

INTERNATIONAL JOURNAL OF LAW MANAGEMENT & HUMANITIES

[ISSN 2581-5369]

Volume 7 | Issue 3

2024

© 2024 *International Journal of Law Management & Humanities*

Follow this and additional works at: <https://www.ijlmh.com/>

Under the aegis of VidhiAagaz – Inking Your Brain (<https://www.vidhiaagaz.com/>)

This article is brought to you for “free” and “open access” by the International Journal of Law Management & Humanities at VidhiAagaz. It has been accepted for inclusion in the International Journal of Law Management & Humanities after due review.

In case of **any suggestions or complaints**, kindly contact Gyan@vidhiaagaz.com.

To submit your Manuscript for Publication in the **International Journal of Law Management & Humanities**, kindly email your Manuscript to submission@ijlmh.com.

International Liability of Commercial Space Activities and Space Debris

ABHISHEK VARSHNEY¹

ABSTRACT

*Space activities are generally sophisticated and involve a high frequency of risk. Notwithstanding the precautionary measures that are taken by the commercial operators in any point of time which include launch, passing through air space, in-orbit manoeuvring and operating and de-orbiting, the rules and procedures are aimed to ensure the prompt payment of a full and equitable compensation for such damage constitute the international liability regime, which is a crucial importance in space law. The very first reference of international liability for damage caused by the space objects and their components on Earth can be traced back to the very beginning of the space era. The United Nations General Assembly had declared the international liability, as one the legal principles, governing the activities of states in the exploration and use of outer space, just a few years after the first ever artificial satellite was launched in 1963. This was later made legally binding by the inception in the 1967 Outer Space Treaty and has received further development in the 1972 Liability Convention. The latter is generally referred to as *lex specialis* when the interrelation between the two international treaties is described and introduces several provisions that treat liability for damage caused in specific circumstances somewhat differently.*

International Space Law imputes liability on states that launch or procure launchings of space objects and states from whose territory or facility space objects are launched. This does now however exclude the liability of damages caused by the space objects that are operated by the private entities. International Liability for accidents involving commercial operators stays with the so-called launching states, as this term is defined by the Liability Convention for same states that are listed in the Outer Space Treaty as internationally liable. The damages and liability issues although are well known and are addressed by the Insurance, however, it is not always mandatory.

Often, space-related accidents involve dysfunctional space objects and their parts which are referred to as 'Space debris'. This may include parts like spent rocket stages and defunct satellites, fragments from their disintegration, etc. Since the non-functional state of a space object does not change its legal status, the relevant provisions of international space law that are applicable to space objects continue to apply to what is called space debris. There

¹ Author is a LL.M. student at IFTM University, Moradabad, India.

are certain practical problems which arise with identification of space debris and consequently, an efficient implementation of the liability regime.

Keywords: *International Space Law ; Outer Space Treaty ; Liability Convention ; International Liability ; Commercial Space Activities ; Space object ; Launching State ; Damage ; Compensation and Space Debris.*

I. INTRODUCTION

The rapid advancement of technology and science has given several countries the ability to use and exploit outer space. Many rich and emerging nations engaged in unrestricted space research in the preceding century, and as a result, space trash production has expanded dramatically. Defunct satellites that are still orbiting the Earth and have successfully completed their missions are collectively referred to as "space debris" since they are considered to be space rubbish. The legal framework governing the use of space must incorporate space debris remediation since it will be essential to the long-term viability of space. The outer space has become crowded with both operational and non-functional space objects, which has led to an unforeseen overcrowding of orbits. As countries and non-governmental entities continued to launch their objects into space, the available space in outer space has significantly diminished.[1] To address the issue of space debris, active debris removal (ADR) has been proposed as a means to reduce the amount of debris already present in space. ADR involves more aggressive measures compared to mitigation, as it requires actively retrieving debris and guiding it to burn up in the Earth's atmosphere. Since many space objects lack post-mission disposal capabilities, external vehicles are necessary to perform ADR. The technical methods employed in ADR include capturing and removing debris. Currently, ADR technology focuses on larger debris due to their higher likelihood of colliding with other space objects. Spacefaring nations are actively developing technologies for active debris removal (ADR). In 2012, the European Space Agency (ESA) initiated the Clean Space initiative to protect the sustainability of the outer space environment. Private companies like Astroscale and The Aerospace Corp. are also involved in commercializing ADR. However, despite Indonesia's increasing reliance on satellite technology and its plans to build a spaceport for launching satellites, the country has not yet made efforts in mitigation or remediation, despite having 25 deployed satellites, 15 of which are inactive. It is crucial for Indonesia to consider defining legal aspects related to space debris to ensure the long-term sustainability of its space activities.[2]

