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Space Debris: A Continuous Threat

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ABSTRACT

According to the statistics presented by the European Space Agency (ESA) in January, 2021 there are about 6020 rockets launched till date since the beginning of space era in 1957. It has further provided that the amount of debris objects present in the orbit are about 128 million objects that are larger than 1 mm in size to less than 1 cm; 900000 objects that are larger than 1 cm and less than 10 cm and; 34000 objects that are larger than 10 cm in size. This number would go on increasing with the rapid rocket launches in space and the chances to remove these debris from outer space and also from the Earth's orbit are very slim. Hence the situation calls for an urgent need to preserve and protect the environment of outer space for current and coming generations for a sustainable development.

I. INTRODUCTION

With the development of technology in the field of communication and transmission, has made the nations become dependent on the satellites. The satellites not only aid and assist in communication but also strengthen the economy. But the satellites are at continuous risk from solar storms, meteoroids and already existing space debris.³ Space Debris are man-made material which exist in the space that no longer serves a valuable purpose. If in case there is any collusion in the outer space the debris so generated will continue to remain in the outer space and it may affect the other satellites and other space mission. Apart from the damage which may occur because of the solar storm and meteoroids another threat to the outer space environment is the rapid rise in the Anti-Satellite Weapons. The debris generated from the Anti-Satellite weapons pose enormous risk to both satellite and outer space.⁴

Currently there are thousand pieces of debris which have accumulated in the space. The problem would continue to rise as the chances are very slim to remove the debris from the space. The size of the debris is too small to be even tracked and in order to avoid any disaster

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³ NASA, "Space Debris and Human Spacecraft", (27 September 2013), Retrieved from https://www.nasa.gov/mission_pages/station/news/orbital_debris.html (Last visited 20 March 2021).

⁴ James P. Lampertius, "The Need for an Effective Liability Regime for Damage Caused by Debris in Outer Space" (1992) 13 Michigan Journal of International Law 447.

the International Space Station has been required to move from its orbiter at multiple occasion.⁵

In order to curb, control and restrict the space waste, the Space Debris Mitigation Guidelines⁶ provided by the Coordination Committee of the Inter-Agency Space Debris (IADC) are the ones that are playing a significant role on the accumulation and control on the problem. The guidelines aim to alleviate the problem of space debris, but they have been able to confine the generation of new space debris but they do not resolve the existing debris problem. Further, the guidelines are discretionary in nature and it depends on the state whether they are willing to adopt and enforce the guidelines. In the recent years there has been a lot of discussion pertaining to strengthening of the guidelines. The stricter guidelines would put a check on the launch of satellites, the planned tourism of people in outer space, the utilization of space for carrying out military exercises in the outer space and the greater freedom of commercial space activities. With continuous progress of exploration activities in the area of outer space, the same has given rise to Kessler Syndrome. Kessler syndrome refers to the rise of debris of dangerous mass which will splinter in further collision leading to surging chain activity. The rapid rise of the debris in the space has become a major safety concern. If the increasing trend of space debris is not reversed at the earliest the same will hinder and eventually preclude the access to outer space. Hence we can say that there exists an immediate need to preserve and protect the environment of outer space for current and coming generations for a sustainable development.⁷

(A) Review of Literature

Stepher Gorove in his article⁸ has discussed the freedom to utilize and explore the outer space treaty which is one of the fundamental principle of international space law. In his article he has elaborately analysed this freedom/independence to utilize and explore the outer space with very fundamental questions as to whom this freedom is guaranteed, what is the meaning and scope of this freedom, and lastly what are the restrictions or limitations posed upon such freedom.

⁵ European Space Agency, "The current state of space debris" (12 October 2020), Retrieved from https://www.esa.int/Safety_Security/Space_Debris/The_current_state_of_space_debris (Last visited on 20 March 2021).

⁶ United Nations Office for Outer Space Affairs, "Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space" (2010).

⁷ Scott Kerr, "Liability for Space Debris collisions and the Kessler Syndrome" (11 December 2017), Retrieved from <https://thespacereview.com/article/3387/1> (Last visited on 20 March 2021).

⁸ Stephen Gorove, "Freedom of Exploration and Use in the Outer Space Treaty: A Textual Analysis and Interpretation" (2020) 1 *Denver Journal of International Law & Policy* 93.

Rada Popova and Volker Schaus in their article⁹ has analysed that though the technical concepts and framework for the debris removal and on-orbit servicing has been developed but the legal framework which imposes a legal obligation for debris removal and on-orbit servicing is not there.

Joel A Dennerley in his article¹⁰ has discussed the notion of ‘Fault’ in case of collision of space objects in order to prove the liability of one or both the launching parties involved in such collision. Further this article has highlighted that there exists a loophole in the Convention in relation to the definition of ‘Fault’, which needs to be addressed in urgency.

