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About Young Ignited Minds Foundation

Young Ignited Minds Foundation is a student-run non-profit organization whose primary aim is to help the poor children in acquiring education and helping them become self-sufficient to support themselves and their families. YIMF is registered under Section 12 AA of the Income Tax Act, 1961 and has also got the approval under Section 80G of the Income Tax Act, 1961 for donation towards its objectives.

Young Ignited Minds Foundation (YIMF) is a registered nongovernment entity operating on the NGO scale level. We are an operational NGO, striving to plan and carry out boots-on-theground projects to accomplish our objectives. This requires a great deal of careful planning, communication, and local involvement for each project.

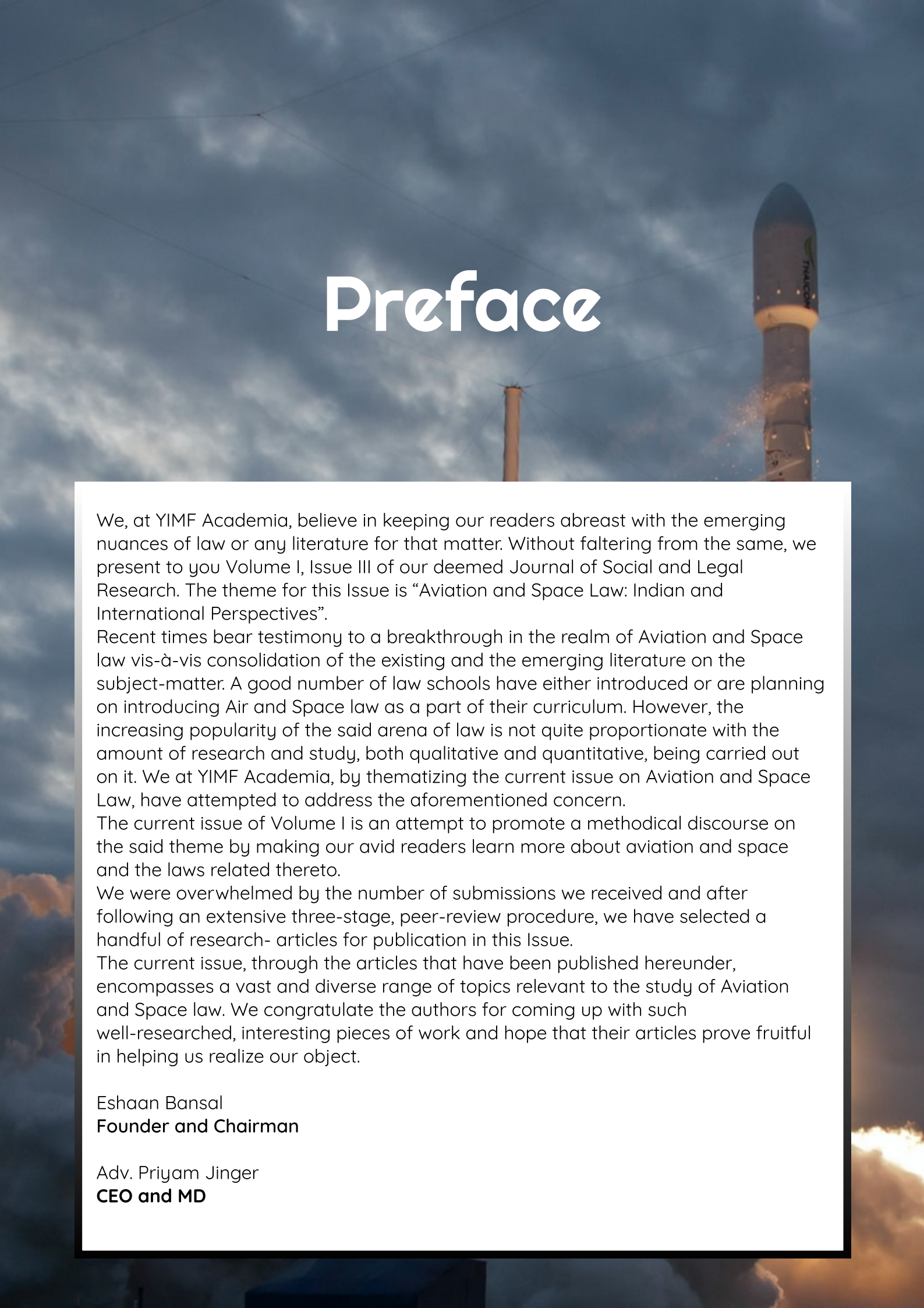
The composition of our organization mostly includes students who have come from different educational background varying from the law, engineering, medical to school students producing dynamic ideas for the effective management of our organization and serving
to allthe allthe sections of our society.

About YIMF Academia

YIMF Academia's Journal of Social-Legal Research is an inter-disciplinary approach based study of the society with different domains of law and other social sciences. It addresses the challenges in the concerned field of study and critically analyses it to conclude with feasible suggestions and course of action. Every version of the Journal focusses on a single broader topic with various sub-topics under its umbrella and targets researchers and academicians alongside students who wish to have an in-depth knowledge of the topics.

YIMF Academia Blog series focusses on basic lacunae present in the field of law alongside the field of Human Rights and other related domains. It is an attempt similar to the Journal but has an audience that is always on the move and has lesser time to grasp more. It is a platform to address the mentioned problems and possible solutions for the same, all described in a short, crisp, and clear manner. Both, the Journal and the Blog series, are committed to achieving a broad national as well as international appeal and attracting contributions from across the sections ofthe civil society.

The Editorial Board is proud to have members from across the country with experiences, both as contributors and editors, in various nationally and internationally acclaimed Journals and Organisations. The Board is a group of talented and hardworking individuals determined to attain perfection and take the YIMF Academia to new heights.



Preface

We, at YIMF Academia, believe in keeping our readers abreast with the emerging nuances of law or any literature for that matter. Without faltering from the same, we present to you Volume I, Issue III of our deemed Journal of Social and Legal Research. The theme for this Issue is “Aviation and Space Law: Indian and International Perspectives”.

Recent times bear testimony to a breakthrough in the realm of Aviation and Space law vis-à-vis consolidation of the existing and the emerging literature on the subject-matter. A good number of law schools have either introduced or are planning on introducing Air and Space law as a part of their curriculum. However, the increasing popularity of the said arena of law is not quite proportionate with the amount of research and study, both qualitative and quantitative, being carried out on it. We at YIMF Academia, by thematizing the current issue on Aviation and Space Law, have attempted to address the aforementioned concern.

The current issue of Volume I is an attempt to promote a methodical discourse on the said theme by making our avid readers learn more about aviation and space and the laws related thereto.

We were overwhelmed by the number of submissions we received and after following an extensive three-stage, peer-review procedure, we have selected a handful of research- articles for publication in this Issue.

The current issue, through the articles that have been published hereunder, encompasses a vast and diverse range of topics relevant to the study of Aviation and Space law. We congratulate the authors for coming up with such well-researched, interesting pieces of work and hope that their articles prove fruitful in helping us realize our object.

Eshaan Bansal
Founder and Chairman

Adv. Priyam Jinger
CEO and MD

Message From

The Founder

This journey of Young Ignited Minds Foundation (YIMF) got conceptualised as a dream of a small team of new entrants in the law college with an aim, along with pursuing their individual academic pursuits, to provide some useful service to the society. With this background, the journey of the YIMF Academia also began last year and I am glad that it has since covered various issues of importance to the researchers of the social-legal fields.

The sheer dynamism of our team is reflected from the fact that as India and the world are moving into next generation of the space research wherein more and more private entrepreneurs are venturing into the field offloading the public institutions.

The new space policy of India and space journeys by the private entrepreneurs is an advance indicator of the upcoming upsurge in this field and its commercial exploration.

Hence this issue of our journal is a timely effort to identify and discuss various issues including highlighting of various risks as we venture into this new space age and journey.

I congratulate the team of YIMF Academia for identifying this very vital area at a very appropriate time as the main focus of the current issue.

Regards,
Eshaan Bansal

Message From

The Editor-In-Chief

Never before had there been a means to bridge the gap between the student community and the legal and academic fraternity. Birthed to provide this means, the YIMF journal is a passion project, created to provide an impetus to young researchers, analysts, and policymakers of the nation.

YIMF- the organization began as an army fighting for social change and justice. YIMF Academia takes the journey one step further, turning action into indelible ink-socio-legal change and justice.

This journal aims to foster cognitive abilities such as critical thinking, extensive analysis, etc. It is a true test for ignited minds to think outside the box now that they are literally and figuratively locked in whilst furthering the purpose of ideating solutions and spreading awareness.

I would like to congratulate and express my heartfelt gratitude to every person in the team who has worked tirelessly to conceptualize and formulate this journal.

We hope to reaffirm how important social legislation is, to create social change and maintain order. Together, anything is possible, especially if this initiative can ignite the minds of the youth of our nation. If not us, then who? If not now, then when?

Regards,
Priyam Jinger

Message From

The Chief Co-ordinating Editor

"It is not enough to be compassionate. You must act."
This quote by Dalai Lama played a fundamental role in my decision to join YIMF over a year ago when I was a final year law student, pursuing a degree in B.A.LL.B from Amity University. I wanted to contribute my share in helping this NGO engineer through its objectives. Being an avid reader, and writer with a decent number of publications, I joined the Editorial Board to stimulate an optimum realization of my skills.
A year hence, I have graduated and started working for a leading Media House as an in-house counsel, but quite inspired by the outstanding work done by this Organisation and content with the productive association I have had so far, my tryst with YIMF continues.
As a Chief- coordinating editor for the journal's third issue of Volume one, working with an ever so passionate and dedicated team of the Editorial Board has given me much glee. I am extremely proud of the teamwork that went into giving this year's issue its shape. Continuing with our zest to think out of the box, we have come up with the theme of space law, which remains one of the least talked about areas of law. The current issue is an attempt to instigate a discourse on the said theme by making our avid readers and active members in the legal field and space field know more about the same.

Regards,
Gaurav Sanghi

Message From

The Managing Editor

With this publication, we present to you Volume I, Issue III of the Journal of Social and Legal Research. As someone who has been a part of the editorial team for the Journal since its inception and has seen the relentless teamwork gone by in the manifestation of each issue, I could not be more proud.

YIMF, through this deemed Journal, has always promoted the avant-garde. With the current issue, which is thematized on Aviation and Space Law, we continue our tryst with the aforementioned. Aviation and space law is one of the most understated areas of law. This issue is, therefore, an attempt to make our avid readers in the legal and space field learn more about the said theme so that a methodical discourse could be instigated on the same.

I would like to congratulate the members of the Editorial Board without whom the conceptualization of the current issue would not have been possible. Working as a Managing Editor with this team has been one rewarding experience.

I would also like to express my sincerest regards to the authors of the articles published hereunder. I am affirmative that their well-researched and exceptional work would give our readers food for thought.

Regards,
Ruchi Goyal

Message From

The Executive Editor

It is a delight and an honour to pen this message for our journal. The entire editorial board is proud that the third issue is being published amidst the ongoing pandemic.

YIMF Academia comprises of like-minded, driven and, highly ambitious young minds who believe that nothing should come between students and knowledge. The objective of each and every member is to keep the baton of knowledge in circulation.

In an attempt to make the third issue of volume 1 distinctive, the editorial board, after much discussion and deliberation, chose Aviation and Space law, which remains one of the least explored areas of law, as this year's theme. With the constant development in technology with each passing year, the said subject-matter is bound to undergo substantial change and thus, with this theme, we have provided the young minds an opportunity to explore the unexplored.

The third issue of the current volume has been made possible by the editorial board members and my highly distinguished fellow editors. The constant guidance of Mr. Eshaan Bansal and Adv. Priyam Jinger has been instrumental in the entire process.

Regards,
Shagun

Table Of Contents

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SPACE LAWS: A GENERAL OVERVIEW[1]

INTRODUCTION:

The article looks at the relevance of the International Space Laws regime against the current backdrop of development in space activities and technologies. With new steps being taken to further exploit outer space and with increasing talks about the offing of new space missions and discoveries, the archaic space law is placed under scrutiny. A flurry of international space activities and developments has raised the question about the credibility of outer space laws in dealing with 21st -century challenges. It explores the issues and challenges arising out of human exploration, environment pollution, militarization, and space debris. The advent of 'space tourism', which demands the law of outer space to vary and adapt to this revolutionary development, with the principled participation of private players. It throws light upon the arrival of private enterprise and how it has led to astounding leaps in technological application while simultaneously complicating issues of liability and responsibility. The paper also highlights issues involving IPRs in respect of inventions made or used in outer space which might require harmonized international norms for their solution. Further, it evaluates the legal lacunae, and suggestions are made to encourage the documentation of a new comprehensive legal framework for space laws.

[1] **Author: Sonal Narayan**
Delhi University

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EVOLUTION OF SPACE LAWS

The expansion of space laws dates back to when U.S. President Dwight D. Eisenhower introduced the concept into the United Nations in 1957, in connection with disarmament negotiations. Following the successful launchings of the Soviet satellite Sputnik 1 in 1957 and the U.S. satellite Explorer 1 in 1958, both the United States and the U.S.S.R. took an active interest in the advancement of international space policy. It was established that traditional laws of sovereignty that allow any nation to claim to be uninhabited and uncivilized lands are not viable in space lands and that countries cannot extend the frontiers of their dominion indefinitely into the space regions above them. In 1959 a permanent Outer Space Committee was formulated to maintain the United Nations Charter and other international law in space, which opened the way for peaceful exploration[2]. In 1963 the Nuclear Test Ban Treaty was signed after an Outer Space Committee resolution to interdict nuclear weapons testing in space. Later that same year a UN General Assembly declaration acknowledged international interest in space development and delineated rules assigning each nation individual responsibility for dealing with transgressions of international law and for any resulting destruction. International cooperation was thus recommended for safeguarding the interest of all astronauts in times of crisis.

THE UNITED NATION TREATIES – A CORNERSTONE OF SPACE LEGISLATION

Space Laws is a conglomeration of international and domestic agreements and guidelines that govern matters like the use of outer space, space exploration, space debris, militarization, weapon use and liability for damages. It involves other fields of law from criminal, commercial, insurance law to property and environmental law.

The United Nation treaties is the most significant cornerstone of Space Legislation. In 1957, the launch of Sputnik-I, into the orbit, led to the establishment of the Committee on the Peaceful.

[2] The Space Laws, Britannica.com

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Uses of Outer Space ("COPUOS") by the United Nations (UN), which further created two sub-committees,[3] namely:

- A legal sub-committee
- A scientific and technical sub-committee

COPUOS has since then been the forbearer in formulating the international law on outer space consisting of five treaties, namely: The Outer Space Treaty, the Liability Convention, the Registration Convention, the Return and Rescue Agreement and the Moon Agreement.[4]

The "Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space including the Moon and Other Celestial Bodies" was one of the five international treaties which were negotiated, signed and drafted in 1967 by the United Nations which is commonly referred to as " The Outer Space Treaty" or the "Magna Carta of Space". The agreement states that each nation will be responsible for any of the space activities originating from their nation whether they're conducted by citizens, companies or the government per se. This treaty precisely forbids the use of outer space for testing and deploying weapons of destruction including nuclear devices. For it treats outer space as the "common heritage of mankind" meant for peaceful uses.[5] This document has been noted as a lodestar in the development of international space law; like most other subsequent space law agreements effectuated by the United Nations, it remains effective even today among participating countries. The treaty was observed in 1968 by an Agreement on the Rescue and Return of Astronauts and the Return of Objects which were launched into Space, to safeguard interest of humans in space, affirmed each states the power of management over the spacecrafts they launch and determined the liability of each states for recovery of equipment. The 1972 Convention on International Liability for Damage Caused by Space Objects was another relevant treaty that contours the rules which deals with recovery of damages caused by space objects.

The Liability Convention is an extension of the outer space treaty, 1968 which imposes liability on the states for any damage it creates in outer space and other territories through its space

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[3] Vasu Manchanda and Kshitij Dahiya- Indian Space Age: The need for Space Legislation
[4] Space Laws Treaties and Principles, UNOOSA available at https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties.html
[5] Radhakrishnan Rao, The strategic importance of space laws in India, IDR.

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activities. The return and the rescue agreement deals with giving potential support to the astronauts in case of unintended landings and taking all possible steps to rescue astronauts[6]. The Registration Convention requires registration with the United Nations before sending something to space. India has been a signatory to this treaty and has conformed to the standards by providing information to the secretary-general of the UN for inclusion in the United Nations Register. The last treaty, The Moon agreement elaborates upon the provisions of the Outer Space Treaty and underscores the fact that the Moon and its natural resources are the common heritage of mankind and that an international procedure should be established to curb its exploitation.

NEED FOR SPECIAL SPACE INTERNATIONAL REGIME

In the Modern era, technology plays an inevitable and indispensable part in human life. Space technology helps in the attainment of sustainable development of mankind and blosters the outer space legal framework. Just as the development of navigation led to the advent of the law of the sea and development of aviation, to the law of the air, the spectacular success accomplished by man in the exploration and use of outer space led to the establishment of an international legal regime on space which consists of multilateral treaties, soft law instruments and general principles of law recognized by civilized states.[7]

These laws were back then developed at the time when space activities were limited to exploration of unknown celestial bodies and space probes. But the consistent proliferation of commercialization, privatization of outer space, deregulation of space activities and the growth of globalization has destabilized the primordial international space regime. The entente on which space law is based was contrived at a time when governments dominated space activities and commercial space ventures were just at the outset. These agreements now remain inadequate for the 21st century and require review. Therefore a special regime needs to be developed to protect the outer space environment and safeguard the interest of space entrepreneurs of our present times.

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[6] Resolution adopted by General Assembly ,UNOOSA available at https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/liability-convention.html

[7] J.E.S. Fawcett, Outer Space (1984) and M.N. Shaw, International Law (2003)

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SPACE ACTIVITIES AND ENVIRONMENT POLLUTION

The inexorable march of space technology has created significant opportunities for benefits to humankind. However, issues involving environmental impacts because of space activities and solicitude for the protection of the space environment are spawning.

Space law recognizes the rights of the states in the exploration and use of outer space, including the moon and other celestial bodies. Since space activities are carried on from the earth's surface to outer space through the air space, they are a source of potential harm to the environment on the earth's surface, in the air and outer space. In some cases, the ramifications of space activities may be caucus while in others they may be grave. The environmental protection, as understood in Space Law, receives a dual form: the forward and the backward one.[8] 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 environmental protection concentrates on Earth's protection from contamination by a space objects . Though these general principles and certain specific rules have been incorporated in the existing space law regime it doesn't provide adequate protection.

Outer space has been exacerbated by hefty carbon dioxide emissions due to the burning of solid rocket fuels. The trace gases which are released by the rocket engines in the upper atmosphere contribute much to the ozone depletion and particles of soot. The enormity of space junk is a mounting concern as disused satellites and other objects accumulate in our earth's orbit. Space debris has also grown to be a significant problem for outer space activities causing fraught. The increasing amount of debris is raising the risk of collision with operational satellites. The pollution of space with debris must be seen as an unfavourable circumstance that accompanies the space activities which needs to be controlled. Beyond this rather technical perspective, the presence of man-made, nonfunctional objects in space represents a global environmental concern. Under Article IX of the Outer Space Treaty, states are obliged to avoid the harmful contamination of outer space. The States and their respective agencies are bound to perform their exploration in a manner that avoids contamination of both extraterrestrial and the Earth environments. The

[8] For more information see (Conley & Rettberg, 2011)Conley, C. & Rettberg, P., 2011. COSPAR Planetary Protection Policy - Present Status. In: M. Hofman, P. Rettberg & M. Williamson, eds. Protecting the Environment of Celestial Bodies. Paris: International Academy of Astronautics Cosmic Study (PECB), pp. 16-24.

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provision commensurate to the obligation to protect the environment in areas beyond the national jurisdiction under the customary "no harm" rule of general environment law factor of space popularization. At the same time, it contours that the existing legal framework does not seem to efficiently respond to the challenge. Rather than adapting the current air space and outer space rules, it would be preferable to establish a comprehensive special regulation for future space tourism.

