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Specificities of United States Law Impact on the Legal and Regulatory Framework for the Global Space Market

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Development of relations in the new sphere of human activity, first among individual States and then among other subjects of space activities (international organizations, legal entities and individuals), requires developing international space law and national space legislation and further improving both public international law and private international law. Specificity of the process of developing the law on relations between the subjects of the global market for space services and technologies is that the first legal mechanisms of these relations have been introduced by the national legal institutions of one country, the United States. Using the comparative method, the article analyses the legal and regulatory framework for space activities in foreign countries with regard to the standardization of their contemporary space activities. The study makes a conclusion that the domestic U.S. policy on supporting the commercialization and privatization of outer space activities is purposefully accompanied by specific foreign policy activities along with the adoption of governmental regulations on individual areas of outer space activities.

Keywords: space activities, global space, law, space commercial activities, space market, policy, United States

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Introduction

The integration processes in the international community demonstrate a general trend towards closer and more cooperative international law subjects and an increase in the number of industries in which interrelated international and domestic law are applied frequently. Not only the scope of international law in domestic law extends due to the exclusiveness of international law itself, but also a formative domestic law impact on international law grows and domestic law is applied by international organizations (Denisov, 1992: 16).

The study of the sources and historical features of the establishment of mechanisms for the international legal and regulatory framework for the global market for space services and technologies (global space market) requires awareness that an international law branch dealing with the issues of this market has been founded almost simultaneously with the provision of the first services of the market. The need for practical space activities and the space race between the two space-faring nations (USSR and USA) accelerated the first steps in developing international space law.

Space activities, universal in the scope of application and global in the scope of outcomes, have, from the very outset, closely interrelated the external, primarily political, interests of States and domestic ones: issues related to the use of space technology to solve global problems of mankind and domestic economic problems of individual countries; problems of international security (non-proliferation of missile technologies, the need to introduce the latest means of verification of disarmament, etc.) and the need to reduce budgetary funding and to increase the commercialization of space activities; prospects for a global information space, opportunities for equitable access to this space by various countries (obtaining practical benefits from the introduction of information technologies) and problems of national security, including the information sovereignty of States, etc.

Development of relations in the new sphere of human activity, first among individual States and then among other subjects of space activities (international organizations, legal entities and individuals), requires developing international space law and national space legislation, and further improving both public international law and private international law. Specificity of the process of developing the law regulating relations between the subjects of the global space market is that the first legal mechanisms of these relations have been introduced by the national legal institutions of one country, the United States. Since the late 1950s of the twentieth century, United States Government agencies have already been active in shaping the public space policy, considering the need for the legal and regulatory framework for this "delicate sphere" of human relations, particularly with regard to aspects of the exploration and use of outer space such as the responsibility of the State for the consequences of those activities (and thus the need for the State regulatory framework), compulsory insurance of space activities (due to the high risks of their realisation), promotion of commercialization (the greater private sector involvement) and increasing internationalization (beyond national boundaries) of those activities. As a result, most of the United States legal instruments in the field of the practical use of space technology have international implications, which is logical, given several points:

First, during the years of the active formation of international space law (60-70s), only two States (USSR and USA) were capable of providing space services to international clients, but the USA offered these services mainly on the market (commercial) basis.

Second, since the beginning of space activities in the United States, the relations between the space actors (both domestic and foreign) have been governed by national space law, which is developed and is more comprehensive than that of other States worldwide (it is enough to recall important effects (for the global space market) of regulatory mechanisms such as licensing, quotas, insurance, intellectual property protection, etc.).

Third, the USA monopoly on the global space market, especially in the most significant segments of the world space market, such as satellite construction, satellite radio- and telecommunications, commercial space launches, etc., in the early years of the space era.

Fourth, the global space market is controlled by the USA through international organizations such as the International Telecommunications Satellite Organization (Intelsat), the World Trade Organization (WTO), etc.

Fifth, the active participation of USA lawyers in the development of international space law, including in the United Nations.

Sixth, purposeful U.S. initiation of informal relationships. Introduction of informal but quite effective legal regulators of the global space market – the Guiding Principles of the Missile Technology Control Regime (MTCR), which address one of the most important issues of space activities, that is, the problem of non-proliferation of missile technologies.

Seventh, the United States actively forms special regulators for the global space market (services quota, anti-dumping price regulation, export licensing, etc.) through bilateral agreements on cooperation with other States in the provision of commercial space services.

In our opinion, this has not only led to a significant impact of the American legal system on the process of law-making in international space law but has also actively contributed to the establishment of market relations among the subjects of the global space market, as well as to the introduction of legal regulators this market that are internationally recognized.

Genesis of USA Space Law

The United States of America is a recognized leader in the legal support of space activities. The space legislation of this country is "older" than the corresponding branch of international law. The chronology of the adoption of the main U.S. space laws proves this:

July 29, 1958 – the USA Congress adopted the National Aeronautics and Space Act (Denisov, 1992: 16). The Act provides for the basic principles of United States state policy on space activities, which, according to this Act, should be devoted to peaceful purposes for the benefit of all mankind. The Act defines the system and legal status of the agencies responsible for the exploration and use of outer space. An important feature of the Act is its comprehensiveness in regulating a wide range of legal relations arising from space activities. The scope of the Act extends not only to outer space but also to the Earth's atmosphere ("... the act deals with a flight within and outside the earth's atmosphere..." (National, 1958)).

The Communications Satellite Act of 1962 (Communications, 1962), for the first time in United States jurisprudence, provided for access to space activities by private firms and corporations. Moreover, it was the first legislative step in the State regulatory framework of these activities and the beginning of forming provisions and principles of market relations in the commercial use of space technology. In the Section "Declaration of Policy and Purpose,"

the Act provides that the United States establishes a global commercial communications satellite system (Communications, 1962). Then it enounces that "in order to facilitate this development and to provide for the widest possible participation by private enterprise, United States participation in the global system shall be in the form of a private corporation, subject to appropriate governmental regulation" (Communications, 1962). According to the Act, authorized users shall have non-discriminatory access to the system; that maximum competition is maintained in the provision of equipment and services utilized by the system; the corporation's activities shall be consistent with the U.S. antitrust laws. The Act established the American Communications Satellite Corporation (COMSAT), which became a co-founder of the global market for space services (satellite communications).

In 1966 the United States Communications Act (1934) was updated to extend the Act to the satellite communications industry, to provide for the conditions for granting a license for that activity and the requirements for a licensee.

The USA National Science and Technology Policy, Organization and Priorities Act of 1976 includes, among its purposes and priorities, advancing in the exploration and peaceful uses of outer space and establishes a system of procedures to ensure that those priorities are met.

In 1978, the USA Communications Satellite Act was amended to designate the private USA company COMSAT as the United States representative to the International Maritime Satellite Organization (INMARSAT).

In 1981, amendments to the USA Crimes and Criminal Procedure Title extended the Act to any vehicle used or designed for flight in space and on the registry of the United States pursuant to the 1975 Convention on Registration. This Act has established, for the first time in the practice of domestic regulation of space activities, the special criminal jurisdiction of a State over unlawful acts on a space vehicle while that it is in flight.

In 1984, amendments and additions to the United States Aeronautics and Space Research Act removed restrictions and in effect, established a regime of maximum favourability for the commercialization of space activities in the United States.

The U.S. Commercial Space Launch Act, enacted in 1984, has the primary purpose of encouraging private sector participation in commercial space launches (Communications, 1962). The Act enshrines the American concept of commercialization of space activities. According to Section 2, "The Congress finds and declares that – the peaceful uses of outer space continue to be of value and to offer benefits to all mankind; private applications of space technology have achieved a significant level of commercial and economic activity, and offer the potential for growth in the future, particularly in the United States; new and innovative equipment and services are being sought, created, and offered by entrepreneurs in telecommunications, information technology; the private sector in the United States has the capability of developing and providing private satellite launching and associated services that would complement the structures now available from the United States Government; the development of commercial launch vehicles would enable the United States to retain its competitive position internationally, thereby contributing to their national interest and economic well-being; provision of launch services by the private sector is consistent with the national security interests and foreign policy interests of the United States and would be facilitated by regulatory guidelines that are applied in thus sector; the United States should encourage private sector launches and, only to the extent necessary, regulate compliance with international obligations of the United States and to protect the public health and safety, safety of property, and national security interests and foreign policy interests of the United States" (Commercial, 1984).

For these purposes, the Act provided for the special agencies designated to overseeing and coordinating commercial launches, issuing licenses and permits for these activities. According to the Act, functions of these agencies include protection of the public health and safety, safety of property, and national security interests and foreign policy interests of the United States. The regulatory process is carried out through a licensing system. The Act establishes the licensing for commercial launches and the operation of launch sites in the United States, and for launches by United States citizens and entities from international space and from the territory of a foreign State.

The Land Remote-Sensing Commercialization Act of 1984 (Land, 1984) aims to ensure proper involvement of the private sector in land remote sensing and minimize the amount of further Federal investment necessary to land remote sensing provided maintaining the United States worldwide leadership in space activities. The Act remains committed to the further commercialization of space activities. However, it states that "full commercialization of the Landsat program cannot be achieved within the foreseeable future, and thus should not serve as the near-term goal of national policy on land remote sensing; however, commercialization of land remote sensing should remain a long-term goal of United States policy" (Nehoda & Shemshuchenko, 1999).

In 1988, amendments and additions to the United States Commercial Space Launch Act were mainly related to liability insurance. Under the amendments, the licensee is required to obtain insurance liability or demonstrate financial responsibility in an amount sufficient to compensate for the damage, to the greatest extent possible, to third persons. The damage is broadly understood to include death, injury, or property damage resulting from licensed launch activities. The monetary amount of such maximum possible loss is determined by the Ministry of Transport after consultation with other agencies. However, this amount should not exceed $500 million for third-party liability or the maximum available on the world market at a reasonable cost. It is also necessary to insure liability ($100 million) for U.S. Government. The State assumes the role of guarantor in respect of damage caused to third parties in excess of the amount of maximum possible loss-based insurance, but up to $1.5 billion. However, the government does not indemnify a licensee's wilful misconduct (Financial, 1998)

In 1990, the United States space bill amended the United States Code regarding patent law to extend national intellectual property law to space objects registered in the United States (Status, 1996).

The United States Commercial Space Act (1998) essentially complements the body of national legislation on one of the most important issues of modern space activities (commercialization) by provisions, which introduce appropriate legal regulators in areas of space activities not yet covered: satellite navigation, the programme for the construction and operation of the International Space Station, the use of reusable space vehicles (shuttles), etc. In our opinion, these additions to national legislation also contribute to solving the problems of regulating relations in the new areas of the world space market.

The U.S. leadership has recognized the achievement of a breakthrough in space activities as a necessary condition for the country to emerge from a protracted crisis (Luzin, 2012). Therefore, in October 2017, the President of the United States mandated the re-establishment of the National Space Council Advisory Group (for the first time since 1993) to promote coordination and cooperation in space activities (National, 2019). This group brings together a wide range of experts who are committed to restoring American leadership in space. Thus, the change in United States space policy and the adoption of legal and regulatory instruments to

ensure reform have enabled the space sector and the entire national economy to be out of the protracted crisis (Soroka, 2019).

The new United States doctrine has been accompanied by new legislation. This is particularly true of the United States space programmes. On 20 December 2019, President Donald Trump signed the "National Defense Authorization Act for Fiscal Year 2020" (National, 2020), to which the United States Space Force officially established and approved the start-up costs of Artemis program (Soroka, 2021).

Among other initiatives, several presidential space directives issued by the current Administration called on the Federal Government to establish a space management system under the Department of Commerce. They are designed to create a commercial climate for the management of an increasingly congested environment (Earth-orbiting objects as well as orbital debris). That is, the American government plans to be a leader in the exploration of outer space, but at minimal cost to the State budget by involving the public and the private sector. The new United States doctrine on space programs emphasizes public-private partnerships (Soroka, 2019).

Development of national space law

Two stages can be distinguished in the development of national space law. The first was related to the beginning of the "space-age": the adoption of the Declaration of Principles by the United Nations General Assembly in the early 1960s and the adoption of the Outer Space Treaty. It was then that a number of States, particularly those that had begun to explore outer space, had adopted general or specific laws on the issue. The second phase started (for most space-faring nations) in the 1980s. It involves the commercialization of space activities and the participation of private firms and corporations. In these circumstances, States had an objective need to regulate the space activities of private entities, to determine their rights and obligations, relations with the State, etc. In this regard, many countries have enacted relevant laws.

An analysis of world national legislation shows that most of them have space laws. However, their scope and content differ. Some countries have only a few ratifications of the international treaties on outer space (most of them), while others have more or less developed space legislation systems (Australia, Brazil, Japan, USA, ESA member countries, South Africa, Russian Federation, Ukraine). Generally, the latter distinguish the term "space activities" and the term "activities related to the exploration and use of outer space."

While space activities are governed both by the principles and rules of general international law and by the principles and rules of international space law, as well as by national legislation, the activities related to the exploration and use of outer space remain largely within the scope of the laws of the country concerned or of private international law. However, it is a nearly general principle of national space law that States are directly responsible for the consequences of space activities. According to Article VI of the Outer Space Treaty, which is generally recognised, States Parties shall bear international responsibility for national activities in outer space, including the Moon and other celestial bodies, whether such activities are carried on by governmental agencies or by non-governmental entities, and for assuring that national activities are carried out in conformity with the provisions set forth in the present Treaty.

The activities of non-governmental entities in outer space, including the Moon and other celestial bodies, shall require authorisation and continuing supervision by the appropriate State Party to the Treaty. When activities are carried on in outer space by an international organization, responsibility for compliance with this Treaty shall be borne both by the international organization

and by the States participating in it and by other countries. The licensing and insurance of space activities are under the focus of the space legislation of these countries.

The increase in various types of space activities in different countries has a direct impact on the status and nature of the respective national legal systems. Since the 1980s, this process has been closely linked to the commercial component of space activities. Due to this, the national legislation of foreign countries has broadened the range of regulations governing the licensing, insurance of space activities, certification and registration of objects of these activities, commercial aspects of remote sensing of the Earth from space and television broadcasting via artificial Earth satellites, etc. These aspects of foreign experience should be taken into account in improving Ukraine's space legislation.

In addition to the purely internal processes of improving national mechanisms for regulating the activities of States on the global market for space services, an adequate process in multilateral and bilateral international relations occurs. This has inspired the introduction to legal relations at the global space market of specific regulatory mechanisms, such as control of the non-proliferation of missile technologies; licensing of individual space activities or specific types of space services and technologies; compulsory liability insurance for the consequences of space activities; commercialization of space activities; protection of the intellectual property of developers, RSE manufacturers and suppliers; quotas of space services by foreign suppliers; anti-dumping actions regarding space services and technologies; government support for foreign investment.

Conclusions

A specific feature of the process of developing the law regulating relations between subjects of the global space market is that the first legal mechanisms of this relationship have been introduced by the national legal institutions of one country, the United States. As a result, most United States legal acts in the field of the practical use of space technology have had an international impact.

The domestic U.S. policy on supporting the commercialization and privatization of outer space activities is purposefully accompanied by specific foreign policy activities. Along with the adoption of governmental regulations on individual areas of outer space activities (licensing and compulsory insurance of space activities), others are being introduced. For example, the conclusion of international agreements on commercial launches, the anti-dumping regulation of space services, the protection of the intellectual property of space technology developers and constructors, by limiting market access of foreign service providers (as space service quotas), etc.

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The Innovative Paradigm of Space Relations Development

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The relevance of this article is based on the need of investigation and research an effective legal mechanisms to regulate the development of new space technologies, which have already provoked problems such as insufficient regulation of space commercialization, space debris disposal, cybersecurity of satellites, other space objects and the general legal liability of space offenses. The study was conducted based on scientific doctrine analysis, international documents and national legislation, certain norms of the United States and Ukraine governing space relations, as well as statistics on the space industry financing in the United States and Ukraine. The methodological study basis consists of leading methods of scientific research – analysis and synthesis, deduction and induction, formalization, formal-legal, comparative-legal, as well as the method of legal modeling. It is revealed that today space relations unite two parallel paradigms of their development – international and national. Each of them pursues its own goals, although formally, they are united by a common slogan. The hypothesis of the need to create a global administrator as a union, which will launch the latest model of settlement of space relations, which will be based on special rules that will determine a unified legal regime for outer space usage and development.

Keywords: outer space, space relations, space legal relations, development, global administrator, global administration

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Introduction

The genesis of social development and statehood testifies to the existence in the world of various models of social relations legal regulation. Under the influence of objective or subjective factors, each country has chosen the type and method of its regulation that best illustrates the proper implementation approach of the social contract. As a rule, public relations are governed by law, precedent and legal customs. To a greater extent, it is the laws that regulate mankind's daily life. They have authority and, in the case of strict regulation, a measure of coercion. This is due to the need of mechanisms development to ensure the harmony of social development.

It should be understood that any legal relations are a form of social relations. They are always endowed with the ability to develop as they arise on the basis of relevant legal norms. Such norms are established and provided by the state and are in constant dynamics.

The axiom is that people live together in an interdependent environment, and their problems require proper settlement (Hart, 1954: 489). The state and society must support each other to cope with poverty and achieve prosperity (Djoharwinarlin, 2012: 345). In this process, the state supports society by providing opportunities and access to preserve traditions and adapt them to a dynamic era (Djoharwinarlin, 2012: 345). Society obeys the law and receives the right to demand from the state to guarantee, protect and ensure the public interest.

The emergence of the first rule of space law – the "instant principle" prompted humanity to rethink the system of public values. There was a need for the formation of joint, supranational mechanisms for regulating such a phenomenon as space relations. In this regard, the first space powers began to sign international space treaties, which became the basis for international space law formation. These norms served as the principles on which space activities should be carried out. However, proper mechanisms for strict regulation of space relations were not provided.

In particular, although the exploration and use of outer space, including the Moon and other celestial bodies, is carried out for the benefit of all countries, regardless of their level of economic or scientific development, and is the property of all mankind (Article 1 of the Treaty on the Principles of State exploration and use of outer space, including the Moon and other celestial bodies, adopted by General Assembly resolution 2222 (XXI) of 19 December 1966 (Res 2222 (XXI), 1966)), there are already evidence of illegal space activities, in particular remote sensing of the Earth from space, in field of satellite broadcasting or usage of nuclear energy sources in outer space. A clear example of this is the crash of the Soviet artificial satellite Earth "Space-954," which led to radioactive contamination of northern Canada in 1978 (Cohen, 1984).

The relevance of this article is based on the need of investigation and research an effective legal mechanisms to regulate the development of new space technologies, which have already provoked problems such as insufficient regulation of space commercialization, space debris disposal, cybersecurity of satellites, other space objects and the general legal liability for space offenses.

Approaches to defining the space relations essence

It should be noted that any legal relationship is a purely social link, which is the social effect of objective law (Jeuland, 2020: 2). That is, space law and space relations are not identical categories. It should also be borne in mind that space relations are a kind of legal and have a number of common features.

The positions of legal theorists Emmanuel Jeuland classified according to the concept of legal relations into four categories:

a) Category 1 (e.g., Duguit, Kelsen): those who criticize or ignore the concept of the legal relation as legal relations between people;
b) Category 2 (e.g., Valley, Savigny): those who use the concept of the legal relationship without making it the basis of law;
c) Category 3 (e.g., Somek, Pavlakos): those who recognize legal relations as a theory within the dogmatic approach to law;
d) Category 4 (e.g., Nedelsky, Foucault): some philosophers of the law insist on human relations (Jeuland, 2020: 4-7).

On the one hand, it is a means of legal influence on public relations and its outcome. On the other, the social relationship between individuals is characterized by the presence of their legal rights and responsibilities (Baklanova, 2017: 1018).

