issue of prospects for the development of the space industry at the International and National levels has recently become quite relevant owing to the leading trend in the space industry is the presence of private business and active International co-operation. The development of International relations in space exploration is due to increasing competition in the space sector. At present, almost all countries in the world need to attract additional technologies and resources to improve the efficiency of space activities.

Space research on the use of outer space resources, conducted by the countries of the world in close co-operation, could help solve the global problems of Mankind.

The principle of international co-operation is an integral part of international law. This provision is, confirmed by the norms of international law.

Article 1 of the Charter of the United Nations (hereinafter – UN) emphasizes that the United Nations pursues the goal of international co-operation in solving international problems of economic, social, cultural and humanitarian nature, which should become a centre for co-ordinating the actions of nations to achieve common goals.

The Declaration on the Principles of International Law Concerning Friendly Relations and Co-operation between States under the UN Charter of 1970 enshrines the, obligation of states to co-operate with each other<sup>2</sup>.

One of the high-tech and competitive industries of the country is the space industry, as it includes a number of enterprises that can represent the state at the global level. The space sector is constantly evolving and has a significant impact on the life of society, opening up promising opportunities for its potential.

Currently, experts in the leading drivers of innovation in space include:

- state space programs in the field of science and national security;
- expanding the use of space-related technologies and services;
- desire to explore space.

The geo-political interests of countries will always play a key role in the development and implementation of state space programs. For a number of scientific research and development, the impetus for development is government support for space science and research. The possibility of space activities for most countries is a matter of prestige and leadership.

The development of the space industry transforms the competitive advantages of the state not only in the international market of space goods and services, but also in world markets for goods and services of other industries, having a multiplier effect on domestic development and the country's position in the world economy.

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<sup>2</sup> The European Space Agency. Retrieved from: <https://www.esa.int/> (accessed 16 May 2022) (in English).

The main economic, technological and social priorities of international co-operation in space exploration is the integration of the domestic space industry into the international division of labour as a market participant, which contributes to obtaining financial resources for research programs and projects and reducing the burden on the state budget.

One of the main sources of scientific and technological progress and a factor in ensuring national security is the space industry, for which a large number of countries allocate significant financial resources. Further development of civilization is, directly related to the co-operation of the world in the development and use of outer space.

The main trend in world astronautics is its assistance in resolving global problems facing states, which in general contributes to the growing importance of International co-operation in the field of space exploration and use.

The world space activity should be, understood as a dynamically developing process, manifested in the sustainable development of civilization.

Currently, one of the urgent issues of state development is to expand the prospects of International co-operation and ensure the stable development of the domestic space industry, which is an important part of the strategic security of national security and occupies a leading position in the state economy.

Certain achievements of the country in the space industry provide it with a leading position in the global high-tech market, as well as add significant importance in the development and use of outer space.

Therefore, obviously, Ukraine's co-operation with the rest of the world in the field of space exploration is an important and urgent issue to ensure effective development of this high-tech sector, which can create the conditions for long-term strategic growth and technological leadership.

**Analysis of recent research and publications.** The work of domestic scientists is devoted to the problematic issues of formation, development trends and prospects of international co-operation of the space industry of Ukraine, in particular Yu. Alekseeva, M. Bendikova, V. Degtyareva, O. Dzhur, S. Koshova, E. Kuznetsov, N. Meshko, V. Prysyazhny, I. Sazonets, L. Soroka and others.

However, taking into account, the views of these authors, it should be noted that Ukraine currently has some unresolved issues regarding the prospects of international co-operation of the domestic space sector with European Union (hereinafter – EU) member states, which determines the relevance of the topic and requires further research and systematization.

The **purpose of the article** is to study the interaction and prospects for expanding co-operation between Ukraine and the European Union in the development and use of outer space.

**Presenting main material.** The development of the world space market has covered most countries. Economic conditions determine the level of development and influence of the state in Space activities around the world, its status as a highly developed in scientific and technological terms of the state.

The state interests of Ukraine are to increase and use competitive advantages in the field of space activities, to occupy prestigious positions in the world market of space goods and services, the formation and development of the commercial sector of domestic space activities.

