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NEED FOR LEGAL CODIFICATION IN TECHNOLOGIES DEALING WITH DECLUTTERING OUTER SPACE DEBRIS TO AVOID PROSPECTIVE DISPUTE

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Abstract:

Humanity's collective heritage is space. The ability to sustain space is essential for further investigation. It all comes down to the series of issues that crop up in space research. Despite the fact that science and technology are resolving the problems, certain solutions should be based on legal considerations. Five conventions that relate to the law of space are available. However, a number of minor concerns have gone unresolved in these conventions. The Office for Outer Space Affairs of the United Nations provided certain committee reports and recommendations (UNOOSA). Future conflicts relating to the invention of decluttering devices have been the main subject of this study. When a private corporation develops a new device, they shouldn't be allowed to monopolize it. Future demand for device usage or services will be enormous. A rule needs to be made and it should be an Erga Omnes *obligation to all the state parties in order to address the commercialization issue on the use of technology and prevent the ambiguity in the Liability Convention that is pertaining to harm brought about by the space objects while cleaning up the space debris.*

Introduction:

"When you look at the stars and the galaxy, you feel that you are not just from any particular piece of land, but from the solar system".

-Kalpana Chawla

In this World full of resources, some things are meant for the common use of mankind, in that way we have certain things that no man can claim it of on his own. One among the Common Heritage of Mankind is the Outer Space, which is beyond the Sky. When the Union of Soviet Socialist Republics (U.S.S.R) launched its first artificial satellite named Sputnik to orbit earth in the year of 1957[2],from that time Human Beings started venturing in the field of exploration of Space. Then there the Law of Space has been emerged. As when the state activities were increased in the outer space the new regime for the use of outer

space have been evolved. The special regime has had its base from the Antarctica treaty in 1959[3], unlike that instrument regulations for use of outer space have started from the very beginning in the frame work of United Nations. They have formed Organization called Ad hoc Committee on the Peaceful Uses of Outer Space (COPUOS) and made the committee as its permanent member.

The committee consider the subject with the purview of provisions of Charter of United Nations and the States activities on Peaceful exploration of the Outer Space. Along with the documents submitted by the committee for the first meeting of the legal subcommittee, the Union Soviet Socialist Republics (USSR) submitted a draft declaration defining the basic principles that direct action consistent to investigating and utilizing Outer Space[4].Having the declaration as the Magna Carta for law of Space several conventions has been made for the Peaceful use of Outer Space by the States. Due to launching of several Space Objects, our earth Orbit was polluted by the debris for over two decades. Several reports by the committee of UN have addressed about the issues related with Space debris. But there is no regulatory framework is framed for the technologies dealing with decluttering outer space debris.

2. Space Debris:

The concept of Space Debris is the most problematic area within the Outer Space Law as of now. Due to emergence of space debris several damage were made by it to the on-board space objects. No existing framework of UN has defined the term Space debris, as well as its mitigation and cleanup of those debris is also unaddressed.

2.1 Definition Of Space Debris:

Satellites are launched for various purposes. They have been launched for observation of galaxies, to research about minerals and nutrients, to forecast weather, and for telecommunication purposes. The satellite i.e., the components of the space objects remain inactive when it losses its working capacity. It forms into cluster or individually floats in the Outer Space and forms into debris. Although the phrase "space debris" has not been defined by international law, it is already widely used.

“Space debris are all man-made objects, including fragments and parts whether can be identified by their owners or not, in earth orbit or re-entering the dense layers of the atmosphere that are non-functional and which cannot do the intended functions for which they are authorized”.[5] Space debris is also known as Orbital debris which characterized as any artificial object in Earth orbit that is non-operational with no plausible anticipation of regaining its intended role, or any alternative use for which it is or may be deemed permissible, including fragments and components thereof.

“Space debris is a general term referring to all tangible man-made materials in space other than functional space objects”.[6]Space Debris is anything made by humans that is no longer functional and either orbiting the Earth or returning to the atmosphere. This covers both individual parts and completed goods were not only made by man-made objects but were formed naturally through meteoroids. It is observed that debris also includes leaking of fuels and coolant droplets, paint flakes and micro particles from the rockets and satellites launched in the orbits. But now the debris were formed majorly through the launched space objects. It is harming entire space environment poorly.

