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## **MINING ON THE MOON AND OTHER HEAVENLY BODIES**

The article reveals the features of mining on the Moon and space objects, analyzes the relevant international and national regulatory legal acts and identifies the prospects for the further development of international space law in this area. Today, the moon and other space objects have come to be considered as a possible resource, a possible source of mining. However, there is the question about the subjects who in this case will be admitted to these processes, including the modalities of such activities by individuals and legal entities of private law.

The article gives the examples of the activities of the United States, Luxembourg and the UAE, which tried to regulate the issue of mining at the level of national legislation and allow such mining for their residents.

This article also considers some issues and features of the Artemis Accords and the Ukraine's accession to it. The Artemis Accords can be considered a compromise of the states, so that they gain the possibility to carry out joint and mutually beneficial activities in the extraction of minerals in space. The main task, which can be seen from the text of the Artemis Accords, is to prevent conflicts that may arise, including in connection with the struggle for space resources. Accession to the Artemis Accords is a rather progressive step for Ukraine, as in 2020 Ukraine became only the 9th signatory country in the world.

Because of accession to the Artemis Accords, legal institutes of Ukraine are determined that need upgrading in the case of incorporation rules about space mining on the moon and other heavenly bodies to the legislation of Ukraine. Activities in outer space not only open opportunities for the realization of the technical potential of Ukraine, but also impose certain obligations on the state to resolve these issues at the level of national legislation.

**Keywords:** international space law, Moon and other celestial bodies, minerals, Artemis Accords, space objects.

**Introduction. Formulation of the problem.** The struggle for natural resources, which is fiercely fought on Earth, has reached space. No one has yet been able to extract minerals from celestial bodies or the Moon, but the Earth is already calculating the value of space resources and deciding whom they should belong to. The moon occupies a special place in planetary geological science, because it is the only body (except the Earth) in the solar system, where the foot of man, including a professional geologist, was present. The coming decades promise a new era of geological research on the moon and celestial bodies. If people live there for a long period of time, there will be an urgent need to ensure the extraction of minerals and the use of natural resources. Now, this issue is only partially regulated in international legislation and national legislation of few countries.

**The relevance of the research topic.** Ukraine is trying to take an active part in space exploration, development of spacecraft and to launch them. We have a capacity to extract minerals on the Moon and other celestial bodies, but in addition to the financial component, Ukraine must have an appropriate legal framework.

**The state of the study.** The issue of mining on the Moon and other heavenly bodies was considered by E. Husby, F. Tronchetti and J. Lewis.

**The purpose and objective of the article.** The purpose of this article is to analyse international and national legislation in the sphere of mining on the Moon and other celestial bodies, in order to transfer the the appropriate regulation model to Ukrainian legislation.

**Statement of the main material.** Outer space and celestial bodies have the status of "res communis" in accordance with international law. Res communis means an area of territory that is not subject to legal title of any state<sup>1</sup>.

The first "rigid" international legal document, which enshrined the principle of res communis, was the Space Treaty of 1967<sup>2</sup> (hereinafter – the Treaty), Article II of which states: "Outer space, including the Moon and other celestial bodies, is not subject to national appropriation neither by declaring sovereignty over them, nor by use or occupation, nor by any other means". Thus, the Treaty declares the unsuitability in space law of a customary rule that allows the acquisition of rights to "no man's land" (Terra nullius) as a result of its discovery, occupation and effective possession. The drafters of the Treaty believed that this would promote equal cooperation between states and save space from becoming a military training ground and a theater of conflict.

However, immediately after the adoption of the Treaty, the formal and legal shortcomings of the document were revealed, and scholars began to find "gaps" in the seemingly unambiguous wording. This applies, first of all, to the understanding of the essence of the term "national appropriation": many researchers have considered "national" as a synonym for "state" and concluded that private entities are free to acquire property rights in outer space.

Some authors (mainly from the USA) compared the text of Article II of the Treaty with the provisions of Article 11.3 of the 1979 Moon Agreement<sup>3</sup> (hereinafter – the Agreement), which explicitly forbids the acquisition of ownership of the surface or subsoil of the Moon and also for zones on its surface or subsoil or natural resources to "... including ... non-governmental organizations or ... individuals ". According to these scholars, the developers of the Agreement thus tried to fill the "gap" of Article II of the Treaty. At the same time, neither the United States, nor the Soviet Union, nor many other countries have become parties to the Agreement, which means that the only binding requirement for them is Article II of the Treaty, i.e. their individuals and legal entities are not subject to any restrictions on ownership in space.

However, most lawyers believe that the provisions of Article II also apply to the activities of private entities.