SPACE TOURISM

Activities linked to space tourism have gained momentum over the years and we have seen a remarkable achievement with the flight of SpaceShipOne, the first private crewed spacecraft which crossed the Karman line. [9]There has been a large public interest in human space flights despite their exorbitant cost. In 2001, American businessman Dennis Tito became the world's first space tourist to pay his way and thereafter twenty-eight-year-old South African multimillionaire Mark Shuttleworth at the International Space Station (ISS) in April 2016 and April 2002.[10] To date, orbital space tourism has been performed only by the Russian Aviation and Space Agency. A capsule-styled spacecraft is being developed by Blue Origin, a company owned by Amazon.com co-founder, Jeff Bezos. Work also continues towards developing suborbital space tourism vehicles which are mainly being done by the Virgin Galactic company. In addition, SpaceX, a private space company founded by South African-born Elon Musk, has announced its planning on sending two space tourists on a loop around the Moon. Most recently, in the summer of 2020, SpaceX launched two NASA astronauts and made history in the world of privately-funded space travel with their Dragon and Crew Dragon spacecraft.

The growth of space tourism is leading to a substantial development in the arena of aerospace technology and will enable routine human access to space. Although space tourism is still in its infancy, it is estimated that the number of space tourists will reach the hundreds.[11] As space tourist activities increase, accidents will inevitably occur, which will give rise to legal questions relating

[9] Tim Sharp,SpaceShipOne: The first private spacecraft available at - https://www.space.com/16769-spaceshipone-first-private-spacecraft.html
[10] Zhao Yun, A Legal Regime for Space Tourism: Creating Legal Certainty in Outer Space, 74 J. Air L. & Com. 959 (2009) https://scholar.smu.edu/jalc/vol74/iss4/6
[11] Sundahl 2009 *Journal of Space Law* 164

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to the duty of states to rescue space tourists in distress, and the liability for damages. The current outer space treaty regime, which emphasizes the use of outer space by states, is to a large extent outdated and unable to deal with these questions concerning the private commercial use of space. The progressive attitude made in this domain suggests that space tourism could become a factor of space popularization. At the same time, it contours that the existing legal framework does not seem to efficiently respond to the challenge. Rather than adapting the current air space and outer space rules, it would be preferable to establish a comprehensive special regulation for future space tourism.

DEMILITARIZATION OF OUTER SPACE

During recent years, it has become ostensible that space has become an important theatre for military activities and aspirations of hegemonic powers. This process is still in its early stage, but there should be no doubt that it's taking place already.

There is no doubt that space is tottering and becoming a less stable environment, even as it holds the promise of becoming a new source of human prosperity. It has been agreed for many years that space should be used for peaceful purposes and the benefit of all humankind. The United Nations General Assembly had a vote on a resolution called the "Prevention of Outer Space Arms Race" where it reiterated the basic framework on international space laws, saying that space should be reserved for only peaceful purposes. It is observed that almost 75% stationed in the outer space orbit performs military tasks such as surveillance, early warning, communication and navigation. The military capabilities of satellites have inspired the military planners to develop anti-satellite weapons and are focused on militarization and weaponization of space to establish their hegemony over the other military users of space.[12] It is not only missiles that can traverse outer space or satellites that can spot targets and guide the missiles, but weapons could be permanently placed outside the Earth's atmosphere, and then, on a signal from the earth, bombard target bases and cities.[13]

[12] Challenges to Security in Space, Defence Intelligence Agency.
[13] PN Tripathi, Weaponization and Militarisation of Space.

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The international community recognizes that the existing legal regime is inadequate for halting the encroaching militarization of space. Article 4 of the Outer Space Treaty addresses that the moon and other celestial bodies must be used exclusively for peaceful purposes. It doesn't inherently prohibit military activities. The bar is exclusively on nuclear weapons and weapons of mass destruction. There's no prohibition on things like setting up military bases, conducting weapons testing, or bringing weapons into space, so long as they aren't weapons of mass destruction and comply with other Outer Space Treaty requirements. [14]The current laws and treaties have lost their significance, and they are not taken into account while planning future operations. The outer Space Treaty is legally too weak to inflict punishments and sanctions for breaking the rules.

INDIA'S POSITION IN SPACE LAWS

India has a highly esteemed position in space technology today. India's tryst with space began in 1962 with the setting up of the Indian Research Space Organization (ISRO) under the auspices of Dr. Vikram Sarabhai. Subsequently, it was the launch of India's first domestically designed satellite, Aryabhatta, which impelled the country's technological advancement in the realm of space. Consequently, ISRO has launched over 300 satellites for 33 different countries in 2019 which is laudable.

Since then India's effort has been engaged in several missions with applications in areas of communication, broadcasting, meteorology, oceanography, a survey of natural resources, monitoring the environment and predicting disasters. India unshackled itself from hegemonic powers and thereby became the seventh nation in the world with indigenous satellite launch[15]. Then came the colossal launch of Chandrayaan (The moon mission) and Mangalyaan (The Mars Orbiter Mission) in 2008 and 2014[16] respectively which brought laurels in the country and its proficiency in space technology

The ISRO has made huge strides in space technology and put India on the world map as a space-faring nation but comprehensive national space legislation, and policy regulating space activities

[14] Pawel Barnet, The inevitability of Militarization of Outer Space.
[15] Senjutti Mallick, Why India needs Space Laws , The Hindu
[16] Supra

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operation undertaken by private and public players in other countries is yet to ensue. India is emerging as an eminent player in the international commercial space market. With the Indian Government making vigorous efforts to use space technology to drive a range of developmental and governance activities in the country, the need for a well-conceived space act has become all and more pronounced. The laws of contract, transfer of property, stamp duty, registration, copyright and patent among other relevant statutes must be revised to bring space-related issues into the domestic laws.[17] Increased private participation in Indian space activities would allow ISRO to concentrate on cutting edge areas of research and focus on a deep space probe.[18] There is a need for congenial space legislation which has provisions to boost the participation of private players in the galloping Indian Space activities. Domestic laws presently applicable, especially intellectual property right (IPR) laws have not been revised to include space-related matters. India has also a comprehensive remote sensing national policy, yet no national law. In order to foster the growth of the Indian space industry and enable private entities to contribute towards making India a space superpower, robust space legislation is all the more imperative.

ROLE OF PRIVATE PLAYERS IN SPACE DEVELOPMENT

The space sector can play a major catalytic role in the technological enhancement and expansion of the state's industrial base. Over the years we see an increase in the private sector participation in the entire range of space activities. Private space enterprise has demonstrated that it is a potential capability and arguably cheaper than the national space agencies when it comes to exploring and developing outer space.[19] Private commercial space enterprises can get the work done just as well as any national space agency and even more efficiently. Incidentally, India is among a handful of countries with advanced capabilities that have calibrated their position in the space sector and can play a significant role in boosting the industrial base in the country. Recently, the Union Cabinet has approved the creation of the Indian National Space Promotion and Authorization Centre (IN-SPACe) to provide a level playing field for private companies to

[17] Surendra Kumar Yadav; International Space Law applicability in Indian Perspective.
[18] Radhakrishna Rao, *The Strategic Importance of Space Laws for India,* IDR http://www.indiandefencereview.com/news/the-strategic-importance-of-space-law-for-india/
[19] Zach Meyer, Private Commercialization of Space in an International Regime: A Proposal for a Space District, Northwestern journal of international law and business, Vol 30.

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use Indian space infrastructure. This is a part of reforms aimed at driving a boost to private sector participation in the field of space-related activities. The creation of IN-SPACe will work towards the goal of greater involvement of private industry, academic institutions and research organizations in India's space sector. With these reforms, the sector will receive new zeal and dynamism, to help the country leap forward to the cutting edge of space activities.

India was one of the major contributors to the UN's Outer Space Treaty to ensure states acted in good faith when using space for peaceful purposes. While India is a party to the Outer Space Treaty, the country did not have any formally legislated laws. The Space Activities Bill 2017 was the Centre's first institutional step towards promoting private participation in the space sector. It drew considerable flak for not thinking through the private sector's concerns, but since then also seems to have been sidelined. There has been no formal law in the country that provides any framework for creating a private space venture. There is a lack of clarity as to how private parties would respond to the opportunities available, due to the absence of enabling specific laws in the arena of space.

ROLE OF INTELLECTUAL PROPERTY RIGHTS IN SPACE LAWS

Considering the paradigm shift in the trends of Outer Space activities from the government to non-government players, it is quite apparent that an international legal framework must be established to address IPR issues arising out of Outer Space Activities. With the advent of globalization and increase in commercialization and privatization of agencies, these non-government entities are circumspect of their property which is both tangible and intangible forms. In a situation where a dispute arises regarding the protection of their property, there is no international legal regime of laws to resolve the disputes. Thus, to resolve the concerted issues of ownership and rights of use, distribution, confidentiality, etc at a global level, there is a necessity to have an efficient international regulatory regime of laws. Another reason for the need for IPR for outer space is to encourage innovators, researchers, and scientists to provide for future business opportunities in the advancement and development of space technology. If protection is given to their invention through pertinent IP laws, it provides an environment where people are more encouraged to work

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in the area. For example, protecting research conducted to make a blueprint of a sustainable habitable environment on Mars.[20]

Though the regime of intellectual property is governed by national laws, international entities like the World Intellectual Property Organization (WIPO) and the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) have succeeded in harmonizing the IP laws to some extent, worldwide.[21] However, such harmonization is not sufficient for extending such protection to space-related activities and inventions. The need of the hour is to establish a uniform legislative regime governing IP laws in space so that even the developing countries can benefit from their creations rather than being overshadowed by the developed ones.

[20] Diganth Raj Sehgal, Need for Intellectual Property Rights in Outer Space, Ipleaders https://blog.ipleaders.in/need-intellectual-property-rights-outer-space/

[21] Intellectual Property and Space Activities, Issue paper prepared by the International Bureau of WIPO, April 2004

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PEACEFUL USE OF OUTER SPACE: A VANISHING POINT IN LEGAL JURISPRUDENCE

The confederated U.N Treaties, Agreements, Conventions etc, have given rise to the legal aspects of space, termed as 'Space Law'. The United Nations has been since then charged with providing the legal framework for the greatest technological challenges. The broad international cooperation has thus substantially contributed in the economic and technological advancement. Beside the progress they have also recognised the common interest of all mankind in the exploration and use of outer space for peaceful purpose but there has also been a significant negative impact on the outer space and the earth environment.

The Outer Space treaty which is the bedrock on which all fundamental principles and policies of international space has now become insufficient against the current development of space activities and exploration. Technological advancement have enabled space activities and private operators who have not coalesced into the existing legal system. The commercial exploitation of outer space and space debris is one of the most critical issues that will thrash international community soon. While a need to have a comprehensive IP law that will rise in its relevance as the technology and its applications evolve. As the commercial space activities are growing there is a need to have an amenable legal environment. Lamentably, the extant space law consists merely of some intergovernmental treaties negotiated during the cold war, which are quite inappropriate for business. There is a need to find an equilibrium between the need for treaties to be amended and the protection of evidently safe issues. The space law is splintering, and the lack of consensus may lead the current edifice to fall apart. Thus with the view to ensure orchestrated and peaceful space exploration and exploitation, there is a substantial need to have certain international regulatory and legislative changes. The International community must strive for sustainable development goals which can only be achieved through a comprehensive legal policy.

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SPACE LAWS: INTERFACE WITH ENVIRONMENTAL PROTECTION[22]

INTRODUCTION

Today's era is of science and technology, and space exploration forms a central element in the world of research and development. Space, being a global common i.e. not owned by a single person but shared by the whole world, is prone to misuse. To avoid this, there are certain laws, agreements, treaties and regulations that govern space-related activities, domestically as well as internationally. This body of laws is termed as space law. It covers issues like rules for exploration, weapon use, liability for damages, rescue efforts for astronauts, environmental regulation etc. [23]

The recent cases of Australian fires, fires in Amazon Rainforests in Brazil, the global pandemic and many more such incidents that have been triggered due to environmental issues have brought our focus on environment protection. Space advancements have no doubt brought strategic changes in our conception of the environment. For example, satellites provide early warnings of natural calamities and help to monitor remote areas like Antarctica so that a holistic picture of Earth's environment could be formed. But this increasing space activity is impacting the environment, inside and outside the Earth. Therefore, environmental protection is not only limited to Earth; technological advancement has made it important to protect not only the inner atmosphere of Earth but also the outer space environment.

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[22] **Author: Muskan Garg**
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[23] legalcareerpath.com, What is Space Law? - Becoming a Space Lawyer.

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HOW IS ENVIRONMENTAL PROTECTION CONNECTED WITH SPACE EXPLORATION?

According to research undertaken by different space exploration organizations like ISRO, NASA, etc. there is a possibility that extraterrestrial life exists in the solar system but there are twin concerns. Firstly, Earth life has the potential to contaminate other planets and celestial bodies and secondly the possibility of importing alien contamination into Earth's biosphere. As the space exploration race grew in the 1950s, the need for responsible behaviour towards space exploration was felt.[24] Lotta Viikari says, *"While decades of space ventures have led to significant technological advances, space activities have also brought increasing environmental problems."*

CHALLENGES IN SPACE ENVIRONMENT PROTECTION:

According to Tronchetti, there are four main things that create the need for common space laws. These are technological advancement, increased capabilities of states to launch satellites into orbit, the rise of new commercial activities and the emergence of a new legal and technical issue that was not foreseen while drafting the treaties. These challenges directly or indirectly point towards the environmental degradation from space activities. For instance, technological advancements are the prime reason for environmental contamination on Earth. Further, with the advancement in space technology, space launching vehicles might release harmful gases in the environment that could pollute the environment. The increased capabilities to launch more and more space exploration vehicles create concern about the increased pollution. There are certainly other issues in space exploration that bring our attention to the resulting environmental damage.

- **Space debris:** The increasing space activity has led to a huge accumulation of space debris. It consists of defunct satellites that are no longer in use and those tools which are lost during extravehicular activities. It creates a problem because it can hamper navigation of operational space crafts and can collide with working satellites and obstruct their transmissions. The collision of satellites in orbit in 2009 is a major tragedy due to space

[24]nih.gov, Special Feature: Planetary exploration in the time of astrobiology: Protecting against biological contamination.

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debris.[25] The increased debris also enhances the risk of radioactive contamination i.e. deposition of radioactive material on an object or person which if released into the environment can cause contamination of air, water, surface, soil etc. it can lead to acute health effects like skin burns and chronic diseases like cancer.[26] Kleiman also says that it would become virtually impossible to operate spacecraft in earth orbit if debris continues accumulating.

- **Increasing private sector role in space**: Privatisation is often accompanied by profit maximisation. Therefore increasing private sector participation in space activities raises concerns about the resulting environmental damage, in want of maximising profits. Therefore it becomes important for states to review the current policies and rules to avoid the misuse of space innovation. Another issue involved in the privatisation of space activities is space tourism. This idea became true when Danis Tito went to the International space station with the help of Russia in 2001. As Russia has declared its plan to introduce a space tourist programme, it becomes very important that the protection of tourists is taken care of. The idea of private sector participation is more criticized because the international treaties outline the role of states rather than individuals, which creates a scope of escape from safety concerns for the private player.

- **Space flight pollution:** When rockets are launched, there are certain emissions of gases and particles into the atmosphere. The extent of damage caused due to such emissions is not even estimated. This raises the concern about potential damage to the Earth's environment. Additionally, those rockets that reenter the Earth's atmosphere generate re-entry smoke particles that have an unknown reactivity and composition. These particles could be so reactive that they could gravely impact the chemistry of the atmosphere.[27]

- **Forward and Backward contamination:** During a space probe or spacecraft launch, there could be either deliberate or unintentional biological contamination of a planetary body.

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[25] Dr. Dionysia Theodora Avgerinepoulou and Katerina Stolis, *Current Trends and challenges in International Space law* https://www.essc.esf.org/fileadmin/user_upload/essc/Article_Current_Trends_and_Challenges_in_Space_Law.pdf.

[26] www.epa.gov>radiation.

[27] Leonard David, *Spaceflight pollution: how do rocket launches and space junk affect Earth's atmosphere*, (Nov. 27, 2017), https://www.space.com/38884-rocket-exhaust-space-junk-pollution.html.

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This is called interplanetary contamination. The main problem created by this contamination is that it becomes difficult to track whether the life form is native to that planet or not. It becomes an obstacle in research on the origin of life. There are 2 kinds of this type of contamination:

1. Forward contamination: Transfer of life and other forms of contamination from Earth to other celestial bodies. It could be prevented by sterilization of spacecraft.

2. Back contamination: It is the introduction of an extraterrestrial organism and other forms of contamination in Earth's atmosphere from other planets. This concept is based on the possibility of microbial life on other planets that could transfer from the original planet to Earth through space vehicles. The method of sterilization adopted in forwarding contamination could not be used in material or samples brought from other planets because that would destroy the whole purpose of research. Containment or quarantine is the adopted approach to prevent back contamination. [28]

There is a need for preventing both types of contamination because both types of contamination contain a possible risk of environmental contamination. On one hand, forward contamination will pollute the environment of other planets & probably the life forms existing on other planets will get disrupted. On the other hand, back contamination will pollute the earth's environment due to the introduction of alien particles and can pose danger to earth life forms.

- **Other potential harms from space missions:** Space launches are majorly responsible for ozone depletion in the stratosphere. Every rocket engine requires some sort of chemical reaction which may produce gases and these gases left behind can damage the ozone layer. Although the damage done by space rockets is lesser than that done by vehicles and other human activities, still, there is need for judicious use of space technology. [29]

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[28] *What is Interplanetary contamination?*, THE INDIAN EXPRESS, (July 28, 2020), https://www.civilsdaily.com/news/what-is-interplanetary-contamination/.
[29] Giles Sparrow, *Are rocket launches bad for the environment? How it works?*, (Dec. 9, 2013), https://www.howitworksdaily.com/are-rocket-launches-bad-for-the-environment/

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STEPS TOWARDS PREVENTING SPACE ENVIRONMENT CONTAMINATION:

The possibility of space contamination has led to different restrictions and affirmative actions. For instance, the current solar system exploration programmes are designed to prevent biological contamination and the imposed restrictions are known as planetary protection or planetary quarantine.[30] In 1959, an international group for discussing space activities and related agreements was formed. It is named COPUOS (Committee on Peaceful Use of Outer Space).

DIFFERENT TREATIES PROMOTING A HEALTHY ENVIRONMENT IN OUTER SPACE

Between 1967 and 1979, five different treaties for judicious space exploration were signed. The five treaties are:

- The outer space treaty (Treaty on Principles governing the activities of States in the Exploration and Use of Outer Space, including the moon and other celestial bodies)
- The Rescue Agreement (Agreement on the Rescue of Astronauts, the return of astronauts and the return of objects launched into outer space)
- The liability Convention (Convention on international liability caused by the Space Objects)
- The registration convention (Convention on registration of objects launched into Outer space)

[30]nih.gov., Special Feature: Planetary exploration in the time of astrobiology: Protecting against biological contamination.

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- The moon Agreement (agreement governing the activities of states on the Moon and other celestial bodies) [31]

Out of these, the treaties that cover space-environment are:

1. Treaty on Principles governing the activities of states in exploration and use of outer space, including Moon and other celestial bodies: It came into force on 10 October 1969.

- Article IV of the treaty refrains the countries from placing nuclear weapons or any other mass destruction weapons in orbit around Earth. The treaty completely forbids the "establishment of military bases, installations and fortifications, the testing of any type of weapon and conduct of military manoeuvers on celestial bodies." In this way, the treaty is an important step towards promoting peace on one hand and preventing the contamination of the space environment from nuclear or other hazardous weapons, on the other hand. It is a widely recognised fact that nuclear tragedies not only pollute the environment but also cause other implications. The Chernobyl nuclear disaster in Ukraine is a devastating memory for the whole world. Therefore getting a consensus on the prevention of space from nuclear weapons is a remarkable initiative.

- Article IX of the treaty strictly mandates the states to avoid harmful contamination and adverse changes in the environment of Earth resulting from the introduction of extraterrestrial (outside the earth atmosphere) matter. It also advises the states to take action for preventing the same.

United Nations Treaty on outer space, 1967 also mentions this point that "space missions would conduct exploration to avoid harmful contamination and adverse changes in the environment of Earth resulting from the introduction of extraterrestrial matter."

2. Convention on International Liability for damage caused by space objects mentions that a state who is launching something is liable to pay compensation for damage caused by its

[31] https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties.html.