From the knowledge of cosmic norms origin, it is clear that first there were cosmic relations, which prompted the international community to form an international legal regime for outer space usage and development, which led to their rebirth into legal relations.

This indicates a significant number of their varieties, each of which has its own legal regime. First of all, it is international, which is based on the need to regulate supranational relations between states and private companies operating under their auspices and are active actors in the study and development of outer space. This is implemented by joint agreements and acts of supranational institutions and organizations.

At the same time, international space relations at the beginning of its existence were based on the principles of publicity. At the time, this meant that only the state was responsible for space activities. However, the scientific development of the private sector has significantly outstripped the space innovations of state institutions, so the change in space legal relation nature from public to mixed (public-private) was inevitable and depended only on time (Soroka, 2017: 331).

However, it is more appropriate to assume that space relations are always public, although they may have a private commercial nature. It is implied that the world development of the scope determining the public interest forms a new paradigm of perception of legal relations publicity signs. Today it is quite difficult to form a clear parallel that distinguishes between public and private relations based on public interest, especially in the development and use of outer space, the resources of which are mankind property.

That is why modern international space law expands the traditional notions of spatial boundaries and regulates the effect of general international law on relations between its subjects (Kapustin et al., 2021: 21). Among the most complex and controversial problems of international space law is the problem of determining the range of subjects of this branch of law and the constituent elements of international space law. Unfortunately, these structural elements of the studied system have not yet received a sufficiently complete development and unanimous solution in theory international law. Nevertheless, there is currently a serious legal framework governing legal relations in the field of space activities (Baklanova, 2017: 1017, 1019).

The second is national, which is directly related to the admission, preparation and implementation of space activities by a single country. These issues are regulated by national space law and provide rules of conduct that space actors must follow before and during space activities. As an example, in the USA, such rules exist concerning 1) commercial space regulation, 2) satellite remote sensing of the Earth, 3) satellites of communication, 4) national

aeronautics and NASA activity, and 5) space production. Most of these issues are addressed through space policy, which is implemented through appropriate programs that provide specific administrative rules for its implementation (Smith, 2018: 43). In particular, the crisis of 2000 led to a rethinking and reform of space programs and policy and the development of a new U.S. space doctrine, which is now based on: reducing manned projects and giving preference to automatic flights; redistribution of responsibilities between NASA and private commercial sector (the federal sector is responsible for developing strategic public policies and supporting basic space research, and the private sector is responsible for manned flights and scientific and practical use of Earth's orbit). In addition, the U.S. federal government is currently encouraging policies that require a nationwide focus on job creation related to space activities rather than the pursuit of leadership in accordance with old standards; reducing budget expenditures and increasing public-private partnerships in space projects (Soroka, 2019: 336).

The current state of space relations development

Today, space relations unite two parallel paradigms of their development – international and national. According to the international space relations paradigm, space exploration is a new level of science and technological knowledge, design and testing of fundamentally new strategies for human activity, sources of expanding the boundaries of knowledge and experience (Danilyan & Dzeban, 2019: 7). At the same time, the national paradigm of space legal relations concerns obtaining the maximum selfish result from space resource usage, their transformation into economic values, which will primarily satisfy the national public interest, although formally related to universal values. This is due to the fact that space exploration is expensive.

However, for the United States, as an example, this is a relatively small budget. NASA's spending peaked at nearly 4.5 percent of the federal budget in 1966, fell to 1 percent by 1975, and gradually fell to about half a percent in recent years. By comparison, defense spending in recent years has accounted for about 20 percent of the budget. Congress has allocated about $ 23 billion to NASA in 2021, about 3 percent more than the previous year (Markovich et al., 2021). In other countries, where the financing of space activities is not a priority in terms of socio-economic problems, it is quite a significant financial resource. In particular, for example, the analysis of statistical data and reports of the Ukraine State Space Agency on the financing of scientific and technical activities in the space industry revealed a fairly constant trend of changes in the total costs of this industry. On average, for the last 20 years, approximately 1.5 billion UAH (in 2015 prices) has been spent annually from all (budgetary and extra-budgetary) sources of funding for scientific and technical activities in the space industry.

Moreover, the maximum value of total costs was reached in 2004 (over 2 billion UAH in 2015 prices) and the minimum – in 2018 (over 798 million UAH in 2015 prices) (Bulkin, 2020). It is clear that any financial investment must be justified by the results obtained. And in today's realities, economic benefits are of greater value to less developed countries.

This indicates, firstly, the objective access inequality of countries to the possibility of space exploration, secondly, the change of orientations on the goals of space exploration, thirdly, the different level of space relations development and, consequently, the lack of a unified approach to its use – some countries are active, and most are not.

It is clear that with the emergence of the phenomenon of outer space commercialization, more and more states are interested in the idea of bringing people into space (Til, 2013: 3).

However, there is still no legal regime for the implementation of this. In addition, there are a number of space legal relations, the international or national regime of which is not appropriate to apply.

Of course, space commercialization has many advantages, but in addition to the aspects of practicality and safety, it requires proper regulation of the impact of constant rocket launches on the environment. Some environmentally conscious researchers are concerned about this, as today they are kerosene and liquid oxygen rockets and rockets with a hybrid engine that uses synthetic hydrocarbons and nitrous oxide. Both rockets create an undesirable amount of pollution, but a hybrid rocket specifically emits more carbon than a gas and oxygen machine (Til, 2013: 10).

Accordingly, today it is extremely important to form a new model of settlement of space relations, which will be based on special rules that will determine a unified legal regime for outer space use and development.

Global administration as a way to streamline space relations

The need to rethink views on the role and purpose of law in the context of cosmization of human life implies a deepening of knowledge about its relationship with the globalization changes that occur against the background of increasing the role of sustainable human development. Today, the study of the Earth by individual sciences, which are in no way related to each other, is a thing of the past. This approach is being replaced by the study of the planet from a global perspective, which allows us to understand the Earth as a whole, as a part of space, which is interconnected and interdependent with a single whole of outer space. Part of the new cosmic worldview is the expansion of the subject of many old classical sciences, and they are going beyond the study of purely terrestrial phenomena and processes, the emergence of the cosmic aspect in their research (Grushevitskaya & Sadokhin, 1998).

That is, it is long overdue to create a global administrator as a union, which will determine a single legal regime of space, the peculiarities of its development and use on the basis of the same standards and conditions for all states, as well as tariffs and quotas in this area. It should be endowed with the status of the main body in the field of regulation of space relations and legal relations with the presence of strict regulatory mechanisms and the competence to apply measures to influence the offense.

The main goal of global administrator is to form the imperative of human activity in outer space explication in outer space, expanding the boundaries of human presence in space, taking into account the acquired fundamental knowledge about the structure of the world with a balanced policy of human activity (Danilyan & Dzeban, 2019: 6, 7).

Based on the development of Oleg Danilyan and Alexander Dzeban for the implementation of this, he should base his activities on the following tasks: 1) to form a regulatory framework for the delimitation of outer space and air; 2) to develop a balanced policy and a consistent strategy for the implementation of the development and use of outer space; 3) install fuses for the militarization of outer space; 4) to form ecological criteria, rules and norms of space activity; 5) to develop a legal regime of ownership of space resources and space objects, which according to current international rules is the property of mankind; 6) to form a regulatory framework and evidence-based basis for the implementation of space tourism; 7) monitor the development of telecommunications technologies and introduce innovations in their use in the world; 8)

systematically carry out medical and biological research; 9) constantly monitor the outer space resource capacity.

The raised question needs a separate scientific study and substantiation. However, with the global administration of space relations, it can be argued about the emergence and development of the latest paradigm of space relations, which will significantly expand the boundaries of human understanding of space and its capabilities, as well as protect it from the existing negative consequences of space activities.

Conclusions

The first thing to understand is that space law, space law, and space relations are not identical categories. Space legal relations are a kind of legal one. Therefore, they have a number of common features, are constantly in dynamics and need proper regulation in view of their constant transformations.

Today there are a large number of their varieties, each of which has its own legal regime:

1. International, which is based on need to regulate supranational relations between states and private companies operating under their auspices and are active subjects of space exploration and development. This is realized by joint agreements and acts of supranational institutions and organizations.
2. National, which directly relates to the admission, preparation and implementation of space activities by a single country. These issues are regulated by national space law and provide rules of conduct that space actors must follow before and during space activities.

This leads to the conclusion that today space relations unite two parallel paradigms of their development – international and national. Each of them pursues its own goals, although formally, they are united by a common slogan. This has already led to the existence of space legal relations number, the international or national regime of which is not appropriate to apply, but their parallel existence: has not ensured objective equality of access to space for the development of outer space; caused a change in the guidelines for the development of outer space and different levels of space relations development; a unified approach to its use is not provided.

The hypothesis of the need to create a global administrator as a union, which will determine a single legal regime of space, the peculiarities of its development and usage basing on the same standards and conditions for all states, and will determine tariffs and quotas in this area.

With the global administration of space relations, it will be possible to argue about the emergence and development of the latest paradigm of space relations, which will significantly expand the boundaries of human space understanding and its capabilities, as well as protect it from the already negative consequences of space activities.

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Problems of Production and Launch of Civilian Launch Vehicles

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The article substantiates the urgent need to involve residents of states whose scientific, financial and economic potential is not used in the production and launch of civilian launch vehicles. The basics and primary international legal tools for attracting business structures of various states to the production and launch of civilian launch vehicles have been clarified. An essential criterion for their access to missile technologies has been formed, which is based on unconditional respect and compliance with the norms of international law. According to the criteria of the level of ability to produce launch vehicles into five main classes, the classification of states has been carried out. The concept of transition from bans to stimulating the production of launch vehicles has been formed. The reasons for the successful experience in this area of Romania, the negative experience of the Republic of South Africa and the unsuccessful experience of Brazil have been analyzed.

Keywords: security, production of launch vehicles, state, control, space, space law, rocket technologies

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Introduction

Planet Earth is overloaded with industrial production. Because of this, the greenhouse effect increases exponentially, which leads to global warming. (Leiserowitz et al., 2020). In addition, we should not forget that periodically our planet is hit by large natural bodies, which leads to the extinction of most living things (Kelland, 2010).

In our opinion, all dangerous and most harmful industrial production should be moved outside the planet Earth to space industrial islands. In turn, a certain part of people will be able to live on space tourist islands temporarily and then permanently in artificial space cities and settlements. The construction of the first and second ones should be carried out by aggressively increasing firstly special and supporting satellites in Earth orbits, and then in orbits around the Sun. As a result, the cradle of humanity, Earth should become a green oasis, without any harmful production (Halunko et al., 2021).

These approaches are supported by the views of Jeffrey Preston Bezos, who in 2019 presented the Blue Origin project to expand the effective simplicity of life for humanity to take advantage of the endless benefits of space resources and move more than one trillion people to artificial space colonies in the future. One of the primary tasks that he sets for himself is to reduce the cost of removing cargo and people outside the Earth's airspace by improving the efficiency of launch vehicles (Brown, 2019).

We fully support the views of Jeffrey Preston Bezos that it is necessary to improve the economic and technical efficiency of launch vehicles. However, we stress that at the same time, there is a need to involve as many sovereign states as possible in the exploration and use of outer space; use the public and private scientific, financial, labor and economic potential of not selected, but most potentially suitable for this states.

However, in today's conditions, only a few states are involved in the use of outer space. Even less amount of states design and can launch cargo space launch vehicles (the United States, China, the EU (France, Italy), Russia, India, Korea, Israel), and only three states – the United States, China, and Russia – have successfully overcome the Manned Space Flight Club. This state of affairs is unacceptable and gradually destroys the sphere of human habitation – the biosphere of the Earth and exposes humanity to rapid destruction in the event of a large natural cosmic body or as a result of a nuclear or other existential catastrophes (Bostrom, 2009).

Accordingly, there is an urgent need to encourage more residents of new states to use outer space, in general, and to design, test, and produce launch vehicles in particular. In this article, we will focus on the problem of involving states that currently do not produce or do not have a full production cycle of launch vehicles in this process.

First, we prove in the article that the essential criteria for the admission of new developing states to missile technologies are respect and compliance with the norms of international law. At the same time, the level of democracy of these states and their compliance with the rule of law within the country are also taken into account, but they play a secondary role. Moreover, when new states are admitted to the Space Club of Launch Vehicle Manufacturers, certain

requirements may be imposed to improve the state of respect for Human Rights and freedom of media activity within the state, but this should not turn into ultimatum pressure.

Secondly, we have classified the states (residents of these states) according to the criteria of the level of ability to produce launch vehicles into five main classes: 1) states the residents of which carry out a full cycle, design, test, production, the launch of civilian launch vehicles that can put artificial satellites into Earth orbit; 2) that have the ability to provide a full cycle of design, testing, production, the launch of civilian launch vehicles; 3) that take part in the production and launch of civilian launch vehicles; 4) that do not take part, but have ambitions to do so; and 5) states that have the scientific, financial and industrial potential to carry out the design, testing, production, launch of civilian launch vehicles, but have not declared such intentions. Examples are given of the actual status and possible opportunities of residents from the third (Sweden, Poland), fourth (Vietnam, Indonesia, Sudan) and fifth (Philippines) classes to engage in such activities.

We further prove that there is an urgent need for the international community to change the concept: from banning to stimulating the production of launch vehicles by new states. This is justified by a number of factors, including negative ones. After all, "rogue states" that are outside the limits of international law, such as North Korea, are not stopped by international sanctions and bans. They carry out successful production and launch of military rockets (North Korea, 2021), and states whose potential is worthy of being members of the Space Club of launch vehicle manufacturers are not used. Moreover, states that faithfully comply with the Missile Technology Control Regime become defenseless against rogue states that actively develop their military ballistic missiles.

We paid considerable attention to the instructive negative experience of South Africa when they developed military missiles for the delivery of nuclear weapons under the guise of developing civilian launch vehicles. Back in the early 90s of the twentieth century, they built and successfully tested several launch vehicles. However, due to attempts to deceive the international community, under the pressure of US sanctions and economic and political incentives for decades, the program's implementation for the production and launch of launch vehicles is curtailed (Sokolski, 1993).

The reason for the unsuccessful experience of production and launch of launch vehicles in Brazil is briefly revealed. Which, in our opinion, consists in political miscalculations in choosing partners who can potentially share missile technologies. The article ends with a summary of the successful experience of Romania, where private rocket science is actively developing.

Criteria for assigning states to subjects of international law to resident legal entities that can potentially transfer civilian missile technologies

According to Douglas C. North only 25 countries belong to an open society. Only 15% of the world's inhabitants live in such countries. The remaining 85% of the population lives in the so-called by him natural states (North et al., 2009). At the same time, all states of an open society, without exception, are legal, democratic states with a market economy. However, not all states that have prescribed these values in their constitutional norms are such. Accordingly, in our opinion, in essence, all states of an open society should be able to exchange civilian missile technologies. This is confirmed by the fact that almost all states that are included in the Golden twenty-five Open Society countries, called by Douglas C. North, John Joseph Wallis

and Barry R. Weingast (North et al., 2009), are participants in the Missile Technology Control Regime. Other states of this regime include: Argentina, Bulgaria, Brazil, India, South Africa and Ukraine. They have declared building and practically strive for a democratic state governed by the rule of law and an open society. As for two other member states of the regime – Russia (1995) and Turkey (1997), they tried to meet the latter criterion at the time of their admission to the elite club of space powers. However, in the conditions of the present, they have retreated from it. But we do not equate them. These are very different states in terms of compliance with international law.

However, it should be understood that the so-called natural states, according to the classification of Douglas S. North, John Joseph Wallis and Barry R. Weingast (North et al., 2009), are very different. In our opinion, there are some of them that are worthy of joining the club of space powers. For example, although, in some aspects, Turkey has moved away from the principle of the rule of law within its state (Aslund & Snegovaya, 2021), it continues to adhere to all the norms of international law. Accordingly, in our opinion, it is a worthy club of countries participating in the Missile Technology Control Regime. Conversely, Russia has not only abandoned democratic values and the rule of law within the state, but also grossly violates the norms of international law. It took a direct part in the occupation of certain regions of Georgia and Ukraine, and also carried out the annexation of the Autonomous Republic of Crimea of Ukraine (Matsaberidze, 2015). Moreover, Russia threatens the United States and other states with the use of nuclear weapons by launching its ballistic missiles (Dikhtyarenko, 2018). It is clear that states of this type should not be accepted into the club of space powers, and Russia should be excluded from it. Although in practice, due to US, EU and Ukraine sanctions, it can no longer enjoy the benefits of the Missile Technology Control Regime (Aslund & Snegovaya, 2021).

Accordingly, a significant factor in the admission of legal entities of developing states to receive missile technologies is their formal membership in the Missile Technology Control Regime club. This, despite all controversial issues, should remain an international legal axiom for allowing residents of new states to access technologies for the production and launch of launch vehicles.

Although specialists in the field of rocket science also have a critical attitude to the effectiveness and fairness of the norms of the Missile Technology Control Regime. So, Alexander Levenko believes that currently, there are restrictions for a number of countries caused by their signing of the Missile Technology Control Regime. The only country that has benefited from this is the United States, with its superpower economy. In his opinion, the Missile Technology Control Regime is a tool that supports unfair competition of the United States in relation to other countries, which contradicts international standards (Levenko, 2021).

Within the signatories of the Missile Technology Control Regime, the right of Veto is also used. Suppose a country wants to develop relations on the topic of missile technology with other countries that have signed or have not signed the Missile Technology Control Regime. In that case, it notifies other signatories who have the right to use the Veto. However, the Missile Technology Control Regime does not prevent countries that have not signed this document from ignoring it. Except when the US government decides that the actions of such a country threaten the national security of the United States. Then war is possible, and most often – sanctions from the United States. These sanctions, according to Alexander Levenko, are ill-conceived and sometimes lead to the fact that the objects of sanctions are combined and achieve success in missile technologies despite the sanctions (for example, the creation of a

launch vehicle of the same design in the DPRK and the Islamic Republic of Iran at the same time) (Levenko, 2021). As a result, the "club of space powers" is constantly replenished. The last to join it were the Republic of Korea, the Islamic Republic of Iran and the DPRK – these countries launched their satellites into space with their own launch vehicles. Thus, Alexander Levenko concludes that the Missile Technology Control Regime, as a document, is outdated. Unity of opinion of the signatories members is impossible in the context of a real confrontation between the United States – EU, the United States – Russia, and the United States – China. It is more reasonable to reach a consensus and turn this agreement into a mechanism for promoting the development of civilian technologies – as long as now it is a mechanism for banning military technologies (Levenko, 2021).

We cannot fully agree with Alexander Levenko's criticism of the Missile Technology Control Regime. We believe that there is no alternative to it. However, we support his view that the concept of curbing the development of civilian missile technologies laid down in the analyzed regime should be replaced by a mechanism for promoting the development of civilian missile technologies.

Consequently, in its essence, formal belonging to the Missile Technology Control Regime, namely to legal democratic states or to states of an open society, should not be the exclusive basis for the admission (non-admission) of states and their private and public legal entities to missile technologies.

At the same time, it is necessary to take into account the leading role of the United States and its allies in practically ensuring the implementation of the Missile Technology Control Regime. They are liberal democracies with market economies and tend to promote trade and friendly external relations. To achieve their goals, they use various methods of negotiation and diplomacy that are necessary for effective control and guarantees of the non-proliferation of missile technologies. However, if this fails, the United States can fight the proliferation of ballistic missiles harshly, in particular by applying various types of sectoral and financial sanctions (Sokolski, 1993).

Therefore, the essential criterion for the admission of new states to missile technologies should be respected for compliance with the norms of international law. These can be: 1) states of established democracy; 2) states that have declared their democratic aspirations as a state governed by the rule of law and are practically building such a state; 3) moderately totalitarian states that have long and fully adhered to the norms of international law.

