

HMUN 2025

Outlining frameworks for research in outer space

GA4

**Shams Kamel and Lorin Defne
Kamacı**

Main and Deputy Chair



Forum: Fourth General Assembly

Issue: Outlining frameworks for research in outer space

Name: Shams Kamel, Lorin Defne Kamacı

Position: Main and Deputy Chair

Introduction

Space exploration has long represented human creativity, ambition, and the desire to go beyond our earthly limits. Since the launch of Sputnik in 1957 and the creation of the International Space Station, humanity's journeys into space have reshaped our comprehension of the universe and our role in it. These endeavors have also yielded substantial advancements in science, technology, and global collaboration.

This rapid progress brings up significant concerns regarding the equitable development and governance of outer space. The rise of private enterprises, the growing emphasis on missions to the Moon and Mars, and the essential function of satellite technologies in modern economies place the international community at a pivotal juncture. The GA4 provides a forum to tackle these issues, striving to ensure that space remains a domain for peaceful exploration and shared advantages.

The following report intends to provide the delegates with an overview of the main issues related to legal frameworks that govern space, the technological and economic development of space, and ethics associated with space activities. It also identifies areas where cooperation should be established in the case of issues such as space debris, weaponization, and monopolization of space resources. The following report will hopefully help delegates engage in meaningful debates and present innovative solutions that may shape a sustainable and inclusive future for humanity in space.

Definition of Key Terms

Asteroid Mining

The process of extracting minerals from asteroids has the potential to provide resources for use on Earth or in space.

Celestial Resources

Natural materials found on celestial bodies such as the Moon and asteroids, including helium-3, water ice, and metals, are being explored for scientific research and economic utilization.

Exoplanet Research

The study of planets outside our solar system to identify Earth-like conditions and assess their potential for supporting life.

Geostationary Orbit (GEO)

An orbit around Earth at 35,786 kilometers above the equator, where satellites rotate in sync with Earth's rotation, enabling continuous communication and observation.

International Telecommunication Union (ITU)

A UN agency responsible for managing global communication systems, including radio frequencies and satellite orbital positions, to ensure coordination and prevent interference.

New Space Economy

The growing commercial sector of space, including satellite technology, space tourism, and resource extraction from space, is driven by private companies.

Outer Space Treaty (OST)

A 1967 international agreement that governs the peaceful use of outer space, prohibiting the ownership of celestial bodies and promoting international cooperation.

Planetary Protection

A set of protocols aimed at preventing the biological contamination of Earth and other planets, ensuring the integrity of scientific exploration.

Space Debris

The collection of discarded, non-functional objects in Earth's orbit, such as defunct satellites and spent rocket stages, poses a risk to active spacecraft.

Space Governance

The system of laws, treaties, and agreements that regulate human activities in space, addressing issues like resource usage, territorial claims, and international collaboration.

General Overview

Historical Background

Though there had been conceptual frameworks since pioneering works by scientists such as Konstantin Tsiolkovsky, one of the founding fathers of rocketry, to date, real voyages started in the 20th century. However, actual reasonable advances in space missions came in the middle of the 1900s during the Cold War. This era gained immense momentum from the Space Race between the two superpowers then, the United States and the Soviet Union, up until the Soviet Union sent out Sputnik 1 in 1957. The historic landing on the moon of US Apollo 11 occurred in 1969 as well. This development-geopolitical rivalry sparked a series of technological outbursts and furthered humankind's scientific understanding of our surroundings. As time passed, the exploration of space went beyond the military origins to the realms of scientific discovery, satellite technology, and even human spaceflight, culminating in the establishment of major agencies such as NASA, Roscosmos, and the European Space Agency.

The Outer Space Treaty, signed in 1967, spoke to the peaceful use of space, stating that outer space shall belong to all humanity and thus laid the foundation for international cooperation in space. Yet at this fantastic pace of achievement, new problems emerged: as satellite launches became routine, the junk of space started building up the danger to manned and unmanned missions. In the course of the 21st century, space exploration ceased to be a matter for nation-states alone and took on a new private dimension-the New Space Economy.