The importance and significance of space activities lies in several positions:

a) space exploration is a priority for the development of human civilization in general;

b) the leading positions of the state in some areas of space activities is a leading factor that determines the country's participation in the international division of labour and strengthens the state's position in foreign policy;

c) the development of the space industry as the flagship of the national economy stimulates the development of related industries, helps to increase the competitiveness of its own products, thus ensuring high-quality economic growth.

Recently, there has been a trend of active involvement in the development and use of outer space of new countries, which in general contributes to increased competition, stimulating the development of the global space sector and opening opportunities for new technologies.

Currently, the key trends in world space activities include:

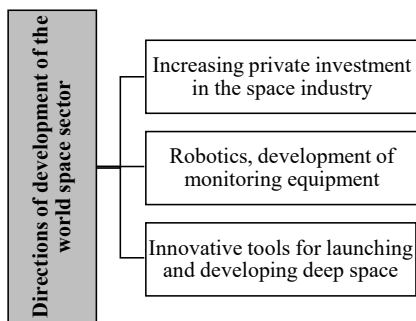
- study of outer space;
- solving national security problems;

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- solving socio-economic problems with the use of space;
- use of scientific and technical results of astronautics in all spheres of development of modern society;
- solving problems of creation and development of promising spacecraft, etc.<sup>3</sup>

In fig. 1 shows the leading directions of development of the world space sector.



**Fig. 1. Leading directions of development of the world space sector<sup>4</sup>**

Modern space activities are an important component of the world economy, science and security sector, it combines infrastructure and “breakthrough” areas. In 2021, the global space market amounted to 340 billion US dollars, 56% of this amount is terrestrial satellite equipment and services, 37% – satellite services, 5% – the production of spacecraft, and 2% – launch services. Currently, about 3 380 spacecraft are in orbit (compared to 2 700 in 2020).

Recently, competition in the field of space exploration has increased significantly – both due to the development of a number of countries and

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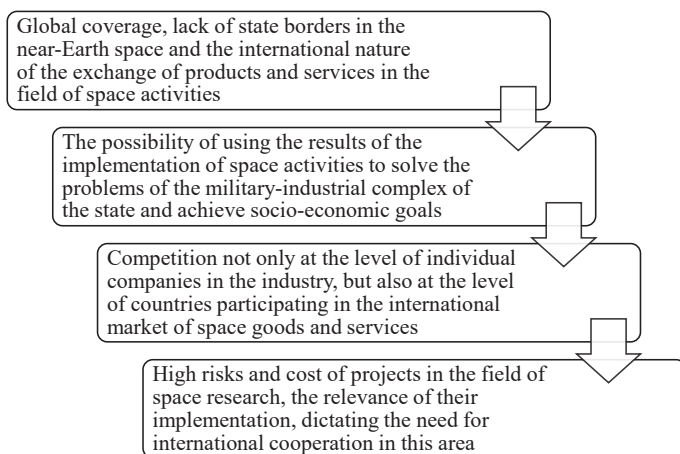
<sup>3</sup> Koshova, S. (2022). Rozvytok kosmichnoi haluzi v Ukraini [Space industry development in Ukraine]. *Investytsii: praktyka ta dosvid – Investments: practice and experience*, vol. 3, pp. 81–87 (in Ukrainian).

<sup>4</sup> Komitet Verkhovnoi Rady Ukrainy z pytan zovnishnoi polityky ta mizhparlamentskoho spivrobotnytstva [Committee of the Verkhovna Rada of Ukraine on Foreign Policy and Inter-Parliamentary Cooperation]. Retrieved from: <https://komzak.rada.gov.ua/> (accessed 16 May 2022) (in Ukrainian).

the entry into the market of many new companies. After all, digitalization and industrial development are increasingly opening up space for small companies.

According to experts, in 2021 Europe has invested about 7,7 billion euros in the development of space programs. While NASA has almost 20 billion dollars, and the US Department of Defence another 24 billion<sup>5</sup>.

