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PEACEFUL EXPLORATION AND USE OF OUTER SPACE: VALUABLE INSIGHTS AND CONTEMPORARY CHALLENGES FOR INTERNATIONAL SPACE LAW

МИРНЕ ДОСЛІДЖЕННЯ ТА ВИКОРИСТАННЯ КОСМІЧНОГО ПРОСТОРУ: ЦІННІ ВИСНОВКИ ТА СУЧАСНІ ВИКЛИКИ ДЛЯ МІЖНАРОДНОГО КОСМІЧНОГО ПРАВА

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The article examines the evolution and current state of international space law, focusing on the principles governing the peaceful exploration and use of outer space. It provides a historical and analytical overview of the key international instruments that form the legal foundation of space activities, beginning with the 1967 Outer Space Treaty and extending to subsequent agreements on liability, registration, and the rescue of astronauts. Special attention is devoted to the growing role of international organizations such as the United Nations Office for Outer Space Affairs (UNOOSA) and the European Space Agency (ESA), whose functions are analyzed in the context of coordinating multilateral efforts, promoting transparency, and ensuring the sustainable management of outer space.

The article explores new and emerging challenges in the space domain, including the rapid rise of private commercial enterprises, the prospects of space tourism, and the extraction of natural resources from celestial bodies. The increasing militarization and potential weaponization of outer space are considered among the most alarming contemporary issues, posing risks to the long-standing principle of peaceful use.

Through a comparative legal perspective, the article identifies gaps in existing international instruments and emphasizes the urgent need to strengthen the regulatory framework governing space activities. It highlights the importance of updating existing treaties and creating new mechanisms capable of responding to technological, economic, and security developments.

Ultimately, the article advocates for enhanced international cooperation and legal harmonization to guarantee that outer space remains a domain of peace, scientific progress, and shared benefit for all humankind. It calls upon states and private actors alike to act responsibly, preserving space as a sustainable environment for future generations.

The purpose of this article is to examine the evolution, key principles, and current challenges of international space law, with a focus on how the legal framework has developed to regulate the peaceful exploration and use of outer space. It aims to highlight the significance of international cooperation and to underscore the urgency of addressing unresolved issues, such as private commercial activities, space tourism, resource exploitation, and the risk of militarization, in order to maintain space as a domain for the common benefit of humanity.

Analysis of recent research and publications shows that that while international space law has provided a solid foundation for governing activities beyond Earth's atmosphere, rapid technological advancements and the growing involvement of private actors have exposed significant gaps in the existing legal framework. Scholars and practitioners emphasize the importance of adapting legal instruments to cover new frontiers such as space tourism, asteroid mining, environmental protection, and the prevention of space militarization. The literature reflects a consensus that only through robust international collaboration can the evolving space sector be managed in a way that preserves peace, sustainability, and shared benefits.

Key words: International space law, Outer Space Treaty, peaceful use of space, private space activities, space tourism, resource exploitation, space militarization, international cooperation.

У статті досліджується еволюція та сучасний стан міжнародного космічного права з акцентом на принципах, що регулюють мирне дослідження та використання космічного простору. Подано історичний і аналітичний огляд основних міжнародних документів, які становлять правову основу космічної діяльності, починаючи з “Договору про космос” 1967 року та закінчуючи подальшими угодами щодо відповідальності, реєстрації космічних об’єктів і порятунку астронавтів. Особливу увагу приділено зростаючій ролі міжнародних організацій, таких як Управління ООН з питань космічного простору (UNOOSA) та Європейське космічне агентство (ESA), функції яких розглянуто в контексті координації багатосторонніх зусиль, сприяння прозорості та забезпечення сталого управління космічним простором.

У статті також аналізуються нові та актуальні виклики у сфері космічної діяльності, зокрема швидке зростання приватних комерційних підприємств, перспективи розвитку космічного туризму та видобутку природних ресурсів на небесних тілах. Зростаюча мілітаризація та потенційне озброєння космосу визначаються серед найбільш загрозливих сучасних тенденцій, які ставлять під сумнів усталений принцип мирного використання космічного простору.

З позиції порівняльно-правового аналізу виявлено прогалини в чинних міжнародно-правових інструментах і наголошено на необхідності зміцнення нормативно-правової бази, що регулює космічну діяльність. Підкреслюється важливість оновлення існуючих договорів і створення нових механізмів, здатних адекватно реагувати на технологічні, економічні та безпекові виклики.