Frameworks for Space Research

In view of guiding these rapid developments in space exploration and for the sustainability and peaceful use of outer space, over time, various frameworks and agreements have been developed. These frameworks are important in coordinating international cooperation, regulating activities in space, and addressing emerging challenges such as space debris and resource exploitation.

The Outer Space Treaty (1967)

The Outer Space Treaty remains a cornerstone of international space law, proclaiming that the study of space shall be conducted in such a way that its benefit shall be extended to all countries, underlining the principle of the peaceful use of outer space. It bans putting nuclear weapons in space and establishes that space shall be free for exploration and may be used by all states. It was signed by 109 countries, which provided a legal basis for all types of activities related to outer space.

Nowadays, this treaty faces various challenges because of the flourishing commercial space enterprise and technological advancement regarding exploration in space. With the space economy continuously seeing the entry of new players, especially private companies, there arises a growing demand for newer regulations on issues such as space mining, satellite collision, and commercial activities in space. The vagueness of the treaty on certain aspects, such as extractive use of space resources and the commercialization of space, has called for more specific regulations that would prevent any conflict on resource exploitation and make space accessible to all.

The Space Debris Mitigation Guidelines

As space missions started increasing, so also did space debris, turning over time into one of the most critical challenges thrown at researchers and agencies. Space debris, or so to say, refers to non-functional satellites and spent rocket stages that threaten active satellites or human missions. In response, the guidelines were set forth by such space agencies as the United Nations and the Inter-Agency Space Debris Coordination Committee, or IADC, in order to avoid further generation of debris that will make space missions truly sustainable in the long term. They recommend good practices such as designing spacecraft that will get rid of themselves when their work is done, active removal techniques, and so on.

International Cooperation through UNOOSA

UNOOSA has been playing a very significant role in international cooperation with respect to the exploration of space and related research. This office is mandated to enhance the peaceful use of outer space, bring nations together in developing space science and technology, and create legal regimes that will guide activities within space. UNOOSA also helps the states cooperate through committees like COPUOS, which provides a forum to negotiate new agreements on space-related issues. Such cooperation is needed for the solution of common challenges, such as the management

of space debris, enhancement of satellite communications, and application of space-based technologies in climate monitoring.

Space Resource Exploration and Utilization

Other new frontiers in space exploration involve harnessing the resources of space, including asteroid mining and the extraction of materials from the Moon. In this regard, there are a number of open issues regarding ownership, environmental concern, and benefit sharing, which calls for clear frameworks in how space resources will be extracted.

Although the 1979 Moon Agreement was done to regulate the use of the resources on the moon, most of the spacefaring nations have avoided ratifying it, while others have put forward arguments for updating the legal framework in regard to commercial interest in mining. While the Outer Space Treaty declared that the use of space resources shall be to the benefit of all humanity, the regulation and sharing of those resources have remained a question. In a situation where more private companies and nations aspire to exploit space resources, new and more comprehensive frameworks have to be developed in order not to create potential conflicts but to provide for fair distribution.

Current Situation

Space, over the last couple of decades, has gradually moved from being an exclusively government-driven venture to one in which private enterprise also plays an increasingly high-profile role. The private companies leading this drive include SpaceX, Blue Origin, and Rocket Lab, with innovative technologies such as reusable rockets, something that has dramatically lowered the cost of space travel. In fact, it opens a world of new possibilities hitherto unthinkable: space tourism, satellite internet, and mining on asteroids.

While this has taken place, some other issues concerning sustainability and governance regarding outer space have arisen. A deficit of regulation pertaining to outer space commercial activities such as space resource extraction and the proliferation of satellites has, thus, spurred various debates as to how equitability is offered in these issues, the prevention of monopolization, and the prevention of conflicts over resources. Especially the concern about space debris has become critical, with thousands of dead satellites and rocket parts littering Earth's orbit, creating hazards for any future missions and long-term viability in space.

Another huge challenge is the problem of space militarization. Conventionally, space has been considered a domain for peaceful cooperation; however, there is growing concern about the weaponization of space. The United States, China, and Russia have developed technologies that can be used in anti-satellite warfare and could disrupt communication systems, military operations, and the global economy.