The international market of space goods and services has a number of specific features (see fig. 2).



**Fig. 2. Specific features of the international space market<sup>6</sup>**

The current stage of development of space activities is, characterized by the emergence of new challenges of understanding and design.

This is due to the recent increase in the share of the private sector in the space market, its new formats, promising uses of near-Earth resources, as well as the emergence of space entrepreneurs “new wave” – New Space.

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<sup>5</sup> Statista: The Statistics Portal. Retrieved from: <https://www.statista.com/> (accessed 16 May 2022) (in English).

<sup>6</sup> Derzhavne kosmichne ahentstvo Ukrainy [State Space Agency of Ukraine]. Retrieved from: <https://www.nkau.gov.ua/> (accessed 16 May 2022) (in Ukrainian).

These companies have developed technologies, attracted investment and earn money by providing services to the state and private clients.

These new technologies can be, satellite imagery, rocket launches or targeted products based on new technologies.

This distinguishes them from space economy companies with a stricter division into “Iron” producers, operators and service operators. A striking example of New Space is “Space X” of Ilon Mask, created in 2002 to reduce the cost of space travel.

The formation of the space industry of Ukraine began in 1992, when the President of Ukraine L. Kravchuk established the National Space Agency of Ukraine, which in 2010 was renamed the State Space Agency of Ukraine<sup>7</sup>. At that time, the key tasks for the development of the space sector were:

- a) formation of state space policy;
- b) search for vectors of conservation and development of the space industry;
- c) development of the management structure of enterprises in this sector.

In order to perform these tasks, the State Space Agency of Ukraine was granted the status of a central executive body<sup>8</sup>.

The main tasks of the State Space Agency of Ukraine are:

- implementation of state policy in the field of space activities;
- systematization of the practice of application of legislation, development of proposals for its improvement, preparation of draft legislation, implementation of measures to adapt domestic legislation to the norms of the European Union in the field of space activities;
- ensuring the creation and operation of terrestrial and space segments of satellite communication, broadcasting and remote sensing systems;

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<sup>7</sup> Derzhavne kosmichne ahentstvo Ukrainy [State Space Agency of Ukraine]. Retrieved from: <https://www.nkau.gov.ua/> (accessed 16 May 2022) (in Ukrainian).

<sup>8</sup> Ministry of Economic Development and Trade of Ukraine (2019). Pro zatverdzhennia polozhen pro strukturni pidrozdily upravlinnia koordynatsii kosmichnoi diialnosti departamentu stratehichnoho rozvytku sektoru oborony ta bezpeky: Nakaz Ministerstva ekonomichnoho rozvytku i torhivli Ukrainy vid 13 serpnia 2019 r. № 1384 [On approval of regulations on structural units of the department for coordination of space activities of the department of strategic development of the defense and security sector: Order of the Ministry of Economic Development and Trade of Ukraine of August 13, 2019 № 1384]. Retrieved from: <https://zakon.rada.gov.ua/rada/show/v1384731-19#Text> (accessed 16 May 2022) (in Ukrainian).



- control and analysis of space conditions and coordinate-temporal and navigation support;
- taking measures, to promptly, identify sources of danger, assistance within its powers to achieve the appropriate level of reliability and efficiency of public administration systems in a special period;
- support and improvement of space activities;
- ensuring the effective use of scientific, technical and production potential of enterprises, institutions and organizations belonging to the sphere of its management;
- creation of conditions for the introduction of space technologies in the production of competitive products for the needs of the domestic and foreign markets;
- organization of scientific, scientific and technical, investment, information and publishing activities, creation and implementation of modern information technologies and computer networks in the field of space activities;
- exercise of other powers specified by law<sup>9</sup>.

International co-operation with the European Space Agency and NASA is a promising area for the development of the domestic space industry. Currently, Ukraine co-operates with 30 countries and participates in 12 international space organizations. After all, only international cooperation in the field of space exploration and use will help Ukraine to implement future programs and projects<sup>10</sup>.

