

Outer Space Debris: Law, Control and Mitigation – An Analysis

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ABSTRACT: *The growth of orbital space debris is both a consequence of and a potential hindrance to space activities. The risks posed by space debris propagation in the most used orbital regions highlight the need to adequately address the challenges posed to the sustainability in outer space. The preservation of the access to and usability of outer space in the long-term requires that action is taken which has to be the result of both mitigation and remediation measures for existing and future space missions. The deficiencies in law for space debris remediation mechanisms originate from the fact legal framework for space activities does not impose any legal obligations for debris removal and on-orbit servicing.*

The paper revisits legal questions whether the States have an international rights and obligation to actively remove space debris from Earth orbit caused by the space activities. The research studies have shown that growth of debris in space could be limited if mitigation measures are properly implemented. But with regard to the mitigation of space debris, only a few of the nations have implemented the UN space debris mitigation guidelines on the peaceful uses of outer space. The paper analyzes the issue in the light of current framework in its infancy and faces technical, financial, political and legal issues.

KEYWORDS: *Space debris, remediation, environmental protection, orbital propagation, space debris mitigation guidelines, active debris removal.*

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I. INTRODUCTION

The most used orbital regions in near-Earth space by the growing amount of space debris, adequate consideration of instruments aiming at the mitigation and remediation of space debris represents an important tool to ensure the viability of space activities in the future. The Outer Space Treaty is sometimes referred to as a “Constitution” of space law as it contains the basic principles for space activities is considered to contain principles of customary international law, which bind not only state parties to the treaty but also non-signatories.¹ Such customary principles are Articles I–IV, VI, VII, VIII and IX of Outer Space Treaty, 1967 (Hereinafter called as ‘OST’) and have served as a basis for the development of the further treaties on space law.

International law designates outer space and celestial bodies the status of a global common a domain beyond national jurisdiction which is not subject to national sovereignty. This is laid down in Art. I para.1 of the OST, the exploration and use of outer space should be regarded as the ‘Province of all mankind’. The use of outer space as a global common, including economic² and non-economic uses as well as scientific exploration of outer space and celestial bodies, should be free the sense of remaining accessible for all states and their nationals on the same terms, without discrimination of any kind. Accessibility as a means to carry out space activities should be preserved not only in the short-term perspective, but on a long-term basis as the dependency of humans on outer space will only grow in the future.

Definition of ‘Space Debris’

In the International Law Association’s International Instrument on Space Debris³ 66th Conference, 1994 was the first international attempt to provide a legal definition of ‘space debris’ unanimously adopted. In the first article on definitions, space debris has been defined in paragraph (c) as, “manmade objects in outer space, other than active or otherwise useful satellites, when no change can reasonably be expected in these conditions in the foreseeable future.”⁴

¹Brownlie, I. ‘Principles of Public International Law, 6th Ed., Diakonia: Bromma, Sweden, 2003; pp. 6–12. ISBN 978-0199260713.

² Jakhu, R, ‘Legal Issues relating to the Global Public Interest in Outer Space’, *Journal of Space Law* 2006, p.32, 31–110.

³The ILA Finalizes its International Instrument on Space Debris in Buenos Aires, August 1994, (1995) 23 *Journal of Space Law* p. 47.

⁴ For the text of the instrument, see *Karl-Heinz Böckstiegel*, “ILA Draft Convention on Space Debris” (1995) 44 ZLW 29.

“Space debris are all manmade objects including their fragments and parts, whether their owners can be identified or not, in Earth orbit or re-entering the dense layers of the atmosphere that are non-functional with no reasonable expectation of their being able to assume or resume their intended functions or any other functions for which they are or can be authorized.”⁵

The definition of space debris provided in the UN COPUOS Guidelines is as follows that all man-made objects including fragments and elements thereof, in the Earth orbit or reentering the atmosphere, that are nonfunctional. It enshrined in the UN Guidelines can be classified as ‘soft law.’⁶ Although soft law is said to lack “the requisite normative content to create enforceable rights and obligations,”⁷ they are capable of producing certain legal effects.