In support of this position, the text of Article II is usually analyzed in the light of Article VI of the Treaty, which contains the term "national activity", which includes the activities of private entities. It is logical to conclude that the term "national" is used throughout the text of the Treaty in the same sense.

Some authors refer to the fact that natural and legal persons, in order to fall under the principle of prohibition of national appropriation<sup>4</sup>, should not be explicitly mentioned in the text of Article II: according to Article VI of the Treaty, private entities can only carry out space activities "... with the permission of ... the relevant state." But if the state is banned from certain activities, how can it allow its private entities to conduct it?

There is another point of view, according to which the prohibition of "national appropriation" implies the prohibition of private appropriation, which cannot exist independently of the state. Indeed, the essence of the law is to authorize and provide it with the state, and hence the assignment of space by individuals and legal entities in any case will be carried out with the permission of the state, i.e. a violation of Article II of the Treaty.

The fact is that during the creation of the Treaty – in the 1960s – the only possible subjects of space activities were states: individuals and legal entities then did not participate in any space project. Thus, the creators of the Treaty simply did not see the point in mentioning private entities in the text of Article II<sup>5</sup>.

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<sup>1</sup> Grant, J. P., Barker, J. C. (ed.) (2009). Res communis. *Encyclopaedic Dictionary of International Law* <<https://www.oxfordreference.com/view/10.1093/acref/9780195389777.001.0001/acref-9780195389777-e-1964?rskey=vEq39g&result=4>> (2021, May, 14).

<sup>2</sup> *Договір про принципи діяльності держав по дослідженню і використанню космічного простору, включаючи Місяць та інші небесні тіла, 1967* (ООН). Офіційний сайт Верховної Ради України <[https://zakon.rada.gov.ua/laws/show/995\\_480#Text](https://zakon.rada.gov.ua/laws/show/995_480#Text)> (2021, May, 14).

<sup>3</sup> Husby, E. (1994). Sovereignty and Property Rights in Outer Space. *Journal of Intellectual Property Law&Practice*, 3, 359.

<sup>4</sup> Lewis, J., Lewis, C. (2005). A Proposed International Legal Regime for the Era of Private Commercial Utilization of Space. *The George Washington International Law Review*, 745.

<sup>5</sup> Tronchetti, F. (2008). The Non-Appropriation Principle as a Structural Norm of International Law: a New Way of Interpreting Article II of the Outer Space Treaty. *Air&Space Law*, XXXIII/3, 281.

With regard to national legislation in this area, on April 6, 2020, US President Donald Trump signed a decree authorizing the extraction of minerals on the moon by future US space missions. It states that the United States does not need direct permission stipulated in international agreements to extract minerals from other celestial bodies, because the United States does not consider space as a global area for mineral resources<sup>1</sup>.

The signing of the decree is associated with the depletion of mineral resources on Earth. Also, to live and explore the Moon and celestial bodies, one will need to use the mineral resources of the moon and celestial bodies. This is a real situation. For example, the European Space Agency plans to land a spacecraft at the lunar South Pole in 2022 to drill a well in the subsoil in search of frozen water in the pores or even clean ice and other volatile compounds<sup>2</sup>.

According to P.K. Bern, an associate professor of planetary geology at North Carolina State University, the moon is not a particularly valuable place for the extraction of precious metals such as gold, platinum or rare earth elements. This is due to the process of differentiation, in which relatively heavy materials sink and lighter materials rise when a planetary body partially or almost completely melts. In general, most of the moon's heavy and precious metals are probably deep in the mantle or even in the core, where it is impossible to access<sup>3</sup>.

As for international legal regulation in this area, on November 13, 2020, Ukraine became the ninth country in the world after the United States, Great Britain, the United Arab Emirates, Luxembourg, Japan, Italy, Canada and Australia, which signed the Agreement on implementation of the NASA Artemis program (Artemis Accords). They outline the principles of interaction in the exploration and peaceful use of the Moon, Mars, comets and asteroids. The Russian Federation and China have refrained from signing.

These Accords is primarily intended to formalize the principles of research and economic activity of states in outer space, where the main reference point is the beginning of activities in deep space. The Accords outline 10 principles of space activities: peaceful activities, transparency, interoperability (functional interaction), emergency assistance, spacecraft registration, publication of scientific data, preservation of space heritage, extraction of space resources, conflict prevention and counteraction to the formation of space. The Accords are designed to ensure the practical functionality of the provisions of the Treaty on the Principles Governing the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (1967).

The Artemis Accords do not contain a reference to the Agreement on the Activities of States on the Moon and Other Celestial Bodies (1984), as the United States did not sign the latter. However, as was mentioned before, in 2020 D. Trump signed an order to support commercial extraction of resources on the moon and other celestial bodies and stressed that the United States refuses to consider the resources of the Moon and other celestial bodies to be the property of mankind (as actually declared by the Moon Agreement) and seeks to spread this approach to other states.