Classification of states (residents of these states) according to the criteria of the level of ability to produce launch vehicles

Based on the principles of the urgent need to involve the resources of residents of many sovereign states in the design, production, testing and provision of civilian launch vehicles, there is a need to determine the real current state of this problem. We have shown above that the essential criterion for the admission of new states to rocket technology must be respected for compliance with international and space law.

Based on this criterion, states and their residents engaged in the design, production and launch of launch vehicles are divided into five main classes:

1. States residents who carry out a full cycle of design, testing, production, and launch of civilian launch vehicles can launch artificial satellites into Earth orbit. These countries include the United States, China, the EU (France, Italy), India, Korea, Israel, and Japan. For example,

during 2020, the United States carried out 44 launches of launch vehicles, and China 39, which were completely designed and manufactured by scientists and manufacturers of these countries, almost independently of each other. At the same time, private SpaceX played a significant role in ensuring launches in the United States, and China is proud of the successful launch of a new heavy-class launch vehicle, the Long March 5B, which can lift up to 25 tons of cargo into orbit (Deville, 2021).

2. States that have the ability to provide a full cycle of design, testing, production, and launch of civilian launch vehicles, but for various reasons do not carry out this, for example, the United Kingdom, South Africa, and Ukraine. For example, the Southern Machine-Building Plant named after Makarov (Ukraine) used to produce civil space launch vehicles of the Cyclone and Zenit family in cooperation with Russian partners (Hurska, 2020). One after Russia's annexation of the Autonomous Republic of Crimea of Ukraine, the fighting of Russian-terrorist troops in certain areas of the Donetsk and Luhansk regions of Ukraine, cooperation between Ukraine and Russia on the joint construction of launch vehicles was suspended (Russian, 2016). Currently, the Makarov Southern machine-building plant (Dnipro, Ukraine) produces the first stages of Antares launch vehicles and the fourth stage for the European Vega launch vehicle (Hurska, 2020). However, in the current conditions, Ukrainian manufacturers do not carry out a full cycle of production and launch of launch vehicles. Now the Ukrainian government and private businesses are trying to revive the industry and restore the traditional role of Ukraine in the world's space rocket economy. In particular, the private Ukrainian company Science&Space LLC has developed and received a patent for the GreenSpace rocket and space complex with a reusable launch vehicle with "cold engines" (Levenko, 2021).

3. States residents of which take part in the production and launch of civilian launch vehicles, for example, Germany, Canada, Poland, Romania, Bulgaria, Spain, Portugal, and other member countries of the European Space Agency, Australia, New Zealand, Brazil, Argentina, and Kazakhstan.

For example, the Swedish Space Program (NRFP), as a national strategy for the development of Space Research approved by the Swedish parliament in May 2018, states that investment in space is closely linked to the future of the Swedish nation on Earth. In particular, the analyzed strategy provides for further modernization of the Esrange Cosmodrome as a base and test site for launching reusable rockets and balloons. The Esrange launch pad, due to its unique geographical location and the availability of competent personnel, is quite suitable for launching small satellites. At the same time, the Swedish spaceport can compete with space launch pads in Norway and the United Kingdom, which also see opportunities for themselves and try to reach the finish line first in this race. Since 1970, Sweden has participated in the European launch vehicle launch program, in which Swedish companies play a key role in engine development. Sweden participated in the creation of the European Ariane-5 launch vehicle. This participation helps to support the production of space technology by Volvo Aeros (Gutman, 2019).

Poland has its own space agency, which is an active member of the European Space Agency; in particular, it participates in the production of joint European, French and Italian launch vehicles Ariane-5 and Vega. After the collapse of the socialist bloc, Poland stopped producing short-range liquid-fueled ballistic missiles. However, experience and technology are not completely lost. Thus, the Warsaw Aviation Institute develops solid-fuel launch vehicles, hybrid rocket engines and liquid-propellant rocket engines for delivering small satellites to an

altitude of 100 km and 100 kg to an altitude of 600 km. Hybrid and liquid engines use highly concentrated hydrogen peroxide of 98% (in the test laboratory, when developing catalysts and a two-component micro-engine, hydrogen peroxide of 99.9% concentration is used). Polish scientists have also created experimental liquid engines based on highly concentrated hydrogen peroxide 98% and gas. They developed an original catalyst for the decomposition of hydrogen peroxide. For these purposes, the production of highly concentrated hydrogen peroxide 98% has been mastered in the laboratory conditions of the Warsaw Flight Institute. These are currently being transferred to a private company, a Polish Space Company, for production adjustment (Levenko, 2020).

4. States residents of which do not take part in the production and launch of civilian launch vehicles but have ambitions to do it. For example, the Advisory Council for the development of outer space in Indonesia has modest goals to launch its own satellite on its own launch vehicle into a low-Earth orbit (200-300 km) by 2025. In today's conditions, they are testing a small-sized prototype of a launch vehicle. Experts have doubts about the implementation of such a project due to insufficient funding from the Indonesian government. At the same time, the Indonesian Space Agency and the designers of the Indonesian launch vehicle are guided by the experience of NASA and the success of the private American company SpaceX, Japan, China and India (Indonesia, 2020). At the same time, it should be noted that there is no official information that Indonesia is also implementing a project of a solid-fuel three-stage dual-use Launch Vehicle. This project is not being implemented successfully because there was a serious accident when launching one of the rocket stages (Levenko, 2020).

Officially, space exploration in Vietnam is at an early stage. Universities and amateur clubs are engaged in space exploration. Japanese grants make a significant contribution to the development of space technologies in Vietnam. As for the launch vehicles, it was not possible to get information about their development in Vietnam from open sources. Only demonstration water rockets are being developed and launched (Indonesia, 2020; Vietnam, 2021). However, there is non-official information that private space companies in Vietnam are working with their government to recreate outdated launch vehicles produced in the Soviet Union (Levenko, 2020).

5. The states (residents of these states) that have the scientific, financial and industrial potential to carry out the design, testing, production, and launch of civilian launch vehicles, however, did not declare. For example, the Philippines does not have the ability to independently develop launch vehicles that would deliver useful civilian cargo into outer space. They have not signed most international space treaties and currently do not have a space agency that implements a holistic space development strategy. Although even in the 70s of the 20th century in this state, there was a state program for the development of missiles, which was not implemented. In today's conditions, space research is carried out by national universities through the implementation of separate programs that are not directly related to space. The functions of the space agency are distributed among various government agencies and divisions. Filipino scientists emphasize the need to create a national strategy for the short-, medium- and long-term development of space research, the creation of a National Space Agency. They raise the issue of providing funding for space education and business-related to Space Research and development in the space industry. Their goal is to create a national powerful and thriving space industry (Rogel, 2020).

National Space Activities in Sudan began in the 1970s, leading to the establishment of the National Remote Sensing Center (NRSC) in 1977 by the Government of Sudan under

the jurisdiction of the National Research Council, the Ministry of higher education and research. In 1996, the NRSC was reformed into the remote sensing Authority (RSA) with the competence to conduct research and development in the field of remote sensing of the Earth, the application of GPS technologies. RSA implements human development programs such as education, training, and awareness-raising programs in collaboration with academic institutions and professional associations. In addition to remote sensing and astronomy, Sudan is also developing programs and building the capacity of satellite technologies. In June 2013, the Government of Sudan had established the Institute for Space Research and Aerospace (ISRA) within the National Research Centre of the Ministry of Science and communications as part of the national plan for developing and applying space technologies in several national social and economic plans. The academic community plays an important role in the development of space and astronomy in Sudan. Universities in Sudan, such as the University of the future and the University of Khartoum, offer space science and astronomy programs. The government of Sudan since 2016 has launched an ambitious portfolio of aerospace, aviation and telecommunications development projects, which included successful launches of Sudanese ones. Sudan's private space sector focuses on telecommunication and Internet services, which uses the US and Chinese launch vehicles to launch its satellites into low-Earth orbit (Space in South Africa, 2019).

As for the design and production of its own launch vehicles, Sudan's government and private companies are not officially engaged in this. However, more than five years ago, China sold Sudan a WS-1 Tactical Missile System with technology, equipment and ingredients for self-manufacturing solid rocket fuel. Sudan has good specialists in the field of rocket scientists who have studied in Russia and Ukraine. Thus, practically in Sudan, there is a potential for creating a multi-stage solid-fuel launch vehicle by upgrading the Chinese tactical missile system.

Justification for the paradigm shift – from banning to stimulating the production of launch vehicles by developing countries

In our opinion, the international community should leave the policy of stimulating the development of civilian missile technologies in the past. The states of the space club should not preserve their rocket and space developments on commercially favorable terms, which eventually lose their relevance, but move to stimulate the production of peaceful launch vehicles to residents of new states who potentially need to transfer civilian rocket technologies.

After all, the solution to this problem is a matter of human survival. The success of the space colonization project directly depends on the success of its implementation. Artificial deterrence of the development of peaceful launch vehicles becomes an obstacle on this path. Civilian launch vehicles remain the only source of human and cargo entry into outer space. In addition, curbing the development of peaceful missile carriers practically does not protect humanity from the development of military ballistic missiles by rogue countries. For example, China, which is under increased international sanctions, has built and deployed approximately 700 short-range ballistic missiles capable of hitting most of South Korea, 300 medium-range ballistic missiles that threaten Japan, and has also developed several intercontinental ballistic missiles (McGrath & Wertz, 2015).

In other words, the international community should develop and approve the international

public and private space legislation that will be favorable for the development of rocket carriers of resident states whose financial and economic potential is not currently being used.

After all, the research, use and legal protection of outer space, its colonization should be carried out by individuals and legal entities of most countries of the world. It is not only the natural right of sovereign states to undertake activities related to the exploration and use of outer space. This is a scientific and financial burden that they must put on the benefit of all mankind. This should be done on the basis of both public and private International Space Law. Otherwise, the situation may go beyond the humanistic and legal dimensions. This process can become uncontrolled, lead to further development of terrorist organizations and states that contribute to terrorism of their missile technologies, and developing democratic states become defenseless against them (Halunko & Didenko, 2019).

Experience of the Republic of South Africa in developing the national missile program

The experience of the Republic of South Africa is interesting and instructive. At which we can observe the transformation of the national missile program of an actively developing state.

For example, South Africa initiated its first space program in the 1980s of the twentieth century. Its goal was to develop its own satellites and launch vehicles. The space infrastructure of the facility for satellite integration and testing and the Launch Complex for launching launch vehicles were created in Arniston, on the southern coast of the cape, about 180 km west of Cape Town. A powerful industry has been developed to support this program (Space, 2020).

Until 1993, this country was successfully developing a program of its ballistic missile carriers. In total, four space rockets were built: three of them were launched on suborbital trajectories in the late 1980s. However, as a result of the direct efforts of the United States, South Africa abandoned the rocket program. This was justified by the fact that the South African space program was a cover for combat topics, namely the danger of nuclear proliferation and the likely danger of violating the Missile Technology Control Regime (Sokolski, 1993).

In 1993, the South African government suspended its missile program not because of international sanctions, but because of the economic and political advantages provided by the United States. However, in 1999, the United States sanctioned South Africa for importing ballistic missile technology from Israel. After all, according to American law, the United States president is obliged to prohibit the export of ballistic missiles or related technologies by any foreign entity that exports or imports missile technologies, contrary to international guidelines contained in the Missile Technology Control Regime. Since the US president delegated this authority to the secretary of state to make this decision, and the evidence for South Africa's missile operations with Israel was convincing (Israeli officials admitted that they exported ballistic missiles), the deputy secretary of state duly reported the sanctions (Sokolski, 1993).

As already revealed above, South Africa's missile program was suspended. The reason for this was the national policy of apartheid, which was condemned by the international community, the possible manufacture of dozens of nuclear charges that were produced secretly outside the borders of UN International control. Thus, it is likely that South Africa at that time violated the treaties on the non-proliferation of nuclear weapons and the regime of non-proliferation of missile technologies. Accordingly, the concerns of the United States and other states of sustainable democracy were justified. At the same time, the South African government

of that time made the right conclusions, in our opinion. It abandoned further development of the rocket program and focused public funds on the space satellite program.

Despite these problems, South Africa occupies a significant place in the world. Currently, South Africa includes many subjects that play a significant role in scientific research, exploration and use of space. They have found their approval in scientific institutions and the business industry. They have practical achievements in the implementation of satellite programs, satellite engineering and auxiliary space technologies. An audit of the South African industry showed that the annual turnover of the private space business and the public space sector is about 20 million dollars. About 180-200 people are involved directly in the South African space industry. The existing infrastructure and skilled workforce, both within these facilities and in the broad industry that supports them, allow South Africa to position itself as a Regional Center for Space Science and Technology (Space, 2020).

South Africa is an active participant in International Space Activities. Space activities in South Africa are regulated by the Space Affairs Act of 1993. The South African Space Affairs Council (SACSA), established under this law, is responsible for representing South Africa in international forums dealing with space affairs, as well as for authorizing, licensing and overseeing space activities in South Africa. The South African National Space Agency (SANSA) was established in 2010 to coordinate and implement the National Space Program. SANSA reports to the Department of Science and technology. SANSA is the leading agency for establishing and implementing agency-level space cooperation agreements with other countries' space agencies. Civil society is also playing an increasingly important role in the development of the space industry in South Africa. More and more scientific and research institutions and private sector agents are being involved in space activities. The University of Cape Town has Space and Astronomical Society that promotes space awareness among students and local youth. South Africa's national space policy issues general guidelines for conducting space activities that should be implemented in support of national priorities, especially in relation to poverty reduction, economic opportunities, technological opportunities and improving the quality of life (Space, 2020).

So, the attempts of a developing state under the guise of civilian missile technologies to develop the military end badly. On the example of South Africa, you can see that this leads to the practical closure of them under the pressure of US sanctions and economic and political incentives. When the practically ready and tested system for designing, manufacturing and successfully launching launch vehicles was stopped.

Brazil's thorny path and the success of implementing missile programs by private companies in Romania

The Brazilian space agency has its own Alcantara spaceport. From which Brazilian probe missiles are launched, in particular VSB-30 (2004). Rocket science experts are well aware of the developments of Brazilian scientists regarding hybrid and hydrogen peroxide-based rocket engines. Since 1984, a number of two – or four-stage solid-fuel launch vehicles have been developed. Brazil has repeatedly tried to create common to developed space states heavy launch vehicles, such as Cyclone-4 with Ukraine and implement the Southern Cross rocket program with Russia, but due to various factors, the successful implementation of these projects did not happen (Strelkova, 2017).

So, Brazil's path to space was and remains difficult. This state has a very strong financial,

scientific and economic potential, its own spaceport and, although not entirely successful. Nevertheless, it has gained experience in the development, construction and launch of launch vehicles. This makes it possible to believe in the great space future of Brazil as a powerful platform for the production and launch of everything, including heavy and especially heavy launch vehicles.

The Romanian space agency (ROSA) is the national and international coordinator of Romania's space activities. It is a state institution that is fully funded from its own income. The mission of the Romanian space agency is to coordinate national research programs and space programs to promote Romania's development in the space industry. As a coordinator of national research and space programs, ROSA develops and coordinates the implementation of the National Space Program. As a government representative, the Romanian space agency enters into cooperation agreements with international organizations such as the European Space Agency (ESA) and the Space Research Committee (COSPAR), as well as bilateral cooperation agreements at the government level. At the same time, the agency conducts its own research and development through the ROSA Research Center (Agenția, 2021).

Romania has created good conditions for the development of the private space business. This makes it possible for private space companies to develop. The private company ARCA is developing a series of Haas 2C launch vehicles to launch from a military base in the Black Sea and has plans to launch small satellites into orbit. In addition, there is an influential public organization ARCAspace – the Romanian association of cosmonautics and aeronautics, although the main office of which is located in New Mexico, USA. It was founded in 1999 as a non-governmental organization in Romania by Romanian engineer D. Popescu and other rocket science enthusiasts. Since then, ARCA has launched two stratospheric rockets, four large-scale stratospheric balloons, including a cluster balloon, and received two government contracts with the Romanian government and one contract with the European Space Agency. They are developing a single-stage rocket to enter orbit, which should be economical, not reusable. ARCA has developed and continues to develop a family of Haas missiles in various sizes and configurations, including the ambitions of a Space Launch Vehicle with a capsule capable of delivering a crew of five people to space (Levenko, 2020).

So, despite the lack of direct state funding, Romania has created good conditions for the development of private space rocket science. This is facilitated by a system of favorable geopolitical, legal, organizational-legal and organizational factors. Geopolitical factors include Romania's membership in the European community, particularly the European Space Agency and NATO, and the presence of joint formal and non-formal associations with the United States. In legal terms, Romania is a member state of the EU and is fully within its legal framework. The National Space Agency is a member of the European Space Agency. In the organizational and legal field, private space companies are under the pragmatic supervision of the Romanian national agency, which is interested in the development of private rocket construction. A successful organizational aspect is the presence of professional enthusiasts who started and developed the national rocket science industry in Romania.

Conclusions

All of the above makes it possible to generalize that at the present stage of human development, it is unacceptable that the potential of most states of the world is not used for the benefit of the exploration and use of outer space. The causes of this negative phenomenon

are formed. International legal ways to attract to the construction of civilian launch vehicles scientific, financial and another potential of residents of dozens of states that meet the established requirements for the safety of transmitting missile technologies to them are identified. In the following scientific articles, we will further develop the principles and legal tools for involving in the production of civilian launch vehicles as many developing states that respect the norms of international law as possible.

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Public Administration of Space Activities in Europe and the People's Republic of China: an Example for Ukraine

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Many countries were involved *in space activities. The three leading spacefaring nations are the United States, the PRC, and the Russian Federation. The People's Republic of China is the second-largest in the world, with a great number of scientific and technological achievements in this field, PRC has the highest rate of development. Ukraine's success is so modest that by 2021 it has been no longer considered a spacefaring nation abroad. However, in 1991 Ukraine was even ahead of the PRC in space research. This requires thorough consideration. Moreover, the conditions for public administration of space activities in the PRC and in one of the stable countries in Europe, the Kingdom of Sweden, should be studied, drawing parallels with Ukraine. The authors have carried out applied analytical research with a view to achieving greater efficiency in the work of the State Space Agency of Ukraine by improving public administration. The empirical scientific method is applied, that is, research and generalization for implementation in practice. The authors conclude that cooperation with the PRC in the field of space and missile activities should be continued, adapting the targeted provisions of Ukrainian legislation and the PRC to that end, taking into account the need to adapt European Union legislation to the legal framework of Ukraine.*

Keywords: public administration, space activities, State Space Agency of Ukraine, China National Space Administration, CNSA, Swedish National Space Agency, SNSA, aerospace industry

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Introduction

Many countries were involved in space activities. By 2021, China was the fastest-growing country in missile and space activities. The specificities of Chinese structures planning, providing management and executing objectives set by the government do not separate the space and missile components (which, however, is also the case in Ukraine, but without mentioning the missile component) that shift to aerospace (for example, the creation of a Chinese counterpart to a reusable orbiter in the form of an aerospace rocket plane of the Space Shuttle type).

A comparison of the achievements of the National China Space Administration and the results of the State Space Agency of Ukraine in 2020 reveals a huge gap in indicators.

The results of China's participation in world aerospace activities are shown by the leading Chinese corporation China Aerospace Science and Technology Corporation (CASC) – in the official release (Blue Book, 2021), the so-called the 2020 Blue Book of China Aerospace Science and Technology.