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space objects on the surface of Earth. There is also provision for damage caused elsewhere than the surface of Earth in Article III of the treaty.

3. Moon Agreement, 1979: Article 4 of this treaty calls for the "establishment of an international regime to govern the exploitation of natural resources" and Article 7 (d) introduces the concept of equitable sharing in the benefits derived from those resources. Thus the treaty recommends equitable sharing of resources between different countries to promote the judicious use of resources that will be founded on other planets. It's a universally acknowledged fact that the war for resources, whether it is oil and natural gas, is one of the main reasons for environmental degradation. Therefore, having a treaty for international cooperation in the use of resources found outside the Earth will not only avoid wars but also the consequential environmental damage due to wars.

4. In 2009, "Space Debris Mitigation Guidelines of the committee on the peaceful use of outer space" was adopted for limiting debris released during spacecraft operations, to minimise the potential for break up during operational phases, to minimise the possibility of accidental collisions in orbit, prevent international destruction and avoiding long term spacecraft presence in earth orbit after the end of mission. Although the guidelines are not binding instead voluntary, still its impact is far fetched because all major organisations and actors in outer space have adopted these guidelines. [32]

[32] www.unoosa.org>spacelaw>spacedebrismitigationguidelinesofthecommittee.

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CONCLUSION

As space exploration is increasing day by day and many private companies like SpaceX are also becoming an important part of space activities, it becomes important to have concrete legislation to prevent the contamination of the space environment as well as earth environment from space activities. The treaties and conventions are like soft laws (that are not legally binding but useful in preventing controversial situations among countries by enhancing understanding among the states). Therefore, the rules outlined in the treaties are more of duties rather than obligations which create a possibility for escaping the provisions through loopholes. Also, certain states have refused to sign these treaties because they think that this will limit their power. For instance, the moon treaty of 1979 has only 17 signatories with no major country like the USA, because of its clause promoting equitable distribution. Therefore global cooperation is necessary to devise a strict rule that could apply to all states who violate the provisions of space laws. Certain issues like privatization, space debris etc. which are not addressed in any convention or treaty urgently need legislation to minimise the harm. Long term space sustainability is the need of the hour and therefore revamping and revisiting the old treaties to modify them according to changing times is very important.

It is a fact recognised by all the treaties that all states have equal claim over outer space and no single country could claim sovereignty on space. This creates the need for uniform space laws, even more. In the end, it can be concluded that:

"Coordination in Space laws is very important because the loss to every country from contaminating the space environment is very potent."

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PRIVATE PARTICIPATION IN THE SPACE SECTOR[33]

INTRODUCTION

The participation of private sector in space exploration started way back in the 1960's. But, the 21st century experienced a sudden splurge in such participation with the entry of companies like SpaceX, Virgin Galactic and Blue Origin expanding their area of operation. Now with the increasing demand for space exploration and related activities governments of different nations have started relaxing their rules and regulations and have started making new laws and legislations to ease private participation in the Space sector so that they can aid the government in such projects as well as start their own individual missions. There is no limit to space exploration, so if done carefully and judiciously great advancements can be made in the field of science and technology providing new information to the humankind about the universe above.

Outer space, a world which one would have believed to be a place impossible to reach and way beyond human capabilities, got ventured through with the launch of the first-ever artificial satellite, Sputnik 1 in 1957, by the space giant, the country Russia, opening up a new world for human exploration. The launch is followed by continuous developments leading to satellite launches by many other countries like the USA, India, France and Japan. Later, more greater achievements were witnessed like Apollo 8, the first manned mission to the moon and the first orbiter mission to the red planet Mars. With even greater leaps there seems to be no limit to what can be accomplished. It should be noted that all of these were majorly state-controlled and state-funded initiatives.[34]

Now, we have entered an era when not only the governments of different countries but also the private sector have been given the liberty to put their resources together and reach the universe

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[34]Major Milestones, Space Exploration Britannica https://www.britannica.com/science/space-exploration/Major-milestones.

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above, i.e., space while ensuring proper compliance with the laws set by the national and the international authorities regarding the same.

The first-ever private mission to space can be traced back to 1961 with the launch of the OSCAR 1 (Orbiting Satellites Carrying Amateur Radio) satellite, it was built by a group of California based radio operators and was operated for around 20 days and became the world's first non-governmental satellite.[35]

The rest of the 20th century did not encounter any major development regarding private sector participation in space programmes but the 21st century has till now witnessed world's six and extraordinary private participation in related projects with companies like SpaceX, Virgin Galactic and Blue Origin making their mark by bringing to life great technological advancement and governmental space industry and exploration activities.

WHY PRIVATE PLAYERS?

- ***What private participation essentially means:***

Privatization of any sector in an economy refers to the transfer of ownership and control of a business, industry or service from the government to the private sector of an economy. This does not necessarily mean complete transfer, it can be partial also.

With respect to the context of the space industry, lately, the governments of different countries have moved towards privatization by transferring partial ownership and command of the space industry to the private sector as well as towards liberalization by easing the norms, rules and regulations for the operation of the private sector which were previously restricted.

- ***Why have they been given a green signal to enter space?***

The reason for this move towards liberalization can be attributed to the need for the private sector to provide a level playing field to the government sector, competing with them by constantly improving and at the same time helping and supporting each other to make up for the inefficiencies.

[35]Communications satellite, Oscar 1, https://airandspace.si.edu/collection-objects/communications-satellite-oscar-i/nasm_A19640011000.

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Moreover, with the rising demand for space-based applications worldwide, it is becoming difficult for government organizations to cater to all those needs alone.[36]

Private companies have entered the exploration domain to propel the sector forward more vigorously and swiftly than it would be in the case if left to governments alone.

CURRENT SCENARIO OF PRIVATE PARTICIPATION

Private participation in space is not a new concept, it has been happening pretty consistently since the 1980s, however, then it was restricted mainly to the manufacturing, fabrication and testing of rockets and satellites in many countries like India and in countries like the USA it involved building and launching satellites into low Earth orbit. But from the past decade, they are getting relaxations and opportunities to such an extent that they have been given the freedom to also work towards sending cargo and crew to the International Space Station (ISS) and beyond.[37]

- **INDIA**

In June 2020, the Union Government of India made a historic decision as it approved the participation of private players in the entire range of space activities. The Cabinet approved the formation of the Indian National Space Promotion and Authorization Centre (IN-SPACe), which will act as an arm of the Indian Space Research Organization (ISRO).

This newly created center will act as an interface between ISRO and the private players and be a regulator as well as facilitator and ensure that there is optimum utilization of the available resources. The Indian industry barely has a three per cent share in a rapidly growing global space economy because of the lack of adequate resources technology, so IN-SPACe will on be increasing this participation by assessing the needs and demands of private players, including educational and research institutions, and explore ways to accommodate these requirements in consultation with ISRO.[38]

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[36] *India opens space sector to private players: What it means for ISRO,* FE, June 26, 2020, https://www.financialexpress.com/lifestyle/science/india-opens-space-sector-to-private-players-what-it-means-for-isro/2005105/

[37] Monica Grady, *Private companies are launching a new space race- here is what to expect*, THE CONVERSATION, October 3, 2017, https://theconversation.com/private-companies-are-launching-a-new-space-race-heres-what-to-expect-80697

[38] *Supra*, note 2

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According to Mr. K Sivan, the Chairman of ISRO, ISRO is ready to provide all its facilities to private players and support their space-related projects, which are approved by IN-SPACe. He also mentioned that if necessary, ISRO would even provide land to private players if they wish to set up their own launch pad inside ISRO's launch station in Sriharikota which will help them mitigate the large investments required to set up these facilities.[39]

- **USA**

USA is the country which has been in the forefront with respect to private space flights since the 1960s with the launch of OSCAR 1 in 1961 and Telstar1 in 1962. Talking about the developments that led to the current situation of immense private participation in the country:

- The private company SpaceX founded by Mr. Elon Musk working towards designing, manufacturing and launching advanced rockets and spacecraft since 2002 successfully launched and recovered its Dragon Capsule on its first mission in 2010, marking the first time a privately developed and operated spacecraft was recovered from orbit.[40]

  Then in 2012, the second mission of SpaceX's Dragon capsule completed a successful rendezvous to the International Space Station to deliver cargo, making it the first private spacecraft to do so.[41] The following years also experienced similar successful space missions.

  Most recently and most importantly, in May 2020, SpaceX launched NASA astronauts Bob Behnken and Doug Hurley into orbit on its Falcon 9 rocket and Crew Dragon spacecraft, becoming the first private company to take astronauts to space.[42]

- Virgin Galactic, a British American private spaceflight company operating in USA founded by Mr. Richard Branson in 2004 conducted a space test flight in July 2021 where Richard Branson and three other employees rode on a flight as passengers, Branson

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[39] *IN-SPACe to be the new space industry regulator, says ISRO chief Sivan*, THE HINDU, June 25, 2020, https://www.thehindu.com/sci-tech/science/new-space-industry-body-inspace-to-be-in-place-in-3-6-months-ksivan/article31911841.ece

[40] SpaceX launches success with Falcon 9/ Dragon Flight, Commercial Crew and Cargo, https://www.nasa.gov/offices/c3po/home/spacexfeature.html

[41] SpaceX Launches Falcon 9/ Dragon on Historic Mission, Commercial Space Transportation, https://www.nasa.gov/exploration/commercial/cargo/spacex_launch.html

[42] Michael Sheetz, *SpaceX launches two NASA astronauts to space for the first time in historic US mission,* CNBC, May 30, 2020, https://www.cnbc.com/2020/05/30/spacex-launches-two-nasa-astronauts-to-space-for-the-first-time.html

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becoming the first person to travel in his own spaceship. This test flight turned the idea of space tourism into reality.[43]

- Another US company, Blue Origin founded by Jeff Bezos, has been an active private participant in developing vehicles and technologies to enable commercial human space transportation. In 2015 the company successfully launched its New Shepherd launch System into space. On 20 July 2020, Bezos is all set to be on the first passenger flight of his space company along with his brother and the winner of the auction being held for one of the seats in the New Shepard flight. An operation very similar to what was conducted by Virgin Galactic.[44]

Many other US based companies like Scaled Composites[45] and Sierra Nevada Corporation[46] are actively working towards improving their presence in such space exploration activities.

- **OTHER COUNTRIES**

Luxembourg, a country in Europe and one of the wealthiest in the world has been making efforts to establish itself as the ideal location for carrying out new space ventures, especially for private participants. The result is that the country's space sector now consists of around 50 companies and makes up for about 2% of the GDP of the country.[47]

- On November 7, 2020, China launched Ceres-1, a new type of rocket that is just 62 feet in height, and is capable of taking 770 pounds of payload into low Earth orbit. Only a few might have realised the fact that it was a commercial rocket and not one built by China's National Programme. The nation's growing private space business is completely focused on giving tough competition to the USA in the space race.[48]

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[43] *Richard Branson takes off first in space tourism race*, THE HINDU, July 12, 2021 https://www.thehindu.com/sci-tech/science/billionaire-richard-branson-reaches-space-in-his-own-ship/article35268871.ece

[44] Michael Sheetz, *Jeff Bezos' Blue Origin to launch first space tourism passengers on July 20 and auction off a seat,* CNBC, May 5, 2021, https://www.cnbc.com/2021/05/05/jeff-bezos-blue-origin-space-tourism-flight-launches-july-20.html

[45] Portfolio, Scaled Composites, https://www.scaled.com/portfolio/

[46] What we do, Sierra Nevada Corporation, https://www.sncorp.com/what-we-do/

[47] Louis Brennan, *How Luxembourg is positioning itself to be the centre of space business*, THE CONVERSATION, July 17, 2019 https://theconversation.com/how-luxembourg-is-positioning-itself-to-be-the-centre-of-space-business-120436

[48] Neel V. Patel, China's surging private space industry is out to challenge the US, MIT technology review, January 21, 2021, https://www.technologyreview.com/2021/01/21/1016513/china-private-commercial-space-industry-dominance/

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- *"For the industry to realize sustainable growth, a shift from the government to the private sector is urgently needed,"* says Masanori Tsuruda from the Ministry of Economy, Trade and Industry (METI) of Japan.[49] In the private sector, the companies are working in collaboration with the government to deliver results to the public with the help of government funds and to ensure the accomplishment of the Space Industry Vision 2030, which is to double the size of the space industry in the country by the 2030s.[50]

HOW THEY COPE WITH GOVERNMENT ESTABLISHED ORGANISATIONS

The reality is that the Private players do not have to worry about coping up with government established organizations like NASA (National Aeronautics and Space Administration), JAXA (Japan Aerospace Exploration Agency) and ISRO as their work go hand in hand, a lot of the projects are in collaborations between the government and the private agencies.

Even if its a fully private mission the government organizations play the role of their biggest supporter as ultimately such initiatives improve a country's stand in the space industry.[51]

Moreover, many governments are also facing the problem of shrinking budgets, realizing that private players can invest in the industry and also earn a good profit, they back their participation. Though with high profit comes high cost and high risks, so to work efficiently they need a supportive environment.

As discussed before in countries like India, centres like IN-SPACe have been set up by the government with the sole purpose of assisting private organisations. Aimed at making available ISRO's ground and space-based infrastructure as well as its resources to interested organisations who wish to carry out space-related activities.

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[49]The rise of Japan into new space, Focal point on commercial exploration in Japan, https://media.nature.com/full/nature-cms/uploads/ckeditor/attachments/8865/00_Editorial_UK.pdf

[50] Hiroko Yotsumoto and Daika Ishikawa, The space law review, Japan, December 17, 2020, https://thelawreviews.co.uk/title/the-space-law-review/japan

[51] Sandhya Ramesh, *This is how government plans to bring ISRO, private players to boost India's space sector,* The Print, 20 August, 2020,https://theprint.in/india/governance/this-is-how-govt-plans-to-bring-together-isro-private-players-to-boost-indias-space-sector/486001/

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When it comes to the funding of these companies, with the increasing popularity of space exploration and commercialization, investors are viewing this industry as one which will definitely flourish shortly so are readily making serious efforts in the same. This trend is most prominent in the USA where companies have raised billions of dollars through investor funding.[52]

LAWS AND TREATIES THAT REGULATE PRIVATE PARTICIPATION

UN LAWS

The United Nations Committee on the Peaceful Uses of Outer Space (COPUOS) was set up by the General Assembly in 1959 to govern the use and exploration of space and ensure peace, security and development. One of the many tasks of this committee is to review international cooperation in peaceful uses of outer space and also studying legal problems arising out of the exploration of outer space. The committee also brought to life five treaties and five principles concerning the use of outer space.[53]

One of the five treaties is :

- The Outer Space Treaty i.e. The Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, 1967. It says that the exploration and use of outer space shall be carried out for the benefit and in the interests of all countries and shall be the province of all mankind. At the time when this treaty came into force, almost all the space activities were dominated by the public sector so the treaty was mainly state focused. However, Sec VI of the treaty does talk about " non-governmental entities" and *states Parties . . . shall bear international responsibility for national activities in outer space, whether such activities are carried on by governmental agencies or by non-governmental entities . . . The activities of non-governmental entities in outer space . . . shall require authorization and continuing supervision by the appropriate State Party to the Treaty.*[54] This means that outer space activities carried out by non

[52] Michael Sheetz, *Investment in space companies put at record $ 8.9 billion in 2020 despite covid,* CNBC, January 25, 2021, https://www.cnbc.com/2021/01/25/investing-in-space-companies-hits-record-8point9-billion-in-2020-report.html

[53] Committee on the peaceful uses of outer space, COPOUS 2021, https://www.unoosa.org/oosa/en/ourwork/copuos/index.html

[54] Outer Space Treaty, supra note 60, art. VI.

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governmental agencies are the liability of the respective government and subject to their jurisdiction. (write who has ratified these treaties)

- The Liability Convention that came into force in 1972 provides that a launching State shall be absolutely liable to pay compensation for damage caused by its space objects on the surface of the Earth or to aircraft, and liable for damage due to its faults in space.[55] What can be inferred from this is that the state will be responsible for the acts of private companies.
- The Registration Convention that came into force in 1976 provides that the governments of the respective countries are required to maintain a national registry containing every specific detail of every object that has been launched into space from that country's territory and also provide these registries to the Secretary-General for inclusion in the United Nations Register. Since it uses the word all objects, the objects launched by private players have to be included in this register too.[56]
- The Rescue Agreement that came into force in 1968 provides that *States shall take all possible steps to rescue and assist astronauts in distress and promptly return them to the launching State and that States shall, upon request, provide assistance to launching States in recovering space objects that return to Earth outside the territory of the Launching State.*[57] Again, since this treaty came into force in a year when no one would have imagined that even private players might need to carry out rescue missions of astronauts, hence this treaty only talks about the stand of states in such situations so this treaty fails to provide a framework for private actors.
- The Moon Agreement that came into force in 1984 provides that the Moon and all other celestial bodies should be used only for peaceful purposes and its environment should be protected and not disrupted. It also says that the Moon and its resources are a common heritage of mankind. According to the agreement, in the event of the establishment of a station on these bodies, the UN must be informed about the purpose and location of such establishment.[58]

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[55]Convention on International Liability for Damage Caused by Space Objects, Treaties and Principles, https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introliability-convention.html

[56]United Nations Register of Objects Launched into Outer Space, Space Object Register, https://www.unoosa.org/oosa/en/spaceobjectregister/index.html

[57] Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, Treaties and Principles, https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introrescueagreement.html

[58] Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, Treaties and Principles ,https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/intromoon-agreement.html

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Although these regulating treaties exist, they do not have much relevance to the current scenario of private participation and are very ambiguous in that aspect. Having come into force in times when private participation was just beginning, they were made mainly with the point of view of states only. One thing that is common in all these treaties is that it holds the government of the respective countries liable for the acts of the private sector too.

Another important point that must be noted is that out of all these treaties The Outer space treaty is the only customary international law meaning it is binding on all the countries, while the rest of the treaties are only applicable to those countries who have ratified it. It is quite apparent that these treaties need to undergo significant amends to fit in the era of extensive private participation in space exploration.

DOMESTIC LAWS

- **IN INDIA**

New Space India Limited (NSIL), incorporated on 6 March 2019 is the commercial arm of ISRO with the primary responsibility of regulating and enabling Indian industries to take up high technology space-related activities. It is also responsible for promotion and commercial exploitation of the products and services emanating from the Indian space programs.[59]

As per the Remote Sensing Data Policy, 2011 The National Remote Sensing Centre(NRSC) has been authorised to acquire and disseminate in India all the satellite remote sensing data acquired from national and international satellites for development purposes. Furthermore, the government reserves the right to impose control over imaging tasks and distribution of data from Indian remote sensing satellites, when it is believed that national security and/or international obligations and/or foreign policies of the government are required.[60] A space activities bill was drafted in 2017 to remedy this situation, however, the bill has not yet been passed by the Union cabinet of India (talk about what the bill contains). (citation) But the bill pays a lot of emphasis on the need to have a licensing regime to govern the activities of emerging Indian companies in the space sector. Then

[59] New Space India Limited, ISRO centers, https://www.isro.gov.in/about-isro/newspace-india-limited-nsil#:~:text=NSIL%20is%20the%20commercial%20arm,emanating%20from%20the%20Indian%20space

[60] Remote Sensing Data Policy (RSDP), Indian Missions, https://www.nrsc.gov.in/EOP_irsdata_Policy/page_1?language_content_entity=en#:~:text=Remote%20Sensing%20Data%20Policy%20(RSDP)&text=As%20a%20national%20commitment%20and,Sensing%20Satellites%20(IRS)%20programme.

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it includes common legislation for all the companies although they might be engaged in different kinds of activities, hence it does not provide the required regulatory clarity.

Thus, it can be said that, The Space Activities Bill would have been a poor candidate if the government had continued with it.[61]

Article 51 of the Indian Constitution states that in the absence of any domestic law, international law applies.[62]

It would not be fair to say that India has got proper space legislation in place, there are still many areas it lacks in. Having approved the functioning of a committee which is IN-SPACe that will lead to a heavy increase in private participation, the government does not have any proper law to regulate it.

- **IN USA**

Currently, the US is leading the domain of space exploration. It is also a part of four out of the five treaties mentioned before.