Section 11 of Accords "Conflict Prevention" defines the concept of "safety zones" around areas where activities are conducted, which could potentially lead to harmful interference in other activities. These zones will be created, changed and developed depending on the status of a particular activity. The first reaction of the international community was the question of whether security zones will not turn into attempts to establish national sovereignty on celestial bodies, which is prohibited by Art. 2 of the Space Treaty. However, the answer to this question depends on the scale of the activity that will be carried out by one or another subject of space activity on the celestial body.

Formally, the drafters of the Accords answered this question by stating in paragraph 11 of Section 11 the obligation to respect the principle of free access to all areas of celestial bodies and all other provisions of the Space Treaty when they use security zones. However, paragraph 4 states that the signatories undertake to refrain from any harmful interference with each other's use of outer space.

Section 10 "Space Resources" declares that the extraction and use of space resources from the surface or subsoil of the Moon, Mars, comets or asteroids must be carried out in a manner consistent with

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<sup>1</sup> The Office of the Federal Register (2020). *Encouraging International Support for the Recovery and Use of Space Resources* <<https://www.federalregister.gov/documents/2020/04/10/2020-07800/encouraging-international-support-for-the-recovery-and-use-of-space-resources>> (2021, May, 14).

<sup>2</sup> Moneycontrol (2020). *US President Donald Trump signs executive order to mine on the Moon* <<https://www.moneycontrol.com/news/world/us-president-donald-trump-signs-executive-order-to-mine-on-the-moon-5146281.html>> (2021, May, 14).

<sup>3</sup> EarthSky (2019). *Voices Mining the moon* <<https://earthsky.org/space/how-to-mine-the-moon>> (2021, May, 14).

the provisions of the Outer Space Treaty, and the extraction of space resources is not a national appropriation under Article 2 about space<sup>1</sup>.

Neither the Artemis Accords nor the Outer Space Treaty contain direct prohibitions on the establishment of ownership of space resources. This means that the general recognition by all signatories of the legality of exploitation and subsequent recognition of the right of ownership of space resources is a kind of legal precondition for participation in the Artemis Program. It is noteworthy that the three signatory states to the Accords have settled in advance the issue of commercial extraction of minerals on celestial bodies. These are the United States (Law on Competition in Commercial Space Launches, 2015), Luxembourg (Law on Space Resources, 2017) and the UAE (Federal Law №12, 2019)<sup>2</sup>.

However, Australia is currently the only signatory to the Artemis Accords, which is also a signatory to the Agreement on the Activities of States on the Moon and Other Celestial Bodies (1979). St. Article 11 of this Agreement establishes that the Moon and its natural resources are the common heritage of mankind, and that the Moon's subsoil, parts of its surface or subsoil or natural resources may not be owned by any State, international intergovernmental or non-governmental organization, national organization or non-governmental institution or any individual<sup>3</sup>.

For Ukraine, the signing of the Artemis Accords is gaining new relevance also for the reason that this step will be a prerequisite for further conclusion of the Framework Agreement between the Cabinet of Ministers of Ukraine and the US Government on cooperation in space exploration and use (previous Framework Agreement of March 31, 2008 expired on January 22, 2019). In terms of structure and content, the Accords are a protocol of intent (or memorandum).

The legal question of how Ukraine can accede to these Accords now arises. In accordance with paragraph 1 of Art. 9 of the Constitution of Ukraine, part of the national legislation of Ukraine are those international treaties, the binding nature of which was approved by the Verkhovna Rada of Ukraine<sup>4</sup>. At the same time, paragraph 2 of Art. 9 of the Law of Ukraine "On International Treaties of Ukraine" stipulates that ratification is subject in particular to political treaties (such as cooperation)<sup>5</sup>. In this context, it should be recalled: Section 1 of the Accords itself declares that accession to the Accords constitutes a political commitment to the principles described therein, and Section 13 does not provide direct guidance on how States may agree to be bound by the Agreement<sup>6</sup>.

Thus, the way in which Ukraine agrees to be bound by the Artemis Accords will depend on the following factors:

1. in which manner the states shall express its agreement to be bound by these Accords (Article 8 of the Law of Ukraine "On International Treaties of Ukraine");

2. whether the Accords will be subject to ratification depending on the level of the signatory on the Ukrainian side (interinstitutional agreement; agreement on behalf of the Government of Ukraine; agreement in the form of the Decree of the President of Ukraine – in accordance with Articles 12-13 of the Law of Ukraine "On International Treaties")<sup>7</sup>.