Selected 2020 indicators should be grouped by the type of activities into:

1. China is the world's second-largest launcher of 114 launch vehicles (1,277 spacecraft launches in the world); in terms of the number and mass of spacecraft launched, China has launched 39 launch vehicles and 89 spacecraft with a total mass of 103,06 tons, an increase of 29.3 percent over the previous year; the Long March rocket (CASC) has become the world's leader, completing 34 missions in 2020; the return of a first-stage vehicle of the rocket Long March 3B (Levenko, 2020) has been tested; private companies are building reusable rockets, such as the launch vehicle of 10-fold use of LinkSpace Aerospace Technology, Group, LV NewLine-1 (NewLine-1, 2021).
2. The Beidou-3 global satellite navigation system has been completed and put into operation.
3. The Mars probe Tianwen-1 has been successfully launched, as well as the lunar mission Chang'e-5, and lunar soil samples have been delivered to Earth; the mission of earth orbit space station is underway with the launch of the Long March 5B rocket – 2021 (2021 China's, 2021).
4. The high-resolution earth remote sensing system has been completed.
5. Chinese Space Shuttle – ShenLong (Divine Dragon) has been tested (Levenko & Pauk, 2020).
6. In international cooperation, the microsatellite ET-SMART-RSS is donated to Ethiopia, the EgyptSat-2 satellite for Egypt is being manufactured, the satellite for Sudan is put into operation, and Ukraine receives Chinese high-resolution satellite data on favourable terms, and much more.

In Ukraine:

1. The enterprises of the State Space Agency of Ukraine were involved in the production and support of the launch of the Antares launch vehicle (USA) and the final-stage engine of the Vega rocket (European Union).
2. The National Space Facilities Control and Testing Centre of the State Space Agency of Ukraine have received, processed data from Chinese satellites and transmitted information to State structures, as well as has registered all space objects in Earth orbit and all earthquakes in the world.

In addition, that was all in 2020. It should be noted that the first Egyptian satellite was created and manufactured in Ukraine. Moreover, recently, satellites were launched into orbit by Ukrainian launch vehicles in international cooperation.

Degradation is evident.

However, what about other countries that are not world leaders? For example, in Sweden, a space launch facility for sounding rockets has been operating since the 1960s, space institutions and space industries operate (Gutman, 2019). Rymdstyrelsen (Swedish National Space Agency, SNSA) is responsible for space research, funding distribution, development of new technologies and implementation of Earth remote sensing technologies in Sweden. The space strategy has been adopted. Sweden is a member of the European Space Agency (ESA). In 1961, Sweden launched its first rocket into space.

For more than 50 years, in Sweden, the Esrange Space Center has been operating where sounding rockets have been launched since 1968 (as of December 2019, 570 sounding research rockets, 60 of them Swedish, have been launched) (Levenko, 2019) and satellite information is received.

According to an analysis, the State of affairs in Sweden was relatively stable in this space activity until 2018, when the government first presented a strategy for the development of space research.

Moreover, no funding was provided. It had been announced in late 2020: the government had allocated about €9 million for the construction of infrastructure on the Esrange for the serial launch of small satellites over a three-year period. It was stressed that satellites would be civilian in nature and not linked to the Ministry of Defence and would not spy on other countries. Thus, the industry has shifted from stable development to the space race, where Sweden competes with other European countries, primarily Norway and its Andøya Space neighbouring Esrange and Scotland.

It is reasonable to assume that Sweden's decision was, among other factors, spurred with news that a few months earlier, in the summer of 2020, three countries (the United Arab Emirates, China, and the United States) had launched their probes on Mars within days of each other. However, the timing of the launch was due to very different planetary reasons, namely the proximity of Earth to Mars two months later.

Therefore, the State of affairs is as follows:

1. Development of space activities (the PRC).
2. Stability in space activities (Sweden).
3. Degradation of space activities (Ukraine).

However, it should be considered that by the time of the independence of Ukraine (1991) in the first years of its existence, Ukraine and the PRC had almost equal indicators, and Ukraine even surpassed China in its achievements. Both countries were almost equal then. Since 1991, the PRC has undergone transformations aimed at the intensive development of the space-based civilian component of military space science and industry. Subsequently, China has shifted to the dual-use industry, where the civilian sector has been provided with military technology already developed.

Therefore, the impact of various factors as prerequisites that have developed in Ukraine regarding public administration of space activities should be considered. In particular, our task is to study the legal (legislative) framework for space activities of the State Space Agency in Ukraine and to find imperfections by comparison with the actively developing management

of the China National Space Administration (CNSA) and with the stability under the Swedish National Space Agency (SNSA, Rymdstyrelsen).

The theoretical and methodological basis of the research is the works of Ukrainian legal scholars Valentyn Halunko and Serhii Didenko (Halunko & Didenko, 2019), Larysa Soroka (Soroka, 2020; Soroka, 2021), as well as researchers from other countries, such as Leonid Gudoshnikov (Gudoshnikov, 2012), Pavel Troshchinskii (Troshchinskii, 2011; Troshchinskii, 2016), Irina Prokopenkova (Prokopenkova, 2016), Vasilii Kashin (Kashin, 2015), Xueguang Zhou (Zhou, 2017), Chenjie Lee (Lee, 2013).

In addition to the works by scientists of different branches, the authors analyse the legal and regulatory framework in the space activities of Ukraine,[1] the People's Republic of China,[2] the European Union and the Kingdom of Sweden,[3] the results of the work of the Subcommission on Space Cooperation and the Commission on Cooperation between the Government of Ukraine and the Government of the People's Republic of China[4], as well as the results of own long-standing practical experience in this field (1966-2021).

The studies compare information for three countries (the PRC, Sweden, Ukraine) by the following categories:

1. Management structure.
2. Laws.
3. By-laws.
4. Programmes.
5. Systems for controlling programme performance and applying the inevitability of liability.

Management structure

The structure of the sector and its subordination are determined by the State authority that forms policy on space and missile activities and the central executive State authority, which ensures policy implementation into practice.

With regard to the PRC: the CPC Central Committee – the Chairman of the PRC – the National People's Congress of the PRC with the participation of the People's Political Consultative Conference – the State Council of the PRC – the Ministry of Industry and

[1] The Constitution of Ukraine (as amended by Law No. 27-IX of 03 September 2019, no. 38, Art. 160); Laws of Ukraine (National Space Legislation. Available online: https://www.nkau.gov.ua/en/space-law) and regulatory documents of the Cabinet of Ministers of Ukraine (incl. the Regulation on the State Space Agency, approved by the Resolution of the Cabinet of Ministers of Ukraine No. 281 of 14 May 2015 as amended on 7 September 2020 No. 819. Available online: https://www.nkau.gov.ua/ua/dka-ukrainy/polozhennia-pro-dka; programs and concepts for the development of the space industry in Ukraine (incl. National target-oriented science and technology space program of Ukraine for 2013-2017, approved by the Law of Ukraine of September 5, 2013 № 439-VII. Available online: https://www.nkau.gov.ua/en/activity/programs/776-national-target-oriented-science-and-technology-space-program-of-ukraine-for-2013-2017

[2] Constitution of the People's Republic of China, as amended on 11 March 2018. Available online: http://www.gov.cn/guoqing/2018-03/22/content_5276318.htm; Standard of China Space. Available online: http://www.cnsa.gov.cn/english/n6465684/n6465689/index.html; White Paper

[3] Strategy and policy documents. Available online: https://www.rymdstyrelsen.se/en/about-us/strategy-and-policy-documents)

[4] The fourth meeting of the Commission on cooperation between the Governments of Ukraine and the PRC held. Available online: https://www.nkau.gov.ua/ua/news/khronika-podii/1642-vidbulosia-chetverte-zasidannia-komisii-zi-spivrobitnytstva-mizh-uriadamy-ukrainy-ta-knr

Information Technology under the supervision of the Central Military Commission of the PRC – the State Administration for Science, Technology and Industry for National Defense – the China National Space Administration (CNSA) with CNSA subordinate organizations, such as the Centre for Space Law and the China Institute of Space Law – provincial governments – metropolitan governments.

Of particular note is the role of the China Institute of Space Law, founded in December 1997. It includes the former Ministry of Aerospace Industry, the Ministry of Foreign Affairs, the former Commission of Science and Technology (now the Ministry of Science and Technology), the former Commission of Science, Technology and Industry for National Defense (now the General Armaments Department), and the Chinese Academy of Sciences. The unit was initiated and established as a national academic organization that includes relevant national departments and research institutes in space law, space science and technology and applied institutes, as well as experts and scientists in space law.

Research and production academies are transferred from the CNSA. The China Aerospace Science and Technology Corporation (CASC) is a key one that includes a large number of other academies, institutes, factories, landfills and launch sites, involving a company of foreign economic activities to ensure international cooperation. "The China Aerospace Science and Technology Corporation is the main contractor for the Chinese space programme. It is state-owned and has many subordinate entities that design, develop, and manufacture a range of spacecraft, launch vehicles, strategic and tactical missile systems, and ground equipment" (China, 2021). It is under the management of the State-owned Assets Supervision and Administration Commission of the State Council (SASAC).

With regard to Ukraine: the Supreme Council of Ukraine – the President of Ukraine – the Cabinet of Ministers of Ukraine – the Vice Prime Minister, the Minister of Strategic Industries of Ukraine of the Ministry for Strategic Industries of Ukraine – the Department of Aviation and Space Policy Development – the State Space Agency of Ukraine and its three subordinate organizations, three research institutes, ten engineering and production enterprises. This structure existed at the time of this writing (State, 2021).

With regard to Sweden: the King of Sweden – the House of Bernadotte – Riksdag of the Estates – Prime Minister of Sweden – the Government of Sweden – the Ministry of Education and Research – the Swedish National Space Agency (SNSA) (Swedish, 2021) and its units.

The SNSA has no industrial facilities.

Rymdbolaget (the Swedish Space Corporation SSC), which is under the management of the Swedish Ministry of Industry, manages space research and use in Sweden. The SAAB Corporation plays a leading role in this work among private firms, involving 53 institutions and companies.

The SSC operates the Esrange Space Center (Gutman, 2019). In addition to the Esrange, the SSC has ground stations in Chile and Australia.

A preliminary analysis suggests that in the three cases under consideration fairly well-developed governance structures exist, although they are fundamentally different. In these countries, the very management structure of space and missile activities is required, and that is enough.

In the PRC and Sweden's research institutes, space facilities and industries (corporations) are not subordinate to space agencies. Therefore, the government organization, determining policy on space and missile activities by preparing programmes, and the implementers of these programmes are different. Initially, in Ukraine, industrial enterprises were under the

management of the ministries of the Cabinet of Ministers, while research institutes belonged to the National Academy of Sciences of Ukraine.

Laws

The legislation of the three countries is reviewed.

Sweden is guided by European Union laws with regard to the European Space Agency. These laws are known because Ukraine has signed the Association with the European Union, so about 50 of these laws and regulatory documents are already available on the website of the State Space Agency of Ukraine. All of them are not adapted in Ukraine. Therefore, Swedish legal stability is not even in the equation.

This can be considered as a deficiency in the management of space and missile activities in Ukraine: there is no adjustment of European Union legislation to the legislation of Ukraine.

A further comparison is made between the PRC and Ukraine.

General trends are identified in the structure of PRC and Ukrainian legislation:

1. The Constitutions are adopted (of Ukraine as revised in 2004, of the PRC as revised in 2018).
2. In both countries, about 90 laws are used that can be classified as "space law."
3. Ukraine adopted the Law 'On Space Activities' (1996), the PRC debates that a law on space activities in China is required (Chinese, 2011); since 2000, the Chinese Society of Space Law has prepared research reports on topics such as "Legislative research of the Space Law of the People's Republic of China," "Legislative research of Space Management Rules," and "Comparative research of Space Law in the main countries of the world." The results of these studies will be used in the preparation of new law; the Institute of Space Law of the Harbin Institute of Technology (Hu, 2017) is also involved in the preparation of the Law on space activities in China.
4. Activities are carried out within the framework of the Decrees of the President of Ukraine and the Chairman of the PRC, the Resolutions of the Supreme Council of Ukraine and the National People's Congress.
5. All-Union State Standard and a certain number of National Standards of Ukraine are used in accordance with international agreements in Ukraine, while the PRC uses about 1460 national standards to provide space and missile activities.

Both countries take into account the requirements of national security and defense legislation.

Some differences can be attributed to national specificities:

1. The main programme document in Ukraine is the National target-oriented science and technology space programme of Ukraine for 2013-2017 without reference to the State planning programmes; in China, the programmes are in the form of so-called White Papers within the framework of each PRC five-year development plan, "Programme 126" operates for the development of the dual-use economy, "National medium and long-term programme of scientific and technological development (2006-2020)" was in force in the period under review.
2. The use of the governmental legal regulations does not involve local law-making in Ukraine; in the PRC, among thousands of legislative acts, a large number are adopted by provincial governments and urban agglomerations.

The legal and regulatory frameworks of Ukraine and the PRC for space and missile activities are similar. A significant difference is that the lack of regions' participation in space activities, space policy and its results remain State affairs, following the example of the USSR, and do not take into account the political and economic changes in Ukraine after 1991.

It is obvious that in quantitative estimations, the difference is insignificant. Therefore the quality of the Law of Ukraine "On Space Activities" (in the latest revision with changes no. 912-IX of 17 September 2020) is analysed.

The analysis reveals that in declaring the main political objective (the law defines the main political areas of public administration to space activities: "promotion of social, economic and scientific progress of the State, increase of well-being of citizens"), its articles are not perfect, and the objective contradicts and the requirements of the Articles of the Law:

1. International agreements (Art. 9) have introduced restrictions on space activities in Ukraine without regard to the interests of Ukraine.
2. The rights of commercial and private entities are expanded. Still, authorization for international negotiations and the signing of contracts is required. The possibility of prohibiting non-State ownership is established – which is inadmissible in commercial activities, and an administrative court may only order prohibition (Art. 11), contrary to Art. 18, which proclaims the equality of all forms of ownership in international activities.
3. Moreover, the law does not clearly define the time frame for the adoption of space programmes, which has led to the fact that Ukraine has not had the one from 2017 until 2021 (Art. 7 of the Law).

The Law does not cover all modern tasks, such as remote sensing of the Earth, the basis of a modern space programme in Ukraine, which must be used by State organizations and in the economy of Ukraine. At present, such use is not regulated: information obtained through the use of budgetary resources is public property that can hardly be transferred or sold to anyone. The need to adopt the additional law of Ukraine, "On State Regulation of Remote Sensing of the Earth," was urgent 10 years ago, a draft was prepared, but in Ukraine's traditions, the adoption of the law would automatically require the creation of a new Ukrainian agency to manage remote sensing of the Earth.

In 2021, this became possible: the State Space Agency no longer functions as a ministry and is subordinate to the relevant ministry, where additional agencies can be established if necessary. The main drawback of the Law of Ukraine "On Space Activities" until 2021 was that the same legal entity formed national policy on space and missile activities in the form of programmes. The same legal entity was the executive of programmes. Therefore, the law avoided liability for non-performance or poor performance of programmes and did not define the liability of officials for the absence of a programme as such.

By-laws

State bodies adopt legal regulations with a view to streamlining public administration on specific issues.

In Ukraine, even at the legislative level, regional authority structures are not involved in space and missile activities.

In Sweden, for example, the northern regions of Norrbotten and Västerbotten have great expectations of the forthcoming modernization of space infrastructure, on which they have been in dialogue with the government for many years. There has already been a dramatic increase in the number of jobs and the relocation of new professionals from other regions and from abroad.

In order to speed up these processes, Aerospace Cluster Sweden has already been formed, and it includes major companies such as AIT, Brogren Industries, Carmenta, Finepart, Kyocera, Quintus, Spacemetric, and International exchange conferences are being carried out. Municipal leaders plan hundreds of new jobs, including due to start-ups by students of the Space Faculty neighbouring Kiruna Spaceport, graduating next year and starting their careers in Swedish space development. In addition, new experts will be required to handle the increasing amount of data from satellites. Thereof processing centre should also be located close to the Spaceport.

For Ukraine, regional law-making is an example.

The State Council of the PRC gave the right to regional governments to legislate on the solution of the main political problem of regional development with the growth of socio-economic indicators. A good example is the signing of such acts to attract foreign investment: sometimes legal regulations even in some ways contradict PRC laws (the formation and adoption of a new law in China can take decades) because they take into account local specificities and time factors.

The positive results of local administration in space and missile activities can be seen in the case of Shandong Province, located on the Shandong Peninsula in part of the urban agglomerations of Yantai and Qingdao.

The socio-economic situation in the province is reflected in the 13 five-year reports and the 14-year target set in the February 2021 Report (Li, 2021).

Over five years, the province's industrial development is characterized by a 30.2% increase in regional GDP; the value of products of high-tech industries amounted to 45.1% of the total value of industrial production above specified, which is 12.6% more than in 2015. Now there are more than fourteen thousand high-tech enterprises, which is 3.5 times more than in 2015. In addition, 102 new listing companies, then reaching 334, and 8 companies with a market value of more than 100 billion yuan were registered.

2.516 million poor people in 8,654 villages below the provincial standard were lifted out of poverty. The average disposable income per capita per year reached 32,886 yuan, twice as high as in 2010. The average subsistence level in urban and rural areas rose by 55 percent and 98 percent, respectively.

High-speed railways and expressways opened to traffic on overpasses reached 2,110 km and 7,473 km, respectively.

The time to start a business in the province has been reduced from 20 to one day. As a result, a total of 10,000 businesses with foreign capital have been established.

The construction of 'Green Intellectual Industrial City of Shandong' and other major projects have been started.

Taxes and fees have been cut by 185 billion yuan.

A total of 7,514 provincial, local legal acts have been reviewed and enacted to ensure compliance with the 13 five-year plans.

This information is followed by the development of the local space and missile industry in the province.

Greater Shanghai stands out as one of China's most important science and technology centres. Its future competitor, the city of Qingdao, is developing intensively. The nearby Yantai has long since become a centre for designing and manufacturing satellites with the necessary components.

The Yantai Government's website highlights a significant event: information about the space development of the Haiyan County seaside city, which is part of Yantai.

On 22 April 2020, the construction of the 'Eastern Aerospace Port' industry project (e.g., for the launch of locally produced commercial launch vehicles from offshore platforms) and the signing ceremony for 10 major space projects (Jones, 2020) began in the city of Haiyan. Four space investment sites are being established: National Special High-Tech Satellite Science and Technology Park Project (supported by the Industrial Park for Satellite Data Utilization in Qingdao), the National Special Satellite Demonstration Town, Oriental Aerospace Port (Haiyang), Industrial Park Development Co., Ltd. The PRC Aerospace Industry Office operates in Haiyan.

In Yantay, Shandong Longkou/Assembly & Test Center manufacture rocket engines (NewLine-1, 2021) for LinkSpace Aerospace Technology Group, a private aerospace company.

Together with other space and missile organizations and companies of Yantai, all of this merges into Yantai Aerospace. And this is a municipal initiative. The process is managed by the Office of the Shandong Provincial Commission for Integrated Military and Civilian Development as well as the CCP municipal local committee. The very complex system of management and control of the space and missile industry in the PRC is justified by the achievement of high results. The local regional level demonstrates the same.

Programmes

The main document of the State Space Agency of Ukraine is analysed in the latest version (National target-oriented science and technology space programme of Ukraine for 2013-2017) (Levenko & Drozdenko, 2021) in comparison with the 2016-2020 White Paper of the PRC (White Paper, 2016). Both programmes declare similar goals, but the size of Ukraine and the PRC is not commensurate, including in terms of projected revenues from space activities.

First of all, this is determined by the principle of programme construction: in the PRC, it is part of China's five-year plan of social and economic development. In Ukraine, it is the departmental document of the Space Agency.

Differences in planning result in different programme outcomes.

Analysis of Ukraine's space programme shows that up to 2015, it has been successfully carried out (launches of launch vehicles with the participation of Ukraine, cooperation with the European Space Agency, cooperation with Brazil, the Russian Federation, the United States of America, etc.) But since 2015, the funding has been reduced, and personnel changes have been made in the agency's management (seven times the head changed). The Ukrainian remote sensing satellite and other Ukrainian satellites, the communication satellite, have not been launched. The main political thesis, "promotion of social, economic and scientific progress of the State, increase of well-being of citizens" has not been defined in the programme clearly and has not been implemented.