Метою статті є дослідження еволюції, основних принципів і сучасних проблем міжнародного космічного права з акцентом на розвиток правового механізму, що регулює мирне дослідження та використання космосу. Особливу увагу приділено значенню міжнародного співробітництва та необхідності врегулювання невирішених питань, таких як приватна космічна діяльність, космічний туризм, видобуток ресурсів і ризик мілітаризації, з метою збереження космосу як сфери спільного блага людства.

Аналіз сучасних досліджень і публікацій показує, що, хоча міжнародне космічне право створило міцну основу для регулювання діяльності за межами атмосфери Землі, швидкий технологічний прогрес і зростаюча участь приватних суб’єктів виявили значні прогалини у чинній правовій системі. Науковці та практики наголошують на необхідності адаптації правових інструментів до нових напрямів, таких як космічний туризм, освоєння астероїдів, захист навколишнього середовища та запобігання мілітаризації космосу. У науковій літературі простежується консенсус, що лише завдяки ефективному міжнародному співробітництву можна забезпечити сталий розвиток космічної сфери в інтересах миру, безпеки та спільного блага.

Ключові слова: міжнародне космічне право, Договір про космос, мирне використання космосу, приватна космічна діяльність, космічний туризм, видобуток ресурсів, мілітаризація космосу, міжнародне співробітництво.

Introduction. Science has expanded humanity's gaze, allowing us to behold the world from fresh perspectives and comprehend its intricacy, instilling a new sense of wonder. The human race is undergoing a profound introspection of its identity and place within the vast cosmos, driven by an insatiable desire to explore new frontiers and constantly push the limits of knowledge. In this day and age, as renowned American science fiction writer Ray Bradbury aptly expressed, humanity comprehends that " we are all children of this universe. Not just Earth, or Mars, or this system, but the whole grand fireworks ". With each new scientific breakthrough, we dive deeper and deeper into the realities of the universe, scrutinizing its complex laws and mysteries, and trying to find human-centred explanations for them. Humanity is striving to understand every corner of our immeasurable world, and space is no exception.

Presentation of the primary research material. Since the onset of the space age in the latter half of the twentieth century, the significance of peaceful space exploration and use appears to be increasingly noticeable with each passing day. Contemporary society recognizes that this field of activity now holds a prominent position within the global economy, scientific discourse, and even political spheres. The launch of Sputnik 1 on October 4, 1957, not only opened the curtain on the world of space exploration, the space race, space technology, and international cooperation in this area but also contributed, as Stephen Freeland, a professor of international law at the Western Sydney University, noted, to the development of a new mindset centred around the exploration of space exclusively for the common good. Indeed, it is crucial to recognize that progress in the space industry demands each nation to carefully consider both the remarkable opportunities and inevitable obstacles along the way, emphasizing the vital role of responsibility in our striving. Only when everyone acknowledges the imperative that space exploration must serve the common good, will it truly become a glimmer of hope for our civilization.

Some argue that our modern way of life is profoundly connected to the cosmos, albeit only sometimes fully grasped. From receiving weather forecasts to advancements in navigation, trade, security and science, we are able to observe the integration of space into the framework of the global community. It is important to understand that the advancements in any new field of science naturally affect nearly every aspect of society. The law has never been an exception to this principle; it has consistently demonstrated its ability to adapt and change in accordance with constantly evolving requirements. Thus, logically tracing the historical roots and interconnections of space exploration is of crucial importance for comprehending the future trajectory of the development of international law governing activities beyond Earth's atmosphere.

In 1967, the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, the first comprehensive international agreement aimed at regulating space utilization was signed. This treaty outlined fundamental principles governing nations' activities in outer space. According to these principles, space, including the moon and celestial bodies, cannot be claimed by any nation (Article II). The treaty allows for extensive scientific research and commercial use of space, emphasizing that such activities should benefit all countries, regardless of their level of development (common benefit clause, Article I). In addition to that, the treaty promotes the peaceful use of space (Article IV), prohibiting the placement of weapons in space, including military bases and maneuvers on celestial bodies, and partially restricting the use of weapons of mass destruction in space. Astronauts, in accordance with the agreement, are considered to be representatives of humanity, and states are responsible for both governmental and non-governmental space activities, as well as liable for any damage caused by their space objects.

Over decades The Outer Space Treaty has served as the foundational framework of international space law. However, as this field of knowledge continued to evolve and become increasingly miscellaneous, the need to expand upon the principles outlined in the Outer Space Treaty was clear-cut. It is worth noting that a series of treaties and resolutions concluded thereafter have significantly contributed to the further development of this branch of international law, not to a lesser extent.

