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CENTRE FOR AEROSPACE AND DEFENCE LAWS (CADL)
NALSAR UNIVERSITY OF LAW, HYDERABAD

CENTRE FOR AEROSPACE AND DEFENCE LAWS (CADL)

NALSAR University of Law, Hyderabad

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OPPORTUNITIES AND CHALLENGES IN AVIATION AND SPACE INDUSTRY

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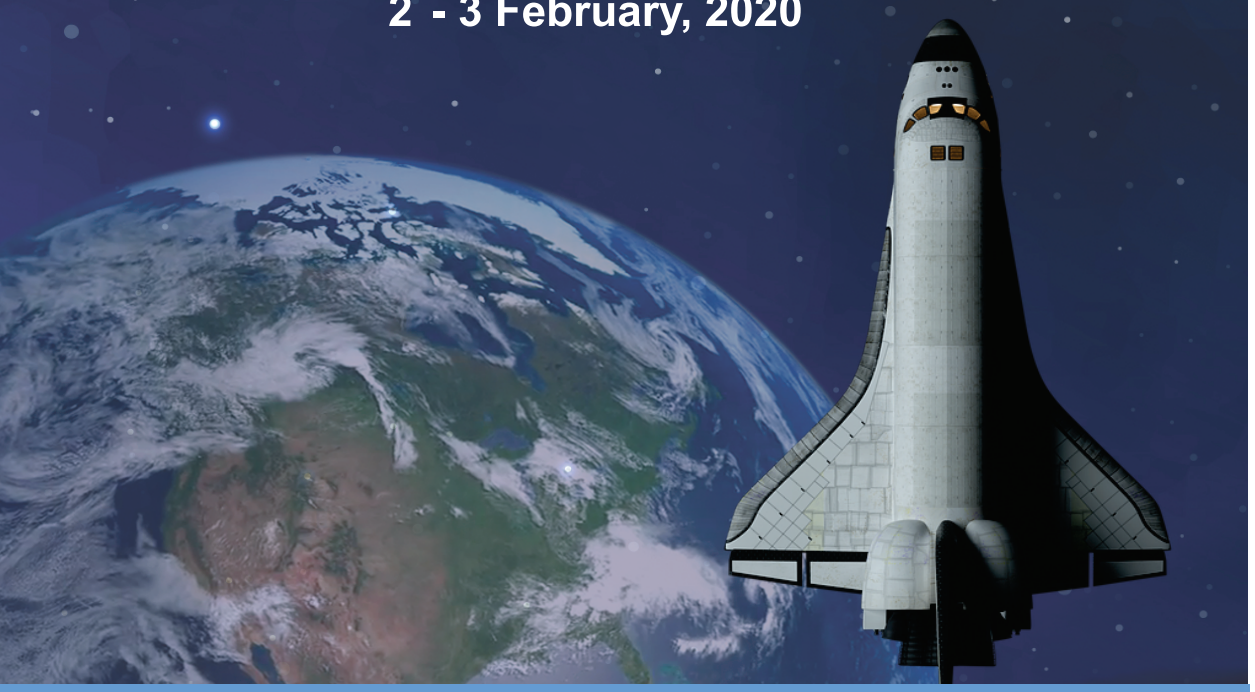

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EDITORIAL

Centre for Aerospace and Defence Laws (CADL), NALSAR, as an institution stands for par excellence research and through its courses, journals, newsletters, moot courts, conferences and other activities, bringing the attention of the Aerospace and Defence community to forefront and highlighting its contemporary issues and challenges at a global level.

The *Indian Journal of Air and Space Law (IJASL)*, an exclusive and vital part of the CADL, is inclusive of articles from authors, scholars, and students across the world. This area of study draws its relevance on various specialties: each of which is undergoing doctrinal and practical transformation as a result of new and emerging contemporary developments. This Journal was conceived with the intention to highlight recent developments, relate them to theoretical issues and critically analyse their implications. It caters to a broad spectrum of audience such as students interested in the field of international aerospace and defence laws, practicing lawyers, judges, research scholars and for all the other interested professionals.

It gives me an immense pleasure and enthral to release the VIII and IX Issue of *Indian Journal of Air and Space Law*. I am thankful and grateful to all those who have contributed their research work in the field of Aerospace Laws. This issue of the Journal contains many contentious themes pertaining to the sphere of Air and Space Law such as: Space Security, Countering Cyber-Attacks in Outer Space, Cyber Terrorism in Outer Space, Space

Debris, Legality of Space Mining, Registration Convention, 1975, Legality of Terraforming of Celestial Bodies under the Outer Space Treaty, etc.