James P. Lampertius in his article¹¹ has discussed the notion of ‘Damage’ suffered by one or other launching State in collision with space object of some other launching state. It has analysed the current legal system or framework of International Space Law governing the liability/responsibility provisions for the damage caused/suffered by space debris.

II. TYPES OF SPACE DEBRIS

Because of the high pace of the debris even the small pieces possess utmost threat if it collides with other man-made object in the space, it can completely make the satellite dysfunctional and will release further debris/space waste in the outer space . The Space debris/waste can be classified into various categories: -

- i. Defunct spacecraft, satellites.
- ii. Object used while launching the satellite.
- iii. Small particles which would have originated because of an accident, collisions, explosions or because of any other reason.¹²

Category and tracking of Space Debris

The quantity of space debris available in the outer space is sufficient enough to destroy the satellites upon impact. The debris has been categorized on the basis of their size:

- i. **Category – I** – 10 CM and larger in diameter and larger, which can be tracked by Space Surveillance Network (SSN) of U.S.Air Force
- ii. **Category – II** – 1 CM to 10 CM, cannot be tracked.

⁹ Rada Popova and Volker Schaus, “The Legal Framework for Space Debris Remediation as a Tool for Sustainability in Outer Space” (2018) *Aerospace* 55.

¹⁰ Joel A Dennerley, “State Liability for Space Object Collisions: The Proper Interpretation of ‘Fault’ for the Purposes of International Space Law” (2018) 29 *1 European Journal of International Law* 281.

¹¹ James P. Lampertius, “The Need for an Effective Liability Regime for Damage Caused by Debris in Outer Space” (1992) 13 *2Michigan Journal of International Law* 447.

¹² Louis de Gouyon Matignon, “The Legal Status of Space Debris” (23 June 2019), Retrieved from <https://www.spacelegalissues.com/the-legal-status-of-space-debris/> (Last visited on 21 March 2021).

iii. **Category – III** – Object between 3 MM and 1 CM.¹³

The damage to the satellite can be avoided if the location of the debris is known. The debris falling in category I are the most dangerous one. The SSN system is able to track the debris which are larger than ten centimeters and is in LEO and larger than 30 centimeters in GEO. With the available technology and means only a minute portion of the debris can be trailed and major catastrophe can be avoided. But, that's not the case with small debris and it can cause major destruction.¹⁴

III. EXISTING SPACE LAWS

With the Launch of Sputnik 1 a new race for space exploration took place. Which eventually created a need for a managing, regulating and governing the outer space. Currently the Outer space is regulated/governed through 5 international treaties: -

- i. 1967-The Outer Space Treaty
- ii. 1968-The Rescue Agreement
- iii. 1972-The Liability Convention
- iv. 1975-The Registration Convention
- v. 1979-The Moon Agreement

Further, the space is governed with the resolution passed/concluded by the General Assembly(GA) United Nations approved in 1982, and the regulations/legislations formed by various nations at their own level.

Among all the treaties, resolution and legislation the Outer space treaty has a very vital role as it pertains the basic and fundamental principles for the activities which takes place in space and created the ground work for other 4 treaties. Further, the Outer Space Treaty not only binds the signatories to the treaty but also non-signatories.

If we analyse the Outer Space treaty one will realise that Articles I-IX have laid the foundation for the expansion of further treaties on space law.

International Law has pronounced the status of Celestial Bodies and Outer Space as that of a 'Global Common'. It means that the regime of outer space is not subjected to any national sovereignty, in other words, it is a domain beyond national jurisdiction of any State. This provision has been provided under Article 1 Para 1 of the Outer Space Treaty, 1967 (hereon

¹³ ESA's Space Debris Office, ESOC, "Space Debris by the numbers", (08 January 2021), Retrieved from https://www.esa.int/Safety_Security/Space_Debris/Space_debris_by_the_numbers (Last visited 23 March 2021).

¹⁴ Rada Popova and Volker Schaus, "The Legal Framework for Space Debris Remediation as a Tool for Sustainability in Outer Space" (2018) *Aerospace* 55.

referred as OST, 1967), which states that “the utilization and exploration of outer space must be held as the ‘province/heritage of all mankind’.”

It is somewhat intricate to describe this perception in particular language, but it is beyond suspicion that regardless of any state’s technological or economic condition, all states must have equal rights to access and utilize the outer space. Hence Para 2 of Article 1 of the OST, 1967 provides that “all states shall have equal and free accessibility for the purposes of exploration, either economic or scientific, without any discrimination.”

Here the term ‘accessibility’ should not be restricted to short-range perspectives to carry out the space activities, but also must be provided on the basis of long-range as the reliance of human beings on the resources of outer space will escalate in coming future. As a result of which the sustainable use of outer space has to be ensured/guaranteed.