Kinds of Space Debris

Space debris consists of both natural particles (meteoroid) and artificial particles (man-made). The meteoroids are in orbit around the sun, while artificial debris is in orbit around the Earth. The latter is commonly referred to as Orbital debris.

Space debris can be divided into four categories:-

- 1) **Inactive payloads or inoperative objects**- They are made up of satellites which have run out of fuel for station-keeping operations or have malfunctioned and are no longer able to manoeuvre.
- 2) **Operational debris**- It includes any intact object or component part that was launched or released into space during normal operations. The largest single category of this type is intact rocket bodies that remain in orbit after launching a satellite.
- 3) **Fragmentation debris**-They are created when space objects break apart. Debris of this type may result from collisions between space object and either natural or artificial orbital debris.
- 4) **Micro particulate matter**-This type of debris are created due to gradual disintegration of the surfaces on a satellite due to exposure to the space environment.

Sources of Space Debris

The largest percentage of space debris originates from fragmentation of space craft and launch vehicle stages due to energetic events such as explosions or collisions. The sources of space debris in Earth orbits can be (a) accidental and intentional break-ups which produce long-lived debris and (b) debris released intentionally during the operation of launch vehicle orbital stages and spacecraft. The main sources of Space debris can be divided into two major categories as:

- (1) **Mission Related Objects** – The main causes of mission related objects are objects released by design and unintentionally related objects. Objects released by design includes operational debris (fasteners, covers, wires), objects released for experiments (needles, balls etc.), Tethers designed to be cut after experiment. Unintentionally released objects includes fragments caused by ageing (flakes of paints and blankets derived from degradation), Tether systems cut by debris, Objects released before retrieval to ensure safety and liquids with high density (leaked from the nuclear power system, etc.).
- (2) **On Orbit-Break Ups** - Debris can result from on orbit break-ups includes intentional destruction, accidental break ups and collisions. Intentional destruction like destruction for scientific or military experiments and intentional collision etc., destruction prior to re-entry in order to minimize ground casualty and destruction to ensure security of on-board devices and contained data.

International Space Law operating on Space Debris

1) Outer Space Treaty, 1967

The Outer Space Treaty, 1967 emphasizes the importance of international cooperation in the field of activities in the peaceful exploration and use of outer space, including the Moon and other celestial bodies. Articles VI and VII of the Treaty create international responsibility for national activities whether such activities are carried on by governmental agencies or by non-governmental entities.⁸ The major problem is to identify the owner of any

⁵ http://www.iadconline.org/docs_pub/IADC.SD.AI20.3.10.2004.pdf.

⁶ Joseph Gold, “Strengthening the Soft International Law of Exchange Agreements” (1983) 77 AJIL 443; Christine Chinkin, “A Hard Look at Soft Law” (1988) Proceedings ASIL 371, at 389; C. Schreuer, “Recommendations and the the Traditional Sources of International Law” (1977) 20 German Yearbook of Int’l Law 103.

⁷ Francesco Francioni, “International ‘Soft Law’: A Contemporary Assessment” in *Vaughan Lowe and Malgosia Fitzmaurice* (eds.), *Fifty Years of the International Court of Justice, Essays in Honour of Sir Robert Jennings* (Cambridge University Press, 1996) at 168.

⁸ Article VII of the Treaty “Each State Party to the Treaty that launches or procures the launching of an object into outer space, including the Moon and other celestial bodies, and each State Party from whose territory or facility an object is launched, is internationally liable for damage to another State Party to the Treaty or to its natural or juridical persons by such object or its component parts on the Earth, in air space or in outer space, including the Moon and other celestial bodies.”

space debris and even if the owner can be identified, clean-up operations are too expensive and impractical to undertake. The treaty also imposed international liability on each state party who launches an object in outer space and thereby causing damage to another state party to the treaty. It limits liability to acts against another state party and not to acts which causes pollution to outer space.