In the direction of European integration, the main goal of domestic space policy is active cooperation with the European Space Agency (hereinafter –

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<sup>9</sup> Cabinet of Ministers of Ukraine (2011). Pro skhvalennia Kontseptsii realizatsii derzhavnoi polityky u sferi kosmichnoi diialnosti na period do 2032 roku: Rozporiadzhennia Kabinetu Ministriv Ukrainy vid 30 bereznia 2011 r. № 238-p [On the approval of the Concept of implementation of the state policy in the field of space activities for the period until 2032: Decree of the Cabinet of Ministers of Ukraine of March 30, 2011 № 238-p]. Retrieved from: <https://zakon.rada.gov.ua/laws/show/238-2011-%D1%80#Text> (accessed 16 May 2022) (in Ukrainian).

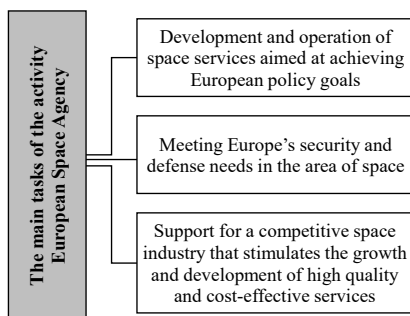
<sup>10</sup> Atamanenko, B., Fedoniuk, R. (2014). Mizhnarodne spivrobitnytstvo yak instrument uchasti v hlobalnykh kosmichnykh proektakh [International cooperation as a tool of participation in global space projects]. *Kosmichna nauka i tekhnolohiia – Space science and technology*, vol. 20, no. 3(88), pp. 3–13 (in Ukrainian).

ESA) and space agencies of the European Union, which will allow Ukraine to participate in promising international space projects and gain membership in ESA in the future.

The European Space Agency is the main regulator of the European space market, whose mission is to manage the development of the European space industry and ensure that public investment will ensure socio-economic impact and national security<sup>11</sup>.

Over the decades, ESA has developed and implemented the principles and rules of co-operation between countries, which allowed for the efficient use of financial resources of member states. ESA's strategic goal is the peaceful development and use of outer space by all states.

In fig. 3 shows the key tasks of ESA.



**Fig. 3. The main tasks of the European Space Agency<sup>12</sup>**

ESA is currently implementing three space programs:

1. Copernicus is the world's leading Earth observation system focused on climate monitoring.

2. Galileo, Europe's own European global navigation satellite system, which provides highly accurate global positioning data, consists of a grouping of 24 operating satellites.

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<sup>11</sup> The European Space Agency. Retrieved from: <https://www.esa.int/> (accessed 16 May 2022) (in English).

<sup>12</sup> The European Space Agency. Retrieved from: <https://www.esa.int/> (accessed 16 May 2022) (in English).

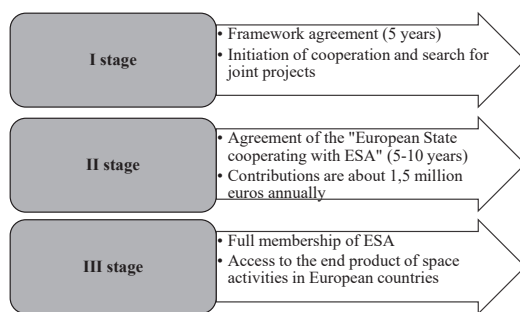
3. EGNOS – European Geostationary Navigation Service, a pan-European safety and navigation system for aviation, maritime and ground users in most European countries<sup>13</sup>.

A Joint Working Group on Ukraine’s co-operation with the EU, in space research and peaceful uses of space, was, established, in March 2003, in Brussels by ESA and the European Commission.

In accordance with Chapter 8 of Section V of the Association Agreement between Ukraine and the EU, the parties to this agreement promote the development of mutually beneficial cooperation in the field of civil space research and the use of outer space in the following areas:

- global navigation satellite systems;
- Earth observation and global monitoring;
- space science and research;
- applied space technologies, in particular launch technologies and rocket engine technologies.

The process of Ukraine’s integration into ESA consists of three main stages (see fig. 4).