ADR is considered a practical solution for preserving the space environment. However, studies indicate that it is an expensive endeavour requiring advanced technological capabilities.

Consequently, defining the legal aspects of ADR becomes vital. Key legal considerations include jurisdiction and control, ownership, authorization, responsibility, and liability. ADR operations, due to their challenging remediation techniques, can pose risks to other satellites in orbit, making accidents a potential concern. This analysis will examine how the Liability Convention of 1972 and the Indonesian Space Act of 2013 address ADR and assess whether they offer sufficient provisions.[3]

As space activities continue to grow, the issue of space debris becomes increasingly significant and requires attention from the global community. The approaching anniversary of the Outer Space Treaty provides an opportunity to reflect on achievements in the past and chart a collective path forward.

Space debris, also known as orbital debris, consists of human-made objects ranging from tiny paint flecks to non-functional satellites. It is generated through normal space activities, collisions between objects, and even anti-satellite weapons. The presence of a growing population of debris in near-Earth orbit poses a substantial threat to operational satellites and human life in space or on the ground due to the risk of collisions. Moreover, in the long term, space debris jeopardizes the sustainability of space activities and renders Earth orbit inhospitable by turning it into a debris-filled zone.

While scientific predictions regarding space debris involve some degree of uncertainty, the scientific and technical communities concur that concerted action is necessary on multiple fronts to mitigate the proliferation of hazardous orbital debris. The complexity of legal aspects surrounding debris currently occupies space lawyers and raises more questions than answers. These questions demand comprehensive and thoughtful consideration from all stakeholders involved in outer space activities.[4]

The legal status and liability of non-governmental entities involved in commercial activities in outer space are not clearly defined within existing space law frameworks. Non-governmental entities refer to private actors engaged in activities such as commercial launches, supplying equipment or parts to space agencies, and manufacturing spacecraft and satellites. Potential litigation arising from these commercial activities primarily revolves around financial consequences of damages caused and technical complications that private entities may encounter, such as providing faulty parts to space agencies.

Under the Outer Space Treaty of 1967 (Article VI) and the Liability Convention of 1972 (Articles II and III), the launching state is held liable for any activities in outer space, including non-governmental activities. This means that in the case of accidents or consequential damages

resulting from commercial activities conducted by any sovereign state, the state is held responsible.

This article specifically focuses on the issue of liability for commercial activities conducted by non-governmental entities within the existing international space law regimes. It examines the relevant principles of space law and international law that apply to outer space activities. The article also investigates the impact on the space liability regime and the legal framework governing the relationship between private entities and state liability. This analysis is particularly significant given the increasing number of private spacecraft scheduled for launch in the future.

II. LEGAL FRAMEWORK

Similar to other areas of law, space laws are built upon the principles of international cooperation and equality. The Committee on the Peaceful Uses of Outer Space (COPUOS) has played a pivotal role in developing five important treaties that govern space activities and aim to ensure the preservation of the outer space environment. The Committee on the Peaceful Uses of Outer Space (COPUOS) has been instrumental in the development of key treaties that regulate space activities and promote the peaceful exploration and utilization of outer space. These treaties, collectively known as the "Five United Nations Treaties on Outer Space," The Five Agreements are as follows :

1. Outer Space Treaty of 1967 : The Outer Space Treaty was considered and agreed upon by the Legal Subcommittee in 1966, with the General Assembly adopting it through resolution 2222 (XXI) in the same year. The Treaty was largely based on the Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space, which was adopted by the General Assembly in resolution 1962 (XVIII) in 1963. However, the Outer Space Treaty introduced several new provisions. In January 1967, the Treaty was opened for signature by the three depository Governments: the Russian Federation, the United Kingdom, and the United States of America. It entered into force in October 1967. The Outer Space Treaty establishes the fundamental framework for international space law and includes the following key principles:
 - **Benefit and Interests of All:** The exploration and use of outer space should be carried out for the benefit and in the interests of all countries and should be considered a common endeavour for all of humanity.
 - **Free Exploration and Use:** Outer space is to be freely explored and used by all states, without any discrimination or exclusivity.