Therefore, it is very much important for us to discuss whether the freedom/independence of States to utilize the outer space for the purposes of exploration as provided under OST, 1967 can be safeguarded, if such activities of the states have harmful consequences leading to orbital pollution.

IV. THE FREEDOMS V. THE USABILITY OF OUTER SPACE

When we talk about the freedom to utilize of outer space for the intention of exploration, the initial question that comes to our mind is as to ‘who is entitled to this freedom?’. The OST, 1967 has provided that all the states are entitled to the freedom/independence to utilize of use of outer space, whether it is signatory to the treaty or not.¹⁵

The next question that arise is whether this freedom is absolute or restricted. If we have a closer look at the OST, 1967 it can be said that freedom provided under it is not absolute but somewhat restricted or limited. On the one hand, it provides that all the states must have the freedom/independence to utilize, explore or conduct a scientific investigation of the outer space without the requirement of asking permission from any international entity or from any other state or states.¹⁶

But on the other hand, the OST has also provided that this freedom shall be exercised so that there is no harmful interference or impairment. The following are some of the exceptions to the independence of utilization of Outer Space provided under OST, 1967.

¹⁵ Stephen Gorove, “Freedom of Exploration and Use in the Outer Space Treaty: A Textual Analysis and Interpretation” (2020) 1 Denver Journal of International Law & Policy 93.

¹⁶ Ibid.

A. Common Heritage of Mankind (CHM)

The concept of CHM is provided under Para 1 of Article 1 of OST, 1967 and also under Article 11 of Moon Treaty. The purpose behind the inclusion of such concept is to protect certain areas of immensely greater importance which is outside the jurisdiction of any national territory and is also to ensure its integrity and availability for coming generations. The concept of CHM can also be reflected in the provisions of the UN Convention in the Law of the Sea(UNCLOS) as well as it is enshrined in the Preamble of Antarctic Treaty, though not expressly but impliedly. Outer space being the ‘province/heritage of all mankind’ must be available for all and shall also be preserved and protected for the current and coming generations.¹⁷

B. Military Exercise of Outer Space

Another restriction to the freedom of utilization of outer space is provided under Articles 3 and 4 of the OST, 1967. Article 3 of the OST, 1967 provides that the freedom or independence to utilize the outer space must be in consonance with the International Law principles and also in accordance with the United Nations Charter (UN Charter), which provides for the preservation and promotion of international security, peace, understanding and co-operation.

Whereas Article 4 of the OST, 1967 prohibits the states to carry any weapons of mass destruction (WMD) or nuclear weapons, use of any nuclear weapon or WMD, place any nuclear weapon or WMD, or install any nuclear weapon or WMD on celestial bodies. It has also provided that installations or testing of any weapons and establishing military bases on outer space is prohibited as well.¹⁸

Further Article 4 of the OST has provided that the freedom of utilization of outer space must be limited or restricted for the ‘diplomatic purposes’ only. If the military activities are for their own technical examination and for any other diplomatic function which is lawful, then it is not prohibited under the OST.¹⁹

C. Environmental Protection of Outer Space

Another essential restriction related to the freedom of utilization of outer space is provided

¹⁷ Eytan Tepper, “Structuring the Discourse on the Exploitation of Space Resources: Between Economic and Legal Commons” (2018) 49 Elsevier Ltd.

¹⁸ Sylvia Maureen Williams, “International Law and the Military Uses of Outer Space” (1989) 9 SAGEJournals 407.

¹⁹ Louis de Gouyon Matignon, “The Legality of Military Activities in Outer Space” (24 January 2019), Retrieved from <https://www.spacelegalissues.com/space-law-the-legality-of-military-activities-in-outer-space/> (last visited on 22 March 2021).

under Article 9 of the OST, 1967. It restricted the freedom in the sense that if the use of outer space can result into harmful corruption of the outer space or is it can bring unfavorable changes to the environment of Earth by bringing back any celestial or extra-terrestrial object or matter into the biosphere of Earth, then such activity or utilization of outer space is prohibited or restricted.²⁰

Article 9 of the OST also endow with that if any State party has a basis to suppose that its action might result into harmful corruption or can bring unfavorable changes to the environment of Earth, then such State can go ahead with the activity prior to the conduction of necessary and appropriate international consultations.

It further endow with that if a State Party has a basis to suppose that the action of another State can result in harmful corruption or may bring unfavorable changes in the Earth's environment, then such State can request necessary and appropriate consultations.

From above it can be inferred that such restriction is to protect both the Earth and Outer Space from possible risks of harm to it. The concept upon which this provision is based is called the 'Principle of Planetary Protection'. Also, this provision relies on the principle of sustainability or in other words sustainable development.²¹

V. LIABILITY FOR DAMAGES IN OUTER SPACE AND ON EARTH

The Liabilities has been fixed on state through various space treaties. Article VI and VII deals with the liabilities for damages suffered by space objects. The procedure for compensation and damages has been dealt in Liability Convention 1972.