2.2. Reason for Aggrandizement of Space Debris:

As we have seen earlier, space junks were formed through launching of space objects into outer space. Around two decades it has been increasing day by day. All the satellites that enter into space has the possibilities to become debris. When all the launched satellites remain inactive in orbit then they will form a space junk. State and some private organizations frequently launching the space objects into the outer space. Some objects return to atmosphere quickly. It should be placed in the lower orbit. They Returning to the atmosphere after a few years. Sometimes they will burn up and scattered into pieces in the space environment. The communication and weather satellites are often placed in geostationary orbits. When those satellites burn, the debris will circulate for hundreds and thousands of years.[7]

When one satellite is destroyed, it will break into thousands and thousands of pieces. The broken pieces will remain there in the orbit. If every satellite has the capacity of destroying by lack of technology or other reasons, then the space junks will get increased in the outer space. Satellites, not only for exploration but for other communications were launched by the corporate companies. Companies like SpaceX, One Web satellite constellation sending huge number of satellites into Space.[8]Satellite launched by the space X company is for the Starlink[9] project. All the other company were launching satellites for similar and various purposes. Amazon is planning to put thousands of its Kuiper satellites into low earth orbit.[10]

The existing satellites are also the reason for increase in space debris. Russia‟s satellite named Kosmos-1408, put into orbit in 1982. It was utilized to pick up radio signals below the earth. By testing the Nubol missile, it was used against the satellite. It was destroyed and blasted into 1,500 pieces are trackable and innumerable others are too small to be located..[11]State like China, the United States and India have also shot down the satellites by conducting the missile tests.

2.3. Guidelines of IADC:

The Inter-Agency Space Debris Coordination Committee (IADC) is an international forum for space agencies and authorized governmental or intergovernmental bodies to coordinate efforts relevant to the issues of natural and man-made debris in space.. Mitigating space debris is need of the hour now, as Debris population is increasing. To save the space environment for future generations, it is necessary to take preventive steps for implementation of debris mitigation measures. Numerous domestic and global spacefaring country groups framed certain guidelines for space debris issues. They have some fundamental principles in their guidelines. They are as follows:

1. Avoiding collisional and destructive on-orbit break-ups
2. Removing spacecraft and orbital stages that have completed their mission operations from the occupied, viable orbit locations
3. Restricting the amount of items released during regular activities

With the consent from the IADC member agencies these fundamental principles included in the IADC guidelines. Member agencies of IADC are, Canada, China, France, Italy, German, Europe, India, Japan, Korea, America (US), Russia, Ukraine, United Kingdom. The guidelines have recommended a management plan for each

and every program and project. The mitigation plan needs to contain a few things, which has been stated in the guidelines:

1. Space debris mitigation activities should be addressed in the management plan,
2. The plan ought to incorporate the evaluation and alleviation of hazards associated with space debris, along with the relevant guidelines.
3. The steps taken to reduce the risk associated with malfunctions that could result in space debris being produced, and
4. A plan should be created for what to do with the spacecraft once the mission is over.
5.

Mitigation measures[12] are,

1. To restrict the material discharged during regular operations,
2. In order to reduce the possibility of On-Orbit disruptions,
3. After the mission is terminated, and
4. To avoid collisions while in orbit.

3. Collision-A Catastrophe for the Space Faring Nation:

Collision of space objects occurs when the space debris collide with other active space objects. Due to collision also there will be increase in space debris. It leads to huge loss for the space faring nations.

3.1. Collision of Space Object:

Satellite collision produce orbiting fragments from smaller to bigger in size. Each fragments have probability of inducing further collision. It might cause debris to form belt in the earth orbit.[13] In a study titled, "Collision Frequency of Artificial Satellites: The Creation of a Debris Belt," the author Kessler,[14] noted that possibility of The frequency of satellite collisions rises as satellites are launched into orbit. The Kessler Syndrome warns that a cascade of space junk will dishearten the thought of human activities towards the Space. He also manifested that the cascade process has already begun, and every impact or explosion that occurs in orbit will gradually raise the probability of subsequent collisions.

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3.2. Effect of Collision:

Collision occurs when two space objects collide. Even a paint particle of the object makes large damage to the other objects. The damage occurs to the space object is the greatest loss for the space faring nations. They invest more to the launch of each and every satellites. Loss is not only based on Monetary value, but also the technical support for the state will get loss. Weather forecast, telecommunication signals were received from satellites only. If these satellites get damaged it will create greater loss to the nationals. Technically space agencies from various states were indulged in the avoidance of collision through their upgrading technologies. Inevitable collision occurs when there is a failure of technology. And thus, the development of detritus occurs and the effects of collision were higher.