- **Non-Appropriation:** Outer space is not subject to national appropriation, meaning no state can claim sovereignty over any part of outer space through occupation or other means.
- **Weapons in Space:** States are prohibited from placing nuclear weapons or other weapons of mass destruction in orbit, on celestial bodies, or stationing them in outer space.
- **Peaceful Purposes:** The Moon and other celestial bodies should be used exclusively for peaceful purposes, without any militarization or hostile activities.
- **Astronauts as Envoys of Mankind:** Astronauts are considered as representatives of all humankind and should be provided with necessary assistance and treated with dignity.
- **Responsibility and Liability:** States bear responsibility for their national space activities, regardless of whether they are carried out by governmental or non-governmental entities. They are also liable for any damage caused by their space objects.
- **Avoidance of Harmful Contamination:** States are obliged to prevent the harmful contamination of space and celestial bodies, taking into account the principles of environmental protection.

These principles form the core elements of the Outer Space Treaty, which lays the foundation for international space law and promotes cooperation, peaceful exploration, and the preservation of space for the benefit of all nations and humanity as a whole.[5]

2. Rescue Agreement of 1968 : The Rescue Agreement, formally known as the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, was adopted by the United Nations General Assembly on December 19, 1967, and entered into force on December 3, 1968. It is one of the five international treaties governing space activities. The Rescue Agreement primarily focuses on the obligation of states to rescue and provide assistance to astronauts in distress. Its key provisions include:

- **Rescue of Astronauts:** States have a duty to rescue astronauts who have landed in territory other than their own or who are in distress in outer space. This obligation applies regardless of the nationality of the astronauts involved.
- **Return of Astronauts:** States are required to ensure the safe and prompt return of

astronauts to their respective countries after they have landed in the territory of another state or have been recovered in outer space.

- **Return of Space Objects:** States must also facilitate the return of space objects launched into outer space that land outside the territory of the launching state. This provision applies to both manned and unmanned missions.
- **Notification and Assistance:** States are encouraged to provide mutual assistance and to promptly notify each other of any incidents or accidents involving astronauts or space objects. They should also take necessary measures to prevent the spread of hazardous substances.

The Rescue Agreement underscores the importance of cooperation among states in ensuring the safety and well-being of astronauts involved in space missions. It aims to promote the prompt rescue and return of astronauts, as well as the recovery and return of space objects. By establishing clear obligations and procedures, the agreement contributes to the advancement of international space law and the peaceful exploration of outer space.[6]

3. The Liability Convention of 1972 : The Liability Convention of 1972, officially known as the Convention on International Liability for Damage Caused by Space Objects, is an international treaty that addresses the liability of states for damages caused by space objects. It was adopted by the United Nations General Assembly on March 29, 1972, and entered into force on September 1, 1972. The Liability Convention establishes a framework for determining the liability of launching states for damages caused by space objects, including satellites and spacecraft. Key provisions of the convention include:

- **Scope of Liability:** The convention applies to damage caused on the surface of the Earth, to aircraft in flight, and to persons or property on board aircraft or spacecraft. It also applies to damage caused by space objects on other space objects.
- **Fault-Based Liability:** The convention imposes absolute liability on launching states for damage caused by their space objects on the surface of the Earth or to aircraft in flight. This means that a launching state is held responsible regardless of whether it was at fault or negligent.
- **Presumption of Fault:** In cases where damage is caused to a space object or its components on the surface of the Earth or in outer space, fault-based liability applies. The injured party must establish that the damage was a result of a fault

or negligence on the part of the launching state or its personnel.