The convention is based on the theory of peaceful coexistence and co-operation. One of the key reasons for fixing liability was to avoid the conflict that may arise between the nations over the damages. The convention creates a several and joint liability for any damage caused when two or more states mutually launches a space object. Any damage occurred because of the launching object has to be compensated irrespective of the fault, even if the damage was due to chance.²²

The convention does not limit any liability and therefore the same shall be done in accordance with justice and equity. Though, the convention limits liability according to the type of damage caused. In order to reduced the debris in space and to understand the potential

²⁰ I.H.Ph. Diederiks Verschoor, "Environmental Protection in Outer Space" (1987) 30 *German Y.B.Int'l L.* 144.

²¹ Mark Williamson, "Protection of the Space Environment: the first small steps" (2004) 34 *11 Advances in Space Research* 2338.

²² James P. Lampertius, "The Need for an Effective Liability Regime for Damage Caused by Debris in Outer Space" (1992) 13 *2Michigan Journal of International Law* 447.

of space at maximum peaceful coexistence is meaningful only in conjunction with the principle of mutually beneficial cooperation.²³

The convention restricts international liability in two cases: -

1. If the damage has been resulted by a space object of one launching State to the space object of another launching State, or to the persons on board of such space object of another launching State, or to the property of space object of another launching State, provided that the damage has been suffered elsewhere than on the surface of the Earth.
2. The launching State shall only be liable for the damages suffered on its own fault or if it has been suffered due to the fault of persons for whom the launching State is responsible.²⁴

If neither side is at fault, each of them sustains the damage it incurred.

If both the parties are at fault, then the burden of compensation or the deciding point of apportionment of damage between the two States shall be made in accord with the extent to which they are at fault. If in case burden of compensation or the deciding point of apportionment of damage cannot be reached, then both the parties sustain the damage equally.²⁵

The Urgency

In order to curb the issue at the earliest the nations are required to take necessary steps before things go out of hand. In order to achieve it, the IADC guidelines²⁶ are required to modified, existing debris are required to be removed from the environment.

The IADC guidelines are not adopted by the nations and even if they are adopted it is implemented according to the whims and wishes of the nation. The major reason for non-implementation of the guidelines is that they are voluntary therefore it there is no enforcement. With the increase in continuous space proliferation and large number of new launch being scheduled there is an immediate need for a mechanism to dispose of the defunct satellites in order to make space for new ones. There is an alarming need to amend the guidelines at the earliest whereby following guidelines shall be introduced: -

²³ Joel A Dennerley, "State Liability for Space Object Collisions: The Proper Interpretation of 'Fault' for the Purposes of International Space Law" (2018) 29 1 *European Journal of International Law* 281.

²⁴ *Ibid.*

²⁵ James P. Lampertius, "The Need for an Effective Liability Regime for Damage Caused by Debris in Outer Space" (1992) 13 2 *Michigan Journal of International Law* 447.

²⁶ United Nations Office for Outer Space Affairs, "Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space" (2010).

- i. The Rule of the Road
- ii. Liabilities on the owner and operator to remove the debris caused during or after the launch of the satellite.
- iii. Putting a check on the number of launches carried out in a year.
- iv. Development of technologies for the protection of satellites.

If the existing debris is not removed from the space it will hinder the moment in space. But the debris can only be removed by joint efforts of all the stakeholders. Though stricter regulation may aid and assist in curbing the future issues by which the liability can be fixed on the owner of the debris, registration of debris, advance warning system in lieu to avoid collision and etc.²⁷

VI. CONCLUSION

In lieu to control and restrict the spread of debris in the space the burden is on every nation especially the ones who are exploring the space at a rapid speed. The cost of it should be borne by the one who are generating the maximum benefit out of it.

Unfortunately, even after realizing the repercussions the current efforts are flawed and the space debris continues to be a threat. The way satellites are sent in the outer space and the path that is adopted by the satellites there is no “rules of the road” which increases the risk of collision and the best example is that of a satellite operated by Iridium.

But there are certain general steps which should be adopted by all the space agencies across the world in lieu to contribute and restrict the space debris: -

- i. The design of the space craft shall be modified in order to avoid leaving debris in the orbital stages.
- ii. The satellites of which services are terminated shall be de-orbited or shall be brought back to earth.
- iii. Making it mandatory for the launching state or a private player if any to remove the debris caused by its satellite or by its negligent or deliberate act.

²⁷ Rada Popova and Volker Schaus, “The Legal Framework for Space Debris Remediation as a Tool for Sustainability in Outer Space” (2018) *Aerospace* 55.