For many decades, international cooperation would play a pivotal role on the global platform as well. The UN-COPUOS, being directed by UNOOSA, is at the very forefront of dialogue within and among space-faring countries. Similarly, so are initiatives like the International Telecommunication Union, as this organization works to undertake activities of allocation and frequency use regulation for space communications. While this work continues, the fast-tracked commercialization of space coupled with the increasing number of countries and companies involved in space activities has presented a host of new governance challenges.

Key Issues and Players

Space research is increasingly shaped by a series of challenges that need coordination between key players: governments, private companies, and international organizations. The most common issues include space debris. As the number of satellites increases in orbit, so does the amount of debris left behind. This debris poses a very serious threat to functioning satellites, space stations, and even astronauts. The risk of collision between space objects can further create them and increase the risks. There are, therefore, increasing international demands for cooperation on mitigation measures against the growing debris and for advanced methods of the removal of it. For this reason, space agencies and private companies now focus their efforts on technologies that can safely reduce waste in space and prevent future collisions.

The exploitation of space resources -asteroid mining and extraction of lunar resources- is another huge challenge in space research. Thereby, a high value might be reaped from the potential to harvest useful materials in space to enable a number of revolutionary industries on Earth. In doing so, legal, environmental, and ethical complications arise. For instance, questions like ownership, benefits sharing, and minimization of environmental damage are already hotly debated. As more countries and private entities enter this field, managing space resource extraction becomes more complex; hence, international cooperation and clear regulations to ensure fairness and sustainability in practices are direly needed.

Another important area that requires attention is the updating of space laws. Although the 1967 Outer Space Treaty laid the foundation to make sure space exploration was conducted in a peaceful manner, it does not deal with current issues, such as the rise of commercial space ventures or the exploitation of space resources. That is why clearer regulations are required in order to ensure space continues to be a domain for all of humanity and not just a privileged few. The UNOOSA plays a very important role in managing these concerns, overseeing treaties, and fostering international collaboration in this respect. As space becomes increasingly commercialized and more players enter the space activities arena, the concept of space law itself needs to evolve. Key players are taking part in deciding the future of space exploration. National space agencies like NASA, Roscosmos, and ESA still play leading roles in research and exploration. Major missions, development of technologies, and often international cooperation rest with these agencies. Now, private companies such as SpaceX, Blue Origin, and Virgin Galactic also take leading roles in space research. They increase accessibility to space, lower mission launch costs, and create technology for space tourism and resource mining. As this commercial sector expands, these players are having an increasing influence on the study of space.

Besides them, new emerging space-faring nations like China and India are rapidly becoming valuable contributors in this field. The China space program, under the stewardship of the CNSA, has attained a lot of feats, including manned space travel and missions to the moon. The Indian Space Research Organization, ISRO, has also made giant strides in this arena, pulling off successful missions to both Mars and the moon and international cooperation on space matters. This is increasingly being joined by the private players from the Global South, thus changing the face of space globally and bringing in a lot of diversity into space research.

Last but not least, international organizations like the United Nations, through UNOOSA, are irreplaceable in stimulating peaceful cooperation and regulating the rapidly developing commercial space economy. While space activities will be more and more disseminated among states and private entrepreneurs, international cooperation will become very important in keeping space exploration service to all humankind and carried out in a sustainable manner. In such a way, the future of space research will depend on the elaboration of frameworks able to approach such complex issues while stimulating transborder and intersectoral collaboration.

Timeline of Key Events

Date

Event

4th of October, 1957	Launch of Sputnik 1
12th of April, 1961	Yuri Gagarin's Orbit
20th of July, 1969	Apollo 11 Moon Landing
14th of May, 1973	Launch of Skylab
20th of November, 1998	Start of ISS Construction
2th of November, 2000	First International Crew on ISS
21st of July, 2011	End of Space Shuttle Program
21st of December, 2015	SpaceX Falcon 9 landing
6th of October, 2023	NASA's Artemis I Mission

Major Parties Involved

United States of America

The United States has remained and continues to remain a huge space exploration player right from the days of the Cold War, and all because of NASA innovations and private companies like SpaceX and Blue Origin. The country is on the side of commercial involvement in space activities, having enacted a few domestic laws, including the Commercial Space Launch Competitiveness Act, allowing further private claims on mined resources outside the Earth. This position has drawn criticism since it seems as though it is contradictory to the premise of equitable resource sharing as laid out in the Outer Space Treaty. On top of all this, the United States is also the foremost space militarization research, thus raising concerns regarding outer space weaponization.