Advancement and implementation of ever-evolving aerospace technology has resulted in tremendous global impact to diversify the field on numerous levels and calls for a further heated debate and research in this field. Nevertheless, apart from the academic and practical point of view, such interest for increasing need for exploration and uses of outer space can also be seen through scientific thriller movies, books and illustrations as well.

With the augmentation of globalization, intermingling and interdependence of economies, liberalization of space policies, technological developments in aerospace industry, privatization of certain aerospace segments, and the growing trends in non-interventionist bilateral and multilateral agreements, there is a development of new trends that are emerging in the aerospace industries throughout the world. Privatization and intensified global competition are forcing the aviation and space industries to become responsive, increasingly competitive and committed by focusing more closely on their stake-holders.

The recent venture of the Indian space agency ISRO to explore the surface of Mars is one instance which shows that the Indian aerospace technology is fast evolving, in response to the development happening elsewhere. While, India has accomplished international acclaim in the area of aerospace technology

development and utilization, there is still the need for integration for efforts at the national level, from the standpoint of the private sector. Nevertheless, it is an undeniable fact that the Indian Aviation sector is still in need for reformation in terms of liability, compensation and regulation of competition. At the same time, military missiles and satellites technology requires at par development with the International standards, in an effective and efficient manner as opposed to purchasing the same from other states at an exorbitant price. Therefore, the efforts of this Journal would be to promote and encourage a healthy and innovative debate on all facets of aerospace industry and ensure that the ethical standards of research are complied with.

The publication of IJASL is only possible with the relentless effort put in by **Prof. Faizan Mustafa-Vice-Chancellor, NALSAR University** and his constant, unequivocal and fortifying support coupled with his exemplary leadership, pleasing personality and brilliant administrative skills that have been a source of inspiration for us. He has continuously and regularly steered the academic path to evolve avenues for research and publication and attain higher levels of excellence.

I, on the behalf of the Editorial Team, profoundly and gratuitously thank our Patron for bestowing his faith in our ability to publish this Journal. I extend our gratitude to our National and International advisory board, whose valued suggestions and advice has guided the Journal in every aspect.

The Journal is our modest venture in further and advance research in the field of aviation and space law, and we at Centre for Aerospace and Defence Laws, sincerely hope, to keep up with our efforts for the continuation of the Journal.

I also sincerely hope that you enjoy reading this Issue as much as we enjoyed working on it.

V. Balakista Reddy
Editor-in-Chief

CENTRE FOR AEROSPACE AND DEFENCE LAW (CADL)

The NALSAR University of Law has always endeavored to promote quality research in contemporary legal issues. One of the contemporary but neglected areas in Indian legal realm is Air and Space laws. To fill this gap and to promote further studies and research in the aerospace law, the University established the advanced Centre for Aerospace and Defence Laws (CADL) in 2005 with object to contribute to the development of aviation and space laws and related policies by conducting and promoting research and teaching at different levels. Since then, NALSAR-CADL has been continually promoting the study of Air and Space Law by conducting National and International Conferences, Workshops and Publishing Newsletters, Books and Articles in Aerospace law field.

The University has been teaching the subjects of air and space law for the past ten years. Till the date, there are many students with degrees in air and space law who have now been absorbed in the national mainstream and are working with the airlines, airports and the multinational corporations. Recently, NALSAR-CADL has also launched few innovative On-site and Online courses which include the Two-Year Master's Degree in Aviation Law and Air Transport Management (MALATM); Two-Year Master's Degree in Space and Telecommunication Laws (MSTL); One-Year Post-Graduate Diploma in Aviation Law and Air Transport Management (PGDALATM) and One-Year Post–Graduate Diploma in GIS & Remote Sensing Laws. The objectives of these courses are to cater to the needs of unprecedented aviation growth

coupled with commercialization of space and telecom industries, which calls for thousands of skilled manpower to meet the managerial requirements of rapidly growing airports, airlines, aerospace and telecommunication sectors. CADL also undertakes collaborative research activities in areas of common concern with state governments, NGO's and other international organizations.

A NOTE FROM THE FOUNDER OF THE ESSAY COMPETITION

1ST DR. APJ ABDUL KALAM AIR AND SPACE LAW AND POLICY ESSAY COMPETITION

The aerospace industry in the 21st century is enjoying rapid growth and development, but remains rooted in the foundations, efforts, and ideas of yesterday. Faced with a wide variety of emerging industry practices and complex issues, law and policy in the aerospace sector must not only continue to develop apace, but also foster development and innovation. The objective of this annual essay competition is to offer insight into pertinent issues and challenges, offering potential solutions and analyses from professionals and experts in the fields of air and space law. Moreover, these insights demonstrate the global nature of air and space activities, and how current and future challenges require a progressive approach in the development and application of law and policy. This collection of essays, addressing the contemporary issues and future challenges in air and space law, provides a valuable resource for experienced practitioners and students. By delving past headlines and buzzwords to explore current and future challenges and solutions, these essays should present a rigorous legal examination relevant to the missions and efforts of international and regional organisations, civil aviation professionals, international and national space agencies, private operators, investors, insurers, and aviation and space consultancies.