The Blue Book of the PRC as the programme was implemented in China. The report on its implementation was presented in 2021 to the National People's Congress of the PRC. In the national tasks of the PRC, this thesis, identical to the Ukrainian one, has been fulfilled.

Moreover – China has officially recognized the eradication of poverty in the country and huge scientific and technological achievements that rank second in the world in space and missile technologies.

The Swedish National Space Agency participates in the programmes of the European Space Agency. The Strategy for Swedish space activities was presented by the government in 2018 for the first time in more than half a century of Swedish space history (2019 New Edition). It expressed the intention to adapt space exploration legislation to the current needs of the space industry. The Outer Space Law of 1983, which has been in force so far, is largely obsolete, as nowadays, there is a need to attract private capital for space research on a larger scale and as soon as possible. The relevant legislation of other European countries should be taken into account and cases of adverse effects on the Swedish space competitive capacity should be reflected in the new law. The possibility of commercial space flights should also be considered and approved by law. Furthermore, measures are envisaged to modernize the Esrange Space Centre in order to make it a European launch site, to create Swedish satellites, to participate in European programmes on remote sensing of Earth and the introduction of Earth remote sensing data for practical use, with the creation of a data archive in the Norrbotten region [6]. In addition, national security and defence should be ensured. The programme is approved by the Parliament (the Riksdag) and is executed under its control.

Responsibility

As mentioned above, even at the level of the city of Yanta, control of space projects is exercised not only by the State authorities but also by the CPC and the Provincial Office for Integrated Military and Civilian Development. Therefore, the implementation not only of the White Paper's plans, but also of other State programmes, such as "Program 126" development of the dual-use economy, "National medium- and long-term program of scientific and technological development (2006-2020)," is monitored.

Comprehensive control is carried out by State structures vertically, up to the CPC Central Committee.

In Sweden, violations of the Acts of the Parliament are dealt with by the judiciary.

In Ukraine, responsibility for implementing the National target-oriented science and technology space programme of Ukraine is not clearly defined even by the Law "On Space Activities." Internal control is carried out within the State Space Agency of Ukraine. The reports of the head of the Agency are formal and more media-oriented.

Conclusions

State policy on space and missile activities of the reviewed information regarding the PRC and Sweden differs from the one of Ukraine in the form of its provision.

The structure of the State Space Agency for 2020 looked like a mini-military-industrial complex of the USSR, with research institutes and enterprises subordinated to the Agency. Ukraine's State objectives are virtually non-existent in the space programme.

The State Space Agency has no military-industrial mission. In fact, the Agency is a means for the full use of space and missile residues of the USSR branch in modern Ukraine until their complete disposal.

The activities of the State Space Agency are under the control of the Cabinet of Ministers of Ukraine, although the Agency has no clear economic objectives.

Control of other branches of authority with regard to the development of space and missile activity sector, as a tool of development of technologies and science in the State, is formal (the Supreme Council of Ukraine, the President in the parliamentary-presidential country, political parties).

Military and civilian components are clear in space and missile (aerospace by other terminology) industry in the PRC. The CNSA is responsible only for the civilian area with open international cooperation, using advances in military technology and implementing the results of its work in China. The CNSA programme of activities is formally similar to that of the State Space Agency of Ukraine, but it is an integral part of the five-year development plans of the PRC with all the legal liability resulting from this. Control is multi-level: control exercised by the higher executive authority, legislative control, and control exercised by the Party in all branches of government. Therefore, public administration is practically applied in the Chinese-specific socialist legal system.

The study reveals the need for a partial reform of both the activities of the State Space Agency of Ukraine and its legal framework. Government reforms carried out in Ukraine in 2021, make this possible.

1. Recommendations for further research.

The State policy of Ukraine on space activities with the provision of the main mission of "promotion of social, economic and scientific progress of the State, an increase of well-being of citizens" should be determined as a basis, while the space sector structure that mimics in miniature the military-industrial complex of the USSR should be abandoned in the State Space Agency of Ukraine, transferring all industrial, research and development organizations and enterprises to the Ministry for Strategic Industries of Ukraine.

The transfer of the function of State policy-making in the field of space to the Ministry for Strategic Industries of Ukraine requires positive assessment, while the function of the State Space Agency of Ukraine should be a space programme identifying ways of implementing policy and determining the administrative liability of officials for incorrect policy-making and non-performance of the programme.

The tasks of the defense component of space activities should be transferred to the Ministry for Strategic Industries of Ukraine, taking into account the proposals of the Ministry of Defence.

The need for the corporatization of space industries to develop in international cooperation should be assessed.

2. It may be recommended to include the space programme in the development programmes of Ukraine, which will be made in the future by the Supreme Council of Ukraine on a submission from the Cabinet of Ministers, on the basis of proposals by the Ministry for Strategic Industries of Ukraine. This process should be administratively labile for all officials without exception, despite the inviolability of deputies and the Speaker of the Verkhovna Rada, the President, the Cabinet of Ministers, regional administrations, city and district leaders.

3. Following the example of the PRC, regional self-governing entities can be involved in the law-making to implement space programmes with regard to social and economic development at the local level.

4. The control of space policy implementation by the majority political party in the Supreme Council of Ukraine should be regulated at the legislative level.

5. The development of bilateral cooperation with individual EU countries regarding space and missile activities (for example, with Sweden) is considered positive, having adapted European legislation to space and missile activities in Ukraine.

In conclusion, it is recommended to proceed with cooperation with the PRC in space and missile activities, having adapted for this purpose targeted provisions of the legislation of Ukraine and the PRC, taking into account the need to adapt European Union legislation to the legal framework of Ukraine. Therefore, public administration of space activities in Ukraine will be supported by international law and bilateral agreements between States to increase efficiency and achieve the main objective: promotion of social, economic and scientific progress of the State, an increase of well-being of citizens.

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Realistic Dilemma and Legal Countermeasures against the "Non-Appropriation" Principle in Outer Space Treaty[1]

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The "non-appropriation" principle in Outer Space Treaty is of great significance in protecting the interests of all countries and the commonly inherited property of mankind. As the U.S., Luxembourg, etc. have claimed that countries or private entities can keep the right of ownership of outer space resources, the "non-appropriation" principle faces the realistic dilemma and legal challenges of unclear binding subject and low legal effect. Under the guidance of the thought "constructing a community of human destiny," the international community shall identify the applicable scope of the "non-appropriation" principle and regulate the non-government organizations' illegal possession and use of outer space resources; establish a special international institute of management for outer space resources by drawing lessons from the management mode of international seabed area; construct the development permission and notification mechanism for outer space resources to meet the needs of all countries in exploration of the outer space resources and achieve sustainable use of the outer space by mankind.

Keywords: non-appropriation, international custom rules, Space Law, outer space resources, and legal countermeasures

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Introduction

To maintain a peaceful development environment and achieve a win-win situation among all countries on resource development in outer space, in 1967, the United Nations formulated the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies (hereinafter referred to as Outer Space Treaty). The Outer Space Treaty puts forth the "non-appropriation" principle that no appropriation of the outer space and celestial bodies therein by any countries by claiming, possession, use, or any other means (Treaty on Principles, 1967). To further strengthen the binding force of the "non-appropriation" principle on all countries and protect public properties against encroachment, there are also many other provisions matching and associating with the "non-appropriation" principle in the Outer Space Treaty, including the common interest principle, with which countries who develop and explore the outer space shall comprehensively protect interests of all member states; free exploration and utilization principle which clarifies that all countries shall, in strict accordance with relevant provisions of international laws and based on mutual equality and respect, access into all areas of celestial bodies in outer space freely; and international cooperation principle which appeals and advocates mutual-aid and cooperation among all sovereign states during exploration of outer space resources for the benefit of all mankind (Treaty on Principles, 1967). In consideration of the legal nature and ownership of rights, outer space is very similar to high seas, international seabed areas, the South Pole and the North Pole, belonging to the "commonly inherited property of mankind"; it has the following characteristics (Joyner, 1986):

1. Not owned by any countries, organizations or private persons.
2. All human beings have the right to explore and use the natural resource thereof.
3. Developers shall focus on the interests of all countries and share the profits from exploration with all countries and their citizens.
4. The outer space shall be for peaceful purposes specially, with no discrimination among all exploration countries.
5. All mankind and the descendants shall work together to fully guarantee the safe and sustainable use of outer space resources.

The United Nations General Assembly (UNGA) published an international convention and a resolution to reiterate the "non-appropriation" principle in Outer Space Treaty. For example, on December 5, 1979, the UNGA adopted the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (Moon Agreement). It stipulates in Article 11 that celestial bodies (including the moon) and their resources are the common heritage of mankind, and the natural resource on and below the surface of the moon shall not be the property of any countries, governments, international non-governmental organizations, non-governmental entities or any natural persons (Agreement, 1979). Apparently, it is basically consistent with the provisions in Article 2 of the Outer Space Treaty, reconfirms the common attribute of outer space resources and promotes the "non-appropriation" principle to be a basic international custom rule (Lee, 2004).

Since its establishment, the "non-appropriation" principle has played a crucial role in regulating and controlling the behavior of exploring outer space resources by developed countries, developing countries, domestic organizations, and citizens. According to the "non-

appropriation" principle, developed countries shall, on the basis of no discrimination against developing countries and in accordance with the Outer Space Treaty and other relevant Laws of Outer Space, explore and use outer space resources legitimately to meet their and their citizens' growing demand on natural resources; for developing countries, the principle provides them opportunities for fair participation in the competition, expands their and their citizens' living space and changes to a certain extent the traditional international pattern that dominating the development of outer space by western powers. In a word, the "non-appropriation" principle is conducive to maintaining the sustainable development of natural resources in outer space and the common interest of mankind. All countries shall observe it strictly during resource exploration and give priority to the Outer Space Treaty as a "constitution of outer space."

1. Realistic challenges and legal dilemma against "non-appropriation" principle

With the exploration for outer space goes deep constantly and the exploration technology improves increasingly, the United States, Luxembourg and International Telecommunication Union (ITU) formulated legislation that permitting private entities or countries to possess, use, transport and sell natural resources in outer space, arising high question and strong dissatisfaction from the international community. Moreover, in the long-term judicial practice, the "non-appropriation" principle exposes its legal dilemma gradually in unclear subject definition and weak legal binding effect, posing a serious threat to the safety of common properties of mankind (natural resources in outer space). The realistic challenges and legal dilemma against the "non-appropriation" principle are specifically shown in the following two aspects.

1.1 Realistic challenges: concept conflict and influences to international security and stability

To accelerate the competition in outer space resources and seize the high ground of outer space, presently, some developed countries indulge and even encourage their private subject to explore, develop and use outer space resources, and publicize vigorously the concepts "countries who explore gain the ownership" and "outer space resources can be appropriated" (Liao, 2018: 40), which breach apparently the "non-appropriation" principle that has been accepted in the traditional international law on outer space and are highly likely to reduce the market share of outer space and damage the expected benefits of other countries, in particular to developing countries. On November 25, 2015, the former U.S. President Barack Obama published The U.S. Commercial Space Launch Competitiveness Act. According to the provision "exploration and use of outer space resources" in Chapter IV of the Act, U.S. citizens are gifted with the mining rights for outer space of near-earth asteroids (Bennett, 2018) and the freedom of possessing, transporting, selling and using resources in asteroids and other spaces (H.R. 2262-U.S., 2015); the Act also stipulates that unless making the United States to breach the international obligation, the federal government shall not restrict enterprises and citizens to develop outer space resources by setting administration barriers (Li, 2017: 1576) so that private entities can have the ownership of outer space resources without disturbance and implement effective management for them.

On July 13, 2017, Luxembourg, after drawing lessons selectively from the concept "countries who explore gain the ownership" put forth by the United States, formulated the Law

on Exploration and Use of Outer Space Resources (Draft Law, 2016). It stipulates explicitly that operators who propose to explore for commercial purpose and use outer space resources (state-owned companies limited by shares, partnership companies limited by shares and limited liability companies stipulated by laws of Luxembourg or European companies registered in Luxembourg generally) shall submit a written application to relevant department in advance and can obtain the rights of exploring, mining and possessing outer space resources with the permit and approval from corresponding approval institutions (Draft Law, 2016). Since then, Luxembourg has become the first European country stipulating the "appropriation of outer space resources" by legislation.

Also, ITU distributed geostationary orbit resources to different countries according to "historical method" and "plans ahead," bringing in severe challenges to the "non-appropriation" principle. The "historical method" requires member states to register in the International Frequency Registration Board (IFRB) (an organization under ITU) before using radio frequency, and countries registered ahead shall be given priority to use the radio frequency; according to the "plans ahead," the geostationary orbit resources shall be distributed to each country by portions to getting out of the limit by registration time (Cao, 2007). There are large differences between the "historical method" and the "plans ahead." Still, they both acknowledge directly or indirectly the claim that "outer space resources can be owned by countries," coinciding with the legislation of the United States and Luxembourg.

All countries over the world have attached great importance to the attribution of rights for natural resources in outer space since the proposal of the concept that "private entities or countries can possess the outer space resources" by the United States, Luxembourg and ITU. According to the provisions of classical Roman private law, the prior possessor can only claim ownership and implement effective management for ownerless lands (Zhou, 2004: 250). In light of outer space, it is stipulated explicitly in the Outer Space Treaty and other relevant treaties that natural resources in outer space and all celestial bodies therein are the commonly inherited property of mankind. The outer space does not belong to the prior possession subject as stipulated in the International Law, and no country or private person can appropriate the natural resources therein in the excuse of prior possession. For this reason, most countries hold that the behavior of the United States, Luxembourg and ITU. However, it can arouse to a certain extent the enthusiasm of private entities or countries on outer space exploration and create more economic benefits, breaches seriously the international customary rule "non-appropriation" on outer space use. In addition to the illegality, the behavior is likely to intensify the geopolitical relations of all countries in the outer space field, endanger the international relationship, destabilize international security and stability and damage the legitimate interests of all mankind. As claimed by Belgium on the 55th session of the United Nations Committee on the Peaceful Uses of Outer Space (UNCOPOUS): "if an entity has too much freedom when acquiring resources, its free access right may be restricted greatly; once the right of acquiring resources cannot be balanced in different countries, offensively inflated 'bright line' zones and fighting for lands may emerge."

In a word, the concept of the United States and Luxembourg that "countries or private persons can enjoy sovereign rights over outer space resources" is inconsistent with the "non-appropriation" principle and brings in realistic challenges to the safety of outer space, and is resisted and opposed by international community.

1.2 Legal dilemma: unclear subject definition and low legal effect

As previously mentioned, the Outer Space Treaty stipulates only no appropriation of the outer space and celestial bodies therein by any countries by claiming, possession, use or any other means, but fails to specify the restriction to the non-governmental organizations, social groups and private entities; it is very fuzzy and uncertain, and thus offers plausible excuses for some non-governmental organizations and private entities in wanton possession, use or sale of outer space resources. There are huge gaps remaining among countries in juridical practice. Some countries hold that, as an important part of countries, the rights of social groups and private entities depend fully on the authorization of the countries. According to the Outer Space Treaty, no countries can claim sovereignty for outer space. It is more impossible for non-government organizations to develop outer space resources beyond countries without control. From this point, the National Aeronautics and Space Administration (NASA) made a decision for the "case Gregory Nemitz claiming private rights for asteroid 433" that rejecting Gregory Nemitz's claims since his theory "individuals can possess celestial bodies" was lack of relevant legal support (Hobe et al., 2017). In the case of selling lands on the moon of the Lunar Embassy to China, the People's Court of Haidian District, Beijing said that no countries and their citizens and organizations have the right to claim ownership of the moon. Nevertheless, some countries still claim that individuals shall possess any parts of the outer space legitimately on behalf of themselves or other individuals, private groups, and international organizations (Gorove, 1968). They permit and even strongly support their private entities in possession, exploration and use of outer space resources, and the United States and Luxembourg bear the brunt. Up to now, the international community still fails to reach an agreement on the scope of the binding subject of the "non-appropriation" principle. This could feasibly cause some countries who expect to gain much profit in the outer space field to instigate their domestic private entities to possess and develop in large scale the natural resource in outer space, bypassing the Outer Space Treaty, and thus damaging the lawful rights and interests of other countries and their citizens.

Besides the unclear binding subject, the "non-appropriation" principle has an internal logic dilemma that its legal binding force derives from and depends on the "state sovereignty" principle, showing low legal effect. It is specially shown in the following two aspects: first, the establishment of the "non-appropriation" principle. The Outer Space Treaty has the same legal nature and characteristics as general treaties. It produces a legal binding force only on sovereign states who join in and approve it and cannot be used as the legal basis for managing and controlling non-contracting or acceding states. In other words, only countries who acknowledge the "state sovereignty" principle can join in the Outer Space Treaty and are bound by the "non-appropriation" principle. It means that the "state sovereignty" principle is the premise for the "non-appropriation" principle. Second, the alteration of the "non-appropriation" principle. With the exploration technology for outer space resources improve day by day and the demand for natural resources constantly increases in different countries, some countries attempt to possess outer space resources wantonly by shaking and changing the position of the "non-appropriation" principle in international laws of outer space. Suppose more and more countries question or object to the rationality of the "non-appropriation" principle. In that case, predictably, all parties are highly possible to formulate new treaties and rules following the state sovereignty principle to break free from the "non-appropriation" principle.

We hold that the "state sovereignty" principle, as the logical basis and core belief of the existing international legal system, will almost produce legal binding force to all countries and is difficult to alter and substitute. On the contrary, the "non-appropriation" principle binds only the countries approving or joining in Outer Space Treaty and is not the unalterable basic legal principle; its legal effect is much weaker than the "state sovereignty" principle (Zhao, 2019: 26).

2. Legal countermeasures of the "non-appropriation" principle in the "new era"

In 2017, China promoted the construction of a community of human destiny and built an open and inclusive new era that enjoys lasting peace, universal security, and common prosperity. The proposal of constructing a community of human destiny offers a good program for the improvement of the "non-appropriation" principle largely; all countries can, with this opportunity, clarify the applicable scope of the "non-appropriation" principle furthermore, establish a special international institute of management for outer space resources and construct the international development mechanism for outer space resources. Especially, the international community may set about from the following three aspects.

2.1 Clarify the scope of application of the "non-appropriation" principle

The "non-appropriation" principle in Outer Space Treaty provides "sovereign countries are not entitled to the ownership of outer space resources," but domestic private entities and non-governmental organizations are not included in the scope of the restriction. This vague and uncertain expression has led to the encouragement in free development and commercialization of foreign space resources in the United States, Luxembourg and other countries, which is extremely easy to harm the economic interests of other countries, especially the underdeveloped countries. Based on this, we believe that all parties can clearly define the subject scope of the "non-appropriation" principle by amending the Outer Space Treaty, the Moon Agreement and other international conventions. However, due to the huge gap between countries in the technology of exploiting outer space resources and difficult coordination on the interests of countries, it is difficult for all countries to reach an agreement on whether the "non-appropriation" principle should restrict private entities within a short period of time. Therefore, considering the balance of interests of all mankind and the actual level of development of all countries, the international community should adopt a relatively neutral and relaxed attitude, establish a concept of combining principle with flexibility and generality with the exception, and provide different provisions on the ownership and usufruct of space resources. As far as ownership is concerned, the natural resources in outer space belong to the common heritage of mankind, which is related to the survival of all mankind and the interests of every country. In order to truly make outer space a "resource treasury" for mankind and prevent some scientific and technological powers from infringement of the interests of other countries or regions through abusing their legal rights, all parties shall broadly interpret the Article 6 of the Outer Space Treaty ("all countries shall bear international responsibility for their space activities, no matter such activities are carried out by government departments or non-government departments") (Treaty on Principles, 1967) as follows, the "non-appropriation" principle is not only binding on all parties, but also should strictly regulate the illegal occupation of outer space resources by any private entity or non-governmental organization" (Liao, 2018: 65).