- **Limitation of Liability:** The convention provides for a limited liability regime where the total liability of a launching state is capped. The specific limit is determined by the size of the launching state's space object and its purpose (whether it is a manned or unmanned mission).
- **State Responsibility:** The convention emphasizes that the liability of a launching state is a matter of international responsibility and does not affect the responsibility of any other state involved in the launch or use of a space object.

The Liability Convention promotes the principle of accountability in space activities and ensures that launching states bear responsibility for damages caused by their space objects. It encourages cooperation and provides a legal framework for addressing liability issues in the peaceful exploration and use of outer space.[7]

4. The Registration Convention of 1976 : The Registration Convention, formally known as the Convention on Registration of Objects Launched into Outer Space, is an international treaty that establishes a framework for the registration of space objects launched into outer space. It was adopted by the United Nations General Assembly on January 14, 1975, and entered into force on September 15, 1976. The main objective of the Registration Convention is to enhance transparency and facilitate the identification and tracking of space objects. Key provisions of the convention include:

- **Mandatory Registration:** The convention requires states to register space objects that they launch into outer space. Registration is mandatory and should be done with an appropriate national authority or with the United Nations Office for Outer Space Affairs (UNOOSA).
- **Contents of Registration:** The registration information should include details such as the name of the launching state, the date and location of launch, basic orbital parameters, and general function of the space object. If the object is intended to remain in orbit for more than one year, additional information is required.
- **Publication of Information:** The registration information is to be published by the registering state or UNOOSA and made available to other states and the international community. This promotes transparency and facilitates the exchange of information related to space activities.

- **Modification and Cessation of Registration:** If there are changes in the status of a registered space object, such as its transfer of ownership or cessation of operation, the registering state is responsible for updating the registration information accordingly.
- **International Cooperation:** The convention encourages states to cooperate in the exchange of information regarding space activities and the sharing of data related to registered space objects.

The Registration Convention plays a vital role in maintaining a comprehensive and up-to-date record of space objects launched into outer space. It enables states and the international community to monitor and track space activities, which is crucial for ensuring the safety, security, and peaceful use of outer space. By promoting transparency and international cooperation, the convention contributes to the overall governance of outer space activities.[8]

5. The Moon Agreement of 1979 : The Moon Agreement, officially known as the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, is an international treaty that aims to establish a legal framework for the exploration and use of the Moon and other celestial bodies. It was adopted by the United Nations General Assembly on December 5, 1979, and entered into force on July 11, 1984. The Moon Agreement builds upon the principles established in the Outer Space Treaty of 1967 and focuses specifically on activities related to the Moon and other celestial bodies. Key provisions of the agreement include:

- **Ownership and Use of Lunar Resources:** The Moon Agreement declares that the Moon and its natural resources are the common heritage of humankind. It prohibits any claim of national sovereignty over the Moon or any part thereof and establishes that the resources of the Moon should be used for the benefit of all countries and all people.
- **International Cooperation:** The agreement encourages international cooperation in lunar exploration and the use of lunar resources. States are urged to share scientific information and promote joint projects to enhance the understanding and peaceful use of the Moon.
- **Environmental Protection:** The Moon Agreement emphasizes the importance of protecting the lunar environment and requires states to take measures to prevent the disruption of the natural balance of the Moon's ecosystems. It also calls for the preservation of historical sites and objects of cultural value on the

Moon.

- **Liability for Damage:** The agreement establishes the liability of states for damage caused by their activities on the Moon. States are required to compensate other states or international organizations for any damage they may cause.
- **Verification and Registration:** States are obligated to register any activities they undertake on the Moon and provide timely and accurate information about their missions and scientific findings related to the Moon.