The 2020 National Space Policy replaced the 2010 National Space Policy. The Policy sets out *the nation's commitment to leading in the responsible and constructive use of space, promoting a robust commercial space industry, returning Americans to the Moon and preparing for Mars, leading in exploration, and defending United States and allied interests in space.*[63]This showed the country's interest in the commercialisation of space and its support to the private sector moving forward in the same.

The National Space Transportation Policy, 2013 includes guidelines for the commercial space transportation sector and recognizes the importance of commercial human spaceflight including both governmental and commercial spaceflight. Under this policy, the New Entrant Certification talks about the liberty that private companies have to compete for US government missions as long as they meet the technical criteria for certification. Overall this policy encourages NASA to

[61] Narayan Prasad, *Space Activities Bill, meant to boost private role, will create confusion instead,* THE PRINT, October 11, 2019, https://theprint.in/science/space-activities-bill-meant-boost-private-role-confusion/303950/

[62] Art. 51, The Constitution of India 1949

[63] National Space Policy, Space Policies, https://www.space.commerce.gov/policy/national-space-policy/#:~:text=The%20National%20Space%20Policy%20sets,and%20allied%20interests%20in%20space.

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collaborate with private sectors for the transport of cargo to and from the International Space Station (ISS) to make it cost-effective and to ensure that national resources are used as much as possible.[64]

Commercial Space Launch Competitiveness Act (the Act) that came into force in 2015 encourages commercial investigation of space assets and specifically asks the residents to take part in such investigation of space assets while confirming with the worldwide commitments of the nation as well as after getting approval from the Federal Government.[65]

It can surely be said that currently, the US has the best and most elaborative space laws in place as per the requirements of the present environment.

- **OTHER COUNTRIES**

In Luxembourg, the Law of 15 December 2020 on Space Activities that came into effect on 1st January 2021 marks an important milestone as it aims at diversifying and growth of the space industry especially by the inclusion of private participants It provide an attractive environment for investors and entrepreneurs to create an environment of competitiveness which would lead to the overall growth of the sector..[66]

The Law of 2017 on the Exploration and Use of Space Resources authorises private space exploration missions as well as utilization of space resources after getting permission from the competent minister or ministers of each mission.[67]

In Japan, the Space Activities Act came into force in 2018 creating a conducive environment by authorising space operations by private players. To grow the space sector, they are encouraging private participation by providing them with legal backing. To ensure proper functioning, the government has also put in place an authorisation process for launches and operation of satellites to confirm that they are properly equipped with the required resources, skill and expertise.[68]

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[64] National Space Transportation Policy, Space Policies, https://www.space.commerce.gov/policy/national-space-transportation-policy/

[65] U.S. COMMERCIAL SPACE LAUNCH COMPETITIVENESS ACT, PUBLIC LAW 114–90—NOV. 25, 2015 https://www.congress.gov/114/plaws/publ90/PLAW-114publ90.pdf

[66] Legal Framework, The Agency, https://space-agency.public.lu/en/agency/legal-framework.html#:~:text=Luxembourg%20ratified%20the%20Treaty%20on,(Liability%20Convention)%20of%201972.

[67] *Id.*

[68] Louis De Gouyon Matignon, All about the Japanese space law, June 5, 2020, https://www.spacelegalissues.com/all-about-the-japanese-space-law/

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BENEFITS OF PRIVATE PARTICIPATION

- One major reason for the promotion of private participants is to provide a level playing field to government agencies to increase their efficiency. And at the same time, they can also support each other by working on collaborative projects which would give the best results.
- The inclusion of the private sector allows better utilisation of available resources and helps the countries in becoming self-reliant as they majorly use their national resources.
- With the amalgamation of public and private resources in the space sector, the tasks of space exploration, the dream of space tourism, space mining, satellites and other launches will become easier to achieve.
- Ultimately private participation will lead to an overall expansion of the space sector in the country and improve the country's stand in space dominance worldwide.

CONCERNS REGARDING PRIVATE PARTICIPATION

- The intent of space explorations by government organisations is to provide the world with knowledge about the universe as it values science, learning and its people. But for private players earning returns is the reason for investment and not the public good. So they will take up only those projects where than can earn a profit over the cost incurred.
- Humans haven't been the best safe keepers of the planet Earth, we have extensively robbed it from its natural environment and greenery. Human activities have given birth to problems leading to environmental deterioration. Now when the universe will be open for use by any individual hopefully its environment won't be damaged and will be well protected.
- Another major concern is that many countries still do not have proper laws and regulations in place governing private participation in space and the 5 UN treaties are not very relevant in today's time when space activities are no more state focused. It is the need of the hour for every country as well as for the UN to come up with relevant legislation suitable to the present scenario.

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CONCLUSION

The 21st century has seen some major developments in private participation in space activities. Countries like USA, Japan, Luxembourg and India are diligently working on developing new technologies and undertaking space missions to make their mark. Private participants have entered the arena as great support systems for the government agencies as now they don't have to bear the weight of meeting public expectations regarding space exploration activities alone, rather it would get divided. But a major concern is the lack of proper national and international legislation regarding this participation which needs to be worked upon as soon as possible. Other than that if exploration is done keeping the space environment protected and avoiding unnecessary commercialization and exploitation, there is no end to what humans can know and learn about space and make advancements in the field of science.

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INTELLECTUAL PROPERTY PROTECTION IN OUTER SPACE: AN OVERVIEW[69]

INTRODUCTION

Space Law came into existence in consolidation of following essential factors that lead the world: sovereignty[70], international law[71], and Intellectual Property Rights[72]. Outer space operations are differentiated in the virtue of modern technologies. Intellectual property protection plays a significant role, and by the fact that national law, in general, only applies to a national territory (including air space), not to outer space. This research paper explores the relevancy of Intellectual Property Rights with the outer space.

Intellectual property (IP) rights, in general, encourage and ensure an ever-expanding intellectual community and technical advancement.[73] It is crucial for space exploration to create and incentivize a supportive environment for research and development. [74] Everything just said in the comment would be science fiction if it weren't for it. Various countries respond differently to IP's fundamental beliefs, but the utilitarian, incentive-based approach is by far the most universally acknowledged.

As a result, the creation of socially valued intellectual products would suffer if the creations were unprotected against misappropriation or extensive reproduction. Although IP serves the same purpose in space as it does on Earth, the repercussions of its deployment in space could be far worse. In the realm of space, a dysfunctional IP rights regime not only has economic and social

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[70] United Nations Treaties and Principles on Outer Space, ST/SPACE/61/Rev.1, Art 2; Page no. 4

[71] United Nations Office for Outer Space affairs; https://www.unoosa.org/oosa/en/ourwork/spacelaw/index.html

[72] Intellectual Property and Space Activities- Issue paper prepared by the International Bureau of WIPO; April 2004

[73] WORLD INTELLECTUAL PROPERTY ORGANIZATION, WHAT IS INTELLECTUAL PROPERTY? 23 (2003), https://www.wipo.int/edocs/pubdocs/en/intproperty/450/wipo_pub_450.pdf

[74] International Bureau of World Intellectual Property Organization , supra note 6

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costs, but it also jeopardizes the supportive of growth of space exploration and settlement, as well as pushing the date of its accomplishment ahead as well. [75]

INTERNATIONAL LAWS GOVERNING IPR IN OUTER SPACE:

Unfortunately, currently no single legislation or treaty exists that specifically protects outer-space innovation and research as intellectual property. Although to some extent, the provisions of existing IPR laws can be interpreted to fit the protection of outer-space intellectual property. The following are some examples of international intellectual property principles:

1. ***Paris Convention for the protection of Industrial Property-***

   This Convention, which is the most important international convention particularly on the subject of industrial property, does not specifically address the issue of inventions in outer space. This convention establishes national rules and protocols for protecting and enforcing intellectual property rights at the national level, which must be followed by all Member States. The patent system is also not universal in which, when one Member State gives a patent to an innovation, it obligates the other Member States to award a patent to that innovation as well. Similarly, the refusal or loss of effect of patent protection for an invention in one Member State cannot be utilized by another Member State to deny, revoke, or terminate patent protection for that invention.

   Article 5ter[76] of the Convention has some bearing on extraterrestrial activity. When the full use of exclusive rights would risk the public interest in maintaining transportation freedom, some restrictions are imposed. This stipulates that if ships, planes, or land vehicles are temporarily stationed in another country, the owners of the patents in force are not required to seek permits from them. As a result, items used to assemble an aircraft will be free from requiring licenses if they enter foreign territory on a temporary or unintentional basis.

[75] International Bureau of World Intellectual Property Organization, supra note 6, at 4–5.
[76] Paris Convention for the Protection of Industrial Property (as amended on September 28, 1979) (Official translation)

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2. *The Berne Convention-*

Another important convention in the subject of copyright and related rights is the Berne Convention for the Protection of Literary and Artistic Works. This Convention also makes no mention of rights relating to extraterrestrial operations. This convention lays out the broad principles of national treatment as well as the principle of automatic protection, which means that no formalities are required to obtain copyright protection.

3. *TRIPS Agreement-*

The Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS Agreement) does not particularly address the issue of outer space. This treaty stipulates that if one member confers an advantage, favour, privilege, or immunity to a member of another nationality, the other member must reciprocate unconditionally and immediately.

This agreement also stipulates that patent rights must be available and enjoyed regardless of the location of creation. This can be utilized for inventions made in space, where patents must be given and enforced in the same manner they would be in any other jurisdiction.[77]

4. *The Outer Space Treaty-*

The Treaty on Principles Governing States' Activities in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, often known as the Space Constitution, is the most important document in space law. [78] This is due to the fundamental importance of its legal doctrines, as well as the fact that it has been ratified by 109 countries as of July 2019[79], making it the most generally acknowledged legal instrument in space law. The Treaty is based on a number of key concepts, including the freedom to explore and use space, non-appropriation, peaceful usage, and state sovereignty and responsibility over space objects.

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[77] Intellectual Property and Space Activities Issue paper prepared by the International Bureau of WIPO April, 2004
[78] The Outer Space Treaty has been remarkably successful – but is it fit for the modern age? January 28, 2017 3.59am AEDT
[79] Status of International Agreements Relating to Activities in Outer Space, UNOOSA

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5. *The Rescue Agreement-*

The Agreement on the Rescue of Astronauts, the Return of Astronauts, and the Return of Objects Launched in Outer Space are among the so-called Rescue Agreements. The Agreements entered into force in 1968 and expanded on Articles V and VIII of the Outer Space Treaty, mandating the formation of a cooperative regime for the rescue and return of astronauts and launched objects to their home states.[80] The Agreements' founding principle is simple: state parties must cooperate to rescue cover personnel or launched objects who have been involved in a space accident.

6. *Liability Convention-*

After nine years of talks conducted by COPUOS' Legal Subcommittee[81], the Convention on International Liability for Damage Caused by Space Objects entered into force in 1972. The Liability Convention arose from the need to develop rules governing governments' liability for damage caused by space objects and to establish processes for resolving disputes. The definition of harm supplied in the Convention's first provision is instructive: harm is defined as *"loss of or damage to property of States or of individuals, natural or juridical."* [82]

7. *The Registration Convention-*

In 1976, the Convention on the Registration of Objects Launched into Outer Space came into effect.[83] Its main goal was to develop a system for keeping track of and identifying space objects. This Convention also aimed to broaden the scope of the United Nations Register of Objects Launched into Outer Space, which was created in 1961, and to codify governments' responsibilities in relation to space objects. [84]

[80] Outer Space Treaty, supra note 3, at 4–5 (art. V, art. VIII);
[81] U.N. Off. for Outer Space Aff., Convention on International Liability for Damage Caused by Space Objects
[82] *Id.*
[83] Convention on Registration of Objects Launched into Outer Space
[84] *Id*

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8. The Moon Treaty-

The Agreement Governing the Activities of States on the Moon and Other Celestial Bodies is the second most important U.N. treaty in terms of international law. In contrast to the Outer Space Treaty, the Moon Treaty's importance stems from its failure to be adopted, this highlights the policy and legislative problems that occur in the creation of universal space administration. One of the Treaty's most important provisions is the transfer of sovereignty over all celestial bodies in the solar system to an international governing body.[85]

RELEVANCE OF INTELLECTUAL PROPERTY RIGHTS TO OUTER SPACE:

Because IP has become more of a private or commercial affair in recent years and is no longer restricted to a state-run activity, the grant of IP in outer space activities is crucial. The protection that IP legislation provides to its owner enhances the demand for and value of the IP. IPR in Space implies that the government is willing and capable of protecting innovations that exist outside of traditional territorial bounds (i.e. in Space). With the provision of IP protection, the holder of the IP will be allowed to take legal action to prevent others from using or exploiting his rights without his consent. Vehicles/objects utilized for such activities, actions undertaken within a state's territory for such outer space activities, and technology employed in such activities that is a result of any person's intellectual development are all examples of IP-protected activities in outer space. Remote sensing, direct broadcasting, research, and manufacturing are examples of these technologies.

Business opportunities in outer space are growing as a result of technology improvements, and they may involve IP challenges. As a result, it may be determined that IP in space is the next big thing in the IP world, as the creation of such rights will encourage more players to join in and contribute to space exploration.

[85] G.A. Res. 34/68, supra note 58.

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IP IN OUTER SPACE: INDIAN PERSPECTIVE

In India, as in other nations, the application of intellectual property rules to space-related activity is still in its development. India is a signatory to international treaties such as the 1967 Outer Space Treaty, the 1968 Rescue Agreement, the 1972 Liability Convention, the 1975 Registration Convention, and the 1979 Moon Treaty, among others. Despite this, India's position is similar, and there are no explicit national space laws in place. There is a need for national space laws to assist the general growth of space operations in India, and the government is planning to introduce the Space Activities Bill, 2017, the bill is still under process. The legislation is being introduced with the purpose of enhancing and regulating India's space activities, as well as encouraging private corporate organizations to participate in space operations in India under the government's leadership and authorization through the Department of Space.

The proposed bill's Section 25 deals with the protection of intellectual property rights established in the course of any space-related activities. However, the proposal has a flaw in that it suggests that intellectual property rights developed onboard a spacecraft be considered the property of the federal government. In other terms, if Google launches a satellite from India, will it not own the photographs taken by the satellite? Despite the government's efforts to incorporate private participation in space activities, the bill fails to address and defend private interests. The bill also ignores critical elements such as orbital patents and flags of convenience.

The government's proclamation that private players will be allowed to participate in space operations, as well as the proposed Space Activities Bill 2017, demonstrate the government's willingness and obvious aim to preserve space IP.[86] Even if there are various complexities and inconsistencies that need to be resolved, the government's notification and inclusion of a section on the subject demonstrates its readiness to do so – it's a start.

[86] Explanatory note on Draft Space Activities Bill, 2017; Page no. 3

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CONCLUSION

An internationally acknowledged legal framework managing intellectual property in outer space activities is urgently needed. Given that the 1967 Outer Space Treaty, the 1968 Rescue Agreement, and other similar accords have already been signed by the majority of governments, expanding the scope of such treaties to include intellectual property rights would be extremely helpful.

In addition, the Madrid Protocol can be expanded to include issues from other worlds. A new protocol can be added to the present WIPO Madrid Protocol, which has more than 106 signatories (that would amend the accession process as set out in Article 14 to allow these areas to become jurisdictions).

The need of establishing an international mechanism governing IP rules in space cannot be overstated. The regime must address issues such as the applicability of national IP laws to outer space, the enforceability of rights, dispute resolution when parties launching space objects or conducting research disagree, harmonization of IP laws with other international obligations, morality, and ownership and entitlement. These concerns will almost certainly be rectified in the near future as more parties become aware of this burgeoning subject.

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PRESERVATION OF OUTER SPACE ENVIRONMENT: A DETAILED STUDY[87]

INTRODUCTION

Despite there being no ''ecosystem'' in outer space, the pollution of outer space is a very alarming matter, especially in the area close to the earth. The conventional and international customary laws have not aided in controlling the amount of pollution. The increasing activity in space has accelerated the possibility of more pollution. To counter this, loose models such as Resource Conservation and Recovery Act (RCRA)[88], and the Comprehensive Environmental Response, Compensation, and Liability Act [CERCLA], etc. have been enforced by the U.S. Environmental Space Agency. Serious enforcement and adaptation of such likely laws on an international level will surely regulate the adulteration of celestial spaces region.

There are diverse pollutants, mostly observed beyond Earth's solar system are 1) Back Pollution, 2) Forward Pollution. This article will throw light on the second type which hasn't been covered much. This pollution means pollution arising from the earth, its atmosphere, or space itself thus, affecting the quality of the space environment. Solid waste, encompassing all forms of debris in outer space of non-hazardous nature, hazardous waste, and then radioactive waste, all have serious long-term threatening effects. Biological and electromagnetic pollution comes under the esoteric category. The focus of the paper is on the third threatening categories:

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[88] Resource Conservation and Recovery Act, 42 U.S.C. §§ 6901-87 (1982).

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THE OUTER SPACE SPOLIATION WARNING

Existing desecration: what is the current status? The Earth's orbit witnesses abundant of imported substances especially the human-made debris that is located in various orbital paths, consisting of a variety of wastes in the varying sizes. The waste includes human waste, discarded spacecraft, satellites, fuel bolsters, some cameras, copper needles, millions of metal shards, the product of some 60 explosions, etc. Clouds of gas fragments like nitrogen and hydrogen chloride, radioactive debris are also there.

The greater part is tracked down in the Earth's locality and is still functioning, for example, Plutonium 238 (life of 87.5 years), Uranium 235 (half a life of 713 million years).[89] The quantity, position, naming, and proprietorship of this debris are cataloged by the U.S. Air Force's Space Defence Operation Centre. This reflects the crucial nature of space pollution when a Federal agency is given responsibility for a task like such.

Is This Pollution a Threat? There are two arguments on whether man-made pollution is a threat or not. One view presents that the ecosystem in space is in nature's rawest form and thus not bound by any environmental considerations. So there is no need to think on its ''contamination'' twice because Pollution in such an inhospitable place does not concern humans.

The other view argues that the above argument is narrow and reductive, outer space can also have an ecosystem of its own. It is majestic and a source of curiosity and inspiration and therefore needs to be protected in its full glory. There is a need to stop space pollution to prevent safety hazards to space travelers, the astronauts deal with the risk of carrying hazardous substances. Space experiments require the space to remain in a pristine form, to be effective. The harmful gases and rays are causing depletion of the Ozone layer resulting in fatal diseases. These arguments are enough to indicate that man-made pollution is indeed a great threat to outer space, looming in uncertainties.[90]

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[89] C. CHRISTOL, THE MODERN INTERNATIONAL LAW OF OUTER SPACE 765-67. See also Morrison, supra note 10, at 10-14

[90] Isikoff, U.S. Firms Unveil Plan For Space Lab, Washington Post, at C3, describes plans between Westinghouse Electric Co. and Space Industries Inc. to build the first commercial space research lab. Tucker, Fairchild Bids to Build First Gas Station in the Heavens, Washington Post, Sept. 15, 1986, at Washington Business 3, describes Fairchild Space Company's plans to design a system to refuel satellites and extend their useful lives.

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Is There a Threat of Future Pollution? There is no doubt about the threat of future pollution when humanity's records are taken into consideration. The plans of increasing space exploration and use of outer space for commercial reasons will ensure that this pollution may increase. The accelerated interest of private enterprises has been leading to space's commercial exploitation. The use of space has made it easier to utilize some technologies and activities.[91]

This practice of dumping the debris, untreated into outer space has been taking place without a care in the world. Eventually, the waste generated will be too large to pack and left in the space for disposal purposes. As this is a slow process, it presents a window for the world community to address and deal with the issue; to develop legal rules and regulations to put a leash on such type of pollution.