However, suppose a "one-size-fits-all" approach is adopted to absolutely forbidden sovereign countries and citizens from exploiting any kind of outer space resources. In that case, the development subject's enthusiasm for exploring outer space and the exploitation of natural resources by various countries will surely be dampened. Therefore, the international community should, on the basis of the above provisions, attract the state and private entities to actively and continuously develop outer space resources through the provision of exception clauses to promote the leapfrog development of the economy and society. It mainly includes the following three approaches: first, the international community can grant sovereign states and private entities the right to freely explore, develop and utilize outer space resources, with a certain degree of restrictions on the conditions, extent and scope of the exercise of this right; secondly, under the guidance of the concept "the development of outer space resources is in the common interest of all mankind," actual developers are given limited rights of income and benefits from outer space resources. According to the different roles and contributions of various countries during the development, rights and interests are allocated in a targeted way and the development between countries with developed, underdeveloped or even completely non-space capabilities is balanced (Zhao & Jiang, 2018: 90); thirdly, referring to the eligibility conditions of land miners in Jus Privatum, all stakeholders are required to pay appropriate considerations to the owners of outer space resources or specialized international space agency in exchange for the right of exploitation and utilization of outer space natural resources, on the premise of following the "non-appropriation" principle and corresponding management mechanisms (Liao, 2018). Therefore, a win-win model of cooperation between actual and non-actual developing countries is established to fully protect all parties' legitimate rights and interests in outer space.

To sum up, we think it should provide private entities and non-governmental organizations not entitled to the ownership of outer space resources, but are granted the right to develop and utilize them according to the law rationally. The principle of "non-development oriented, supplemented by limited development" is suggested to adopt, thus realizing the balance between the protection of the common heritage of mankind and all countries' interests in the field of outer space development.

2.2. Establishment of a special outer space resources agency

In view of the public nature and transnational nature of the international seabed area and outer space, through learning from the experience and lessons of the international seabed area system construction and the management mechanisms and models of various countries for the international seabed area, the international community can establish an outer space resources agency (internal space agency) similar to the International Sea-Bed Authority to rationally allocate outer space resources and balance the interests of all parties.

As we all know, the Outer Space Treaty repeatedly stresses, the natural resources in outer space belong to the common heritage of mankind, and any subject exploiting them must benefit the development of all parties. Therefore, while establishing the international space agency, the international community should take the lead in developing the concepts of "non-appropriation," common interests, free exploration and utilization, equal development and sustainable development to deal with the coordination and conflicts between the countries with powerful and weak space capabilities. Under the guidance of such principles, space resources agencies should also include as many member states as possible to lay a solid organizational foundation. In general, international space agency can choose the following categories of countries as his member states (Lee, 2009: 588):

1. Countries that are capable of fully exploring and exploiting outer space.
2. Countries with financial investment capability.
3. Any member state of the United Nations.
4. Any independent sovereign country or region.

In this regard, we believe that the first two methods only grant the powerful countries of outer space science and technology and finance the right to exploit natural resources in outer space, which obviously violates the principle of common interests of mankind, deprives developing countries or regions of the qualification for exploration and benefits, and is not in line with the development trend of international space activities. Comparatively speaking, the third method is reasonable in theory. According to the UN Charter, no member state may interfere in the internal affairs of other countries. Specifically, in the field of outer space, this provision is conducive to preserving the exploitation rights and benefits of non-actual developing countries in outer space, but its reasonability still needs further verification in practice. The fourth method takes whether the country enjoys independent sovereignty as a unified standard to measure if the applicant country meets the qualification and conditions for joining the international space agency, thus guaranteeing the rights of all parties to enter the international space agency on an equal basis. It will inevitably develop into the main method generally followed by all countries (Teng, 2016).

In addition to establishing advanced design concepts and attracting more sovereign countries to join space resources agencies, the international space agency should also set up internal organizations with different authorities and responsibilities. Specifically, first, the international space agency may set up a conference of member states, which will be responsible for formulating general policies and regulations, approving the accession or withdrawal of member states, and considering and adopting comprehensive matters such as fiscal budgets; secondly, all major power, weak countries and middle countries in aerospace may consider sending a certain proportion of representatives to form a permanent council, which is responsible for handling the daily administrative examination and approval of the agency and making up for the consequences of delay holding of the conference of member states; thirdly, set up a special finance committee to manage the drafting of financial rules, collection of membership fees and permission fees from member states, etc.; fourthly, establish a dispute settlement institution; fifth, establish related executive institute; sixth, in order to ensure the rational exploitation of outer space resources by various countries and regulate the improper exploitation by development entities, the outer space resources agency should establish an effective internal evaluation and audit institution (Zhao, 2017), mainly including legal, environmental and scientific and technological inspection departments.

In short, the international community should, under the guidance of the Outer Space Treaty and the "non-appropriation" principle, call on sovereign states to actively set up specialized outer space resources agencies and internal departments to create a systematic, complete and comprehensive operational governance mechanism.

2.3 Construction of international resource development permission and notification mechanism

In judicial practice, some states and non-state entities will harm other countries' ownership and usufruct outer space natural resources by abusing their rights. In order to prevent such phenomena and protect the common heritage of all mankind, the international community can

consider establishing a space resource development permission and notification mechanism. Specifically, it mainly includes two aspects:

First, in order to ensure countries, organizations and individuals engaged in actual development activities exploit outer space resources rationally, the international community should require development subjects to strictly follow the permission procedures stipulated in relevant international treaties, for example, complete the application and registration procedures with the international space agency in order to obtain the development permission documents. First, formal review. The applicant should prove its qualification for the development of natural resources in outer space by submitting supporting materials such as patent technology, investment certificate and existing development experience, and provide a detailed proposed plan for the Council, which includes the purpose, regional scope, methods, years and expected results at different stages of exploitation, impact on the environment, cooperation programs with other countries, and disputes resolution. After that, the international space agency should conduct a preliminary formal review of such materials. If the materials submitted by the applicant are complete without any apparent defect, the application procedure is accepted and can proceed into the second stage. Otherwise, the international space agency shall return the materials not conforming to the relevant regulations to the applicant timely with an explanation of refusal to enable the corresponding amendments or supplements to the materials by the applicant; secondly, substantive review. International space agencies should further carry out a substantive review for those who have passed the preliminary review, for example, transfer materials to the specific examination institutes by types of supporting documents. Such relevant institutes shall provide the examination results truthfully for the international space agency within 45 days. The international space agency should decide whether the applicant can proceed into the next review stage within 30 days. In addition, for those who failed the substantive review, the international space agency will require them to submit an improved development plan and supplementary supporting materials within 60 days for review again; in the end, the voting shall be organized. International space agencies should hold a conference of member states to vote on the applicant's qualification on the exploitation of outer space resources, and finally issue a permission certificate to those who passed the voting, i.e., eligible subjects.

Second, to enable interested parties to beforehand learn the development of outer space resources in other countries and protect their legitimate rights and interests, the international space agency should require all parties to widely inform other countries of its development plans by establishing an outer space exploitation notification mechanism. The notification mechanism may include the following contents: First, any party is obliged to notify the international space agency and the whole international community of its exploitation activities; secondly, upon acknowledging another country's plan for exploitation which is exactly located in the same area simultaneously engaged by one party itself, this party should immediately notify its exploitation time, plan and other relevant contents to the other so as to protect the interests of the first developers from infringement. Finally, states, non-governmental organizations and private entities should report any phenomena found in outer space that may pose a threat to human life or any other organic life phenomena to the international space agency and the whole international community (Zhang, 2010: 33).

The international space agency should select subjects that meet the conditions of exploitation by establishing an outer space exploitation permission and notification mechanism to ensure the rights of non-actual developing countries to explore and utilize outer space freely.

Conclusions

In recent years, the earth has been unable to meet the ever-increasing demand of human resources for uncontrolled exploitation and wanton destruction of natural resources in order to increase their resource reserves and compete for the commanding heights of the "resource war" in the new century, various scientific and technological powers are competing to take the outer space, the so-called "resource reserve," as another key development goal after the earth. In judicial practice, some countries and international organizations such as the United States, Luxembourg and the ITU allow private entities or countries to openly possess, use, transport and sell natural resources in outer space in violation of the "non-appropriation" principle, in order to seize huge illegal benefits and take the lead in competing for space with other countries. In addition, the "non-appropriation" principle has gradually exposed the legal disadvantage and loopholes of unclear binding subject and low effect, making this international custom rule subject to unprecedented practical challenges and theoretical impact. In this regard, we suggest that the international community should clearly define the scope of application of the "non-appropriation" principle and provide corresponding provisions on the issue of ownership and usufruct of outer space resources through a combination of generality and exception. An international space agency should be established to strengthen the unified jurisdiction of all parties. A space exploration permission and notification mechanism should be established to protect the common heritage of mankind and the legitimate rights and interests of all countries.

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Adapting Institutional-Legal Mechanisms of the Space Industry Management to the Challenges of the New Space Era

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The article is devoted to the analysis of the institutional-legal mechanisms of managing the strategically important space industry in Ukraine. Scientific-theoretical research methods: abstraction, idealization, construction of hypotheses and models, documentary analysis and synthesis, objective truth, cognitive-analytical, etc. Results: the origin and historical genesis of constituent elements of institutional-legal mechanisms of the management of the space industry in Ukraine and the problems of adapting these mechanisms to the trends of the "new space," are analyzed. The scientific aim is to contribute to developing the adequate and integrated legal regime of the management of the space industry in Ukraine and improving its institutional framework's effectiveness. Discussion: the evolution of the institutional framework and of the national space industry and its legal regime is analyzed on the background of Ukraine's space activities and trends of the "new space." The management of the national space industry needs not a fragmentary but a comprehensive administrative legal regulation and its harmonization with the respective regime of the leading space-faring nations.

Keywords: institutional-legal mechanisms, State Target Scientific-Technical Space Program of Ukraine, new space, space industry, adaptation of the law, self-regulatory organization

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Introduction

Ukraine's space industry has undeniable achievements – from 1962 to 2021, 163 Ukrainian-made rocket carriers were launched from 6 cosmodromes worldwide, placing 380 satellites by order of 25 countries into orbits; 27 spacecraft were produced (Rokytsky, 2020). However, its scientific-technical potential and its markets have been substantially lost due to the following critical determinants:

1. Poor management of the major international projects involving the Ukrainian space authorities and enterprises, including the Alcantara Ukrainian-Brazilian joint spaceport for Cyclone-4 launchers, the Sea Launch and the National Satellite Communication System with its pivotal Lybid satellite.
2. Severing geopolitical ties with Russia that made joint space projects (e.g., Dnepr launcher or the Ukrainian docking system) were impossible.

In the last decade, humankind has entered the "new space" era, when private aerospace companies created be Elon Musk, Jeff Besos, Richard Branson, et al. capture significant shares of the upstream (means of access and presence in space) and downstream (means of information retrieval, orbital production, navigation) markets and design their space programs. A couple of decades ago, states were spending colossal public budgets to create space technologies confirming their superiority and leadership; then, the space technologies were created by the state, for it and at public expense. On the contrary, the new/commercial space requires a very different approach, including the sheer cut of the launch cost and the exponential growth in creating new rocket-space technologies, aimed at:

1. Creating outposts beyond the Earth (e.g., Moon "villages" and space islands to ensure the preservation of the achievements and gene pool of humankind (Halunko et al., 2021).
2. Mining on celestial bodies (asteroids and planets of the Solar System).
3. Orbital manufacturing in "0"- gravity and vacuum.

Ukraine's space industry residual scientific and technological potential allows it to become an important supplier of solutions for the new global space ecosystem, including developing and producing aerospace systems, processing space data, etc. In our view, that may be achieved only provided the institutional-legal mechanisms of Ukraine's space industry management were adapted to Ukraine's integration into new global space product supply chains and its new international alliances in the aerospace sector.

Contemporary institutional-legal mechanisms of the space industry management

The contemporary institutional-legal regime of space industry management in Ukraine is based on Art. 92 of its Constitution and started to evolve soon after Ukraine had gained its independence. The Law of Ukraine "On Space Activities" (Law, 1996), as a core act of the system of national space law, defines the principles of that management in Ukraine and establishes the legal basis of its organization and general requirements for the international space cooperation.

The current state of that Law, analyzed by the leading Ukrainian scientists (Shemshuchenko, 2012), provokes some well-founded criticism (Shemshuchenko & Semenyaka, 2019), as it contains norms with no proper mechanism of their implementation. To implement the rules of Articles 8, 12, 13, 27 of this Law, the Cabinet of Ministers of Ukraine has yet to approve the rules of space activities in Ukraine, registration of space enterprises in Ukraine, while the President of Ukraine – the procedure for the interaction of the Ministry of Defense of Ukraine and the intelligence bodies with the central executive bodies in the space activities.

In our view, the Law in question insufficiently addressed the emergence of the "new space" and the interests of its participants (until 2020, the space activities in Ukraine were pursued exclusively by the state-owned enterprises). Thus, it was modified in October 2019 to end the state monopoly on space activities, lift the excessive regulation and enhance the investment attractiveness of the space industry. The introduced declarative permissive procedures aim at creating attractive economic and legal conditions for conducting space activities. While the legal regime was modified without a clear forecast of the effects, the modifications shall be reviewed for their compliance with the principles of the adequacy of public regulation of the space industry. The respective institutional-legal mechanisms implementing the novelties of the space activities, including the registration of the pursuance of space activities as well as licensing, shall be installed.

There are several draft laws "On state regulation of satellite navigation" (Draft Law, 2013) and "On state regulation of remote sensing of the Earth" (Order, 2013) that, if adopted, would determine legal, economic, organizational and financial fundamentals of public regulation of the specific space activities in Ukraine or by its subjects abroad. These bills shall be updated and forwarded for approval by lawmakers as soon as possible.

Attracting the extra-budgetary sources of funding of space projects requires the adequate regulation of private-public partnerships (including cross-border ones), provided with the Law on Public-Private Partnership (Law, 2010). It is important that the state creates organizational and administrative conditions for such partnership, given the innovative and investment attractiveness of space activities.

Linking the priorities of the space industry development with the funding (primarily public) used to be one of the key functions of the State Space Agency of Ukraine (the "SSAU"). The Agency was established and granted the special status with the Decree of the President of Ukraine (Decree, 1992). From the institutional point of view, SSAU had been the central state body competent to form and implement the state space activities policy until 2012. Following the delimitation of powers of administrative bodies with the revision of the Space Activities Law, SSAU was deprived of the function of space policy formation, remaining with the one to ensure its implementation. Indeed, until 2019, SSAU had de-facto been performing the policy formation function.

The Agency had been developing the 5-year State Target Scientific-Technical Space Programs, to be approved by the Verkhovna Rada of Ukraine, since 1994. The programs provided the means to preserve and develop the scientific and production potential of the space industry for the benefit of the national economy and security and Ukraine's entry into international space markets. In recent years, space activities have been conducted in the absence of the Program, while since 2020, the powers to form the space policy and to develop the Program were transferred to the Ministry of Strategic Industries of Ukraine (Resolution, 2020). Notably, the space industry was determined "strategic" by virtue of its transfer under the reign of that Ministry.

Adapting the institutional-legal mechanisms of the space industry management

Adapting the institutional-legal mechanisms of the space industry management to the new economic, technological and geopolitical realities is vital for Ukraine. The work uses the theoretical aspects of Professor Frans von der Dunk (International, 2018), as well as Associate Professor Larysa Soroka (Soroka, 2020), while the fundamentals of improving the institutional-legal regime of any sector of activities in Ukraine has been laid down in the work of leading administrative law scholars (Administrative, 2020).

We suggest adapting such mechanisms comprehensively, not fragmentarily, based on a clear understanding of Ukraine's space sector position in producing and using competitive high-tech space products. We see the main task of such adaptation in bringing those mechanisms in line with the needs of the current stage and prospects for the development of space activities. It should be carried out on a thorough analysis of the practice of applying the existing ones, the best practices in the national space and administrative law, and the experience of the leading space-faring nations. The inconsistencies and conflicts in the institutional-legal mechanisms shall be eliminated.

Effective management and placing the decision-making at the optimal level in the state are fundamentally important for the development of the strategic space industry. However, as a result of the redistribution of powers and unclear legal algorithm of coordination, the management of the space industry is dispersed between the MSIU and the SSAU, as the central executive bodies responsible for forming and implementing the policy in the field of space activities.

As a result of the adoption of the Law of Ukraine No 143 "On Amendments to Certain Laws of Ukraine on State Regulation of Space Activities" (October 2, 2019), two formulations on central executive bodies appeared in the Law "On Space Activities," namely:

1. Central executive body, ensuring the formation and implementation of state policy in the space activities.
2. Central executive body implementing state policy in the space activities.

In pursuance of the Law of Ukraine No 143, and in accordance with the resolution of the Cabinet of Ministers of Ukraine No 819 dd. 07.09.2020, the scheme of direction and coordination of central executive bodies was changed, providing for the direction and coordination of the SSAU through the Vice Prime Minister of Ukraine – Minister of Strategic Industries. SSAU has retained the focus on implementing the state space policy, managing the space facilities, as well as the civilian educational and research programs. Meanwhile has lost a significant part of its powers, its prestige has been reduced, which is inconsistent with global practice, which demonstrates an increase in interest in space activities and the creation of appropriate special government agencies.

According to the Concept of optimization of the system of central executive bodies, approved by order of the Cabinet of Ministers of Ukraine dd, 27.12.2017 No 1013-r, there may be a conflict between the functions of public policy and certain functions of managing the objects of state property, inspection, supervision and the provision of administrative services. That may lead to the development of biased and low-quality policies, increase budget expenditures on existing government programs and resist change. Also, the existing division of powers between the SSAU and the MSIU contradicts the Public Administration Reform Strategy of Ukraine until 2021, approved with the Order of the Cabinet of Ministers of Ukraine

dd 24.06.2016 No 474. The Draft Law No 1424, if adopted (Draft, 2021), would eliminate the conflict of competencies between the MSIU and the SSAU and leaves very few inconsistencies as to the competencies of both bodies.

There is an ongoing discussion on the appropriate institution to manage the state-owned space industrial enterprises – the MSIU, the SSAU, or the Cabinet of Ministers of Ukraine. We see two solutions of either leaving the management of those enterprises with the SSAU, or creating a state holding company, similar to Ukroboronprom, directly subordinated to either SSAU or the Cabinet of Ministers of Ukraine. At the lowest common denominator, the effective functioning and competitiveness of the state-owned space enterprises in the new space economy ought to be ensured with their organizational and economic transformations: corporatization or even further privatization.

The innovation and production potential of the space industry may be enhanced by using such forms of priority development as scientific, industrial parks and clusters. These forms shall be developed in coordination with the Ministry of Education and Science (in charge of the scientific parks) and the Ministry of Regional Development of Ukraine.

Furthermore, we propose strengthening the institutional mechanisms of the policy-making on the space activities with the "council of users of the space services." It might be institutionalized as the consultative body at the highest level possible – either at the Cabinet of Ministers or the President. That body shall determine the priorities of the development of the space industry encapsulated in the document, similar to the existing National Space Strategy (Order, 2015), as approved by the SSAU and based on scientific forecasting and analysis. Creating such a "user-oriented" body would allow to balance the interests of the space industry in the narrow sense, that is stunningly losing its capacities, and the users of space technologies (including defense and security sector, ICT, agribusiness, etc.). That, in turn, should eliminate disproportions in the distribution of the scarce state funding as well as shape partnerships necessary to realize strategic projects in the space sector.