2) The Liability Convention, 1972

The Convention on International Liability for Damage Caused by Space Objects, 1972 assigns liability based on ownership of the objects involved. Article II of the Convention reads as “A launching state shall be absolutely liable to pay compensation for damage caused by its space object on the surface of the Earth or to aircraft in flight”. Article III reads as “In the event of damage being caused elsewhere than on the surface of the Earth to a space object of one launching state or to persons or property on board such a space object by a space object of another launching state, the latter shall be liable only if the damage is due to its fault or the fault of persons for whom it is responsible. The problem with regard to the convention is that the origin of the vast majority of debris objects that are not catalogued cannot be determined.

3) The Registration Convention

The Registration of objects launched into outer space requires the countries to register the launch and re-entry of objects with the Secretary General of the United Nations. The convention helps to establish the ownership of space objects. But it does not require notification if a registered object explodes or fragments. Hence, liability for damage caused to space debris cannot be imposed

4) The IADC Space Debris Mitigation Guidelines 2002

The international discussion on space debris mitigation starts with the efforts of the Inter- Agency Space Debris Coordination Committee (IADC) which submitted its guidelines in 2002. The primary purpose of the IADC is to exchange information on space debris research activities between member space agencies, to facilitate opportunities for cooperation in space debris research and to identify debris mitigation options. The measures proposed by IADC to mitigate space debris include:

- 1) Limiting debris released during normal operations
- 2) Minimize potential for on-orbit break-up
- 3) Post mission disposal and
- 4) Prevention of on-orbit collision
- 5) UN-COPUOS Guidelines, 2007

The United Nations Committee on Peaceful Uses of Outer Space (UNCOPUOS) and its scientific and technical sub-committee created “Space Debris Mitigation Guidelines in 2007. These guidelines outline space debris mitigation measures for the planning, design, manufacture and operational phases of spacecraft and launch vehicles. The guidelines call for the removal of spacecraft from orbit or for their disposal in other orbits so as to avoid future collision. The UN-COPUOS were considered to be not effective and are “voluntary and not legally binding”. The seven guidelines include the following:

- 1) Limit debris released during normal operations
- 2) Minimize the potential for break-ups during operational phases
- 3) Limit the probability of accidental collision in orbit
- 4) Avoid intentional destruction and other harmful activities
- 5) Minimize potential for post-mission break-ups resulting from stored energy
- 6) Limit the long-term presence of spacecraft and launch vehicle orbital stages in the low earth orbit (LEO) region after the end of their mission
- 7) Limit the long-term interference of spacecraft and launch vehicle orbital stages with the Geosynchronous Earth Orbit (GEO) region after the end of their mission

Space Debris- Impacts

Collision and Interference are the major risks of space debris poses to human life. A collision may result in loss of property or life, damage to person or property, release of contamination etc. Space debris also causes interference with scientific, commercial and military space activities. Space debris can interfere with space based acquisition of scientific data by causing damage to the surfaces of optical instruments and solar panels or by impairing the accuracy of the scientific data. Inactive payloads and rocket fragments may disturb the receiving frequency bands in which the sensitive instruments operates thereby preventing the reception of celestial radio-signals.

Space debris disfigures photographs of distant stars and galaxies and lead to false discoveries. Space debris congestion may also lead to interference with telecommunication satellites and disrupts space-based

operations. Space debris is also used as a military weapon. Nations could deliberately create debris and use it to harm every satellites, communication devices and even astronauts. Debris can also pose a hazard to other debris as well. When two pieces of debris collide, they can fragment and create more debris, thus it in turn increases the likelihood of more collisions cause Cascade Effect. Overcrowded space debris is also an obstacle to place new satellites in the sky. Thus the major risks posed by space debris includes the damage it can cause to satellites, using it as military weapon, its ability to self-generate and finally its ability to re-enter the atmosphere and cause surface harm.