It's important to note that the Moon Agreement has not been widely ratified, and major spacefaring nations, including the United States, Russia, and China, have not become parties to the agreement. As a result, its provisions are not widely recognized as customary international law. Nonetheless, the Moon Agreement remains a significant document that addresses important legal aspects of lunar exploration and resource utilization, and it continues to contribute to the discussions and debates surrounding the governance of outer space activities.[9]

III. LEGAL STATUS OF THE SPACE DEBRIS

The process of addressing the issue of space debris through traditional legal frameworks faces unique challenges due to the nature of outer space and its legal realities. The issue of space debris and its legal ramifications has gained increased attention due to the rise of space travel. While scientific and technological research on space debris has been ongoing for many years, the development of a comprehensive international legal framework to address its complex legal concerns is still lacking. The Outer Space Treaty of 1967, considered the cornerstone of space law, provides only limited guidance on the specific issue of space debris. Its general clauses do not offer detailed recommendations on countermeasures to address debris at the state level, leaving room for interpretation by legal professionals. The treaty holds states responsible for their actions in outer space and for any harm caused by particles launched into space by them.[10]

One fundamental legal challenge is the definition of space debris. While scientists and engineers use technical definitions focusing on non-functional man-made objects in Earth orbit or re-entering the atmosphere, translating this into an international legal definition is not straightforward. The existing space law treaties do not explicitly mention 'space debris,' and the closest related term is 'space object.' The treaties apply this term to any object launched into space and determine important legal consequences such as jurisdiction, registration, and

liability. However, the treaties do not provide a precise definition of what constitutes a 'space object,' nor do they consider the functional or non-functional nature of the object when applying legal consequences. This lack of specific terminology and criteria for space debris poses a challenge in developing comprehensive legal frameworks. The issue of space debris and its legal ramifications has gained increased attention due to the rise of space travel. While scientific and technological research on space debris has been ongoing for many years, the development of a comprehensive international legal framework to address its complex legal concerns is still lacking.[11]

Article IX of the Outer Space Treaty emphasizes the need for states to undertake their operations in outer space with respect for the interests of other treaty parties. While this provision does not explicitly address space debris, it can be interpreted to compel states to take measures to prevent and minimize debris, allowing for safe and sustainable space exploration. The Liability Convention of 1972 further expands on the issue of space debris. It establishes a liability framework where launching states are held accountable for damages caused by private companies for whom they are responsible. However, it is important to note that only states that have ratified the Liability Convention are eligible to bring a claim under its provisions. Efforts have also been made by organizations to address the problem of space debris. The International Law Association's Space Law Committee, since 1986, has examined the legal implications of debris and proposed an "International Instrument on the Protection of the Environment from Damage Caused by Space Debris" in 1994. This instrument, consisting of 16 articles, represents the first legal text on space debris agreed upon by an international organization.

Overall, while existing space law treaties provide a foundation for addressing space debris, further development of an international legal framework specifically focused on debris is needed. The efforts of organizations and ongoing discussions within the legal community are vital in shaping the legal response to the challenges posed by space debris. While the existing space law treaties provide a foundational framework, they do not directly address the issue of space debris. The absence of a clear legal definition of space debris within the treaties creates obstacles in formulating precise and effective legal measures to tackle this problem.[12]

IV. THE RISK OF LIABILITY

The operation of satellites and rockets in outer space poses risks of accidents and potential liability. Notable incidents, such as the 2009 collision between the Iridium 33 and COSMOS 2251 satellites, highlight the dangers of space debris. In that case, the debris was identifiable, but no claim was pursued. Another example is the 1978 crash of the Russian COSMOS 954

satellite in Canada, which caused extensive contamination due to its nuclear power sources. Canada sought compensation from Russia under the Liability Convention and customary international law, resulting in a settlement. Additionally, the disintegration of the Columbia space shuttle in 2003 led to debris falling in Texas, causing damage on the ground. With the projected growth of satellite deployments and space debris, the risk of such incidents is expected to increase.