It is worthwhile considering the establishment of a self-regulating body in the space industry, alongside the practice of the aerospace industry in some countries (e.g., the USA). Such self-regulating body in our country might be created on the basis of the law on self-regulating organizations, its draft being considered by the Verkhovna Rada of Ukraine (Draft, 2011) and be granted with certain administrative powers (e.g., registration of the declaration of space activities). It would enable supplementing the institutional-legal mechanisms with the markets ones and the tools of self-regulation. In order to ensure the safety of space activities, the more complex administrative services like certification, verification of compliance with the requirements of airworthiness, technical regulations, licensing shall be administered by the central executive body, namely the SSAU.

Last but not least, the rules of space activities management in Ukraine shall be harmonized with the institutional-legal mechanisms of the prospective partners, e.g., countries where "commercial" spaceports oriented towards Ukrainian launch vehicles are being construed. The comparative analysis of such regimes in Ukraine and China, and the best practice of space project management were recently analyzed by Oleksandr Levenko and Oleksandr Drozdenko (Levenko & Drozdenko, 2021).

Conclusion

The institutional-legal mechanisms of managing the industry in Ukraine ought to be sophisticated, with the following key measures:

1. Redistributing the decision-making and regulatory powers among the executive and policy-making bodies.
2. Reconsidering the role of the central executive bodies in the state-owned space enterprise management and promoting their reorganization in Ukraine in order to increase their efficiency and competitiveness.
3. Introducing on a limited scope self-regulation into the space industry.
4. Harmonizing the institutional-legal mechanisms with the ones of the prospective partners.

Implementing these measures can help integrate and manage the space industry in Ukraine and improve its institutional framework.

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Basic Principles of Public Administration of Critical Information Infrastructure: the Example of Ukraine

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The article considers the issues of stability of critical information infrastructures (CII), based on the analysis of current domestic legislation in the field of national security in general and cybersecurity – in particular, highlights the basic principles of administrative and legal support for the stability of critical information infrastructures. It is determined that the principles are enshrined in legal norms to establish a coordinate system in a particular area for its proper functioning. The analysis of the legal literature showed that most of the authors who studied the principles of administrative and legal support of a particular area, the main characteristics of these principles include: principles; defined in regulations; which create conditions; on which any activity is based; which is regulated and regulated. The analyzed regulations allow us to conclude that the activities in the field of protection of CII are based on a system of principles, which includes both general and special principles. However, we are interested only in the set of principles that regulate the sustainability of CII and not only their protection. To such a system, we include the following principles: the rule of law and respect for human and civil rights and freedoms; ensuring the national interests of Ukraine; openness, accessibility, stability and security; public-private partnership; proportionality and adequacy of protection measures to real and potential risks; priority of precautionary measures; objectivity and legal certainty of CII objects; standardization of procedures and standardization of technical requirements; cooperation and interaction. The author, under the system of principles of administrative and legal support for the stability of critical information infrastructure, means a set of basic guidelines that take into account the interests of man, society and state, based on which public policy is formed, which allows critical information infrastructure to withstand threats, recover quickly from violations functioning.

Keywords: stability, critical information infrastructure, public administration, legal support, system, principles

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Introduction

In recent years, in developed countries, the trend of expanding the context of measures related to the functioning of critical information infrastructure (CII) is growing: issues of protection (security) of CII are considered together with issues of its sustainability. At the same time, more and more attention is paid to the issues of ensuring stability in comparison with the issues of protection. This shift in the focus of the issue is due to the fact that the modern security environment is characterized by the emergence of new threats and dangers against the background of rapid processes of evolution and transformation of existing threats (The State, 2020). The possibility of cases of their various combinations should also be considered. Under such conditions, no established system of protection (security) can fully provide protection against all threats and dangers. After all, while the development of a protection system designed for certain threats continues, new threats and dangers appear in the world. Therefore, more and more attention is paid to the stability of CII – its ability to be ready and adapt to changing conditions and resist change and recover quickly after malfunctions. Thus, finding out the ability of critical information infrastructure to sustainability, we will analyze the system of principles of its administrative and legal support.

In the article, we will: consider the principles of administrative and legal support; we will pay attention to the protection of critical infrastructure, as well as the problems and prospects for the implementation of European practices in Ukraine; we will analyze the process of reforming the defense system and increasing the resilience of Ukraine's critical infrastructure in the context of modern threats. Let us dwell in detail on the modern model of administrative and legal regulation of the protection of critical infrastructure.

Theoretical definition of the concept "principles of administrative and legal support"

One of the fundamental foundations of administrative and legal support for the sustainability of critical information infrastructure in Ukraine is the principles of such activities. This is due to the fact that any legal, economic or social phenomenon has its origins. It is about its formation and development, about what underlies it. With the help of the category "principles," the core, the primordial basis is revealed. However, we need to find out what the "foundation" is. In the beginning, it should be noted that the term "principle" comes from the Latin word "principium," which means the beginning, the basis. At the same time, the principle is what underlies a certain theory of science, the inner conviction of man, the basic rule of conduct (Principle, 2021). The word "principle" means a scientific or moral principle, basis, rule, from which do not deviate. In legal doctrine, when defining the concept of principles of law, scholars use such categories as the initial theoretical provisions, basic, guiding principles (ideas), general regulations, leading foundations, patterns, essence, coordinate system and more. Many categories are homogeneous. Therefore, the principles are general, guiding (basic, main, starting, initial theoretical, general normative-guiding, guiding) provisions. As for the "principles of law," there is no stable definition of this phrase; different scholars in their works bring different characterizing data and features. In addition, the term "principles of law" uses the term "legal principles." These two concepts differ in that first, there are legal principles, and only then, with the advent of the system of law and legislation, the principles of law appear (Sokiran, 2020).

The principles of law are enshrined directly in legislative acts (articles, preambles of constitutions, laws) or follow from the content of specific legal norms. For example, the Doctrine of Information Security states that it is based on the principles of respect for human and civil rights and freedoms, respect for human dignity, protection of its legitimate interests, as well as the legitimate interests of society and the state, ensuring the sovereignty and territorial integrity of Ukraine (Decree, 2017).

Thus, the principles are enshrined in legal norms, to establish a coordinate system in a particular area for its proper functioning.

Recently, more and more attention in society has been paid to the relationship between the state and civic institutions, which are based on updated principles. We agree with the position of Victor Tsymbal, who noted that the peculiarity of modern management practice is to build relations between the state, civil society and business on the principles of partnership, effective interaction, transparency, decentralization, implementation of the participatory mechanism of public administration. Civil society institutions and business structures have the opportunity to express their views on certain socially significant issues and participate directly in the development and adoption of management decisions (Tsymbal, 2016).

Thus, public authorities should take into account these principles when forming relations with non-governmental structures, because this is the only way to build an effective, sustainable and inclusive state policy of socio-economic development of Ukraine.

Examining the principles of administrative and legal support of voting rights of citizens of Ukraine Eugene Serdyuk concludes that they should be understood as the basic initial, objectively determined principles on which the activities of subjects of administrative law to ensure the voting rights of citizens of Ukraine, the normal functioning of the state and civil society as a whole (Serdiuk, 2014: 73). Principles in the field of administrative and legal support for the circulation and use of weapons were studied by Sergey Didenko, who determined that these are the main initial, objectively determined principles on which the activities of public administration entities to ensure the circulation and use of weapons to ensure citizens' rights for self-defense, defense of Ukraine from external aggression, normal functioning of the state and civil society. He justifies the expediency of principles in the field of administrative and legal support for the circulation and use of weapons by the fact that such activities require the state to clearly regulate the actions of public administration in order to properly, timely, impartial and objective regulation of this sphere of public life (Didenko, 2016: 71). Arthur Zamryga understands the principles of administrative and legal support of economic activity in Ukraine as a set of normatively fixed framework, objectified in the form of instructions, guidelines and guarantees that determine the direction of the impact of regulatory, administrative norms on public relations between the state and business entities, as well as procedures for their interaction and general functioning of the economic market of the country (Zamryha, 2019).

These authors to the main characteristics of the principles of administrative and legal support include principles, defined in regulations, which create conditions; on which any activity is based; which is regulated.

The regulatory definition of the principles of ensuring the sustainability of CII

There is no special law that would regulate legal relations and establish a system of principles to ensure the sustainability of CII. The issue of CII is regulated in the field of critical infrastructure protection and cybersecurity.

Thus, the concept of creating a state system of critical infrastructure protection, approved by order of the Cabinet of Ministers of Ukraine dated December 6, 2017, No 1009-r, determined that the problems of ensuring the protection of critical infrastructure should be solved by: creating a regulatory framework for the organization of state bodies and economic entities in the field of critical infrastructure protection; creation of the organizational and institutional structure of the state system of critical infrastructure protection; determination of powers, tasks and responsibilities of the subjects of the state system of critical infrastructure protection (On approval, 2017).

In turn, the Cyber Security Strategy of Ukraine of March 15, 2016, No 96/2016, cybersecurity of Ukraine should be based on the principles (Cybersecurity, 2016):

a) The rule of law and respect for human and civil rights and freedoms;
b) Ensuring the national interests of Ukraine;
c) Openness, accessibility, stability and security of cyberspace;
d) A public-private partnership, broad cooperation with civil society in the field of cybersecurity and cyber defense;
e) Proportionality and adequacy of cybersecurity measures to real and potential risks;
f) Priority of precautionary measures;невідворотності покарання за вчинення кіберзлочинів;
g) Priority development and support of domestic scientific, scientific-technical and production potential;
h) International cooperation in order to strengthen mutual trust in the field of cybersecurity and develop joint approaches to counter cyber threats, consolidate efforts in the investigation and prevention of cybercrime, prevent the use of cyberspace for illegal and military purposes;
i) Ensuring democratic civilian control over military formations and law enforcement agencies of the state formed in accordance with the laws of Ukraine, operating in the field of cybersecurity.

The application of legislation in the field of cybersecurity and the adoption of decisions by the subjects of power to implement the provisions of the Law of Ukraine "On Basic Principles of Cybersecurity of Ukraine" are carried out in compliance with the principles of (On the basic, 2017):

1. The minimum necessary regulation, according to which the decisions (measures) of the subjects of power must be necessary and minimally sufficient to achieve the goals and objectives defined by this law.
2. Objectivity and legal certainty, the maximum possible application of national and international law in relation to the powers and responsibilities of state bodies, enterprises, institutions, organizations, citizens in the field of cybersecurity.
3. Ensuring the protection of users' rights of communication systems and/or consumers of electronic communications services and/or information protection

services, cybersecurity, including the right to privacy and protection of personal data.

4. Transparency, according to which the decisions (measures) of the subjects of power must be duly substantiated and communicated to the subjects to which they relate before their entry into force (their application).
5. A balance of requirements and responsibilities, according to which a balance must be struck between establishing liability for non-compliance with cybersecurity and cybersecurity requirements, as well as for imposing excessive requirements and restrictions.
6. Non-discrimination, according to which the decisions, actions and omissions of the subjects of power may not lead to a legal or factual scope of rights and obligations of a person, which is: different from the scope of rights and obligations of others in similar situations, if only the difference is not necessary and minimally sufficient to satisfy the general public interest; as well as the scope of rights and responsibilities of others in dissimilar situations, if such equality is not necessary and minimally sufficient to meet the public interest.
7. Equivalence of requirements for cybersecurity of critical infrastructure, according to which the application of legal norms should be as equivalent as possible to cyber protection of communication and technological systems of critical infrastructure belonging to one sector of the economy and/or performing similar functions.

Thus, these regulations indicate that the activities in the field of protection of CII are based on a system of principles, which includes both general and special principles. However, we are only interested in the set of principles that govern sustainability, not protection, namely the sustainability of CII. To such a system, we include the following principles:

1. The rule of law and respect for human and civil rights and freedoms.
2. Ensuring the national interests of Ukraine.
3. Openness, accessibility, stability and security.
4. Public-private partnership.
5. Proportionality and adequacy of protection measures to real and potential risks.
6. Priority of precautionary measures.
7. Objectivity and legal certainty of CII objects.
8. Standardization of procedures and standardization of technical requirements.
9. Cooperation and interaction.

Given the amount of work, we will briefly explore some of these principles.

The principle of the rule of law and respect for human and civil rights and freedoms is one of the basic general principles. Thus, Alexandra Rudneva attributed the principle of the rule of law to "mega-principles," human rights standards of the highest value level (Rudneva, 2012); the principle of the rule of law is often widely interpreted through the selection of its individual components ("integrated" approach), in particular, through eight such elements: 1) accessibility of the law (in the sense that the law must be clear, concise and predictable); 2) issues of legal rights should be resolved by law, not on the basis of discretion; 3) equality before the law; 4) power must be exercised in a lawful, fair and reasonable manner; 5) human rights must be protected; 6) means must be provided for resolving disputes without excessive

material costs or excessive duration; 7) the court must be fair; 8) compliance with the state as its international legal obligations and those conditioned by national law (Rule, 2011: 176).

In the context of ensuring the sustainability of CII, the principle of the rule of law and respect for human and civil rights and freedoms is as follows:

First, there is a need to change the prevailing view that human rights are an obstacle to security. Perhaps the most widely cited example of human rights that interfere with security is the claim that encryption, which is critical to the exercise of the right to privacy, prevents law enforcement from carrying out its work. Therefore, some governments are arguing to reduce the encryption to provide access to encrypted communications for law enforcement. However, experts agree that it is impossible to provide access to encrypted communications for a single government without doing so for all governments or for attackers (Brown & Esterhuysen, 2019). In other words, the weakening of cybersecurity for law enforcement purposes cannot be done without weakening security for all and without endangering human rights. This is because cybersecurity is inextricably linked to human security, which is a fundamental human right. Cybersecurity and human rights are complementary and interdependent. In order to effectively ensure freedom and security, it is necessary to strive to protect the former and the resilience of the latter.

Second, it is critical to apply human rights-based approaches to cybersecurity laws, policies and practices. Cybersecurity should never be an excuse for human rights violations. Instead, recognizing that individual and collective security is at the heart of cybersecurity means that the protection of human rights must be at the heart of cybersecurity policy-making. For example, the Freedom Online Coalition's Internet Free and Secure Working Group (Freedom, 2021) has developed a set of recommendations on cybersecurity and human rights to ensure that cybersecurity policies and practices are based and fully in line with human rights.

The advantage of human rights in the field of information security was pointed out by the European Court of Human Rights (ECHR). Thus, in its judgment of March 25, 1983, in Silver and other ECtHR, it stated that "a law conferring discretion must determine the limits of the exercise of such a right." However, detailed rules and conditions must be contained in substantive law (ibid., series A, No 61, pp. 33–34, pp. 88–89). The accuracy of the wording required by the "law in this regard will depend on the specific situation ... granting the executive power by law"- or a judge – "unrestricted discretion would be contrary to the principle of the rule of law. Therefore, the law should clearly define the limits of any such powers conferred on the competent authorities, as well as the manner in which they are exercised ..., in order to ensure adequate protection of the individual against arbitrary interference" (Series A, 82, pp. 32-33, pp. 67-68) (European, 2001).

Thus, the principle of the rule of law and respect for human and civil rights and freedoms is to ensure a balance of protection of the individual from arbitrary interference by public authorities and the stability of a critical information structure by creating certain restrictions set out in law.

The principle of ensuring the national interests of Ukraine. It should be noted that this principle should not contradict the above principle, because as we have already determined, observance of the rule of law and respect for human and civil rights and freedoms is one of the basic fundamental rights. However, this does not mean that national interests in ensuring the sustainability of CII should "suffer" from this.

National interests – an integral expression of the interests of all members of society, realized through the political system of the state as a compromise in the combination of the demands of each person and society as a whole (Babkina & Gorbatenko, 2006). In addition, the combination of interests in the construction of national interests should not only be a guide, but also unite the nation around certain central ideas. For Ukraine, the search for a new system of ideals and guidelines is today a difficult but important task, because without this stage of cognitive and ideological search it is impossible to develop programs of economic, political and other reforms and overcome the systemic crisis (Dashutin & Mikhalchenko, 2001). And, as the Ukrainian human rights activist and co-founder of the Ukrainian Helsinki Group Myroslav Marynovych rightly noted, "we do not know how to unite in peacetime in order to implement good deeds" (The Ukrainians, 2014). Therefore, the author agrees with Larysa Soroka, who, defining national space interests, pointed out that these are "fundamental interests of the individual, civil society and the state, the provision of which is the basis for sustainable development of Ukraine, the welfare of its citizens and security" (Soroka, 2020). Thus, in the formation of any measures aimed at ensuring national interests, in the first place should be the interests of the individual, and only then society and the state.

The priority of the interests of the individual in the formation of national interests is discussed in the Doctrines of Information Security of Ukraine, which determines that the national interests of Ukraine in the information sphere are:

1) Vital interests of the person: ensuring the constitutional rights and freedoms of human to collect, store, use and disseminate information; ensuring constitutional human rights to the protection of privacy; protection from destructive information and psychological influences;

2) Vital interests of society and the state: protection of Ukrainian society from the aggressive influence of destructive propaganda, primarily by the Russian Federation; protection of Ukrainian society from the aggressive informational influence of the Russian Federation, aimed at propaganda of war, incitement of national and religious enmity, change of the constitutional order by force or violation of the sovereignty and territorial integrity of Ukraine; comprehensive satisfaction of the needs of citizens, enterprises, institutions and organizations of all forms of ownership in access to reliable and objective information; ensuring the free circulation of information, except as provided by law; development and protection of national information infrastructure; preservation and increase of spiritual, cultural and moral values of the Ukrainian people; ensuring the comprehensive development and functioning of the Ukrainian language in all spheres of public life throughout Ukraine; free development, use and protection of national minority languages and promotion of the language of international communication; strengthening information ties with the Ukrainian diaspora, promoting the preservation of its ethnocultural identity; development of media culture of society and socially responsible media environment; formation of an effective legal system to protect the individual, society and the state from destructive propaganda influences; creation taking into account norms of the international law of system and mechanisms of protection against negative external information and psychological influences, first of all propaganda; development of the information society, in particular its technological infrastructure; safe functioning and development of the national information space and its integration into the European and world information space; development of the system of strategic communications of Ukraine; effective interaction of public authorities and civil society institutions during the formation and implementation of state policy in the information sphere; ensuring the development of information and communication technologies and information resources of Ukraine; protection of state secrets and other information, the requirements for

the protection of which are established by law; formation of a positive image of Ukraine in the world, communication of operative, reliable and objective information about events in Ukraine to the international community; development of the system of foreign broadcasting of Ukraine and ensuring the presence of a foreign-language Ukrainian channel in cable networks and in satellite broadcasting outside Ukraine (Decree, 2017).

In some normative legal acts, national interests are formed, taking into account the priority of state interests. Thus, in the Law of Ukraine "On National Security of Ukraine," the fundamental national interests of Ukraine are (On the National, 2018):

1. State sovereignty and territorial integrity, democratic constitutional order, prevention of interference in the internal affairs of Ukraine.
2. Sustainable development of the national economy, civil society and the state to ensure the growth of the level and quality of life of the population.
3. Ukraine's integration into the European political, economic, security, legal space, membership in the European Union and the North Atlantic Treaty Organization, the development of equal mutually beneficial relations with other states.

Thus, under the principle of ensuring the national interests of Ukraine, we understand the creation of conditions for the safe, sustainable operation of critical information infrastructures, their use in the interests of the individual, society and the state.

Conclusions

Thus, the analysis of various scientific approaches to understanding such categories as "principles," "legal principles," "principles of administrative and legal support," as well as current regulations of Ukraine allowed to state that activities in the field of administrative and legal support of sustainability CII is based on a system of principles that includes both general and special principles. To such a system, we include the following principles: the rule of law and respect for human and civil rights and freedoms; ensuring the national interests of Ukraine; openness, accessibility, stability and security; public-private partnership; proportionality and adequacy of protection measures to real and potential risks; priority of precautionary measures; objectivity and legal certainty of CII objects; standardization of procedures and standardization of technical requirements; cooperation and interaction.