State Responsibility

The State responsibility is “a legal construct that allocates risk for the consequences of acts wrongful by international law to the artificial entity of the State.”⁹ The distinction between State responsibility and liability lies in the fact that the prerequisite to the former is an act breaching international law and to the latter, the harmful effects of an activity, which is not per se a violation of international law.¹⁰ In international space law, responsibility applies to a “State’s obligation to regulate and control space activity both in the present, and in the future, to assure compliance with not only the letter but the spirit of the Outer Space Treaty principles”, liability on the other hand refers to an “obligation of a State to compensate for damages”.¹¹ As has been observed by Cheng, international state responsibility in the outer space field arises the moment a breach of an international obligation is produced and not when the State is seen to have failed in its duty to prevent or repress such breach, for the State is immediately accountable for the breach on the international plane as if it itself had breached the international obligation.¹²

International Responsibility: Article VI, Outer Space Treaty

The vital question of responsibility over space objects is addressed in *lex spatialis*, first in the 1963 Declaration of Legal Principles and then in the 1967 Outer Space Treaty. At the time of its adoption, the Outer Space Treaty represented “the lowest common denominator of issues on which consensus existed in COPUOS.”¹³ Principle 5 of the United Nations General Assembly Resolution 1962 (XVIII) reflected the compromise reached between the two parties by allowing private participation in space activity subject to the control of the “appropriate State” and imposing consequent international responsibility on the State for such activities.¹⁴ It was later incorporated in Article VI of the 1967 Outer Space Treaty. On deconstructing this article, it is clear that the following obligations are imposed on States:¹⁵

- (i) to bear responsibility for national activities in outer space regardless of whether such activities are carried out by public or private entities;
- (ii) to assure that national activities are conducted in conformity with the Outer Space Treaty and, through Article III, with international law;
- (iii) to authorize and continually supervise, where appropriate, the activities of nongovernmental entities in outer space; and
- (iv) to share international responsibility for the activities of international organizations of which the State is a participant.

The space behaviour of States as subjects of public international law and a *fortiori*, international space law. The regulatory concerns about the activities of private actors will not be addressed because ultimately, States shall “bear international responsibility” for such activities, which “require authorisation and continuing supervision” by the appropriate State under the dictate of Article VI of the Outer Space Treaty. The extent of obligation as far as damage to third parties is concerned is the international responsibility of the obligation to control; in particular to make sure that the obligations set by Article III (activities must be carried on according

⁹ Christine Chinkin, “A Critique of the Public/Private Dimension” (1999) 10 *EJIL* 387 at p. 4

¹⁰ Rebecca M. M. Wallace, *International Law*, (Sweet & Maxwell, 2003) at p. 203.

¹¹ W. B. Wirin, “Practical Implications of Launching State – Appropriate State Definitions”, (1994) 37 *Proc. of Colloq. on the Law of Outer Sp.* at 109.

¹² Bin Cheng, “Article VI of the 1967 Space Treaty Revisited: ‘International Responsibility’, ‘National Activities’ and ‘The Appropriate State’” (1998) 26 *J. Sp. L.* 7 at 15.

¹³ Nicolas Mateesco Matte, “Outer Space Treaty” in R. Bernhardt (ed.), *Encyclopedia of Public International Law*, Vol. 1 (Elsevier, 1992) at p. 838. “Containing general principles for the peaceful exploration and use of outer space, including the moon and other celestial bodies, it was not to deal with all contingencies that might arise from their exploration and use. It is not a perfect instrument. Some of its principles are obscurely stated and its terms lack precision and definition. Nevertheless, it represents the most important source of space treaty law.”

¹⁴ Carl Q. Christol, *The Modern International Law of Outer Space*, (New York: Pergamon Press, 1982) at 65.

¹⁵ Ricky Lee, *Law and Regulation of Commercial Mining of Minerals in Outer Space*, (Springer, 2012) at 128.

to international law, including the Charter of the United Nations as *lex generalis*) and Article VI (activities must be carried on according to the Outer Space Treaty as *lex specialis*) of the Outer Space Treaty are implemented.¹⁶