The anticipated influx of small satellites in low-Earth orbit, requiring frequent replacement, raises concerns about their controlled deorbit or potential crashes on land. Without proper control, the accumulation of debris could lead to chaos and even restrict access to space. The emergence of reusable space-launch technology is set to bring about significant changes in the market competition among launch operators while also affecting the risk of liability. Companies like SpaceX and Blue Origin are developing rockets with reusable stages that can return to the launch site on land or floating platforms at sea. The primary goal of this technology is to reduce the cost of space launches. These rockets are designed to be quickly and repeatedly reused, potentially up to one hundred times. However, there is a possibility that some of these rockets may not return as intended. The return of the first-stage rocket happens rapidly, while the return of the second stage, including orbital realignment and atmospheric re-entry, may take up to twenty-four hours. Guiding the second stage back to the launch pad carries more risk, and there is a chance of accidental impact on the ground in locations other than the designated launch pad. In essence, the use of reusable launch rockets entails lower risk because the flight to the launch pad is controlled, which is an improvement from the perspective of commercial operators and potential individuals on the ground who could be affected by any mishap.[13]

(A) Developments in commercial operators liability risk exposures

In the new era of space exploration, two significant liability developments are anticipated: an increase in claims brought by non-governmental entities and a shift from international tribunals to national ones. When the Liability Convention was drafted, it was expected that claims for damages would be filed under the Convention, and commercial operators could rely on their governments to resolve such claims through negotiation or international governmental trials before the Convention's Claims Commission. However, the case of COSMOS 954 exemplifies the limited compensation available when states bring claims under international treaty law.

With the growth of commercial satellite development in the new space age, there will be a significant departure from the assumption that claims will primarily be resolved by states, as envisioned by the drafters of the Liability Convention. Instead, the involvement of non-

governmental entities in space activities will likely lead to a shift in liability proceedings towards national tribunals, where commercial operators will play a more prominent role in resolving liability claims. The new space age is expected to bring a significant increase in the number of operational satellites, potentially ranging from 1,200 to as many as 27,000. These satellites will predominantly be located in low-Earth orbit and will require frequent replacement. Initially, the majority of satellite operators will be based in the United States. As a result, many of these operators may not have the right to bring liability actions under the Liability Convention, and therefore, most claims are likely to be litigated under U.S. law.

Furthermore, regardless of the provisions of the Liability Convention, claimants are likely to choose to file their claims under national law in order to seek more favourable recoveries in national courts. By pursuing their claims directly against defendants, claimants can have greater control over their cases, engage their own legal representation, and have the option to seek punitive damages. This approach allows claimants to avoid potential political considerations that may arise between national governments. In light of these circumstances, it is advisable for commercial operators to mitigate their increased liability exposure in the new space age by obtaining adequate insurance coverage.[14]

In the new era of commercial space operations, there will be an increase in the number of collisions between space vehicles, as well as an escalating risk of collisions with unidentifiable space debris. This issue primarily presents a liability challenge for commercial operators when dealing with other operators in the industry. The concept known as the Kessler Syndrome suggests that the amount of fragmenting debris will expand at a faster rate than the growth of operational satellites. As commercial space activities continue to flourish, the substantial volume of untracked space debris will pose a threat not only to governmental operators but also to non-governmental operators. Space debris is difficult to navigate and is often not adequately tracked.

In cases where collisions occur and the ownership of the debris cannot be determined, it becomes virtually impossible to pursue compensation from the debris owner. Consequently, collisions between satellites and space debris are likely to become more frequent. It is worth noting that the implementation of reusable rocket technology will have limited impact on liability concerns in this context. There is positive news regarding the increasing liability faced by commercial satellite operators. In June 2018, the U.S. issued Space Policy Directive–3, which aims to address the challenges arising from the growing number of satellites and space debris. The Directive acknowledges the need for new international standards and best practices in space traffic management to prevent the escalation of the Kessler Syndrome. As an initial

step, the United States will develop national safety standards, with the intention of encouraging other nations to collaborate in establishing international safety standards and practices. The ultimate goal is to establish uniform international minimum standards for all space traffic and space debris. This initiative is expected to bring significant benefits to the commercial space industry by reducing the occurrence of collisions and, consequently, lowering the associated liability risks.[15]

V. DRAWBACKS

The current international space laws have a significant flaw when it comes to addressing the issue of space debris. These laws primarily focus on the utilization of space and do not specifically address the problem of space junk. There is a lack of legislation that explicitly prevents countries from intentionally destroying their own satellites. The existing laws mainly discuss the liability associated with orbital debris and the ownership of space objects, but they do not provide clear guidelines on the origin of space debris.