PROMPT JURISDICTIONS AND AUTHORITIES FOR CONTROLLING SOLAR SYSTEM FROM DILUTION

A. Traditional Cosmopolitan Legislations

There are 5 international treaties against outer space pollution. These conventional laws are binding only to countries that have signed these treaties. These nations are the US; the former USSR; the European Space Agency; Japan and China. These treaties namely are:

1) TEST BAN TREATY (1963) termed as the foremost to be signed by the intercontinental potentials against the tainting of outer space by hazardous activities. Its objective is to end the radioactive contamination affecting the human environment. But it is limiting in its scope as the focus is only on contamination by an explosion and not any radioactive leaks.[92]

2) THE OUTER SPACE TREATY (1967), or the 'principle treaty', addresses space pollution more directly than any other international treaty. It considers space as common to all mankind but never to be owned. The Common Heritage of Mankind (CHOM), creates a

[91] TIME, Sept. 29, 1986, at 59. This is somewhat reminiscent of the West Ford Project. See supra note I 1 and accompanying text and Finch & Moore, Ecospace and Some of Its Legal Implications, 4 J. SPACE L. 117

[92] Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space, and Underwater, 14 U.S.T. 1313, T.I.A.S. No. 5433, 480 U.N.T.S. 43

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sense of global commons in space where space exploration should be for the common benefit and progress of all people. It means the state cannot use space as it pleases for foul use. The treaty holds the state accountable when it comes to deciding the ownership of harmful items placed in space. The treaty also requires parties to notify any harmful space activity to the UN, the general public, and the international scientific community.[93]

3) THE RESCUE AND RETURN AGREEMENT (1968), this agreement is about when any dangerous gadgets are found in external surface then a second country directing the ongoing operation can ask the launcher nation to eliminate the problem.[94]

4) THE LIABILITY CONVENTION (1973), this convention aims at more than one methods of accountability if any destructive undertaking originates in outer system; absolute liability standard is applied in case of harm done to the aircraft. This also establishes that the compensation should restore the victim to the condition before the damage has occurred following international law.[95]

5) THE REGISTRATION CONVENTION (1976) requires a state for notifying the Secretary-General of the UN, about objects launched into outer space by themselves, or even by a private firm. It is also required to report the location, nature, objective, and other prospects to the General Secretary.[96]

From all these conventions some conclusions can be drawn, which are: countries need to respect the CHOM principle of space, any dangerous activities should be notified to the world community. These treaties are crucial as they have been signed by preeminent space powers. A great step towards limiting space contamination.

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[93] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, opened for signature Jan. 27, 1967, 18 U.S.T. 2410, T.I.A.S. No. 6347, 610 U.N.T.S. 205

[94] Agreement on the Rescue of Astronauts, the Return of Astronauts, and the Return of Objects Launched into Outer Space, opened for signature 19 U.S.T. 7570, T.I.A.S. No. 6599, 672 U.N.T.S. 119 [hereinafter Rescue and Return Agreement].

[95] Convention on International Liability for Damage Caused by Space Objects, 24 U.S.T. 2389, T.I.A.S. No. 7762 [hereinafter Liability Convention].

[96] Convention on the Registration of Objects Launched into Outer Space, opened for signature, 28 U.S.T. 695, T.1.A.S. No. 8480

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The second category is Customary International Law. This type of law is independent of conventional international law. The customary international custom needs two elements: Empirical and Psychological elements. These laws are necessary as they act as a set of rules relevant to the countries who even remained as non-signatory to it. All the accords present a view of uniform treatment by the world when it comes to space law in the empirical sense. Psychological element means the wide acceptance of these treaties.

B. Customary International Law

Customary law is *"international custom, as evidence of a general practice accepted by law."* an empirical and *opinio juris* or psychological elements are the components of customary law. It binds the non-signatories in terms of outer space pollution control or other *res communis* areas, such as the sea. The following points show the elaborative use of customary international law-

1) INTERNATIONAL TREATIES

These are multilateral and bilateral treaties whose fundamental duty is to protect the world's environment by prohibiting the disposing of radioactive wastes, oil pollutants, and dumping of wastes in oceans and by imposing control over dreadful human activities. There are six such existing treaties work in these directions are-

(1) Antarctic Treaty[97]

(2) International Convention on Civil Liability for Oil Pollution Damage[98]

(3) Agreement on Cooperation in the Field of Environmental Protection Between the United States of America and the Union of Soviet Socialist Republics[99]

(4) Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter[100]

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[97] Antarctic Treaty, Dec. 1, 1959, 12 U.S.T. 794, T.I.A.S. No. 4780. The treaty was signed by 13 nations, including seven space powers: the United States, the U.S.S.R., the United Kingdom, Ireland, Belgium, France and Japan. Although this treaty divided the use of the Antarctic up among the 13 signatories, it still has a flavor of viewing the Antarctic as res communis (though admittedly for a communis of 13), and as such, deserving of some environmental protections.

[98] International Convention on Civil Liability for Oil Pollution Damage, Nov. 29, 1969, 9 I.L.M. 45, 64 AM. J. INT'L L. 481. The treaty requires adequate insurance by carriers, and creates a trust fund to pay claims, if an incident has occurred and the carrier wants to limit its liability to treaty-based monetary limits. This agreement has been signed by all of the space powers.

[99] Agreement on Cooperation in the Field of Environmental Protection, May 23, 1972, United States-USSR, 23 U.S.T. 845, T.I.A.S. No. 7345, reprinted in 1 INTERNATIONAL PROTECTION OF THE ENVIRONMENT: TREATIES AND RELATED DOCUMENTS 50-57 (B. Ruster & B. Simma eds. 1975).

[100] Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, Dec. 29, 1972, 26 U.S.T. 2403, T.I.A.S. No. 8165

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(5) Convention on the Prohibition of Military or Other Hostile Use of Environmental Modification Techniques[101]

(6) Agreement Governing the Activities of States on the Moon and other Celestial Bodies[102]

2) INTERNATIONAL DECLARATION

Either it would be the principles of the Stockholm Declaration Of The United Nations Conference On The Human Environment[103] or the articles of United Nations General Assembly Resolution 3281: Charter of Economic Rights and Duties of States[104], the major focus of all the settled regulations begins and ends over the environmental protection norms. Even the Resolutions of the Organization for Economic Cooperation and Development (OECD)[105] member countries are striving hard against transfrontier pollution.

3) INTERNATIONAL ORGANIZATIONS

International Organizations such as The International Law Commission (ILC), The International Atomic Energy Agency (IAEA), and United Nations Environmental Program (UNEP) encourage codification of international environmental laws bothered with the safe operation of nuclear devices and coordination and funding among the nations concerning the environment.

4) INTERNATIONAL CASES

The final observations of *The Trail Smelter*[106], *The Corfu Channel*[107], and *The Lake Lanoux*[108] cases made us understand that judicial interpretation is another way to resolve the disputes among states and held the wrongdoer liable under the International Environmental Law.

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[101] Convention on the Prohibition of Military or Other Hostile Use of Environmental Modification Techniques, May 18, 1977, 31 U.S.T. 333, T.I.A.S. No. 9614.

[102] Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, Dec. 5, 1979, G.A. Res. 34/68, 34 U.N. GAOR Supp. (No. 46) at 77, U.N. Doc. A/Res/34/68

[103] Stockholm Declaration of the United Nations Conference on the Human Environment, U.N. Doc. A/Conf. 48/14, 11 I.L.M. 1416 (1972).

[104] Charter of Economic Rights and Duties of States, G.A. Res. 832 (1975), reprinted in UNITED NATIONS RESOLUTIONS 300 (D. Djonovich ed. 1984d cooperate).

[105] 2 AIR WAR COLLEGE ASSOCIATE PROGRAMS, THE EUROPEAN COMMUNITIES ch. 14 (18th ed. 1984).

[106] Trail Smelter (Can. v. U.S.), 3 R. Int'l Arb. Awards 1905 (1949).

[107] Corfu Channel (U.K. v. Albania), 1949 I.C.J. 4, reprinted in McDOUGAL & REISMAN, INTERNATIONAL LAW IN CONTEMPORARY PERSPECTIVE 524 (1981).

[108] Lake Lanoux (Fr. v. Spain), Arbitrated Decision of Nov. 16, 1957, reprinted in 24 INTERNATIONAL LAW REPORTS 101 (E. Lauterpacht ed. 1961); 53 AM. J. INT'L L. 156 (1959)

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In *The Cosmos 954 Case*[109], the Liability Convention, the Outer Space Treaty, and customary international law played a significant role and were utilized rightly. Then onwards all the territories were made accountable for their pollutive actions and represented certain rigid obligations concerning space undertakings.

5) DOMESTIC PRACTICE

A few developed nations like the USA, Russia, and European Space Agency members have their separate countries legislations like the CAA, NCA, FWPCA, SDWA, RCRA, CERCLA, TOSCA, and NEPA to achieve environmental clarity, the USSR and Union Republics on Protection of Health follows the uniform application of states to avoid contamination and lastly the ESA countries constitute the OECD's declaration along with European Economic Community (EEC)[110] treaty to construct atmosphere free from tainting respectively.

SUGGESTED CONTROLS ON OUTER SPACE POLLUTION

After reviewing and concluding the California Western International Law Journal Volume 19 No. 1 (2015) on solutions regarding space pollution. There are two chief problem resolving bodies often address separately came into scene i.e.

1. The International Atomic Energy Agency (IAEA) promotes and assists research, expansion, and pragmatic exercise of nuclear means for peaceable means counting the use of nuclear weapons throughout the globe. It comes within the ambits of the United Nations Environmental Programme.
2. The Office of Outer Space Environmental Protection (OOSEP) acts as a clearinghouse; put forward accords, internal legislations, and directives to establish controls over the wide spreading of pollution in space. It performs inspections, clean-up activities and acknowledges the calls from the states on their space activities that involve potential pollution.

[109] Dept. of External Affairs, Canada's Claim Against the U.S.S.R. Arising Out of the Cosmos 954 Incident and the Claim's Settlement, Note No. FLA-268 (Jan. 23, 1979).

[110] Kelly, International Regulation of Transfrontier Hazardous Waste Shipments: A New EEC Environmental Directive, 21 TEx. INT'L L.J. 85, 90 (1985). The member States of the EC include all of the ESA States, except Switzerland and Sweden.

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Even after the big attempts done by such bodies or statutory laws, the system highlights some considerable loopholes which can be overcome by the creation of force-cleaner generators that vandalize the space pollutants therein and do not allow them to touch the earth's atmosphere. The mandatory approach to OOSEP to take action at the pinpoint location and come out with the vital source of harm. There is no doubt that OOSEP lacks the required resources which need an urgent address.

Demand for consistency with the principles of the Stockholm Declaration especially with principle 21, 22, and 25 which enforces the steadiness among various states; the victim state should be indemnified by the polluter. Moreover, the discoveries on reusability and disposability of space waste need to be concerned and a few by-laws like SRCRA has to go under little amendments. Last but not the least, obviously the world demands more international coordinating agencies like OOSEP so that more operations could take place. Other than this, each state should perform its clean-up functionings using its resources plus funding in equal proportion is required as OOSEP runs on voluntary contribution.

The above arguments presented a similarity between the treatment of desert and outer space. Just like the desert, space is being considered as 'waste land' by leaving out all the unwanted trash in there. Both the places were new to the explorers and therefore, their cleanliness did not matter much. The accelerated movement and exploration in space are resulting in a lot of waste contaminating the outer space environment.

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PLANETARY PROTECTION & SPACE LAW[111]

INTRODUCTION

NASA's Perseverance rover and China's Tianwen rover[112] have already been launched to search for signs of life on the planet Mars. In 2019, a spacecraft crashed on the surface of the moon with a lot of unwanted small and almost imperishable life forms called tardigrades. Thus, space scientists need to make sure that no such substances land along with the spacecraft. Therefore, we have policies and laws to avoid its occurrence. Planetary protection is the practice of protecting the solar system from contamination by Earthly life and also protecting Earth from life forms that may be returned from other bodies of the solar system. Its policies and requirements ensure safe and verifiable scientific exploration for extraterrestrial life.[113]

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[111] **Author: Sneha Singh**
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[112] Leonard David, *China's Tianwen-1 Mars mission adjusts orbit to prepare for a Red Planet landing,* SPACE INSIDER, https://www.space.com/china-tianwen-1-mars-mission-adjusts-orbit-for-landing.

[113] *'Planetary Protection'*, Office of Safety and Mission Assurance, NASA, https://sma.nasa.gov/sma-disciplines/planetary-protection.

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PLANETARY PROTECTION

Planetary Protection is a line of work regarding the maintenance of real or potential areas of life as pure and well-preserved. Forward and backward are the two forms of interplanetary contamination. The forward form is regarding the contamination of other planets by matter taken from Earth. It guards any life form that might be on those planets. Scientists can be rationally sure that any sign of life they find is, in reality, an indication of "extraterrestrial" life and not transported from Earth.[114] Planetary protection also prevents backward contamination of Earth by extraterrestrial life or bioactive molecules in returned samples from habitable worlds in order to prevent potentially harmful consequences for humans and the Earth's biosphere.

The Earth is inhibited from being infected by extraterrestrial matter that has moved back by the backward contamination. Thus, the astronauts of Apollo 11 were quarantined for three weeks in 1969 to ensure that they brought nothing hazardous, back from the moon. The principles of planetary protection are expected to be followed in missions by space scientists. The places in which spacecraft are constructed are the cleanest places on Earth. The working engineers and scientists wear sealed suits in these rooms to prevent their microbes from contaminating other spacecraft bound for other worlds.[115] The resources are also frequently tested in order to avoid any biological contamination.

COMMITTEE ON SPACE RESEARCH

The danger of infecting celestial bodies has been considered very critically by space scientists. In 1991, International Council for Science[116] was instituted to stimulate global scientific activity in different types of science and technology for the benefit of humankind. It is one of the earliest non-governmental associations in the world. It represents the development and growth of two older organizations known as the International Association of Academics and the International Research Council. The International Council for Science formed the Committee on Space Research

[114] The Conversation, '*Space law' helps prevent earth's microbes from polluting other planets*, THE NEXT WEB, https://thenextweb.com/space/2021/02/05/space-law-helps-prevent-earths-microbes-from-polluting-other-planets-syndication/ (last visited Feb. 6, 2021).
[115] Mike Wehner, *How NASA makes sure it doesn't contaminate other worlds*. BGR, (Feb. 6, 2021), https://bgr.com/2021/02/06/life-on-mars-contamination-nasa/.
[116] *ICSU: International Council for Science,* THE SCIENTIST, https://www.the-scientist.com/5-prime/icsu-international-council-for-science-51742.

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(COSPAR)[117] in 1958. It was the first attempt towards the scientific cooperation of Eastern and Western countries after the Cold War. It is a reviewing organization to the United Nations' Committee on the Peaceful Uses of Outer Space and serves as the global policy-making body on planetary protection. It is an independent organization with no legal mandate. No one is under any legal obligation to comply with its planetary protection policy.

The policy, scientific regulations and suggestions of the COSPAR are globally known as the "gold standard". It classifies planets and moons depending on their possibility for life or sign of life in the past or present. The protective measures will be more significant as the possibility for life.[118] In this way, Mars is protected in a better way than the moon. It implies that operations to upper-class bodies need more decontamination to make sure that fewer possible contaminants travel.

The policy has recognized five classifications for planetary protection obligations based on participating mission, the target body, and scientific examinations. It required no measures for Category I, but the guidelines become strict based on the scientific aim of the specific mission from II to V. The policy of COSPAR is not binding as it is a non-governmental organization. It can be considered as "soft law".[119] It is not an agreement that can be lawfully enforced, but it is an essential standard that should be obeyed.

The flexibility and progressing method of the policy are shown by the development of "Mars Special Regions"[120] because we are advancing our knowledge about the limits inside which life can flourish on Earth and building our consciousness of possible habitability somewhere in the Solar System. Planetary protection is vital for facilitating scientists to examine the natural environments of celestial bodies without intruding with potential living structures that may have formed there.

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[117] *COSPAR Panel on Planetary Protection*, COSPAR Committee on Space Research, https://cosparhq.cnes.fr/.
[118] *Mars: how scientists prevent Earth's microbes from contaminating other planets,* THE CONVERSATION, https://theconversation.com/mars-how-scientists-prevent-earths-microbes-from-contaminating-other-planets-154652.
[119] *Legal regime sustainability in outer space: theory and practice,* CAMBRIDGE UNIVERSITY PRESS, https://www.cambridge.org/core/journals/global-sustainability/article/legal-regime-sustainability-in-outer-space-theory-and-practice/614DDD6FE793315297AABBE983FA9168.
[120] *Planetary Protection and Mars Special Regions,* Review of the MEPAG Report on Mars Special Regions, NAP, https://www.nap.edu/read/21816/chapter/3.

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INTERNATIONAL SPACE LAW

The space governance comprises treaties such as Outer Space Treaty, customary international law, UN General Assembly Resolutions and COSPAR planetary protection policy. It directly addresses States as international law. The Outer Space Treaty of 1967[121] serves as the legal foundation of governance. It focuses on elaborating liability and registration provisions. It states that the nations which are parties to the treaty will be directed by the value of collaboration and joint support in the survey and utilization of outer space.[122] The states should conduct their activities for the benefit and interests of all other nations. It's Article II prohibits the exercise of terrestrial sovereignty in outer space or the Moon and other celestial bodies. It means that the use of outer space gives no sovereign rights over those areas.

The states should research and evaluate outer space to prevent dangerous contamination. They should adopt measures for the unfavorable variations in the Earth's environment, which might result from introducing the extraterrestrial material. The nations are obligated under international law to refrain from dangerous contamination of outer space, Earth, moon, and other celestial bodies. The treaty notifies to keep away from "harmful contamination", but fails to define it. It does not indicate under what conditions it would be required to implement appropriate measures. Space law is part of international law. Therefore, international law can be used for enforcement. There is no specific mechanism for dispute resolution in the treaty so the states can make use of the International Court of Justice (ICJ) and other such measures.

Nowadays, outer space is being explored by private companies in an increased manner. The exploration of space is not limited to the scientific operations of the government only. The treaty makes States responsible for the activities of their nationals and private corporations in outer space and requires that they authorize and continually supervise those activities. State on whose registry a space object is carried retains jurisdiction and control over the space object and its personnel. Therefore, it can exercise legal authority over them.

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[121] *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies*, UNOOSA, https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introouterspacetreaty.html.

[122] *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including Moon and Other Celestial Bodies,* United Nations Office for Outer Space Affairs, https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introouterspacetreaty.html.

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Space governance and planetary protection are evolving as Elon Musk, Jeff Bezos and others continue to advance their non-governmental activities in outer space. The Artemis Accords[123] by NASA is an international agreement for countries to peacefully cooperate and conduct exploration of the Moon. The planetary protection policies of NASA and COSPAR have been updated. NASA's policy is updated to specify that it is the enactment of the requirements of the United States under the Outer Space Treaty.[124] Thus, it is rational to believe that any license approved by the US would be required to oblige to the planetary protection policy of NASA, which affiliates with the approach of COSPAR. Its non-binding guidelines rely on parties that care about their objectives. States have an ability and responsibility to ensure responsible conduct by their nationals and non-governmental entities in outer space and adhere to the principles of planetary protection.

The White House has laid out a plan for overhauling the federal government's policy protection rules, which work to avoid contamination between Earth and other potentially habitable worlds. The document is about the government's intent for a suite of federal agencies to modernize planetary protection rules till next year,[125] The scheme has three aims: avoiding backward contamination, forward contamination, and incorporating private sector views on planetary protection issues due to the increasing abilities and curiosity of companies in flying crafts to other worlds.[126] The plan is considerate about the fact that the government must be careful about its activities and commercial companies.

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[123] *Principles for a Safe, Peaceful, and Prosperous Future,* THE ARTEMIS ACCORDS, https://www.nasa.gov/specials/artemis-accords/index.html.
[124] *Updated: NASA Updates Planetary Protection Policies,* OSMA, https://sma.nasa.gov/news/articles/newsitem/2020/07/20/nasa-updates-planetary-protection-policies.
[125] Meghan Bartels, *Planetary protection needs more than just NASA, White House plan says*, Space, (Jan. 4, 2021), https://www.space.com/white-house-unveils-planetary-protection-plan.
[126] Jeff Foust, *White House releases planetary protection strategy*, SN, (Dec. 30, 2020), https://spacenews.com/white-house-releases-planetary-protection-strategy/.

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CONCLUSION:

Planetary protection is more important now as the number of actors and the diversity of their activities is increasing. It is essential for preserving the scientific importance of outer space.