In the event of a space debris remediation activity, it can be inferred from Article VII of the Outer Space Treaty that although the remediation might be conducted by a third party, the launching State of the space object in question would continue to entail international responsibility for any damage caused by it. While international law does not explicitly impose an obligation to avoid causing damage to another State's space assets, there is an underlying duty to observe a standard of care or due diligence in performance of its activities. With a view towards balancing the conflicting State interests in its 1978 report,¹⁷ the Working Group to the International Law Commission noted that "the essential obligation owed by a State in such a context has tended to be conceived as one of moderation, or of care or due diligence, in relation to its own activities or of private activities within its jurisdiction or control."¹⁸ It was emphasized in the Special Rapporteur's report that "treaty regimes of a universal character, dealing with acts not prohibited by international law, had been established in relation to," among other issues, the regulation of "space objects."¹⁹

It is stated in Special Rapporteur Baxter's first report on international liability for injurious consequences arising out of acts not prohibited by international law in 1980: "Depending upon the circumstances, the standard of reasonable care or due diligence may well require a standard more exacting than its own as part of a special regime of protection that includes guarantees of redress for the potential victims of any hazard that cannot be wholly eliminated."²⁰ The regime of absolute liability provided in the Liability Convention not only as an applicable conventional rule, but also as evidence of the standard of care.²¹

Need for Consent

The existing framework of international space law does not authorize interception with space objects without the prior consent of the launching State. In the case of a removal of an object without the authorization, it would constitute an internationally wrongful act. However, prior consent obtained from the launching State, or the State of registry in the case of multiple launching States, would constitute a circumstance precluding the wrongfulness of conduct that would otherwise not be in conformity with the international obligations of the State performing the remedial activity. It has been opined by the International Court of Justice (Hereinafter known as 'ICJ') that the existence of such a circumstance does not annul or terminate the obligation provides a justification or excuse for non-performance while the circumstance in question subsists.²² Article 20 of the *International Law Commission's Draft Articles on Responsibility of States for Internationally Wrongful Acts, 2001* reflects the basic international law principle of consent.²³ In the consent by a State to particular conduct by another State precludes the wrongfulness of that act in relation to the consenting State is valid and to the extent that the conduct remains within the limits. It must also not be vitiated by the influence of error, fraud, corruption or coercion.²⁴

State Jurisdiction and Control over Space Objects

The term 'jurisdiction' has been described as "the lawful power of a State to define and enforce the rights and duties, and control the conduct of natural and juridical persons." Eminent jurist, Judge Manfred Lachs has defined jurisdiction as "a basic attribute of a State, whereby it exercises fundamental powers as a subject of international law."²⁵ Limits upon the exercise of such jurisdiction determined by the rights of other States and cooperation in international relations. It contains an identical and uniform treatment bestowed on the twin

¹⁶Armel Kerrest, "Liability for Damage Caused by Space Activities" in *Marietta Benkö & Kai-Uwe Schrogl, Space Law: Current Problems and Perspectives for Future Regulation* (Utrecht: Eleven International, 2005) at p. 107.

¹⁷"On the one hand there is the benefit to be obtained by the State conducting the activity, but on the other hand there is the injury inflicted on the foreign State as a result of the conducting of that same activity." Hurwitz, *State Liability for Outer Space Activities*, note 23, at 147.

¹⁸ILC Yearbook 1978, Vol. II, Part two, at 151 (Para 19).

¹⁹Preliminary Report on International Liability for Injurious Consequences Arising out of Acts not prohibited by International Law. Doc A/AC.4/344 and Add. 1 and 2. Reprinted in ILC Yearbook 1980, Vol. II, Part one (Para 4). The law of outer space was included within the category of "recent materials that are, or may be, relevant to the development of a new topic." ILC Yearbook 1978, Vol. II, Part two, at 150 (Para. 12) Also, see Setsuko Aoki, "The Standard of Due Diligence in Operating a Spacecraft" (2012) 55 Proc. of Colloq. on Law of Outer Space.

²⁰Preliminary Report on International Liability for Injurious Consequences Arising out of Acts not prohibited by International Law by Mr. Robert Q. Quentin-Baxter, Special Rapporteur, A/CN.4/334 and Add.1 & Corr.1 and Add.2, reproduced in *ILC Yearbook* (1980) Vol. II (1) at 252.

²¹ *Ibid.*

²² *Gabcikovo-Nagymaros Project (Hungary/Slovakia)*, I.C.J. Reports 1997, at 39, para. 48.