Agreement on the Rescue of Astronauts, the Return of Astronauts and Return of Objects Launched into Outer Space, adopted by the UN General Assembly on 19 December 1967, proceeded with augmenting the legal framework with additional details on that matter, in spite of being oftentimes called vague or imprecise. The Rescue Agreement stipulates that any country that is aware of astronauts being in distress or danger must inform both the Secretary General of the United Nations and the launching authority. It mandates nations to assist in rescuing astronauts who land in their territory due to accidents, emergencies, or unintended landings. If the distress occurs in an unclaimed area, other nations are obligated to aid in search and rescue efforts if feasible.

Convention on International Liability for Damage Caused by Space Objects, 1972, expanded liability rules specified in The Outer Space Treaty. According to this convention, states are internationally responsible for all space objects launched within their territory. This means that regardless of who launches the space object, if it was launched from State A's territory or facility, or if State A caused the launch, then State A is fully liable for any damages resulting from that space object. By holding states accountable for damages caused by space objects, it provides for careful management of conducting space missions and invigorates the development of space technologies. This convention is considered significant for coordinating efforts to address potential risks and mitigate the impact of space debris on the safety and sustainability of space activities.

To gain a comprehensive, holistic picture of the evolution of international space law for analysis and proposal derivation, it is important to mention further treaties that refine and enlarge upon the principles established in the Outer Space Treaty. Convention on Registration of Objects Launched into Outer Space and Agreement Governing the Activities of States on the Moon and Other Celestial Bodies are among them, to name a few.

The Registration Convention, signed with the aim of establishing a central register of space objects by the United Nations Secretary-General, mandates that when a space object is launched into Earth orbit or beyond, the launching country must register it in an appropriate registry. Each launching country should notify the Secretary-General of the United Nations about the establishment of such a registry. In cases where multiple countries are involved in launching a space object, they must decide together which country will register the object, taking into account the provisions of the Outer Space Treaty and any agreements between them regarding jurisdiction and control over the object and its personnel. The details of each registry and how it is maintained are determined by the country managing the registry.

A set of international laws governing the Moon and other celestial bodies in our solar system is proposed by the Moon Treaty. It demonstrates that the Moon ought to be demilitarized and used only for nonviolent purposes. The treaty forbids using the Moon to carry out hostile acts or threats against spacecraft, Earth, or any other object in space, as well as using the Moon to employ force or threaten hostile action. It also prohibits the use of nuclear or other weapons of mass destruction on or within the Moon, as well as the installation of them in orbit around or close to the Moon.

It is clear from a review of the aforementioned treaties that humankind is making concerted, consistent efforts to create

a complete legal framework that will regulate its space operations and activities. This suggests that international collaboration is the only way to achieve efficient and peaceful space exploration for the common good. Thus, it is logical to assume that international organizations are important actors in matters of facilitating this collaboration and promoting responsible and reasonable use of outer space. I believe that consideration of the activities of such organizations is necessary for understanding the current landscape and prospective directions of the development of space law.

As stated by Professor Von der Dunk[1], the Outer Space Treaty's Article II stipulates that outer space as an area is outside the purview of each state's territorial sovereignty and authority. Therefore, in order for the law to be used as a tool to establish some order in space and some fairness in space activities, the community of states must essentially take legislative action at the international level. Intergovernmental organizations offer a reasonable and practical elaboration of such common legislative action in this regard.

The General Assembly established the Committee on the Peaceful Uses of Outer Space (COPUOS) in 1959 to oversee space exploration and usage for the benefit of all mankind, specifically peace, security, and development. The Committee was responsible for examining international cooperation in peaceful uses of outer space, researching space-related activities that the United Nations may undertake, encouraging space research programs, and investigating legal issues relating to outer space exploration.

Established in 1958, the United Nations Office for Outer Space Affairs (abbreviated UNOOSA) has acted as the secretariat to the committee since its creation. It was charged with regulating a broad range of activities beyond Earth's atmosphere. This included but was not limited to, promoting sustainable development through a variety of space-related activities from space law to space applications, providing nations with real opportunity to increase their space capabilities and assisting them in strengthening their ability to develop and benefit from the space industry. Moreover, their specialized programs assist nations in preventing and managing disasters by utilizing space data and technologies, such as satellite images, in the field of disaster risk reduction.

As a specialized agency of the United Nations, the International Telecommunication Union (ITU) develops and coordinates global regulations and standards for telecommunications, including those related to space activities. The ITU's duties have expanded to include space and satellite spectrum management. In addition to that, the ITU oversees the registration of satellite orbits in order to prevent interference and maintain the peaceful use of space.