The Committee on Preventing the Forward Contamination of Mars[127] found that many of the existing policies and practices are outdated regarding the consideration of new scientific evidence about Mars and current research on the ability of microorganisms to survive in severe conditions on Earth. Thus, there is a need for research and development efforts to update planetary protection requirements to reduce the uncertainties in preventing the forward contamination of Mars. It will require additional budgetary, management, infrastructure support, and a roadmap including a transition plan with interim requirements and a schedule. The recommendations of the committee should be considered to establish a new planetary protection framework.

The States should promote the policy because there will be substantial state esteem for the mission that uncovers extraterrestrial life. Various operations have demonstrated to the other worlds that sticking to the COSPAR planetary protection policy does not avoid activity. Still, it might be essential in determining the origin of any detections of extraterrestrial life.[128]

[127] *A Path Forward for Planetary Protection in the 21st Century,* Preventing the Forward Contamination of Mars, NAP, https://www.nap.edu/read/11381/chapter/10.
[128] Thomas Cheney, *Planetary Protection in the New Space Era: Science and Governance*, Frontiers in Astronomy and Space Sciences, https://www.frontiersin.org/journals/astronomy-and-space-sciences#.

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JURISDICTION FOR THE CRIMES COMMITTED IN OUTER SPACE[129]

INTRODUCTION

It is important to note that with the rise in human advancements such as plans to annex foreign planets or various space missions that are being carried forward, it calls for placing a reference to one grey area that has been pestering the International Law as a whole, that is, the space law. We observe that it is more or less unclear, since the crimes that so happen in space are not subject to the boundaries of the earth, giving rise to one major issue which is with regards to the territoriality or the jurisdictional aspect.

In 2019, NASA, along with the United States Government, decided to investigate a case which is the "FIRST CRIME TO BE REPORTED IN SPACE", therefore we look at the principle of "res communis", Nationality, Sovereignty, and various treaties to determine which court should determine the charges against the accused. The scope of the research is not limited to the facts of the aforementioned instance alone but rather tries to answer if the International Law is developed enough with special emphasis on the space laws to determine the question of jurisdiction in various crimes that are committed in outer space.

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INTERNATIONAL AGREEMENTS PERTAINING TO OUTER SPACE CRIMES

A. INTERNATIONAL SPACE STATION INTERGOVERNMENTAL AGREEMENT

The International Space Station is one of the most ambitious projects pertaining to space exploration and is one of the most complex projects involving a lot of international relations. The International Space Station does not have worldwide applicability as the scope is restricted to its member nations alone which contributed to the crux of its formation. The Inter-Governmental Agreement was signed in the year 1998 by the member nations of the International Space Station which includes The United States, Russia, Japan, Canada, and the member nations of the European Space Agency which includes Denmark, The United Kingdom, Belgium, Germany, France, Italy, Netherlands, Spain, Norway, Sweden, and Switzerland. While the earlier treaties such as the Outer Space Treaty merely dealt with the issue of Outer Space Activity regulation by taking the Quasi-territorial approach, the intergovernmental treaty took into consideration the active nationality principle which can be attributed to Article 22(1) of the Intergovernmental Agreement[130] which inadvertently states that the jurisdiction over the crimes committed by an offender in outer space can be attributed to the nationality of that offender. Such a nationality is further attached to the native or national state of the offender which is one of the prime features of the Intergovernmental Agreement. The Passive Nationality Principle is further elaborated as under Art 22(2) of the Agreement[131] which is an important feature that attributes the jurisdiction of the crime to the nationality of the victim against whom the crime has been carried out by the offender.

The International Space Station Intergovernmental agreement was the first attempt towards establishing a concrete set of rules in the management of outer space affairs. While the Inter-governmental agreement is looked upon as suitable regulatory legislation in International Law, it is imperative to understand that the scope of the same or its principles cannot be extended to any other countries. In the ongoing regime of greater advances with regards to space exploration and the growing competition of the annexation of celestial bodies, the apparent need is to make sure that the scope of the International Space Station could be extended in collaboration with the United Nations to make the concept of Space Laws under the International Law universal in its nature.

[130] Art 22(1), International Space Station Intergovernmental Agreement
[131] *Id.*

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B. OUTER SPACE TREATY OF 1967

The Outer Space Treaty is based on the general principle of res communis which roughly translates to 'A common property'. It is important to note that in areas like the high seas, outer space cannot be given a mere identity as the property of one single country but rather, it belongs to mankind to not invoke any sovereignty that can be extended over such a body by any member of the International Community.

The Outer space treaty was initially introduced in the Legal Committee of the United Nations in the year 1966 and the General Assembly called for the adoption of the same through its formal voting procedure under Resolution 2222(XXI). The main rationale behind the adoption of this treaty is to take into consideration the different principles that are available under the customary international law as well as to determine how exactly can the activities of the members of the International Community be regulated. While the General assembly only called for adoption in Resolution 2222(XXI), the Treaty was inadvertently adopted in Resolution 1962(XVIII) in the year 1967. The Treaty puts forth an inherent rule that the Outer space has to be utilized only for the benefit of mankind, that is, in the interests of all the other members of the International Community and the same may not be used for the satisfaction of any personal agenda, something that is the main cause of most of the tussles In the International Community.

The Outer Space treaty also makes it free for all the members to explore the space while the storage and usage and the nuclear weapons in the outer space still stand prohibited while placing due reliance on the Treaty on the Non-Proliferation of Nuclear Weapons. The Non-Proliferation Treaty which entered into force in 1970 aims to prevent the spread of Nuclear weapons so that the over-exploitation of Nuclear energy is harnessed. Further, the base principle in the Outer-Space Treaty places the responsibility on the state pertaining to any national activity that is being carried out, irrespective of the governmental influence that is exerted. That is if the act is being carried out by a private entity and not the government of that particular nation, then in that sort of a case, the onus of responsibility is still placed upon that particular member state. With that having said, it goes on without saying that the mere principle behind the working of the treaty is that the states of the Outer-Space Treaty, 1967 should avoid any harmful contamination of space and other celestial bodies.

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Apart from the outer space treaty, the other treaties that govern the activities in outer space from an International Perspective are- The Convention for International Liability of the Damage Caused by the space objects, which was agreed upon in the United Nations General Assembly Resolution 2777(XXVI) while the convention was deemed to have formally entered the force in the year 1972; The Agreement for the Rescue of Astronauts, Return Of Astronauts and Return of Objects that are launched in the Outer Space that was voted upon and passed in the year 1967 through the United Nations General Assembly Resolution 2345 (XXII) which finally came into force in the year 1968 and lastly the Convention for the registration of objects launched in the Outer Space which was adopted by the United Nations General Assembly Resolution in the year 1974 under Resolution 3235 (XXIX) that entered into force in 1976. It is imperative to note that all these treaties are under the functional mandate of the scope of the United Nations Office for Outer Space Affairs (UNOOSA).

APPLICATION OF CUSTOMARY INTERNATIONAL LAW

Under the customary International Law, the jurisdiction is to be determined based on the three main principles- Territoriality, Nationality and Universality.

Territoriality

Refers to the principle where the jurisdiction of one particular crime will apply to the regulation of civil and criminal offenses that happen within the sovereign borders of that particular state. Such an approach towards a crime more or less glorifies the sovereign power of a Nation's jurisdiction which can be exercised within its territorial borders.

Nationality

The Nationality principle calls for the application of jurisdiction based on the Nationality of either the victim or the perpetrator involved in the crime. The rationale behind such an extension of the jurisdiction is to ensure that the sovereign state is entitled to have control over the activity of the Nationals anywhere and it goes on without any saying that the individuals obey the state's laws even if they are outside the state. It is imperative to note that the Territoriality of the other state will clash with the Nationality of the members of this state which requires the determination of the separation of jurisdiction. Nationality is further divided into Active and Passive Nationality

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Principles. In the case of the Active Nationality Principle, the Nationality of the Offender is taken into consideration while in the case of the Active Personality Principle, the nationality of the victim is taken into consideration. From a procedural point of view, the flow of jurisdiction will give its first preference to the Active Personality principle, and only then will it flow to the passive nationality.

Universality

This principle refers to the exertion of the jurisdiction of the states on the offenders irrespective of their nationality or the territoriality of the subjects. The Universal Jurisdiction can also be perceived under two headings, either conditional or absolute. While the conditional requires the offender to be present in the prosecuting state, the absolute universality is more or less arbitrary with no conditions imposed upon the exercise of jurisdiction by the state. It is important to note that the principle of Absolute Universality would render such that the application of such jurisdiction would cause heavy damage to the territorial sovereignty of the state or the control of the state over its subjects based on the nationality principle. It is important to note that the principle of Universality is not completely defined in the author's opinion as a result of which an issue always arises as to when to and when not to apply such a controversial principle and what exactly is the scope of the same. It is imperative to note down the fact that only a universal body such as the United Nations can be said to have its jurisdiction set under this principle, for, under the powers of the United Nations Security Council as etched under Chapter VII of the Charter of United Nations[132] allows the intervention of the same in any case of a threat to International Peace and Security. The intensity of a backlash when a member state of the International Community exercises its jurisdiction under this principle is much higher than when the United Nations uses this principle which helps us to understand as to who exactly can exercise such a jurisdiction while the same is yet to be substantiated in the terms of practicality as under the International Law. It is also imperative to note that under this principle there could be an imposition of double jeopardy where the criminal is usually shuffled from one court to the other which is against the principle of "*Nemo debet bis vexari, si constat curice quod sit pro una iti eadem causa" which* states that no man shall be punished twice for the same crime.

[132] Chapter VII, Charter of United Nations

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ANALYSIS OF THE PRINCIPLES OF CUSTOMARY LAW

It is important to note that in the case of space crimes, the concept of territoriality will not be applicable because on a rough reading it talks about the exercise of jurisdiction on the territory of that individual member nation of the International Community which is not possible in the space owing to the mere fact that space is considered as a place of 'res communis' and cannot be called as a place that belongs to a sovereign authority of one country which primarily excludes the concept of territoriality from the application when it comes to the determination of crimes under the Space Law. Further, with regards to the Universality Principle, it is however subject to the presence of a concrete authority that regulates the behavior of the countries that perform the set of acts in the space. In this case, the authority can also be interpreted as UNOOSA which has control over the Outer Space Agreement. However, it is important to note that with regards to crimes that don't damage the integrity of the International Community, they simply cannot be dealt as per this principle but rather the onus should be put upon the principles of territoriality and nationality pertaining to the exercise of such a jurisdiction. The author is therefore of the opinion that the crimes that are committed in outer space must be subject to the Nationality Principle. And not to mention I believe that the First Space Crime in the history of mankind has to take into account the Nationality Principle in determining the outcome of the case. The main drawback pertaining to these customary principles is that they are merely theoretical and are completely unsubstantiated and not concrete when it comes to their nature as a whole when we tend to apply the same under practical circumstances.

FIRST CRIME IN SPACE

Facts

NASA started investigating the first crime that is believed to have been committed in space when it saw that Anne McClain, a renowned astronaut was believed to have accessed her ex-spouse's bank account. It was seen that upon the investigation the ex-spouse of Anne McClain, Ms.Summer Worden has found that her bank credentials were entered and the bank account was accessed by Anne McClain from the servers of the International Space Station while Anne McClain was on a six-month space exploration mission. The charges that Ms.McClain was found guilty of were identity theft and improper access to Ms.Worden's private property.

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Analysis

It is important to note that the Outer-Space Treaty resonates with one major factor, that is the space is free to explore wherein there are no restrictions that are to be put forward when the same is being carried out by the members of the International Community. It is important to note down the fact that this rule is however subject to one major condition that is the moon, and the other bodies are to be utilized peacefully which could have been framed to reduce the possibility of space wars. It is imperative to note that Article VIII of the Outer Space Treaty states that any state that is a party to the treaty whose objects are taken to space will retain jurisdiction over such an object which can also apply to the liability that is conferred. The same can be applied to the personnel who represent the said country in carrying out the respective space missions. While the treaty could apply to the International Space Crimes which is of a higher degree, it sets the base for the aforementioned case. When we consider the current circumstance, the astronauts are the personnel of the United States as a result of which Ms.McClain will be seen as a personnel of the United States and in such a case, the laws of the United States applies when we take into consideration the Nationality Principle (in specific, the active nationality principle). While we ought to note that who comes under the ambit of 'personnel' under the Treaty is not determined, it falls as a major flaw of this provision that so was taken into consideration to determine the ambit of the provision in this case. Under such a case, it fails to answer as to what exactly will be the case with regards to private citizens who commit a crime in space? That is because the term 'personnel' is not elaborately determined under this international legislation it is imperative to note that ambiguity arises under the determination of the same. Further, it is important to note that the International Space Station's Intergovernmental Treaty had advocated for a Nationality based jurisdiction since Article 22(1) of the International Space Station Intergovernmental agreement states that:

"Canada, the European Partner States, Japan, Russia, and the United States may exercise criminal jurisdiction over personnel in or on any flight element who are their respective nationals."

While we see that the provision is extended only for the member states of the International Space Station, in case it can be applied, and the crime can be solved using this principle.

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Determination of the jurisdiction

In this case, both the accused and the victim belong to the United States and that is exactly why, going by the provisions of the Outer Space Treaty and the International Space Station Intergovernmental Agreement coupled along with the Nationality principle of the jurisdiction, we get to conclude that the individual will be facing a trial as under the Law of the United States.

SUGGESTIONS AND OBSERVATIONS

We observe that in such a situation if the victim and the perpetrator belong to different nations, the concept of passive nationality can apply and if the same is seen to be ineffective, then the active nationality can also apply. However, while we can only assume there is no statutory backing that answers the question as to what exactly must be applied initially when it comes to such a situation and how exactly can the issue of jurisdiction trespassing be countered under such a circumstance. Now let us say that the individual is not aboard the International Space Station, it further becomes difficult as to how exactly can jurisdiction be applied and if the individual is even subject to the jurisdiction of his state. Assuming that there are a group of astronauts belonging to different national backgrounds with the spacecraft registered under a particular country's name, then in such a case, a question arises as to how exactly can such a crime be taken into account and what jurisdiction will be conferred upon such an arrangement. While going by the nationality principle we can take the active or passive nationality, but however the chronological order as to when the active nationality or the passive nationality principle has to be invoked was not specified. There is another interpretation to it wherein, based on the Nationality principle we can go ahead with the determination of the jurisdiction based on the nationality of the aircraft. Another important flaw is that the International Law has failed to distinctly determine as to what exactly draws a parallel between Air Spaces and the Space Zone since the same was not determined substantively and clearly as under the existing law. While moving on a larger scale of the question, assuming that the spacecraft belonging to a country trespasses over the air space of another country, will it be still considered as a crime as under the Existing criteria and if not, what exactly constitutes the Air Space and the Space in the International Law is something that has to be determined. Further, under such International Cases, it is noteworthy to mention that the International Criminal Court can extend its jurisdiction because of the possibility of space wars for which the international community is not ready for. In such a case, the provision that Space is to be considered as a war

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zone under the Rome statute Article 5(c) and Article 8 can be invoked. It is also important to note that such an International Crime can inadvertently be tackled using the Universality principle while getting done with the nuances of the Nationality Principle but this can be applied only under the circumstance wherein the crime is grave and has an impact on the functioning of the International Community. While in other circumstances, the International Law is rather silent about the applicability of the jurisdiction. While the Inter-governmental agreement vaguely talks about the same, the scope of it is merely restricted to the member nations alone. Further, with regards to the Outer Space Treaty, we ought to note that yet again it is hazy when it comes to the application of the principles and definition of various terms like the 'personnel'. The only suggestion is to make sure that the legislations governing the Outerspace are to be more concrete and substantive, not to mention it is also important to note that a basic code of conduct for all the nations has to be put forward taking into consideration the principles that are customarily followed and the principles that are laid down in the aforementioned international legislations. Such legislation must extend to all the member nations of the United Nations and not to mention, even regarding petty crimes the legislation has to be determined by such an international body owing to the 'res communis' nature of the Space. Although it is a two-step approach, the same will be effective in taking care of the crimes that are being carried out in outer-space. Not to mention, giving the space-mandated International Organizations a judicial character would render it much easier in order to solve the outer-space disputes. Not to mention, in order to determine the applicability of the principles of Territoriality, Nationality and Universality, a certain standard will have to be set in order to make sure that the intervention is just. This is important so that, in the cases where Universality principle is applicable, the jurisdiction cannot be confined to a nation but to the organization that acts on behalf of the International Community and similarly in order to prevent any external intervention in the matters that are subject to the jurisdiction of that particular nation alone.

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CONCLUSION

In the first crime that was committed in outer-space it is imperative to note that based on the principle of Nationality, the laws of the United States will have to apply while the conclusion is reached also by placing a reliance on the various other agreements that were referred to. The International Space Station Intergovernmental Agreement cannot be universally applicable owing to the mere fact that the scope of the same is restricted to its member nations and finally is outdated when it comes to the determination of the space crimes. It looks like the International Law had not anticipated any different type of crime that could arise in the space which calls reforms in the same which brings to a conclusion that the International Law is not developed enough in determining the outcome of crimes that are committed in the outer-space.

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RISE OF PRIVATIZATION IN THE SPACE SECTOR[133]

INTRODUCTION

With the world entering the 21st century, mankind was left with just one final frontier, which it wanted to commoditise. It is the rapidly rising space sector. Today, with the rise of space giants like SpaceX and Virgin Galactic, and with recent reports about a private hotel to be soon launched in outer space, we have truly embarked upon a new era of privatization. What was once considered to be the common heritage of mankind will now become the playground of the corporate giants. With the increasing opportunities in the space sector, several corporates are looking to capitalise the space sector and expand profits. This privatization, while inevitable, will revolutionize the space sector and hence will also have some major impacts, both positive and negative.

The purpose of this research paper is to highlight the new Spacecom Policy of India which has been released to incentivise and promote the privatization of the Indian space sector. To properly understand the implications of this privatization, I have elaborated on the space policies and the privatization undergone by the USA, one of the world leaders in space development. The case study of the USA then helps us to understand how privatization is playing out in countries that have already embarked on this tide of commercialization. I have also underlined several positive and possible negative aspects of privatization.

On 15th August 1969, one of India's premier space research institutions, The Indian Space Research Organization (ISRO) was established. Since then, we have made many great advances in the space sector. India ranks among the top 10 nations in the world with space programmes. India has managed to develop an extensive and comprehensive space programme since then. The Indian space programme includes research and development, low-cost launch vehicles,

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manufacture and operation of Earth observation and navigation satellite system; the lunar mission Chandrayaan I etc. It also includes proposals to launch solar probes and manned space initiatives.[134]

In the current scenario, and up until now, the space programme of India has functioned under the government control. However, recently in 2020, the Department of Space (DoS) released the Spacecom policy 2020. The Spacecom Policy, 2020 is essentially meant for the privatization of the space sector in India. The concept of privatizing the space sector is in line with the rise in privatization in countries like the USA, with American private space majors such as SpaceX and Blue Origin. In this paper, I would like to highlight the various advantages and disadvantages that privatization of the space sector can bring. I would like to discuss the new Spacecom Policy of India and contrast its possible consequences with the rise of privatization in the USA.

[134]A.D. Dutt, *ISRO releases draft policy to regulate space communication by private players* , HINDUSTAN TIMES, https://www.hindustantimes.com/india-news/isro-releases-draft-policy-to-regulate-space-communication-by-private-players/story-hcrB1xAKZDFNQdI0y4GatJ.html (last visited Oct 22, 2020).