²³"Valid consent by a State to the commission of a given act by another State precludes the wrongfulness of that act in relation to the former State to the extent that the act remains within the limits of that consent."

²⁴International Law Commission 'Draft Articles on Responsibility of States for Internationally Wrongful Acts', 2001 with Commentaries to Art.20, at p.175.

²⁵ Manfred Lachs, *The Law of Outer Space* (Leiden: Sijthoff Publishers, 1972) at p.58-69.

concepts of ‘jurisdiction and control’ over space objects in international space law followed by some additional related concepts such as ownership and registry of space objects.

Jurisdiction and control

Article VIII of the OST relates to jurisdiction and control over a space object by a State through launching of the space object. It provides that “a State Party to the treaty on whose registry an object launched into outer space is carried shall retain jurisdiction and control over such object, and over any personnel thereof, while in outer space or on a celestial body.”²⁶ In the first place, an obligation for the State of Registry, to active guidance of the space object; and a prohibition of interference with the space object by a third (non-Registry) State.²⁷

The Soviet authors have further expanded the concept to include activities of special services of the State of Registry aimed at monitoring the technical condition of the space object during the launching and putting into orbit, as well as its functioning in outer space and during the landing. It is unnecessary to dissect the twin concepts of ‘jurisdiction and control’ that have received identical and uniform treatment throughout international space law instruments. Hence, it has been rightly pointed out that “jurisdiction should induce control and control should be based on the jurisdiction.”²⁸

Registration Convention preamble viewed as an attempt towards further elaboration of Article VIII of the OST. Article II (2) of the Registration Convention provides that “where there are two or more launching States in respect of any such space object, they shall jointly determine which one of them shall register the object..., bearing in mind the provisions of article VIII of the OST, and without prejudice to appropriate agreements concluded or to be concluded among the launching States on jurisdiction and control over the space object and over any personnel thereof.” In order to exercise legitimate jurisdiction, it is essential for the State to identify a “sufficient nexus between itself and the object of its assertion of jurisdiction.”²⁹ There is wide scholarly consensus that registration of space objects establishes such a link between the State and the space object.³⁰

In case if a space object is not registered, it has been observed that ownership serves as the determining factor to ascertain which State could exercise jurisdiction and control.³¹ However, some authors do not consider registration as a “legal confirmation of ownership” or a “binding legal commitment of liability” on the ground that the State of registry may not be the launching State.³² The State of registry has been defined in the Registration Convention Art 1(c) as “a launching State on whose registry a space object is carried...”. It follows that the State of registry, therefore, has to be one of the launching States i.e., a State which launches or procures the launching of a space object or a State from whose territory or facility a space object is launched.³³

Environmental Protection of Outer Space

Art. IX of the OST, which is considered the basis for the environmental protection of outer space providing that states parties “shall conduct all their activities in outer space, including the Moon and other celestial bodies, with due regard to the corresponding interests of all other states”³⁴. This provision reaffirms the common character of outer space. Furthermore, it provides that the “harmful contamination” of outer space and celestial bodies shall be avoided Art. IX p. 2 OST and, in case activities can potentially cause “harmful interference with activities of other states parties”³⁵, consultations should be undertaken before the activity is carried out Art. IX p. 3 and 4 of OST.

²⁶ Outer Space Treaty, Article VIII.

²⁷ Bess C.M. Reijnen, *The United Nations Space Treaties Analysed* (Editions Frontieres, 1992) at 119.

²⁸ Gabriel Lafferranderie, “Jurisdiction and Control of Space Objects and the Case of an International Intergovernmental Organisation (ESA)” (2005) 54 ZLW 228 at 231-232.

²⁹ Bernard H. Oxman, “Jurisdiction of States” in R. Bernhardt (ed.), *Encyclopedia of Public International Law*, vol.1 (Elsevier, 1992), at 56. “The requisite contacts with a State necessary to support the exercise of jurisdiction differ depending on the nature of the jurisdiction being exercised”.