Thus, under the system of principles of administrative and legal support for the stability of critical information infrastructure, we understand a set of basic guidelines, regulations that take into account the interests of man, society and state, which form the state policy of administrative and legal regulation of critical information infrastructure, which allows the latter to withstand threats and recover quickly in the event of a malfunction.

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The Concept of "Cosmos" in Philosophical and Legal Discourse

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The article proves the need to rethink views on the role and purpose of law in the conditions associated with the cosmization of our life, which implies deepening knowledge about its relationship with the globalization changes that occur against the background of the increasing role of sustainable development of mankind. The paper uses a dialectical-materialistic method of cognition of objective reality, which made it possible to carry out a comprehensive scientific analysis of doctrinal provisions in the development of the concept of "cosmization of law." The study allowed us to come to a number of conclusions. Cosmization of law is an inevitable process. It provides the transformation of law based on the use of new approaches to the development of a holistic concept of the universe, the idea of the unity of the whole world. The stated process is closely linked to space, so it should create new legal standards based on sustainable, safe, innovative, and inclusive human development. The paper substantiates the need to develop a legal space order under the guidance of a global administrator.

Keywords: global administrator, space, space activities, global administrative law, sustainable development, globalization, cosmization

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Introduction

What is the cosmos? Can it exist without a person, and if it can, what for? What is the essence of human relations in the cosmos? It would seem that these questions are remote for the average person and relate exclusively to the scientific considerations of highly specialized professionals. However, probably every representative of humanity sometimes, accidentally looking up at the night starry sky, at least once thought about what for, how and when cosmos appeared? What place does a person occupy in it? What is the future fate of humanity in it? How can it be used to benefit yourself and others?

All countries of the world are entering a new era of transformation of socio-economic and political-ideological relations, which are associated with the transition from anthropocentrism to biospherocentrism, which makes the interests of man and humanity depends on the needs of the entire planet and all life on it. Gradually, ideas about the connection between the biosphere and cosmos, man and cosmos, society and space entered scientific circulation, becoming an important part of the modern scientific worldview, a characteristic feature of modern culture. These views are usually called cosmism, and the process of forming such a worldview itself is called cosmization of science and philosophy (Grushevitskaia & Sadokhin, 1998).

The need to rethink the role and purpose of law in the context of cosmization of our lives implies the deepening of knowledge about its relationship with those globalization changes that are taking place against the background of the increasing role of sustainable development of mankind. Today, the study of the Earth by separate sciences that are in no way related to each other is a thing of the past. This approach is replaced by studying our planet from a global perspective, which allows us to understand the Earth as a whole and as part of the cosmos, which is interconnected and interdependent with a single whole of cosmic spaces. Part of the new cosmic worldview is the expansion of the subject of many old classical sciences, and they are going beyond the study of purely terrestrial phenomena and processes, the appearance of the cosmic aspect in their research (Grushevitskaia & Sadokhin, 1998).

Therefore, the analysis of the process of scientific-historical cognition of the cosmization of law from the point of view of the given task can contribute not only to a better philosophical justification of modern epistemological and methodological problems, but also create better opportunities for understanding the ideological mechanisms of forming historical concepts, ideas, hypotheses, and obtaining new knowledge about the past (Loseva, 2004: 146), but most importantly, getting new knowledge about the future. After all, the cosmization of law is changing not only through technical innovations that are initially used in space technology, but are gradually becoming part of our daily lives. The process of cosmization is of particular importance when it comes to long-term, strategic prospects for the development of society associated with changes in the value core of the modern worldview (Udartsev, 2019: 14).

Our research is based on the works of Vladimir Vernadsky, Konstantin Tsiolkovsky, Sergey Korolev and others. As for the theory of cosmization of law, it was partially considered in the works of Arkady Ursul, Tatiana Ursul, Sergey Udartsev, Sergey Krichevsky and others.

In the first part of the study, we highlight the conceptual directions of understanding the categories "cosmism" and "cosmization," and in the second – "cosmization of law." In general, the paper substantiates the need to create a new legal space order under the leadership of the global administrator – the World Space Union.

The genesis of conceptual directions for understanding the categories of "cosmism" and "cosmization"

The expansion of borders after the human spacewalk raised many questions for scientists about the knowledge of the nature of law as a special tool for the social engineering of space activities. Which is not only a regulator, but also the main management mechanism for the transition of civilization to a sustainable future in the context of the comprehensive penetration of space technologies and services into our daily lives.

In ancient times, the term "cosmos" was defined as order (from the ancient Greek κόσμος) (Definition, 2020). This word was used in contrast to the Global chaos. For ancient philosophers,

chaos is, on the one hand, a physical space, either empty or filled with something. On the other hand, chaos is the basis of world life. So, "cosmos" and "chaos" are continuous, endless and boundless processes of formation. Therefore, we will use the term "cosmos" and its derivatives in our work, and not "space."

The term "cosmization" or "cosmism" began to be used quite a long time ago. Some scientists consider cosmization philosophical (Kovaleva, 2002: 12; Lytkin, 1996: 67) or a natural school (Gindilis, 1997: 142); others consider it an artistic direction (Karchevtsev, 1995: 6) or a socio-cultural phenomenon (Kurakina, 1993). In our opinion, it should be considered as a kind of thinking, mood, and imagination, with the help of which a kind of transformation of the established order takes place, the development of a new holistic concept of the organic unity of the whole world and its close connection with the universe, the cosmos.

The essence of this term is to assert that going into space changes a lot not only in the scientific sphere as part of culture, but also affects all spheres of social reality, changes the existence of humanity and its spiritual life. This is a qualitatively new milestone in the development of mankind (Atanasova, 2012).

In the works of many authors, the dependence of cosmos and mind was justified, the need to unite people not on the basis of socio-political or ideological theories, but on the basis of ideas of ecological order, sustainable development, and security was proved. Based on the idea of "common life" (Tsiolkovsky, 1989), a paradigm shift in science was justified – from now on, modern scientists are dealing not with nature in its pristine purity, but with nature, which is changed by human activity. The result of these reflections on the role of a man was the formulation of the anthropic principle in modern science (Grushevitskaia & Sadokhin, 1998).

Science develops in stages: normal science – its crisis – scientific revolution (based on a new paradigm) – new normal science (based on a new paradigm). Similar to the evolution of systems in synergetics: equilibrium – chaos – bifurcation point – new system. The scientific revolution has a fundamental character and concerns all the basic structural components of science: value-based, worldview, and practical. This leads to a difficult process of abandoning the old theory, which is accompanied by a kind of intellectual anguish, the change of generations of scientists. As a result: a) there is a change of paradigms, generations in scientific society; b) some concepts occupy a dominant position, while others are either sent to the archive of science, its history or become elements of new paradigms (Kotenko, 2006).

What is a paradigm? Clarifying this question, it is logical to note that the famous American scientist Thomas Kuhn defines it as one or more past scientific achievements, which for some time were recognized by the scientific community as the basis for the development of its further practical activities (Kuhn, 1975: 27).

When studying any processes that are associated with the study of various spheres of human activity, more and more attention is paid to the study of a new worldview. This process requires the introduction of a new system of values, a new solution to "eternal" human questions about the meaning of life, death and immortality, good and evil, which should be focused on human awareness of the consequences of committed actions (inactivity) (Grushevitskaia & Sadokhin, 1998). This, in turn, will help to find out certain patterns of understanding of human activity in any field, including in the field of space activities.

It should be noted that cosmization in science develops at least at three main levels. First, it develops at the empirical level, where new forms and methods of empirical cognition arise: cosmic observation and cosmic experiment. Secondly, it affects the scientific and theoretical

level, where new branches of scientific knowledge arise. The third level is ideological, where a new scientific picture of the world is formed (Starostin, 2012).

Accordingly, in order for knowledge to turn into a scientific concept, it must meet the following criteria:

1. Be true, correspond to the objective realities of being and correctly reflect them.
2. Be accessible, i.e., materialized (monographs, scientific articles, dissertations, etc.) and put into scientific circulation, so that other scientists can research and apply them in further scientific, educational and practical activities.
3. Be logically and philosophically justified. Here we mean the logical correctness of knowledge, the correspondence of the acquired knowledge to the philosophical foundations of science, the ideals and norms of research, the picture of the scientific world and other general principles and laws, the criteria of simplicity, etc. Any scientific knowledge included in the scientific knowledge system must be properly justified by a set of theoretical knowledge and empirical facts (Syrykh, 2001: 32).
4. Be new. Today, as a scientific novelty in various branches of science, it is customary to consider, first of all, new knowledge, which is first proposed at the discretion of the scientific community. Secondly, the methods/ways and means used in the study for the first time or received an atypical combination and were used for the first time in a particular field of scientific research. Third, the specifics of implementation, which is expressed in the uniqueness of the implementation of the developed theoretical provisions in practice. Fourth – innovations that define and demonstrate achievements in the scientific and practical sphere (Baranova, 2018: 31).

In a certain way, the theoretical level of cosmic knowledge is connected with the previous stage of science development, which is called geocentric science. Such transitional forms include branches of science that study inanimate and living objects, as well as humans. We can consider all this in the example of the search for life in the Solar System, the formation of prerequisites for exobiology and space biology. This is the general relationship between space research and the development of the scientific and cognitive activity. In this process of cosmization of scientific knowledge, epistemological characteristics and the growing role of socio-cultural, value-based, and environmental aspects of scientific activity begin to be seen very clearly (Starostin, 2012).

We also note that today there is a combination of globalization and cosmization of public relations. Therefore, the "concept of anthropogeocosmism" (Ursul, 2013), developed by professor Arkady Ursul, deserves attention. The basis of this concept is the thesis that the main goal of space exploration in the near historical perspective is the use of space activities to solve global problems, and in the future – for the transition to socio-natural sustainable development on the planet.

Scientist believes that space activity in its development was initially a global problem, because before the human spacewalk, and for the most part now, this integration branch of science, technology and production had and has a globally terrestrial biosphere and activity basis. In the same sense, cosmization, which is taking place in parallel with globalization, has made a significant contribution to this latest global process. Global problems and processes, spacewalking are a natural consequence of the socio-economic and technological development of civilization. Their successful solution can be ensured in the process of interaction of all forces and factors that work for the transition to sustainable development. Space activity

occupies a special place in this process: it expands the boundaries of the existence of our civilization, takes the activity of civilization beyond the globe, and at the same time a number of global, global problems and processes. If some of them are not solved on Earth, they will continue their cosmic existence. Thus, globalization will complete its "geocentric existence," and common mankind problems will find their extraterrestrial existence (Ursul, 2013: 152) since they will cease to be only global.

Academician Vladimir Vernadsky emphasized that all processes should be studied comprehensively, not limited to the narrow framework of one science and that it is necessary to strive to understand nature as a whole.

In his work "Neosphere," the outstanding scientist noted that "in our time, the framework of a separate science, into which scientific knowledge is divided, cannot accurately determine the sphere of scientific thought of a researcher, accurately characterize his scientific work. Problems that interest the researcher are increasingly not within the framework of a separate established science. We specialize not in science, but in problems. The scientific thought of the scientist of our time with unprecedented success and force delves into new areas of knowledge that previously did not exist or were a parish of purely philosophy or religion. That is the horizons of scientific knowledge increase in comparison with the 19th century. Problems that have gone beyond one science inevitably create new areas of knowledge, new sciences, and increase in the number and speed of their appearance, which characterizes the scientific thought of the 21st century" (Vernadsky, 2004: 90).

We see how today earth sciences using space technologies are successfully developing. New sciences are being created by analogy with Earth sciences, but with a cosmic component (for example, space oceanography, areography, materialology and climatology of planets). But most importantly, completely new space sciences are being created that have no analogues with Earth sciences (for example, alienistics is a discipline that searches for and investigates signs of the presence and activity of aliens (extraterrestrial beings) on Earth and in near-Earth space, and fights misinformation developed on this issue by the Earth's state authorities) (Ufological Dictionary, 2020).

At the same time, along with the cosmization of science, there is also a cosmization of global problems and processes, which essence is in the influence of cosmonautics and space factors on their development and solution. There is not only a single global problem, but also any economic, scientific, technical or other problems of modern humanity that are positively affected by space technologies. Of course, on the path of peaceful and sustainable use of space (Ursul, 2013: 162).

However, cosmization, in addition to having a positive impact on human development, has a number of problems that need to be addressed immediately. Therefore, collective responsibility is growing against attempts to arbitrarily use space technologies, products and services (Ursul & Shkolenko, 1976).

A clear example of the existence of a global problem that does not yet have adequate legal regulation of space activities is the informatization of our lives and the use of artificial intelligence.

Here we are not dealing with a simple increase in the flow of information, but with a qualitative change in the role of the information itself. The world of contacts between people has become necessary for everyone. We need information no less than material items that help us at work or in everyday life. Experts in the field of medicine and psychology have proven that in the conditions of so-called sensory isolation (complete lack of information about the

outside world), a person quickly loses his mind (Alekseenkova, 2009). We now have available types of communication (television, Internet, various means of communication), which have covered almost the entire planet with the help of space technologies and services. Therefore, where the rights of some may harm the rights of others, reasonable restrictions on freedom must be imposed.

This is how the cosmization of consciousness manifests itself in politics and law, which lies in an increasing sense of responsibility for the fate of all the inhabitants of the planet. Cosmos is only a sphere of activity. By itself, it does not change or improve moral and legal norms. They change and can only evolve further "through the prism" (Ursul & Shkolenko, 1976) of social factors. After all, the moral and ethical problems of cosmonautics, their discussion to a certain extent really outstrip the adoption of legal decisions, because these problems are first raised and discussed in the circles of the scientific and political community, currents are formed in the public consciousness, which, as you know, are able to outstrip certain phenomena in public existence.

Therefore, cosmization by its characteristics is a global and universal process associated with space technologies, products, services, and space factors (outer space, space flight, space objects, etc.).

Cosmization of law and sustainable development

Let us return to the eternal question: Are space relations subject to legal settlement? Who does this and how? And the most important question is why?

On the one hand, these questions are primitive and do not make any sense from the point of view of the theory of law and the theory of international law. However, from the point of view of the principles of law, each country should establish legal regimes for the existence, development, protection and protection of public goods and international assets, focusing primarily on the interests of humanity and not relying on its own narrow interests of the country. However, in practice, for the most part, the opposite is true. Despite the fact that democratic and undemocratic states are very different in their state-legal nature, in terms of their behavior in the international arena, in particular in outer space, the difference is insignificant. Each sovereign state defends its own interest, and in the context of the commercialization of outer space, this is primarily an economic interest.

Accordingly, what should be the legal regulation of space relations: total or liberal? Comprehensive or selective? Or where is the intermediate truth that will ensure the effectiveness of management decisions regarding the admission of human envoys to space and provide them with the necessary conditions for the implementation of their goals? As mentioned at the beginning, the main tool for long-term strategic changes in society is the law. Therefore, the study of the legal aspect of space activities and the environmental and legal consequences of human spaceflight, particularly critical understanding of existing opinions in this area, is an important task. First of all, it concerns the cosmization of law in the context of sustainable development. This will be discussed in more detail in the following sections of the paper.

It should only be noted that the means of space activities, as already mentioned, are a powerful intensification factor that can significantly help in the "sustainable" solution of global problems through the use of outer space, forces and processes that go beyond the planet. The fact that the process of cosmization should reflect the sustainable development of mankind has been repeatedly emphasized by scientists and numerous international institutions that

have recently formulated a new strategy for space activities. According to it, it is necessary to abandon the focus on unstable development and environmentally dirty, dangerous, too expensive equipment. The future of space activities is linked to environmentally safe, sustainable socio-natural development (Kaziutinskyi, 2009).

The focus on the "conquest" and "exploitation" of nature (terrestrial or cosmic) by scientific and technical means that are not constrained by environmental restrictions, on the total change of the natural human environment to an artificial one, has lost its former attractiveness in the eyes of most scientists. It now retains only a small number of adherents, according to whom, an increasing deviation from the state of balance with the environment characterizes the past of human civilization and its future. The strategy of "conquering" nature (including space) should be replaced by a sustainable strategy (Kaziutinskyi, 2009).

Against the background of today's problems, the formation of global governance will require a radical transformation of moral and legal norms. These norms will mostly differ from current international and national law, traditional and generally recognized moral norms and imperatives, including universal stereotypes. It is expected that the law of sustainable development will become one of the most likely options not just for international, but for a qualitatively new global law in the transition to sustainable development and the corresponding global governance transition. Therefore, two interrelated global processes will develop in parallel: the globalization of legal systems and processes (domestic, transnational and international) and their radical evolutionary and meaningful transformation (Ursul, 2012: 123), that is, the cosmization of law and society.

A significant type of cosmic order is the legal cosmic order and its phenomenon – the cosmization of law. Today we are witnessing a paradigm shift, resulting in a global scientific revolution – the cosmization of law. Which is considered as a kind of synthesis of knowledge that occurs against the background of our well-established idea of law and new cosmic knowledge. This synthesis will make it possible to offer a new system of knowledge and, together with scientific discoveries about the cosmos, will allow us to put legal science on the path of its transformation and new paradigms.

We note two general vectors related to the beginning of the cosmization of law and the process of forming space statehood. This process is related to the self-regulation of any nation-state in the world that has decided to solve existing problems related to the cosmization of public life by national norms. That is, the regulatory process can develop either spontaneously, or systematically and purposefully. And only by combining these two vectors of public administration, regulation, planning and control, in our opinion, can a harmonious transition to a new level of space statehood (sustainable, safe, environmentally friendly, innovative and inclusive) be ensured, both for the whole of humanity and for an individual country.

A global transition to sustainable development is possible only when it becomes internationally coherent because a sustainable future in principle will not occur in one individual country or any group. The global nature of the transition to a new civilizational paradigm requires the formation of not just new international relations, but fundamentally new global-stable relations that would be guided by new universal standards, norms and principles that would form a new system (form) of law – the global law of sustainable development. It is the global nature of the new civilizational strategy that testifies not only to the priority of international, transnational legal regulation in comparison with the regulation of national (domestic) law. However, the priority of international law is recognized by many states (Ursul, 2012).

We are talking about an obvious feature of the future global law of sustainable development of space activities. Which will manifest itself in the fact that the main acts of recommendation – sources of law – that now form the conceptual basis of this new law will be adopted within the U.N. at its various forums. In turn, regulations designed to regulate global commercial space activities should be adopted by the global administrator, for example, World Space Union.

In turn, law, being formed on the basis of national and international law, is to a certain extent combined with space law, which will gradually become not only international space law, but already a global space phenomenon. But this is only the beginning of the transformation of law. It is possible that the so-called "metapravo" may also appear (Yorysh, 1978: 65; Udartsev, 2003; Ursul, 2012: 143) as a law designed to regulate the interaction of humanity that has gone into space and alleged extraterrestrial civilizations.

The fact that space and the cosmization of law are becoming more and more relevant in our lives and require the development of not only new views, types of regulation, but also a new space doctrine is said not only by lawyers, but also by well-known scientists from other industries.

Finally, as we have repeatedly pointed out in our articles (Soroka, 2020; 2021), the outer cosmos is the common heritage of all mankind. All countries of the world have the equal right to freely explore, develop and use outer space and its celestial bodies, and space activities in all countries of the world should contribute to their economic development. In turn, scientific and technological progress should contribute to the security, survival and development of mankind and promote friendly cooperation of the peoples of all countries.

Conclusions

In philosophical and legal discourse, the genesis of cosmization is due to a paradigm shift based on the global scientific revolution – the cosmization of law, a global and universal process that is inextricably linked with space technologies products, services and space factors. In such conditions, the cosmization of law is an inevitable process, since it involves the transformation of law, based on the use of new approaches to the development of a holistic concept of the universe, the idea of the unity of the whole world and its close connection with space through the creation of new legal standards based on sustainable, safe, innovative and inclusive development of humanity.

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