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OPENING UP TO THE PRIVATE SECTOR :

As mentioned above, ISRO (Indian Space Research Organization) released a new 'Spacecom Policy' in 2020. This includes guidelines to govern the commercial use of orbital slots, satellites, and ground stations. This policy is in mandate with ISRO's initiative to open up the space sector for private players and therefore details on how private players can get the authorization for setting up communication satellites and ground stations. This policy was formulated to enable India to meet its growing demands for satellite-based broadcasting and network connectivity. The government of India has emphasized increasing private participation in the space sector and prioritizing reforms. Keeping this in mind, the government has established a new organization, namely the 'Indian National Space Promotion and Authorization Centre' or in short, IN-SPACe. Furthermore, all of ISRO's infrastructure, scientific and technical resources and even data are to be made accessible to the interested private parties to help them carry out their space-related activities. [135]

The new Spacecom Policy is the successor of an earlier released 'SatCom Policy, 1997'. This policy was released by the Department of Space in partnership with the Department of Telecommunication and the Department of Science and Technology. This policy also highlighted the importance of encouraging private sector investment in the space industry, amongst other goals such as developing satellite communication and launch vehicles. However, the earlier envisaged 'SatCom Policy' could not usher in privatization as it had intended to, because of the lack of a proper framework for the policy. The SatCom Policy was unable to promote private participation as it lacked robustness and incentive. This vagueness of the policy led private companies to become apprehensive of entering into the space sector as there was no surety of return on investment. [136]

Therefore, the new policy has come at the right time considering the advances in the space sector undertaken by several other countries that followed similar models of privatization of the space sector and the Indian private sector, particularly the tech companies that have acquired a certain maturity level to become the partners of the growth of the Indian Space sector. My endeavour in this paper is to compare and analyse the role played by the private sector in some of the advanced

[135]Sarin & co., *In review : space law, regulation and policy in India*, https://www.lexology.com/library/detail.aspx?g=ad45cd5f-488a-437f-9edd-b1d30df4630a (2020).
[136]T.V.R. Ramachandran, *The sky is not the limit for Indian Satcom*, FINANCIAL EXPRESS, https://www.financialexpress.com/opinion/the-sky-is-not-the-limit-for-indian-satcom/1991573/ (2020).

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countries, particularly the USA in bringing innovation in the space sector and how the Indian companies can learn from that experience to build a robust private space sector in India.

USA CASE STUDY :

The USA is one of the first countries which emphasizes the importance of privatization and commercialization of the space sector. The space sector in the USA has experienced a rapid change in the past couple of years due to its constant unfolding of new policies, meant to promote and incentivize private participation. The private players in the USA have realized the potential in the space sector and the benefits from its successful commercialization and so, there have been an inflow of investments in this sector, not only from the big companies such as SpaceX and Virgin Galactic but also from swarms of smaller companies looking to enter into the industry and earn profits. The space sector provides great potential and so private companies are looking to enter into and invest in the fields of space tourism, surface exploration of the Moon and Mars, Asteroids mining, space launchers etc.

The USA saw the first case of privatization in 1990, when a private company developed an air-launched rocket. Since then, a subtle shift had been taking place towards privatization with several public-private partnerships established in early 2000s. This emphasis on privatization has become more prominent in the last couple of years with more and more private players entering the space sector. This paradigm shift from state-led space agencies to private companies has set a mark for providing cheaper, faster and easier access into space.

A major reason for the interest in the space sector shown by private companies is incentivization by the National Aeronautics and Space Administration (NASA), an independent agency of the USA federal government. NASA is looking to establish a system of evolving through partnerships with private companies and so is underscoring several incentives for these private companies. Back in 2019, NASA announced that it would open the International Space Station, a multinational collaborative space station placed in low Earth orbit, for 'private astronauts' or 'space tourists.' NASA realized the potential of this new area of 'Space Tourism' and hence promptly developed a policy to incentivize investment for it.

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NASA has recently collaborated with private companies such as SpaceX and Boeing to develop a program called the 'Commercial Crew Program (CCP)'.[137] This program is being developed mainly to end their reliance on the Russian Soyuz aircraft to send astronauts to the International Space Station and so NASA has awarded SpaceX and Boeing with more than 3.1 billion and 4.8 billion dollars to develop the required capsules. According to NASA, it has invested in several American private companies looking to develop transportation to and from the International Space Station, under the CCP. This is an excellent example of NASA's focus on incorporating and incentivizing private players into the space industry.

POSSIBLE OUTCOMES OF PRIVATIZATION

Aforementioned, the case study of the USA and the new privatization policy of India is indicative that the world at large, and all countries with prominent space programs are moving towards rapid privatization. However, this privatization, while inevitable, may lead to consequences, both positive and negative.[138] I will try to discuss and analyze some of these consequences and the possible solutions, as recommended by the experts in the field, for the challenges posed by privatization.

- **ADVANTAGES**

Based on the simple study of the space policies of most nations and their increasing shift towards privatization or public-private collaborations, we can safely state that privatization holds some benefits for both the governments of said countries and the private companies which invest in the space sector. The major source of revenue for most private companies entering into the space sector is to develop technology for the government. The governments also support such investments by subsidizing research and development to promote growth. If the private companies develop the technology to help ferry astronauts to the International Space Station, they can further utilize this technology to build the 'Space Tourism' industry and earn large profits.

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[137] *Commercial Crew Program – Essentials*, NASA.gov, https://www.nasa.gov/content/commercial-crew-program-the-essentials#.VjOJ3berRaT)

[138] Gomes, Devezas, Belderrain, & Salgado, *The road to privatization of space exploration : What is missing?* https://www.researchgate.net/publication/289635460_The_road_to_privatization_of_space_exploration_What_is_missing (2013).

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An added impact of privatization is that it will lead to a greater number of satellites in space. In fact, with the rise in privatization,[139] a dramatic increase in low-Earth satellites is being predicted by some experts. The new low-cost small satellites have proved to be a very useful invention for scientific research considering their flexibility and inexpensive nature. Moreover, satellite constellations, which are a group of satellites working together as a system, will have a huge impact by improving communication. With a large number of private companies investing in satellites, global connectivity can hugely improve and help provide low-cost high-speed broadband internet services. We especially realize the importance of high-speed internet and improved connectivity in light of the Covid-19 pandemic, where remote forms of working, teaching and learning have become essential.

One of the greatest advantages of privatization, public-private ventures and the consequent increase in the number of low-Earth orbit satellites is that they can help in climate and disaster management. Private satellite firms present the rare opportunity to dramatically increase the data available to scientists for weather and climate forecasting. This increase in data would lead to an increase in the accuracy of the forecasts which could help governments with disaster management and help people prepare for them beforehand. These satellites could revolutionize environmental watch and help scientists study the environment.[140] For example, a small Silicon Valley startup, called Skybox (now acquired by Google and renamed) is a small imagery company which released a fleet of micro-satellites. This means that if a scientist wishes to monitor the glaciers, they can easily do so with the help of high-resolution imagery provided by these satellites.

- **DISADVANTAGES[141]**

While the forces driving human expansion are evolving rapidly and moving towards privatization, we need to consider some of the possible negative consequences and try to explore how they can be rectified. The major challenge posed by privatization is the unrestrained increase in the number of satellites that are getting launched into space. The private companies which have already ventured into the space sector, as well as governments, have managed to develop devices that are extremely small and so they continue to launch a number of them into space. However, this is

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[139] Mani, Bhatt and Reddy, V.S.M, S.B and V.B.R, *Recent Trends in International Space Law and Policy,* Centre for Air and Space Law NALSAR University of Law Hyderabad Telangana India, Asia Law House (Hyderabad).
[140]Freedman, A.F, *The Space Race Is On for Climate, Weather Privatization*, Climatecentral.com, https://www.climatecentral.org/news/the-space-race-is-on-for-climate-weather-privatization-16243 (2013).
[141]*The Pros and Cons of Privatizing Space Exploration*, FORBES, https://www.forbes.com/sites/quora/2017/04/04/the-pros-and-cons-of-privatizing-space-exploration/?sh=41de444a3319 (2017).

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causing the low-Earth orbit to become increasingly crowded leading to an increase in the possibilities of collisions. Not only does this damage expensive equipment, but it also contributes to 'space debris' or 'space junk' which is any piece of machinery or equipment left by humans in space. While space debris doesn't pose that big of an issue today, the continued uncontrolled launch of satellites into space might increase the risk of collisions as there will be unprecedented amounts of space debris in space.

In 1996, an agreement was reached in the United Nations General Assembly and the 'Outer Space Treaty' was passed. This was signed to provide a basic framework on international space law. According to this treaty, the exploration and use of outer space are to be carried out for the benefit and interests of all countries. Amongst other rules, it also stated that harmful contamination of space and celestial bodies shall be avoided. Now, since this document was framed in 1996, it does not contain any clear guidelines for private companies. Technically, anyone who is planning on going and staying on any celestial body, including the moon and mars, would violate the Outer Space Treaty.[142] Nevertheless, several companies are interested in the colonization of Mars and even the moon and wish to send humans into these bodies to stay there. One such company is 'Mars One' founded by Bas Lansdorp. This project wishes to send people to Mars and leave them there to establish colonies. So, this leaves us with the question of whether we wish to start another wave of colonization, which will lead to the exploitation of space and other celestial bodies. Therefore, we need to question whether we have evaluated the possible consequences of polluting space and other planets before planning such ventures.[143]

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[142] *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies*, UNITED NATIONS Office for Outer Space Affairs (https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introouterspacetreaty.html).

[143] P.W. Ward, *The unintended consequences of privatising space*, Sciencefocus.com, (https://www.sciencefocus.com/space/the-unintended-consequences-of-privatising-space/ (2019).

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CONCLUSION

In conclusion, I would like to say that the new Spacecom Policy of India has opened new vistas for private companies for investing in space technologies. It creates scope for the private sector to explore the field of space with more surety about the returns on their investment. The global experiences like that of the USA thus indicate that a model of combination of public and private sector investments in the space sector leads to better understanding, and development of new technologies, new areas like space tourism etc. which may help the global communities in providing better access to many services to the remotest parts of the world through improved satellite communication technologies. However, we should be mindful of the fact that over-exploitation of space and an unfettered race to exploit the resources of space may lead to a situation as we have seen with the over-exploitation of earth's resources resulting in a global race for gaining supremacy and various types of pollution.

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LEGAL ISSUES ON COMMERCIAL EXPLOITATION OF SPACE[144]

INTRODUCTION:

Exploration has its critics, but humans are born explorers. For some, it is about finding new places and stretching their imagination, and for others, it is about resources and the survival of various species. Human evolution has always been linked to transportation. They invented the wheel and conquered the land. All means of transport, be it airways, waterways, or land-ways that helped cover the world; it has always followed the same pattern and carries significance for commercial purposes. Air and Space laws require constant interplay between theoretical concepts and industrial needs and development, be it for commercial purposes or exploration. International law's position is reflected in several treaties, including the Outer Space treaty, 1967[145], and the Moon Treaty, 1979.[146]

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[144] **Author: Simran Koirala**
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[145] *Resolution Adopted by the General Assembly;* UNITED NATIONS OFFICE FOR OUTER SPACE AFFAIRS, https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/outerspacetreaty.html

[146] Prof. Ranbir Singh, *Current Developments in Air and Space Laws,* 433 (2012), http://nludelhi.ac.in/download/publication/2015/Current Developments in Air and Space Law.pdf

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LEGAL REGIME GOVERNING SPACE:

In the late 1950s and continuing through the 1960s, the US and the Soviet Union tried to establish superiority in the new realm of outer space[147]. Both superpowers feared the other becoming dominant and placing new types of weapons in the Earth's orbit, becoming more dangerous to each other, and the rest of the world. After an agitated international competition period, the US, UK, and the Soviet Union signed what is informally known as the 'Outer Space treaty[148]'. This document was the first of its kind and attempted to establish a basis for international space law today. Today, over a hundred countries are a party to the treaty with over twenty more working towards ratification.

At its core, the outer space treaty is a non-nuclear agreement and prohibits military activities in space while also establishing conventional weapons. It also stipulates that space and celestial bodies must be free to be explored by all nations and that no party may claim any region. The only problem with the outer space treaty is that it was drafted back in the 1960s when one's understanding of space was considerably more limited than today, which means much of the language was left relatively ambiguous.

In more recent years, a study of asteroids developed that they are full of precious resources and that Earth species might mine them. The US passed the Commercial Space Launch Competitiveness Act of 2015[149] , which clarified its position on outer space rights[150]. The law laid down in Section 51301 in the USC (United States Code) explicitly allows US citizens and corporations to engage in the commercial exploration and the exploitation of space resources, including water and minerals[151].

Indian Space Research Organization is an organization that started its journey in 1962, the same year when America was prosperous in launching a man on the moon. It has a world record of launching 104 satellites in one go, thereby leading to launching a satellite at a very cheap rate in

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[147] Militarisation of Space; The Cold war (History), Wikipedia, https://en.wikipedia.org/wiki/Militarisation_of_space#:~:text=The%20Cold%20War,-Main%20article%3A%20Cold&text=During%20the%20Cold%20War%2C%20the,and%20started%20the%20Space%20Race.

[148] Daryl Kimball, *The Outer Space Treaty at a Glance,* ARMS CONTROL ASSOCIATION (Oct. 2020), https://www.armscontrol.org/factsheets/outerspace

[149] U.S. Commercial Space Launch Competitiveness Act, 2015, 114th Congress Public Law.

[150] Commercial Space Launch Competitiveness Act of 2015, WIKIPEDIA, https://en.wikipedia.org/wiki/Commercial_Space_Launch_Competitiveness_Act_of_2015

[151] Space Resource Commercial exploration and utilization - Chapter 513 (2015), Public Law https://www.congress.gov/114/plaws/publ90/PLAW-114publ90.pdf

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the present. It had also discovered three species of bacteria that are highly resistant to ultraviolet radiation in the upper stratosphere[152]. However, India is quite some distance away from adapting to the global space business's unfolding changes. In its early years, Indian space programs were constrained by a lack of resources; hence, it seeks innovative ways of getting ahead in space. The budget of ISRO stands at 1.9 billion dollars against 19 billion dollars of NASA and merely has a 2% share in the world space industry[153]. In a recent press conference, India's Finance Minister Nirmala Sitaram pronounced that the private sector will be a co-traveller in India's Space journey. This had been done as a part of the policy reforms to fast-track Investment effort towards Atmanirbhar Bharat (self-reliant India) on December 13th, 2020. While ISRO has innovated and performed inter-planetary, deep space exploration missions with fewer power rockets, India is still nowhere near self-reliance in terms of launch capabilities. India still pays for the French Rocket Ariane V to launch its satellites that weigh over 4 tons[154]. The government dominates the space sector. Although ISRO encourages private sector participation in the national space program, its model is very much the 20th-century program; especially in government domination. As it looks at the private sector's growing role and the effort by nations like the UAE and Luxembourg[155], India needs to move quickly towards a new space activity model. It requires a regulatory environment that encourages a more dynamic role for the private sector so that there is no government domination and innovation is promoted. India is among the global leaders in space exploration, and ISRO has spearheaded its success. These include satellite launches, space launch vehicles, and a range of associated capabilities, but the private sector has not contributed much. However, India lacks the strategy to harness the power of personal innovation in the space domain. This not only limits the exploitation of space for economic development but has profound national security implications. There is a requirement for a strict and flexible policy so that the government and private sector can collaborate and work together for the space sector.

One should rather see and believe that space is a common heritage for all humankind, and therefore, should be utilized to benefit the entire human population; helping fund underdeveloped nations rather than letting great wealth pile up in the hands of a few powerful countries;

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[152] Supra 1 (pg. 434)

[153] Aditya Chaturvedi, *Entry of private players to herald a new era in India space sector,* GEOSPATIAL WORLD (Nov. 30, 2017), https://www.geospatialworld.net/blogs/isro-private-sector-in-indian-space/

[154] Elizabeth Howell, *Ariane 5 rocket launches communications satellites for India, Eutelsat into orbit,* SPACE (Jan. 16, 2020), https://www.space.com/ariane-5-rocket-launches-eutelsat-konnect-gsat-30-satellites.html

[155] --,*UAE Space agency signs MoU with Luxembourg (2017)*, THE ECONOMIC TIMES (Oct. 27, 2017), https://economictimes.indiatimes.com/news/science/uae-space-agency-signs-mou-with-luxembourg/articleshow/61024984.cms?from=mdr

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understanding the language of the outer space treaty; call for a new economic order that would reduce global poverty and increase the well-being of all nations. The treaty says the exploration and use of outer space shall be carried out for the benefit and in the interest of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all humanity.

Motives to influence international space law prevent it from disproportionately benefitting the world's wealthiest countries, *among other things* focusing more on the equitable distribution of profits derived from outer space resources. 'Common heritage to all mankind' as a designation if given to space would lend legal support for the democratic distribution of revenues derived from outer space.

Today, people are nearing the end of their opportunity to ensure the space industry is democratically regulated. What they are facing is not just a new era of space exploration; it is essentially the handling of a key to an inaccessible realm to the world's wealthiest people. If smaller nations and individuals worldwide speak up now, there could be a significant difference here at the beginning of the new era. It is not just national bragging rights that are at stake, but a political and economic struggle over the very nature of the celestial commons.

There are two possible outcomes, the massive intensification of inequality, or the potential for the elevation of all people and a movement towards an egalitarian world. Suppose billionaires and soon-to-be trillionaires, like Jeff Bezos, are even allowed to transcend the Earth's resource limits and access cosmic resources beyond the reach of the entirety of humanity.

In that case, they will amass an abundance of power. The sheer dollar value of off-the-earth resources is merely unfathomable, and the repercussions of allowing all that wealth to flow into the bank accounts of a handful of ultra-wealthy and influential people would have disastrous effects. Like Alaska's sovereign wealth fund which delivers a percentage of oil revenue to its residents, the same could be done for the inhabitants of planet Earth.

There could be laws regarding compensating the companies involved in the extraction and distributing the wealth to reflect a democratic vision of outer space. If people choose to see the space beyond Earth as an international common, it will give them a fantastic opportunity to experiment with redistributive mechanisms beyond nation-states' usual confines. If there is an establishment of a sovereign wealth fund for the entire Earth, as space resource extraction grows and becomes a more profitable industry, redistribution of the revenue could create a genuine global

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universal basic income, freeing half the population of the world from crippling poverty, elevating developing nations, and furthering the advancement of the entire species. The space industry's windfall could allow countries to invest in clean energy, public works programs, education, and space programs.

CONCLUSION

Article 1 of the Outer Space Treaty thereby insists on the further exploration and use of the outer space to be carried out for the benefit, keeping in mind, interests of all the countries and province of all mankind. The res communis omnium or the principle of non-appropriation states that certain property is to be considered as the common heritage of mankind that is basically owned by everyone yet known to none. To conclude, there lies no existence of specific property rights in celestial bodies. The Outer Space Treaty in the domain of space explicitly mentions about the exclusion of acquiring of an unclaimed territory.

A superabundance of resources like platinum that is scarce here on Earth could potentially allow for an expansion of automation to the extent that output is dramatically increased and the need for human labour is reduced. Outer space should not be about flag-waving and conquest but about the expansion of human potential beyond Earth's bounds in a way that elevates all of us.

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DEFUNCTS AND THEIR SPACE IN THE SPACE & LEGAL POSITION OF SPACE DEBRIS[156]

INTRODUCTION

Space junk has been accumulating from the launch of the first man made satellite sputnik 1. The humans began to explore even beyond our earth, the historic event presaged the start of the Space Age. On the other side, in the form of trash we've left our mark in the space. This space junk accumulates from the stage of rockets abandoning satellites into orbit and the once they dead satellites themselves become junk. Not only the satellites but also this junk includes small bits and pieces that are lost in space, such as paint crumbs that peel away from the outer parts, screws, nuts, bolts, garbage covers, etc. These defunct satellites and remains from the collisions have surrounded the earth and formed a cloud of space debris around it. The tiny nuts and bolts moving at high speed could do immense damage to the functioning satellites. And in many other ways space debris is harmful and not having a liability or a solution for this is will lead to much ore destruction of space. This article will be dealing with space debris, legality and liability for it.

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SPACE DEBRIS

According to the European Space Agency (ESA)[157] Space debris, is also known as space litter, orbital debris, space junk, space trash, or space garbage, is also defined as all human-made defunct pieces comprising remains and elements, in earth's orbit or any of such things re-entering the earth's environment. The term space debris was initially referred to the natural debris that is found in the Solar System namely asteroids, comets, and meteoroids. This space debris as mentioned above may also include old satellites, the fragments from disintegration and collisions. From about thousands of launches conducted since the start of the Space age resulted in the accumulation of human-made objects in space and majority of the compiled objects are originated from in-orbit break-ups and some in-orbit collisions.

LEGAL STATUS OF SPACE DEBRIS

Space debris is nowhere explicitly addressed in the current international law. Under the umbrella the UN Committee, international space laws have been created on the Peaceful Uses of Outer Space (COPUOS)[158]. Currently only three treaties with relevance to space debris issues are in force

The Outer Space Treaty, 1967[159] – The activities of exploration and use of outer Space including the moon and other celestial bodies, by the states are governed by the principles of this treaty

The Liability Convention, 1972[160]– convention regarding International Liability for Damage Caused by Space Objects and

The Registration Convention, 1976[161] – convention regarding Registration of Objects Launched into Outer Space.