Russia

Russia has a long history of space exploration, with such achievements as Yuri Gagarin's orbit and the making of Soyuz. Although its prominence declined in space after the Soviet period, Roscosmos still remains a major player as it has very active satellite launches and international collaborations, including partnerships with China. Russia has made a statement with regard to the monopolization of space resources by private entities, emphasizing efforts made towards exploration by the state. It calls for strengthening the United Nations's role in space governance to make decisions collectively.

Indeed, Russia has a long history of space achievements, among which the most talked about would probably include Yuri Gagarin's orbit and the making of the Soyuz spacecraft. Most potentially, its nap in space had dwindled greatly in the post-Soviet era, but Roscosmos still remains a major player whose main focus is on satellite launches and international collaborations such as that with China.

Russia has put up against the monopolization of space resources by private entities and rather lauds government-led exploration. Further, it sees the need for enhancement in the role that the United Nations will play in space governance so as to ensure that decisions are made collectively.

China

Emerging very quickly as a space power, China is doing all it can to enhance its status as an influential player in the world. The advancement has been spearheaded by ambitious missions like Chang'e's lunar missions as well as the Tianwen Mars exploration. The China National Space Administration (CNSA) believes that space exploration should form an important part of national development and scientific progress for any nation. China has invested heavily in the use of satellites and is building its rocket station called Tiangong. China engages other developing nations to promote inclusiveness in space exploration, and the very courageous moves that place it in the way of great military opposition are associated with anti-satellite weapons, among other things.

European Space Agency (ESA)

The ESA is indeed a consortium of European nations pursuing very peaceful human exploration and research in space. Among its flagship missions in this endeavor, it has been able to make some pioneering comet missions directed by the ambitious Rosetta mission. It also has a number of cooperative missions to which it contributes, including NASA and Roscosmos efforts on the International Space Station (ISS). The ESA is a strong advocate for a clean-up of space debris and international coordination for sound governance of space. Finally, it indicates in its mandates its concerns for sustainability and ethics in matters of outer space activities and encourages the development of green technologies.

Space Sector Development

China is emerging rapidly as a space power, doing everything to enhance its status as an influential player in the world. The advancement has been driven by ambitious missions such as Chang'e's lunar missions and Tianwen's Mars exploration. CNSA strongly advocates that space

exploration should form an integral part of a nation's development and scientific progress. China is heavily investing in satellites and is establishing a rocket station termed Tiangong. It engages other developing countries in a bid to make spaces explored more inclusive, and the very brave things it does place it really high in the scale of military opposition, like anti-satellite weapons.

India

India's space program involves a lot of international fame through the great economy of its missions that cover the lunar missions of Chandrayaan and the Mars orbiter of Mangalyaan. The country is intensely advocating equal opportunity for all in terms of their access to space technology resources. Here, space exploration becomes an ideal global issue that must be solved, one of which is climate change. As a result, the space-faring emerging country was concerned with the building up of collaborative efforts with other countries and private entities within the bounds of peaceful and inclusive exploration.

Private Companies

SpaceX, Blue Origin, and Virgin Galactic are just some examples of private companies giving the traditional space industry a face-lift in terms of concepts similar to reused rockets, space tourism, and satellite internet. Without sounding too cliché, these companies are making space cheaper and more accessible but raising questions on their profit motives and sustainability, monopolization, and, particularly, adherence to international laws. Hence, it is necessary for private companies to have laws to govern such entrants concerning balancing commercial interests with the general purposes of space exploration.

United Nations Office for Outer Space Affairs (UNOOSA)

UNOOSA is the key actor in promoting international cooperation and space law frameworks. It is a forum for capacity-building for developing countries as well as for addressing challenges such as space debris, resource exploitation, and so on. Through its committees, notably COPUOS, UNOOSA carries out much-needed work to make sure that space remains a domain for peaceful exploration and common benefits.