3.3. Laws that Regulate Impact of Collision:

The impact of collision is a huge loss as we discussed above. At least to sort it out in a better way, United Nations has had its

framework The convention is known as the Convention on International Liability for Damage Caused by Space Objects. This convention has its starting point from the Article VII of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space; the Moon and other celestial bodies. This Article clearly states that when space object of any launching state causes damage to the other state party‟s space object or to the natural or legal individuals on the planet surface or either in space or the air, then the launching state is internationally liable for harm inflicted upon a different state party.

Liability of launching state, is both absolute and it is responsible for the degree of its carelessness. When the space object made damage to the earth's surface or to the air craft then The initiating state has full responsibility.[15]If the damage occurs other than earth surface, i.e., damage to the property or to the person on board then the Launching state is accountable for the degree of error is made.[16] The convention also gives provision for the joint responsibility of the initiating state when two or more states jointly launches the space object. It also comprises apportionment of compensation, exception from liability. Liability for the harm inflicted upon its own citizens or foreign nationals participating from the time of launching or at any time cannot be claimed under this convention. The claim for compensation for damage shall be communicated via diplomatic means. If the states were not with the diplomatic relations, then they can request other state for presenting the claim. It can also present it through the United Nations secretary general, offered both the state should be the members of UN.

The convention remains ambiguous on interpretation of the term fault. If governments utilize later practice to define the liability convention, state accountability for collisions involving space objects will fall under a liability regime rather than a system of state responsibility for wrongdoing..[17] The convention has not addressed for the representation of non-state parties. It can be suggested that the claimant state can present through Secretary General of UN.

4. Device for Decluttering Space:

It‟s been 65 years now from when the space exploration started by the states. Large quantity of satellites has been initiated by the space faring nations. Around 116 satellites have been the Indian Space Research Organization (ISRO) launched.[18] World wide several nations have launched several satellites. Some satellites haven‟t been re-entered to the earth surface. Many space objects were destroyed in the space environment. Those were formed as space junk as we have discussed in the above chapters. Hence, the debris should be decluttered for easy launching of further satellites.

4.1. Exigency for Technology to Declutter:

As the space debris enveloped the earth orbit. It cannot be handpicked by any astronaut who were in the mission. For cleaning the orbit, a technology or a device is needed. This was an emergency in the part of space exploration. Several nations have invested a lot to innovate a device to dent the space junk. So far 27,000 catalogued objects found in the orbit from paint chips to big objects. “Its probably the one of the most important environmental problems of our time”.[19]To combat this issue, several private investors and companies have involved in invention of device. One of the

companies is Astroscale Inc., a private Japan-headquarter company. It has planned to bring the first garbage truck ever made to remove the obsolete satellites in the year of 2024.[20] The effort made by the astroscale is the one of the best and first step that has been taken for the cleaning of space debris. It has demonstrated its first mission named ELSA, short for "end-of-life services by Astroscale." ELSA is going to pull out-of-service satellites from high altitudes..

In early 2021, it has launched its prototype name ELSA-d i.e., demonstration to gauge its proximity capture technology. This device consists of two satellites namely, a chaser and a target. Each satellite includes an internal magnetic docking plate that allows the chaser to cling to its target. The chaser will examine the target closely and leave it up to the human operators to decide whether or not to clean up after themselves in the fourth and final test of ELSA-d, which will be carried out as a full-service mission.

4.2 Advantages and Disadvantages of Newly Inventing Technology:

Every new invention has both its goodness and badness. When the technology for decluttering of Space is being invented, it will give both the advantage and disadvantages. The advantages are the space environment might get cleaned. It will be highly helpful for further exploration of Outer Space. But the major disadvantage is it might get capture the active satellite. It cannot be done intentionally but due to technical error of the device or by fault of the operator the problem may arise. This issue must be noted by the scientist whoever involved in this invention. The other disadvantage is ELSA is designed to tidy up items weighing less than 2,200 pounds, or one metric ton. But the debris in the space is more than that. Some objects will be more than 10 metric ton by weight. So, it is bit problematic to collect those trashes. High weighed trashes are from the rockets launched.

4.3. Commercialisation of the Technology and Conflict that Might Arise Out of the Invention:

Obviously, when some invention is made in any of the field in science and technology, it promotes commercialisation of the invention. Likewise, this newly inventing technology will be commercialised by the investing party. When companies like SpaceX, Amazon launches more and more satellites, it is this technology should collect the debris made by them. Already for the compatibility of this technology many agencies have taken initiative to launch satellite by installing magnetic plates on their satellite. Earlier in last year the UK based company One Web has funded around 3.3 million dollars for the preparation of space The real deal in debris removal technology: ELSA-m. The space garbage collector's commercial variant, called ELSA-m, can retrieve several decommissioned satellites in a single flight. Most importantly, it will drastically cut expenses..