The International Astronautical Federation (IAF) was created in 1951 as a non-governmental organization to foster conversation among scientists throughout the world and set the groundwork for international space collaboration. For its members' benefit, the IAF aims to create, preserve, and enhance a global network. Worldwide astronautical congresses, international conferences, forums, symposia, seminars, online events, training courses, and educational projects are all organized by it. In addition to publishing research papers, briefings, and policy proposals on space-related subjects, the IAF assists its members in publicizing their own space-related events and goods. The Federation fosters international collaboration while advancing space knowledge and aiding in the creation and use of space assets.

The European Space Agency (ESA) stands as a significant player in the realm of space exploration worth mentioning in this context. Its endeavours span a broad spectrum of domains, including Earth observation through both orbital platforms and remote sensing technologies. ESA is at the forefront of both human and robotic exploration, constantly pushing the boundaries of space exploration with missions to other celestial bodies, including Mars. ESA's focus extends to the development of launchers, which are crucial for deploying satellites and spacecraft into orbit, along with navigation systems for precise positioning and timing services. In the realm of space science, ESA is tasked with studying the cosmos, namely exploring distant planets and celestial phenomena. Additionally, ESA dedicates efforts to space engineering and technology development. Finally, the ESA assumes responsibility for operating various missions and spacecraft, overseeing their missions from inception and launch to operational stages and data analysis.

Having outlined some of the most important provisions of treaties and agreements relating to space law, as well as the role that international organizations play in regulating space activities, I have tried to focus my efforts on emphasizing once again the fact that during the period of time under review, the international community has achieved extraordinary success in promoting cooperative and collaborative space exploration.

However, it is imperative to recognize that, despite having significantly contributed to enhancing the legal framework, humanity has not overcome certain challenges and unresolved issues in the space domain just yet. The list is unexhaustive. The rapid advancements in space technology raise new legal and if anything ethical dilemmas that expect thorough consideration by the global community. It is widely acknowledged and fervently hoped that scientific progress will continue relentlessly, necessitating a corresponding evolution in the legal framework. While celebrating past achievements, nations are supposed to proceed with working together to address existing gaps and rising obstacles to guarantee responsible, safe, reasonable and advantageous use of outer space. The legal status of private companies that operate in space, the regulation of space tourism, the use of minerals and natural resources on asteroids and celestial bodies and potential threats of militarization of space and the Moon are among such unresolved issues, that prompt the dialogue in the international community to develop a comprehensive legal framework, which would be able to adapt and adjust to ongoing needs.

Given the rising human presence in space, it is critical to resolve these challenges as soon as possible, particularly in relation to new privately financed operations conducted by private companies. Commercial companies, backed by their governments, have entered the field in pursuit of opportunities. On January 8, 2024, NASA, for instance, launched Peregrine Mission One, which sent capsules to the Moon with human remains and DNA samples. The plan was to dump human remains on the lunar surface and then release the capsule contents into space. The only serious resistance to the mission came from the Navajo Nation, which saw it as disrespectful to the Moon. NASA's reaction was significant: they could not investigate the payloads since they were owned by a commercial corporation. While commercial enterprises transporting human remains into space are not new, the growing engagement of private entities in space exploration raises new concerns. The emission of biological chemicals has already sparked major worry within the scientific community. In accordance with Article IX of the Outer Space Treaty, governments that perform space activities must consider the interests of other states. They are also required to take precautions to avoid dangerous contamination of outer space, including celestial bodies such as the Moon. A comprehensive examination and evaluation of the possible dangers associated with biological substances and hazardous pollutants is required. Therefore, it is critical to reinforce the legal framework relating to these challenges. Existing international regulations intended at safeguarding, say, the lunar environment from pollution have been readily bypassed, casting doubt on space law's usefulness. Doubtless, enterprises must connect

[1] International Organisations as Creators of Space Law: A Few General Remarks by Frans von der Dunk.

their actions with the fundamental principles of environmental legislation to reduce threats to our planet and other celestial bodies. Additional issues have arisen within the international community over the operations of commercial space enterprises. Taxation, dispute settlement, legal liability, and insurance are only a few of the issues raised.

I believe that in order to maintain the long-term viability of space exploration, international law must quickly and rigorously control all space operations conducted by private companies.