As Founder and Editor-in-Chief of the Essay Competition, I am delighted to share with you that the first edition of the essay

competition received 50 plus submissions from students and professionals around the globe, that included submissions coming from Singapore, Israel, The Netherlands, Australia, Iran, Luxembourg and India. Out of the submissions received, the selected top 10 essay entries are printed in this volume of the Indian Journal of Air and Space Law published by Centre for Aerospace and Defence Laws (CADL), NALSAR University of Law, Hyderabad. In addition to the publication in the journal, a cash prize of One Lakh Indian Rupees (approx., USD 1500) will be announced and awarded to the recipients at the International Legal and Policy Conference on The Future of Transport – Opportunities and Challenges in the Aviation and Space Industry on 2-3 February 2020 at NALSAR University of Law, Hyderabad.

I sincerely thank the jury members who not only supported the initiative but have taken valuable time from their busy schedule to review the essay entries. Following are the jury members of the 1st Dr. APJ Abdul Kalam Air and Space Law and Policy Essay Competition 2020:

Name	**Designation/Company**	**Country of Origin**
Prof. Mia Wouters	Partner, GDS Advocaten	Belgium
Dr. Akhil Prasad	Director, Country Counsel India & Company Secretary, Boeing	India
Prof. Balakista Reddy	Registrar & Centre Head, Centre for Aerospace and Defence Laws, NALSAR University of Law	India
Dr. Charles Stotler	Associate Director, Air and Space Law Program, University of Mississippi School of Law	United States
Ms. Poorvi Kantroo	Doctoral Candidate, NALSAR University of Law	India
Mr. Vikrant	Advocate, Pachnanda Law	India

Pachnanda	Offices	
Mr. Ajai Ramakrishnan	Senior Associate, Clyde & Co.	UAE
Mr. Rishiraj Baruah	Associate, AZB & Partners	India
Prof. Faizanur Rehman	Assistant Professor, Jamia Millia Islamia University	India
Ms. Anastasia Gbem	Legal Advisor, Nigerian Airspace Management Agency	Nigeria
Ms. Chrystel Erotokritou	Legal Advisor, AirHelp	Germany
Mr. Benjamyn Scott	ATM & New Technologies Manager, ASD	Belgium
Ms. Helen Tung	Barrister, Fichte & Co.	UAE
Prof. Aisha Ahmed Sharfi	Assistant Professor, WBNUJS	India
Dr. Moses George	Director (Legal), Airports Economic Regulatory Authority of India	India
Mr. Dushyant Deep	Principal Legal Counsel, IndiGo Airlines	India
Mr. Sidhant Sharma	Legal Counsel, SGI Aviation	The Netherlands
Ms. Charlotte Thijssen	Senior Associate/Attorney-at-law, Kennedys	Belgium
Mr. Christopher Schmidt	International Air and Space Lawyer	United States

The idea of the Essay Competition first came almost 3 years ago but I could not execute the idea. It is only in early 2019 that an initial discussion took place with Indian Journal of Law and Public Policy (IJLPP), who immediately took upon themselves to bring this idea to reality. My sincere thanks to the whole team of IJLPP without whom this essay competition would not have seen the light of the day. I take the opportunity to commend the work of these young, enthusiastic and brilliant minds from the student community that runs this IJLPP journal for their tireless efforts and personally name the team of Rishika Jain, Unsa Khan Sherwani, Pranav Tanwar and Karun Gupta for ensuring the success of the essay competition.

I wish we continue to do this essay competition in years to come and that through this initiative my goal to find some ideas and supporting jurisprudence through this exercise will benefit the aviation and space community members in years to come.

My sincere thanks to NALSAR University of Law, Hyderabad, GMR Group, Sarin & Co, and University of Mississippi School of Law for the support and guidance. We are all doing our best to make a better tomorrow for ourselves, for our family, for our industry and for our country. This essay competition is a small effort from my end (actually a collective effort) to show my passion for the transport industry and my interest in the legal sector that contributes equally for the overall betterment of the society.

Sagar Singamsetty
Founder and Editor-in-Chief
Dr. APJ Abdul Kalam Air and Space Law and Policy Essay Competition

SPACE SECURITY AND THE LAW OF INTERNATIONAL SPACE COOPERATION: THE NEED FOR LEADERSHIP AND COORDINATION

PJ Blount[*]

INTRODUCTION

History may look back at the mid-2010s as the beginning of the breaking point of the international global order that emerged at the end of World War II. As populist politics swept the globe from Asia to Europe and North America, the world saw a marked retraction from states engaging in the international order meant to maintain international peace and security.