³⁰ “Registration of space objects seems *ipso facto* to be sufficient to provide the link between these objects of international law and the subjects of international law.” Stephan Hobe, “Spacecraft, Satellites and Space Objects” *Max Planck Encyclopedia of Public International Law*; “This link has a double intention. On the one hand, it assures to the spacecraft the protection by the State; on the other hand, the interests of third persons are protected by the fact that the State will be responsible for the spacecraft belonging to this State.” *I.H.Ph Diederiks-Verschoor*, “Registration of Spacecraft” in E. McWhinney & M.A. Bradley (eds.), *New Frontiers in Space Law* (Leiden, 1969) at 125.

³¹ “Failing registration, the act of launching and the ownership of such space objects seem to provide a sufficient link.” Stephan Hobe, “Spacecraft, Satellites and Space Objects,” *ibid*.

³² Henry R. Hertzfeld & Ben Baseley-Walker, “A Legal Note on Space Accidents” (2010) 59 ZLW 230 at 233.

³³ Liability Convention, Art. I (c); Registration Convention, Art I (a); Outer Space Treaty, Art. VII.

³⁴ Marchisio, S. Article IX. In *Cologne Commentary on Space Law*; Schmidt-Tedd, H., Schrogl, K.-U., Eds.; Heymanns Verlag: Cologne, Germany, 2009; Volume 1, pp. 175-177. ISBN 978-3-452-27185-3.

³⁵ The forward environmental protection refers to the protection of outer space from any object coming from the earth that may contaminate the outer space, while the backward concentrates on Earth’s protection from contamination by a space object. For more information See

In fact, the treaties on space law neither expressly prohibit the creation of space debris nor impose an obligation on states and their space actors to remove space objects from orbit. Mitigation measures have so far only been adopted as voluntary, non-binding instruments and have been partly adopted in the national laws of some states.³⁶ A general obligation to protect the environment of outer space results from the common interest of the community of states to access and use outer space *erga omnes* obligations is followed by State parties to the OST³⁷ represent the community having a common interest in the protection of the usability of outer space.

II. SUGGESTIONS

- 1) The space debris mitigation measures related to communication satellites in GSO shall be developed.
- 2) Improved design of spacecraft and rocket stage separation and stabilisation devices.
- 3) States which implement mitigation of space debris shall be rewarded with debris credit.
- 4) Development of cost-effective debris mitigation mechanisms and increase cooperation of intergovernmental organizations.
- 5) Proper definition of 'space debris' and inclusion into the current legal framework is needed to spread awareness among space faring nations on the problem of space debris and its risks.
- 6) International Organisations are also important to serve the needs of global space faring nations
- 7) Tracking and Recording of ownership of orbit debris especially in lower orbit shall be developed. Research and modern devices shall be developed for the same.

III. CONCLUSION

Satellite and launch-vehicle manufacturers are not presently legally bound to employ mitigation measures. There are no proper regulations to deal with the problem of space debris. The Outer Space Treaty also does not apply to space debris issue. There is no regulation with regard to the destruction of satellites in space and the creation of space debris resulting from it. In spite of all the international treaties and laws for the man-made space objects, there is no framework in case of contingency that may arise due to the out-burst of space and meteoroid that may enter the atmosphere of Earth and cause huge and exemplary damages to the life and property of humans. It became a need of an hour to discuss and take immediate necessary steps to mitigate contingency arising out of space debris.

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Conley & Rettberg, 2011. COSPAR Planetary Protection Policy – Present Status. In *M. Hofman, P. Rettberg and M. Williamson*, eds. *Protecting the Environment of Celestial Bodies*, Paris: International Academy of Astronautics Cosmic Study (PECB), pp. 16-24.

³⁶UNCOPUOS Compendium on Space Debris Mitigation Standards Adopted by States and International Organizations, UN Doc. A/AC.105/C.2/2016/CRP.16; UNCOPUOS: Vienna, Austria, 2016.

³⁷Status of International Agreements relating to the Activities in the Outer Space.

Available at online <http://www.unoosa.org/oosa/en/ourwork/space/law/treaties/status/index.html>