Possible Solutions

The rapid pace of change that space exploration has been undergoing demands innovative, visionary solutions to all the imminent challenges and opportunities that space will bring in the future. The following recommendations outline the guiding principles for delegates in shaping their resolutions:

1. Iterate and Revise International Treaties

- Amend the Outer Space Treaty (OST) to cater to the new challenges that have emerged, for instance, asteroid mining, private sector involvement, and satellite proliferation-with guidelines clearer for resource utilization and equitable benefit-sharing.
- Propose a New International Agreement on Ethics and Ecology of Space Exploration.

2. Space Debris Management

- Create an International Fund for Debris Mitigation for Space to sponsor the future research and development of technologies such as active debris removal (ADR).
- Establish a mandatory registry for all space-faring nations and also for private companies, requiring them to create end-of-life plans for satellites and spacecraft to minimize debris.

3. Maximum International Cooperation

- The role of the United Nations Office for Outer Space Affairs could be enhanced by creating a task force that will focus on modern topics for the governance of outer space and their implications, including emerging technology.
- Strengthening the Equity of Emerging Space-Faring Nations and Developed Space-Faring Nations

4. Commercial and Public Interests Balanced

- Establishment of a licensing framework in terms of private companies conducting space activities, which would be tuned to international laws and ethical standards.
- Form an international regulatory body that oversees commercial activities such as space tourism and, to a lesser degree, mining into space. It would also ensure transparency and fair practices.

Further Reading

Below are some resources that were instrumental in shaping this report. Delegates may find them helpful for deeper research:

- United Nations Office for Outer Space Affairs (UNOOSA): Provides comprehensive

information on international treaties and agreements related to space law. Visit UNOOSA.

- NASA's Artemis Program: Explains the future of lunar exploration and its potential impact on space research. More details can be found [here](#).
- Inter-Agency Space Debris Coordination Committee (IADC) Guidelines: Detailed recommendations on mitigating space debris. Access the guidelines [here](#).

Bibliography

"Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (Moon Agreement)." *United Nations Office for Outer Space Affairs*,

www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/moon-agreement.html.

"Asteroid Mining: Economic and Ethical Challenges." *Planetary Society*,

2023, www.planetary.org/articles/asteroid-mining-overview.

"Guidelines for the Long-Term Sustainability of Outer Space Activities." *United Nations Office for Outer Space Affairs*,

[www.unoosa.org/oosa/en/ourwork/topics/long-term-sustainability-of-outer-](http://www.unoosa.org/oosa/en/ourwork/topics/long-term-sustainability-of-outer-space.html)

[space.html](http://www.unoosa.org/oosa/en/ourwork/topics/long-term-sustainability-of-outer-space.html). "International Telecommunication Union (ITU)." *ITU*, www.itu.int/en/.

"Outer Space Treaty." *United Nations Office for Outer Space Affairs*,

www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/outer-space-treaty.html. "Planetary

Protection Policy." *NASA Office of Planetary Protection*, planetaryprotection.nasa.gov/.

"Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space." *United Nations Office for Outer Space Affairs*, 2010,

www.unoosa.org/pdf/publications/st_space_49E.pdf. www.unoosa.org/pdf/publications/st_space_49E.pdf.

UNOOSA. "Committee on the Peaceful Uses of Outer Space (COPUOS)." *United Nations Office for Outer Space Affairs*, www.unoosa.org/oosa/en/ourwork/copuos/index.html.

UNOOSA. *United Nations Treaties and Principles on Outer Space*. United Nations, 2022, www.unoosa.org/oosa/ootadoc/data/documents/2022/stspace/stspace61_0.html/ST_SPACE_61E.pdf.

"U.S. Commercial Space Launch Competitiveness Act." *Congress.gov*, U.S. Congress, www.congress.gov/bill/114th-congress/house-bill/2262/text.

Weeden, Brian. "Space Debris: Legal and Policy Implications." *Secure World Foundation*, 2022, www.swfound.org/media/205142/swf_space_debris_fact_sheet.pdf.

Zapata, Edgar. "An Assessment of the Economic Viability of Space Resource Utilization." *Acta Astronautica*, vol. 152, 2022, pp. 196-205, doi:10.1016/j.actaastro.2022.05.015.