**Fig. 4. Stages of Ukraine’s integration into the European Space Agency<sup>14</sup>**

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<sup>13</sup> The European Space Agency. Retrieved from: <https://www.esa.int/> (accessed 16 May 2022) (in English).

<sup>14</sup> Комитет Верховної Ради України з питань зовнішньої політики та міжпарламентського співробітництва [Committee of the Verkhovna Rada of Ukraine on Foreign Policy and Inter-Parliamentary Cooperation]. Retrieved from: <https://komzak.rada.gov.ua/> (accessed 16 May 2022) (in Ukrainian).

In 2015, the Spanish National Institute of Aerospace Technology and the State Space Agency of Ukraine completed work on the EU Twinning technical assistance project in Ukraine, according to which experts participated in the approximation of domestic legislation to EU norms and standards, the budget was 1 450 000 euros. According to the results of this project were:

1. The legislative base in the space sphere was, developed taking into account the European experience (draft laws of Ukraine on state regulation in the field of satellite navigation and remote sensing of the Earth, etc.).

2. Implementation of European satellite navigation systems EGNOS / Galileo on the territory of Ukraine, discussion of Ukraine's participation in the European Earth observation system Copernicus and development of a draft Action Plan for monitoring the territory of Ukraine.

3. Study of the basic principles and standards of project management applied in the EU countries, and development of a roadmap for the establishment of the Project Management Office in the State Space Agency of Ukraine.

4. Support for domestic space institutions to participate in European space programs.

5. Obtaining expert recommendations on further actions of the State Space Agency of Ukraine to ensure Ukraine's gradual accession to the European Space Agency, etc.

Ukraine has identified promising areas of co-operation with European countries in the space sector, in particular:

1. Space sciences, namely astronomy and astrophysics, solar system research and solar-terrestrial physics.

2. Earth exploration programs and their applications, namely environmental monitoring, meteorology, aeronomy and geodesy, disaster prevention.

3. Telecommunications, namely the provision of services and satellite navigation.

4. Microgravity research, namely space biology and medicine, data processing.

5. Development and use of the terrestrial segment.

6. Launch vehicles.

7. Exchange of specialists to participate in research and promote educational activities in the field of space sciences and technologies.

8. Providing assessment and expert assistance in space project management<sup>15</sup>.

In 2019, the State Space Agency of Ukraine signed an Agreement on the technical operation of the Copernicus space component with ESA.

In the Strategy of Ukraine's space activities for the period up to 2022 developed by the State Space Agency of Ukraine, one of the main areas of implementation is Ukraine's gradual acquisition of ESA membership status and active participation in the, Space Debris Control Program and implementation of European Space Standards in Ukraine<sup>16</sup>.

Expanding the prospects of co-operation between the domestic space industry and the EU in the development and use of outer space for Ukraine has a number of advantages:

- access to scientific and technological European space programs;
- stimulating the development of domestic entrepreneurship;
- Ukraine's place in the international arena as a high-tech state;
- increase investment attractiveness.

The development of space technologies is an effective means of ensuring the state's competitiveness on the world stage and stimulating the activities of high-tech industries. Carrying out space activities for Ukraine is an effective tool for integration into European space structures and an important factor in ensuring the prestige of the domestic space industry.

**Conclusions.** Ukraine's cooperation with European countries in the field of space technology will allow the domestic space sector to effectively implement and use the achievements in the development and use of outer space in the interests of national economy, defence and welfare.

The multifaceted focus and expansion of promising areas of cooperation between Ukraine and the EU in the field of innovation and technological development, including strategic areas such as space exploration, maintain

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<sup>15</sup> Derzhavne kosmichne ahentstvo Ukrainy [State Space Agency of Ukraine]. Retrieved from: <https://www.nkau.gov.ua/> (accessed 16 May 2022) (in Ukrainian).

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a stable long-term platform for strengthening economic relations and contribute to a competitive economy for Ukraine and EU countries.

There is no doubt that as a result of the implementation of space projects based on international co-operation, Ukraine will be able to successfully develop the space industry, which will be a key driver of the domestic economy.

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