Experts forecasts that the market for the clearance of space debris will be highly competitive. To protect their investment, they were ready to pay more for the service. When one single private organisation involved in the invention, all the other will fought for the service of the invention. The conflict will arouse of it. Liability arisen out of the usage of technology and the term of use should be followed parallelly. Liability for capturing of active satellites by the device should be valued and the compensation should be paid accordingly. Whatever may the circumstances be, the

sustainability of the space environment should be maintained by the parties whoever involved in the space exploration by any means.

5. Conclusion and Recommendation:

Space is the collective legacy of humankind. Sustainability of space is mandatory for future exploration. As we discussed above it is all about the chain of problems that arise in space research. Though science and technology remediating the issues, some solutions should be made from legal aspects. We have five conventions which is related to law of space. But in these conventions several minor issues have been unaddressed. Some committee reports and guidelines were given by the Office for Outer Space Affairs of the United Nations (UNOOSA). The primary issue that has been focused under this study is, future conflicts regarding the invention of decluttering device. When the device is invented by private company, it should not be monopolized by them. Demand for the usage or service of device will be huge in future. To prevent the ambiguity in Liability Convention which is related to harm brought about by the space objects while cleaning the space debris, to face the commercialisation issue on the use of tech, a regulation should be made and it shall be a *Erga Omnes* obligation to all the state parties.

[1] She was the first Indian American astronaut and first Indian woman in space. She first flew on Space Shuttle Columbia in1997 as a mission specialist and primary robotic arm operator. *Available at:* https://www.nasa.gov/sites/default/files/atoms/files/chawla_kalpana.pdf. (last visited on November 6, 2022).

[2] The History of Space Exploration, *available at*: https://education.nationalgeographic.org/resource/history-space-exploration (last visited on November 6, 2022).

[3] Vladimir Kopal 2008,"Introductory Note to Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies", Audiovisual Library of International Law, *available at:* https://legal.un.org/avl/ha/tos/tos.html.

[4] *Ibid.*

[5] United Nations Committee on the Peaceful uses of Outer Space, Technical Report on Space Debris, A/AC. 105/720, 1999, Para 6.

[6] Lotta Viikari, *The Environmental Element in Space Law*31, (Martinus Nijhoff Publishers, Boston, 2008).

[7] Jonathan O"Callaghan, what is space junk and why is it a problem? *available at*: https://www.nhm.ac.uk/discover/ (last visited on November 20, 2022).

[8] Supantha Mukherjee, Should we be worried about space debris? Scientists explain *available at:* https://www.weforum.org/agenda/2021/11/ (last visited on November 21, 2022).

[9] It provides internet services through satellites. Every remote place from the world will have high speed internet services. To read and know more visit, https://www.starlink.com/.

[10] Starlink: Why is Elon Musk launching thousands of satellites? *available at:* https://www.bbc.com/news/technology-

62339835 (last visited on November 21, 2022).

[11] Kelsey D. Atherton, This week‟s destroyed Russian satellite created even more dangerous space debris *available at:* https://www.popsci.com/technology/russian-missile-destroys-russian-satellite/ (last visited on November 21, 2022).

[12] Inter-Agency Space Debris Coordination Committee, *IADC Space Debris Mitigation Guidelines,* IADC-02-01 Rev.3, June 2021, p.11-15.

[13] Mike Wall, Kessler Syndrome and the Space debris problem, *available at:* https://www.space.com/kessler-syndrome-space-debris (last visited on: November 22, 2022).

[14] Donald Kessler, he is a former NASA scientist have given idea about cascade of orbital debris.

[15] Convention on International Liability for Damage Caused by Space Objects,1972, art.2.

[16] Convention on International Liability for Damage Caused by Space Objects,1972, art.3.

[17] Joel A. Dennerley, "State Liability for Space Object Collisions: The Proper Interpretation of „Fault‟ for the purposes of International Space Law" 29 *The European Journal of International Law* 301 (2018).

[18] Indian Space Research Organisation, Department of Space, *available at:* https://www.isro.gov.in/SpacecraftMissions.html# (last visited on: November 24, 2022).

[19] Professor Hugh Lewis, an astronautical engineer, University of Southampton, U.K. *available at:* https://www.southampton.ac.uk/people/5wzjd6/professor-hugh-lewis (last visited on November 24, 2022).

[20] Shi En Kim, Can the World‟s First Space Sweeper Make a Dent in Orbiting Debris? *available at*: https://www.smithsonianmag.com/science-nature/can-worlds-first-space-sweeper-make-dent-orbiting-debris-180978515/ (last visited on November 24,2022).