In fact, the term "Space Debris" is not even mentioned in any of the United Nations treaties related to space. Furthermore, the international provisions of space laws are outdated and unclear. They need to be revised and updated to reflect the changing times. The destruction of satellites in outer space, leading to the generation of space debris, is not adequately addressed in these treaties. This has resulted in more incidents where countries lose their satellites due to the presence of debris in orbit. Another limitation is that the current space laws are voluntary and lack legally binding obligations. They rely on countries to voluntarily comply with the provisions, which may not be sufficient to effectively address the growing problem of space debris.[16]

VI. CONCLUSION

To summarize, there is growing awareness among researchers, the public, and businesses about the risks posed by increasing space debris. It is now necessary to seriously consider and discuss the role of legislation in mitigating these dangers, recognizing that the effectiveness of laws may be limited without sufficient resources and political will. At the international level, UNCOPUOS and its Legal Task Force should play a role in developing an international framework and promoting uniform licensing procedures. The development of detailed legislation can start with non-binding measures like resolutions, guidelines, or codes of conduct, which can later evolve into legally binding regulations if proven effective and practical. There are various methods to reduce debris, such as capturing it using mechanisms like nets, harpoons, robotic arms, or tentacles. Another approach involves using electrodynamic tethers to slow

down satellites and bring them closer to Earth for controlled re-entry and burning up. Additionally, techniques like Space Debris Elimination (SPADE) propose using air bursts in the stratosphere to push objects into lower orbits.

It is evident that the problem of space debris is more significant than ever, and changes are expected with the introduction of new rules and regulations. However, these stricter regulations may also impose limitations on space exploration for some stakeholders.

VII. REFERENCES

1. Sukriti Mathur MRMA, 'Space Debris and International Laws: The next Generation Concern' (*The Daily Guardian*, 16 August 2021) accessed 14 May 2023
2. Raju KD and BG, 'Understanding International Space Law and the Liability Mechanism For ...' (*Sage Journals, Volume 75, Issue 4*, 27 December 2019) accessed 12 May 2023
3. 'Remove Debris Space Junk Net Capture Success!' (*SSTL*, 19 September 2019) accessed 22 May 2023
4. Pelton JN, 'New Solutions for the Space Debris Problem' (*Google Books*, 6 May 2015) accessed 4 May 2023
5. Robert Wickramatunga, 'United Nations Office for Outer Space Affairs' (*The Outer Space Treaty*, 1996) accessed 21 April 2023
6. Wickramatunga R, 'Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space' (*United Nations Office for Outer Space Affairs*, 1967) accessed 22 April 2023
7. Wickramatunga R, 'Convention on International Liability for Damage Caused by Space Objects' (*United Nations Office for Outer Space Affairs*, 1971) accessed 22 April 2023
8. Wickramatunga R, 'Convention on Registration of Objects Launched into Outer Space' (*United Nations Office for Outer Space Affairs*, 1974) accessed 22 April 2023
9. Wickramatunga R, 'Agreement Governing the Activities of States on the Moon and Other Celestial Bodies' (*United Nations Office for Outer Space Affairs*, 1979) accessed 22 April 2023
10. Raju KD and BG, 'Understanding International Space Law and the Liability Mechanism For ...' (*Sage Journals, Volume 75, Issue 4*, 27 December 2019) accessed 12 May 2023
11. Ward Munters, 'Space Debris Conundrum for International Law Makers - Room: The Space Journal' (*Room The Space Journal of Asgardia*) accessed 22 May 2023
12. *Ibid*
13. Larsen PB, 'Commercial Operator Liability in the New Space Era: American Journal of International Law' (*Cambridge Core*, 1 April 2019) accessed 22 May 2023
14. *Ibid*
15. Ian Havercroft, 'Lessons and Perceptions: Adopting a Commercial Approach to CCS

Liability' (*Global CCS Institute*, 2019) accessed 22 May 2023

16. Sukriti Mathur MRMA, 'Space Debris and International Laws: The next Generation Concern' (*The Daily Guardian*, 16 August 2021) accessed 14 May 2023.