Space tourism presents a significant opportunity for private commercial firms to expand their projects. It is expected to attract investors and enthusiasts, resulting in rapid revenues and opening the path for more research and financing in other space ventures. At the moment, humanity is at the initial stage of development and promotion of space tourism. Currently, its activities are restricted to short-term trips, barely satisfying the criteria for space travel ad hoc. I am confident that this sector will evolve its policies, enabling companies to offer opportunities for travel to the Moon or even to other celestial bodies such as Mars in the near future.

On the one hand, it is impossible not to admire such scientific breakthroughs, which, say, seventy years ago, scientists and practitioners could only dream of. On the other hand, however, this implies that there are some concerns about the extent to which existing laws and principles of space law are sufficient and effective.

Space tourism offers promising opportunities, yet this notion is not devoid of certain drawbacks. Some scholars argue that the frequent launching of rockets may pose risks to the Earth's atmosphere, leading to its contamination with pollutants such as black carbon. Evidently, the environments of potential celestial destinations are prone to the risk of harm as well. Existing space treaties and resolutions do not explicitly address the tourism activities of private entities, certain environmental obligations are imposed only during space missions. Mars, in particular, is of concern due to recurrent scientific explorations.

The status of space tourists remains one of the most significant issues. The ongoing debate is whether the passengers are astronauts or should be accorded astronaut-like status. This may have a considerable influence on passenger rights, duties and obligations. Astronauts typically undergo special rigorous training before taking part in space missions. In contrast to them, space tourists are thought of as having minimum training and knowledge on this particular matter. Such differences raise questions about their responsibilities, and liability in case of space accidents. In other words, space tourism creates new legal challenges, such as how to safeguard persons who want to fly to space but lack the expertise and specialized training that state-sponsored astronauts get. On these grounds, I am of the opinion that space tourists require special legal status and protection from the international community.

The issue of the use of minerals and natural resources on asteroids presents another complexity in the context of the peaceful exploration of outer space. Asteroids are known to be rich in valuable resources that could potentially provide essential materials for the inhabitants of the Earth. Nonetheless, the legal and ethical implications of exploiting such resources remain unresolved. Questions concerning property rights, ownership, and environmental effects must be addressed to guarantee responsible and sustainable resource exploitation. Countries are pressing forward with space resource extraction ambitions despite the lack of a comprehensive legal framework to manage such peculiarities. Some scholars expressed concerns about " national appropriations " of asteroid minerals, citing that this whole concept may be at odds with Article II of the Outer Space Treaty. Public opposition to asteroid mining also revolves around potential ecological risks and environmental concerns. I personally believe that, notwithstanding the technical challenges associated with its implementation, this concept does not appear unfavorable to me; on the contrary, provided that mineral usage is exclusively for common and beneficial purposes, it can serve the common good of humanity and contribute to further scientific advancement.

The final subtopic to be addressed in this article pertains to the militarization of space and the Moon. The viewpoint that space has already undergone militarization is widely acknowledged. Dr Bleddyn Bowen, an associate professor in astropolitics and space warfare at the University of Leicester's School of History, Politics, and International Relations in the United Kingdom, explains that satellites nowadays are not only utilized for civilian reasons.

Thousands of satellites circling the Earth are critical for missile targeting, fighter aircraft navigation, and nuclear bomb control. This reality threatens international and national security and upsets existing arms control mechanisms, particularly those involving nuclear weapons and missiles. These impacts are feared to spark a new weapons race. Space militarization challenges space cooperation between nations, and the development of space-based military capabilities has raised concerns about the likelihood of conflict and destabilization in the space domain. Logically, the pursuit of space supremacy could potentially lead to future disputes. The Outer Space Treaty recognizes humanity's shared interest in the promotion of space exploration and use for peaceful purposes. Article IV prohibits the launch of items containing nuclear weapons or other weapons of mass destruction into orbit, the installation of such weapons on celestial bodies, and any other form of stationing such weapons in outer space. In this aspect, international space law is closely intertwined with international humanitarian law; unresolved ethical issues of militarization in space fall under their jurisdiction.

Conclusion: International space law is a relatively young yet promising branch of international law with a bright future. Science and law, as history asserts, will never stand still. Humanity should be proud of its achievements and direct its efforts to constantly explore new frontiers. As we look ahead, we still maintain a forward-thinking approach. The accomplishments of the past and the ambitions of the present never cease to open new doors for us.

With several challenges remaining, our path towards the exploration of space and deciphering its mysteries for the benefit of the whole planet necessitates dedication, reasonableness and utmost collaboration between nations.

I am positive that over the next decade, mankind will strengthen the existing legal framework of space law, address legislative gaps, and reinforce the notion that only by common efforts can we attain not supremacy or dominance, but harmony with space exploration and utilization.

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