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[157] Louis de Gouyon Matignon, The Legal Status of Space Debris, Space Legal Issues, June 23rd 2019. https://www.spacelegalissues.com/the-legal-status-of-space-debris/

[158] Tim Robinson, Space Debris: Legal issues, Royal Aeronautical Society, Jan 3rd 2014. https://www.aerosociety.com/news/space-debris-the-legal-issues/#:~:text=Article%20VIII%20of%20the%20Outer,their%20presence%20in%20outer%20space.%E2%80%9D

[159] Treaty on principles governing the activities of states in the exploration and use of outer space, including the moon and other celestial bodies, 27th January 1967, General Assembly Resolution 2222 (XXI). https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/outerspacetreaty.html

[160]Convention on international liability for damage caused by space objects, 29th March 1972, General Assembly Resolution 2777 (XXVI). https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/liability-convention.html

[161] Convention on registration of objects launched into outer space, 14th January 1975, General Assembly Resolution 3235 (XXIX).

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The Outer Space Treaty has three articles in language relevant to space debris issues.

- Article VI states, "States party to this treaty are international responsible for national activities in outer space."
- Article VII makes states party to the treaty internationally liable for damage caused by objects (and the component parts of those objects) that the state will launch or have launched into space
- Article IX allows, states to request consultation concerning the activity or experiment when states which have a reason to believe that a planned activity or experiment can cause potentially harmful interference with other space activities

This Liability Convention makes states liable for damage caused (anywhere other than on the surface of the Earth) to a space object of one launching state or to person or property by a space object of other launching state, only if the damage is caused is by failure or damage of the space object or by the fault of person who is responsible for the space object. The Registration Convention made it mandatory that all the states should notify the UN of any objects they launch and provide the UN with the objects' orbital parameters. The Registration Convention directs the nations who have monitoring or tracking facilities to aid in the identification of space objects that caused damage.

The above mentioned three UN treaties deal with only a few issues due to the presence of space debris, but still there are many space debris issues which are not addressed. Nowhere in these three international treaties the potential need to restrain the formation of new space debris has been addressed. Only Article IX of the Outer Space Treaty[162], is an applicable reference, it speaks about "consultations" that too only if member states believe activities or experiments can cause grave interference with other space activities. Also, as per the liability convention, liability arises based on ownership of the objects involved, vast majority of the debris objects are not catalogued and in such a case to determine the origin and ownership of such debris objects is highly impossible. As the legal definitions of "space debris" and "space objects" are not clear the interpretation and application of treaties to debris issues can be quite difficult.

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https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/registration-convention.html

[162] Treaty on principles governing the activities of states in the exploration and use of outer space, including the moon and other celestial bodies, 27th January 1967, General Assembly Resolution 2222 (XXI). https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/outerspacetreaty.html

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MEASURES

The guidelines set by United Nations Committee on Peaceful Uses of Outer Space[163] – UN COUPOS are voluntary and non-law principles which implies that the states and their nationals have no legal obligation to comply with the rules.

These guidelines did not provide a solution for the space debris issue and also these guidelines are only applicable to designing and operational planning of anew designed spacecrafts and orbital stages. However, these guidelines provide a framework of how to conduct the space activities and pursues to limit the discharge of debris from such operations.

Space Debris Remediation is another measure taken, which aimed at removing the existing space debris by active debris removal method (ADR)[164]. ADR is a process of removing objects such as rocket bodies and defunct satellites which are not functional anymore. The ADR process is followed by another method called on-orbit servicing satellites (OSS), this method helps in improving those defunct satellites by refueling and upgrading which will reduce the risk of space debris. These measures were only proposed but did not come into effect, as they are still under investigation by Defense Advanced Research Projects Agency.

As per Article VIII of Outer Space treaty[165] A State who is a Party to this treaty and on whose records an object is launched into outer space shall hold authority and control over such object, hence only the registered objects come under the space debris remedy. Even though the object is harmful and possesses imminent danger to the functioning satellites, these objects cannot be removed without the consent of the states as these states withhold the legal power to enforce over their space objects. Removing these objects without prior consent of the respective state will be regarded unlawful and hence will be in contravention of the Outer Space Treaty.

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[163] https://www.unoosa.org/documents/pdf/spacelaw/sd/COPUOS-GuidelinesE.pdf

[164] Maya Wei-Haas, Space Junk is a huge problem-and it's only getting bigger, Science, National Geographic, April 25th 2019.
https://www.nationalgeographic.com/science/space/reference/space-junk/

[165] Treaty on principles governing the activities of states in the exploration and use of outer space, including the moon and other celestial bodies, 27th January 1967, General Assembly Resolution 2222 (XXI).
https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/outerspacetreaty.html

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CONCLUSION

The scientific and the technical research fields have been analyzing and researching on space debris for a long time now. But the space debris issue did not achieve the legal recognition it requires. Drafting of an international legal framework to address the issues that space debris raises is essential now. Though the mitigation of space debris will lead to heavy and high raise in the cost of space activities it is necessary to draft a law, indeed an international law for addressing this issue. To have a balanced future of human activities in the outer space in various fields such as communication, broadcasting or navigation, observation demands for an international law.

Though some countries such as United States, Russia and Europe have their own policies, space is an international play fields so consequently space debris becomes an international issue so the solution for this should also be international. Lack of proper legal work may lead to uncompetitive advantage and unbalanced cost of space activities which will become a burden for countries to carry on their space activities.

The release of space debris cannot be diminished but in future a regulation on production can be formed or certain methods of removal should be followed. The legal issue that is liability for destruction. The liability of the state whose space debris or any object which interrupted or destructed a working satellite or space craft of another state, in that case the liability of the destructing state toward the victim state is a vital issue to be addressed. And another major issue is registration of space objects, a clean catalogue or register of space objects being launched by any state will help in determining their space debris and if any destructions caused. Regulating space debris will provide a healthy environment around the earth and healthy 'SPACE'.

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THE LEGALITY OF ANTI - SATELLITE WEAPONS[166]

INTRODUCTION

Approximately 5,000 satellites are set into motion and out of which nearly 950 satellites are currently functioning. [167]Satellites are spread all across the orbit of the Earth and have a huge impact on our daily life. Satellites carry out countless applications like broadcasting, navigating, communicating, etc. The communications networks that are used these days are mostly based on satellites, and anti-satellite weapons are used to destroy these kinds of communication networks. Anti-satellite weapons can be divided according to the ruinous potentiality. Usually, the Anti-Satellite weapons are used to jam the communication of the enemy country with their military force, during warfare. These weapons are also operated to retrieve internal information about the enemy country. In this article, detailed research is performed by the author on the Anti- Satellite weapons, the author also tried to present an analysis on how the Anti Satellite weapons will affect the world's environment. After a detailed review the author tried to find out a conclusion on whether the Anti Satellite weapons are legal, and even if it is deemed to be legal then what are the pros and cons. Technology in warfare is increasing with the evolution of weapons and technology. A German scientist named Werner Von Braun was the first scientist who developed the cruise missile, Vergeltungswaffe- 2 also known as the V-2 that was used by Germany in World War-2.[168]

The benefits of a satellite that can be utilized during warfare or for military communications were first made obvious by the preliminary research satellites of the United States. The development of anti-satellite weapons started in the United States during the 1950s with the Air-Launched Ballistic Missiles and its trial was performed on the United States Satellite Explorer VI. Russia has also been executing substantial tests on orbital intercept systems and started developing the anti-satellite systems by utilizing the Mig 31 D fighter and that satellite could demolish 36 satellites

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[167] Taylor & Francis Online, https://www.tandfonline.com/doi/pdf/10.1080/14777622.2014.891558, (last visited 12th June, 2021)

[168] Space Legal Issues, https://www.spacelegalissues.com/the-legal-status-of-a-missile/, (last visited 12th June, 2021)

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within 24 hours.[169] The idea of anti-satellite weapons mainly came from the core idea of Anti Ballistic Weapons (ABM). But with the development of Anti-Satellite Weapons there arose a huge change in International Law, these developments are not only affecting the laws but also affecting various treaties made by several countries.[170] As satellites play an important role in the daily lives of the people, the development of Anti Satellite weapons is excruciating the lives of the people and affecting the environmental treaties made by several countries across the world.

APPLICABILITY OF LAWS

Space Laws are also considered to be a part of international laws. Not only in the treaties regulating the space activities but also in the wider treaties the subject of space law is included. The laws which are pertinent to the Anti-Satellite Weapons can be classified into three broad areas, and they are the Outer Space treaties or any treaty which is related to outer space or celestial bodies, International Law governing trial and usage of weapons, and pertinent environmental laws. The international agreements on outer space many times refer to the United Nations Charter[171] as it institutes the fundamental principles of behavior among the countries. The United Nations Charter[172] prohibits the use of armed forces "saved in the common interest of the state parties", but it will be hard to visualize if the Anti-satellite weapons are used in the "common interest of the state parties". Along with the question of whether Anti Satellite weapons are legal, another question arises whether using any kind of force in outer space is legal. General Assembly Resolutions played a very crucial role in the growth of space laws. Apart from the Outer Space treaties and international laws, it is important to scrutinize the conventions of the International Telecommunication Union (ITU)[173]. The International Telecommunication Union states the condition of the satellite in the International laws and the treaties made regarding the protection of the satellite, but there is no clear indication about the legality of the Anti-Satellite Weapon.

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[169] David, George Town University Law Centre, https://scholarship.law.georgetown.edu/cgi/viewcontent.cgi?article=1452&context=facpub, (12th June, 2021)
[170] Justin Paul George, *History of Anti Satellite Weapons*, THE WEEK (Feb. 17, 2021, 10:07 PM),https://www.theweek.in/news/sci-tech/2019/03/27/history-anti-satellite-weapon-us-asat-missile.html#.
[171] Charter of the United Nation, 1945, San Francisco.
[172] *Id.*
[173] International Telecommunication Union, 1865, Geneva.

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OUTER SPACE TREATY

The Outer Space Treaty is the prime treaty that regulates all the usage of outer space and hence it will be the first treaty that will be taken into consideration. The legality of anti-satellite weapons is also dependent on the legality of using force in outer space and on the fundamental principles of behaviors among the states. There are no international provisions that directly state that anti-satellite weapons are illegal. One of the most essential means to determine the legality of anti-satellite weapons and the use of force in outer space is to examine the definition of 'Peaceful Purposes' and interpret the term relevantly. The definition of the term 'Peaceful Purposes' is mentioned in the Outer Space treaty,[174] the main aim of formulating the outer space treaty is to prevent any disturbances or conflicts regarding outer space and to encourage proper utilization of outer space and this is what is symbolized as 'Peaceful Purposes'. The definition of the "peaceful purposes" which is provided in the outer space treaty does not specify a particular activity. Article 1 of the outer space treaty gives complete freedom to use outer space. A country can make proper utilization of the outer space, until and unless the usage of that outer space by one country is affecting any other country's peace, national security, usage of outer space, etc. Another basic principle that is stated under Article 1 of the Outer Space Treaty is the "common interest" between the states. Article 4 of the outer space treaty deals with trial and usage of any kind of weapons, Article 4 states that countries should use outer space only for welfare and peace, it also says that the nations should not test or use any kind of weapons or military operations on the moon or other celestial bodies until and unless those military operations were performed to promote "peaceful purposes". But this article in the outer space treaty does not specifically prohibit the use of directed or kinetic energies Anti Satellite weapons. Another main question that arises along with the question of the legality of the anti-satellite weapon is the "use of force"[175]. The provisions related to the use of force may restrict the usage of anti-satellite weapons even if it is considered legal according to other Space provisions. The matter of 'use of force' can be discovered in the United Nations Charter. Article 2 clauses 4 of the United Nations Charter prohibits the states from using threats or force against any other state or any kind of action not compatible with the motives of the United Nations. But under Article 51 and Chapter 7[176] of the United Nations Charter, the countries

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[174] Outer Space Treaty, Art 1(1), Abeyratne, "The use of Nuclear Power Sources in Outer Space", Journal of Space Law Vol. 25(1), pg.20, 1997

[175] Outer Space Treaty, Art 1(1), Abeyratne, "The use of Nuclear Power Sources in Outer Space", Journal of Space Law Vol. 25(1), pg.20, 1997

[176] United Nations Institute for Disarmament Research Geneva, *Prevention of an Arms Race in Outer Space: A Guide to the Discussions in the Conference on Disarmament*, United Nations Publication: New York p. 61 (1991) https://www.researchgate.net/publication/344493662_The_Legality_of_Antisatellite_ASAT_Weapons.

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can use force only to keep up the safety, security, and peace of the nation and only if there is a "threat to peace or breach of peace".

ENVIRONMENTAL LAWS

The environmental conditions must be taken into consideration when legal military conducts are going to take place. The 24th principle of the Rio Declaration[177] says: "Warfare is inherently destructive of sustainable development. States shall therefore respect international law protecting the environment in times of armed conflict and cooperate in its further development, as necessary." This principle drafted in the Rio declaration must be followed even if any country is performing self-defense or using force to safeguard its nation. Every nation should appreciate the international provisions regulating how to protect the environment.

STATUS OF THE ANTI-SATELLITE WEAPON IN ACCORDANCE WITH LAW

As mentioned earlier, there are various kinds of Anti Satellite Weapons. Maybe the legality of Anti Satellite weapons depends on the categories of the weapon. The Nuclear Ban Treaty[178] prohibits the usage of nuclear weapons by the states which are Parties to the Nuclear Ban Treaty. Hence, electromagnetic vibrations which are caused by nuclear explosions like Anti Satellite weapons are restricted by the Nuclear Ban Treaty. There is no such provisions in the International law which states the illegality of testing an anti-satellite weapon, though Article 4 of the outer space treaty prohibits the trial of a weapon on the celestial bodies, it is still not clear whether the article prohibits the testing of anti-satellite weapons only on the celestial bodies or generally in the outer space.

The agreement regarding the activities of the Moon and other Celestial bodies also known as the Moon Treaty prohibits the usage of anti-satellite weapons from the moon. But there is a provision which deals with the amendments in the future and the evolution of technology that can lead to the construction of military installments on the moon. Also, the states have full freedom of installations on the moon for "peaceful purposes", the restrictions which are mentioned in the outer space treaty are broadly described under the Moon treaty, and the provisions under the Moon treaty are more precise and clear. Article 3 of the Moon treaty prohibits the use of force or threat on the moon; hence it can be assumed that if the satellites around the moon get destroyed by any anti-

[177] Rio Declaration on Environment and Development, 1992, 24th Principle.
[178] Test Ban Treaty (Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Over Water, 1963.

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satellite weapon then it will result in the violation of the provisions mentioned in the Moon treaty. So the moon treaty prohibits any kind of usage or trials of weapons (including Anti-satellite weapons). Under International law, it is usual to consider the legality of a weapon by identifying the category of the particular Anti Satellite weapon.

CONCLUSION

As the legality of the anti-satellite weapons depends on the unique character of the weapon then there must be some specific legal provisions based on the category of the weapon. Also before the trial and usage of anti-satellite weapons must be done keeping in mind the environmental impact, as it puts a huge impact on the environment, one of the essential defenses that are always taken to make the Anti-satellite weapon legal is that it does not amount to high human sufferings or is a threat to the lives of humans. But the usage of ASATs must be strict and efficient.[179]

[179]Jasper Schellekens, *Legality of ASATs*, RESEARCH GATE (Feb. 17, 2021, 10:20 PM) https://www.researchgate.net/publication/344493662_The_Legality_of_Antisatellite_ASAT_Weapons.

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PRIVATE PROPERTY RIGHTS IN SPACE: A BRIEF STUDY[180]

Space law was actively developed at the beginning of the 20th century and was followed by a period of inactivity in the field. This inactivity has, in recent years, ceased. For example, in the UK in 2018, the "Law on the space industry" was adopted, which spelled out licensing issues, regulatory requirements, legal liability, and compensation for damage caused by the activities of private space companies.

The new developments are because of the emergence of private businesses in outer space, a significant increase in the amount of space debris, and potential attempts by some States to move the arms race into outer space against the provisions of the Outer Space Treaty.[181] Many new private actors have begun to operate in the space industry like SpaceX and Virgin Galactic which raises concerns about the adequacy of the legal framework at both domestic and international levels for regulating commercial activity in space. These businesses go to space to raise profits.

Various companies, unlike the state, prefer not to invest in non-profitable objectives which may help improve the accessibility of space. The private business invests only where they can make profits. As a result, they provide new and cheaper useful space services in space or through space to individuals and legal entities. Mobile communication, global Internet system, and navigation are all linked with cosmic services. These fields will see an increase in private investment as it is highly profitable.

Moreover, the very idea of private rights over space is a widely debated issue. Many people argue over the Outer Space Treaty's recognition of such private rights. Liability for such private activity shall remain with the Nation which allowed such a private endeavour in space. Also, it is the responsibility of the Nation to supervise the private activity authorized by them.[182] Moreover, no nation can claim sovereignty over any land in Outer Space.[183] The aim of the outer space treaty

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[181] Outer Space Treaty 1967.
[182] *Id*, Article VI.
[183] *Id*, Article II.

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was to ensure that no nation has any legal sovereign claim over any celestial body and no military force is used in space. And to that extent, the Outer Space Treaty ensures no nation has any sovereign claim over celestial bodies and that the resources in space are available equitably to all parties. Although the writers of this Treaty have discussed using the principles derived from exploration of Earth, it was not adopted in the treaty because "both public and private groups . . . work towards formulating standards and procedures that will guarantee access by all to these resources on fair terms and prevent interference by one State with the scientific programs of another."[184]

The issue with private parties in space is according to the Outer Space Treaty, responsibility for any action lies with the government that allowed such an act. And the Nation is responsible to supervise any action in outer space as well. This hinders commercial development as the government is involved again. Also, it brings some ambiguity about the actual ownership of such resources when liability lies with the government for the actions of private actors. Further, private property rights incentivize innovation and efficient use which benefits the society as a whole.

Alan Wasser's[185], argument is based on the legal maxim of *expressio unius est exclusio* which means that the provisions not mentioned in the treaty were left out as a deliberate choice and those nations have the right to recognize a property claim because such a right to recognition was not excluded. He claims that private ownership is not an act of national appropriation as it is not the same as asserting authority. Further, he argues that the private ownership of land can be facilitated with no sovereign authority under the Lockean theory.

Thomas Gangale[186] points to the language of Article II of the Treaty which says "by any other means" which includes any other entity which may not be a government. Article VI states that the responsibility for acts of non-governmental entities shall lie with the government which authorized such action. Thus, Gangale argues that the provision to restrict national appropriation was all-inclusive and not limited to government bodies. He further argues that Article I provides for the free use of the resources and that free use is hindered by appropriation. However, limited appropriation of resources is warranted under the Treaty because it comes under free use. Making

[184] Lipson and Kauenbach, Report to the Nsfw Nrtl Aeronautics and Space Administration on the Law of Outer Space, A.B.A. FOUND. 22(a) (1960).
[185] Alan Wasser & Douglas Jobes, Space Settlements, Property Rights, and International Law: Could a Lunar Settlement Claim the Lunar Real Estate It Needs to Survive, 73 J. AIR L. & COM. 37 (2008).
[186] Thomas Gangale, THE DEVELOPMENT OF OUTER SPACE: SOVEREIGNTY AND PROPERTY RIGHTS IN INTERNATIONAL SPACE LAW 33 (2009).

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an analogy to the law of the sea, he says that celestial resources are Res Communis until extracted by the labour and efforts of a nation or non-governmental body.

These arguments pave the way for the idea of ownership and private actions in space. As non-governmental bodies continue to spearhead the research into space exploration, the treaties governing such action must be unambiguous and clear in governing these acts. Especially in international law, it is important that the treaties being drafted are not left to interpretation on such important and pressing issues. It is also necessary to ensure that the treaties help ensure the social obligation of using celestial resources to maintain the balance between personal gain and the good of society, as resources are the common heritage of mankind. Using these arguments as guiding principles, future treaties must strive to remove ambiguity in the nature of the ownership and to ensure a balance between profit-making and the common good of people. The social-obligation norm should be used as an important factor to determine the extent and nature of such rights.

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