For Ukraine, accession to the Artemis Accords is a significant step that allows it to fully demonstrate all the accumulated technical potential. In particular, to offer for the implementation of the Artemis Program its own concept of research and industrial base on the Moon developed by the Design Bureau "South", as well as other examples of space technology.

However, further agreements, which will be concluded by Ukraine, should clearly define its rights and obligations in the framework of such cooperation. Specialists in commercial law, private international law,

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<sup>1</sup> NASA (2020). *The Artemis Accords* <<https://www.nasa.gov/specials/artemis-accords/img/Artemis-Accords-signed-13Oct2020.pdf>> (2021, May, 14).

<sup>2</sup> EarthSky (2019). *Voices Mining the moon* <<https://earthsky.org/space/how-to-mine-the-moon>> (2021, May, 14).

<sup>3</sup> NASA (2020). *The Artemis Accords* <<https://www.nasa.gov/specials/artemis-accords/img/Artemis-Accords-signed-13Oct2020.pdf>> (2021, May, 14).

<sup>4</sup> *Конституція України, 1996* (Верховна Рада України). *Офіційний сайт Верховної Ради України* <<https://zakon.rada.gov.ua/laws/show/254%D0%BA/96-%D0%B2%D1%80>> (2021, May, 14).

<sup>5</sup> *Закон України Про міжнародні договори України, 2004* (Верховна Рада України). *Офіційний сайт Верховної Ради України* <<https://zakon.rada.gov.ua/laws/show/1906-15#Text>> (2021, May, 14).

<sup>6</sup> NASA (2020). *The Artemis Accords* <<https://www.nasa.gov/specials/artemis-accords/img/Artemis-Accords-signed-13Oct2020.pdf>> (2021, May, 14).

<sup>7</sup> *Закон України Про міжнародні договори України, 2004* (Верховна Рада України). *Офіційний сайт Верховної Ради України* <<https://zakon.rada.gov.ua/laws/show/1906-15#Text>> (2021, May, 14).

international space law and many other legal practices should be involved in the preparation and examination of such international agreements in order to prevent potential risks and inconsistencies.

**Conclusions.** International space law as a separate branch was developed in the era of space conquests between the 1960s and 1970s. Its first binding manifestation was the 1967 Outer Space Treaty, or, in its entirety, the "Treaty on the Principles Governing the Study and Use of Outer Space, Including the Moon and Other Celestial Bodies," which is based on the principle of freedom to explore and use space, which is "the property of all mankind." Thus, space exploration and use can only be done for peaceful purposes.

The signatory states undertake to establish an international regime to regulate the development of the natural resources of the Moon and other celestial bodies when possible. In particular, it should ensure an equal distribution among all States Parties of the profits from these resources, paying particular attention to the interests and needs of developing countries.

A space law passed in November 2015 in the United States allows US citizens to fully develop space resources, including ownership, transportation, use, and sale. The United States believes that such activities do not violate the principles of the Outer Space Treaty because American citizens will not own the celestial bodies themselves, but only the resources after extraction. At the same time, many experts believe that the agreement may allow the appropriation of resources of celestial bodies.

It is problematic to make a clear decision in this legal dispute. The issue of space natural resource development did not exist in the era of the Space Treaty, and its brief wording does not allow to address topical legal issues.

In 2017, Luxembourg followed the path of the United States and passed a law that openly allows the possession of space resources. In February 2020, a similar step was taken by the UAE, a player gaining strength in the space industry.

Different states, in turn, hold completely different points of view: some are strongly opposed to national initiatives to unilaterally regulate such activities. This inability to launch a multilateral regulatory initiative can be traced to all the new space issues that leave room for national initiatives and a one-sided approach.

Especially since in the US, the work is only gaining momentum: in 2020, a presidential decree was signed, which confirms the space law of 2015 and the right of American citizens to own space resources. It also expressed its intention to reach a common position on the use of space resources and to sign relevant agreements with partner countries. A few days later, all this was reflected in the Artemis Accords initiative, which provides for the signing of bilateral agreements between the United States and partners to approve the general principles of exploration and use of the Moon and, in the long run, Mars. These Accords will undoubtedly be a prerequisite for the participation of states in the American program. As for the role of the Artemis Accords, their main purpose is to confirm the readiness of the counterparties to work together on the basis of the principles set out in the Accords. For Ukraine, accession to the Artemis Accords is a significant step that allows it to fully demonstrate all the accumulated technical potential. In particular, to offer for the implementation of the Artemis Program its own concept of research and industrial base on the Moon developed by the Design Bureau "South", as well as other examples of space technology.

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