Interestingly, international cooperation is a bedrock principle of this order and is a critical component in international space law and policy. As a legal norm, it can be traced from the earliest United Nations debates on outer space, and it emerged out of a unique Cold War security environment, which understood cooperation and communication as necessary features of ensuring that the space environment is used for peaceful purposes for the benefit of all humankind. While international cooperation, as a principle, still maintains a central place in state space activities, in the post Cold War security environment, the cohesion that cooperation once ensured is fracturing in contemporary international relations. Commercial activities, rouge state development of space activities, and quickly developing

[*] Post-Doctoral Researcher, Faculty of Law, Economics and Finance, University of Luxembourg.

capabilities have all put strains on the legal regime and the security that it seeks to maintain.

Amidst this fracturing system, the space environment represents a unique example that illustrates the need for international cooperation, not only for its benefits to the space environment but for the benefits that it can have on earth. As space activities and actors continue to change, it would be a mistake to allow enmity among states to undercut the potential that space has for bringing benefits to global society and populations. This paper will argue that international cooperation is a critical component to ensuring the long-term sustainability of space and maintaining security stability terrestrially. Further, it will argue that states should reassess the role of international cooperation in their diplomatic endeavors and that international cooperation should be a component of domestic space law regimes.

This paper will first briefly sketch out the legal conditions that underpin international cooperation with specific reference to the regime established by the UN Charter and the Outer Space Treaty. It will then give an account of anti-cooperative trends in the global diplomatic community. This section will look at trends in such bodies as the United Nations Committee on the Peaceful Uses of Outer Space, the Conference on Disarmament, and the negotiations of the outer space Code of Conduct. Additionally, it will connect these trends to the larger trend of national politics retracting from the international order. Finally, it will argue that states can enhance

their security significantly through the pursuit of international cooperation and that space serves as a unique forum in which to foster this cooperation. This section will argue that states need to reengage with the diplomatic processes that are meant to ensure bilateral and multilateral cooperation. It will also argue that, in light of the recent proliferation of domestic space legislation, states should seek to extend the legal principle of cooperation into their domestic arenas to avoid future conflict.

INTERNATIONAL COOPERATION

In current debates over commercial development of the uses of outer space, it is often forgotten that the legal regime for outer space is centered on ensuring international peace and security. While advocates of commercial development often rely on a rhetoric of enmity between states by stressing concepts like "the new space race," the treaty system places emphasis on international cooperation. Indeed, international cooperation is more than just a passing phase in the Outer Space treaty; it is mentioned seven times: twice in the preamble, once in Article I, Article II, Article IX, Article X, and Article XI. Indeed, "international cooperation appears as the most prevalent theme in the Outer Space Treaty.

The prominence of the phrase in the Outer Space Treaty is an important indicator of the intention of the negotiators of the treaty to extend the multilateralism that emerged in the wake of World War II. Rather than the enmity of the Cold War, the negotiators

sought to emphasize the power of cooperation as a security stabilizer in space. International cooperation is a legal obligation or duty between and among states, that is meant to help ensure multilateralism over the division in space. The post-WWII environment was marked by the fear of a global war with nuclear weapons, and the advent of space technology shrunk the temporal realities of such a war to hours, in the case of ICBMs, or minutes, in the case of space-based nuclear weapons. Cooperation and communication became critical elements of the security regime as a way of building trust and confidence between nations.

This value has been consistently emphasized in United Nations documents. The second resolution that the United Nations General Assembly (UNGA) passed on outer space activities, in 1959, was titled the International Co-operation on the Peaceful Uses of Outer Space.[1] Resolutions on international cooperation have been consistently adopted by the UNGA ever since and are currently adopted on an annual basis, the most recent being in 2018.[2] This most recent resolution notes

> *. . .the importance of international cooperation in developing the rule of international law, including the relevant norms of international space law and their important role in international cooperation for the exploration and use of outer space for peaceful purposes,*

1 UNGA Res. 1492 (XIV) International Co-operation on the Peaceful Uses of Outer Space (1959).

2 UNGA Res. 73/91 International Cooperation in the Peaceful Uses of Outer Space (2018)

> *and of the widest possible adherence to international treaties that promote the peaceful uses of outer space in order to meet emerging new challenges, especially for developing countries*

Despite the emphasis on international cooperation, the legal obligation itself is highly aspirational and ill-defined. There are no specific requirements supporting the idea of international cooperation. The UN General Assembly attempted to add flesh to the bones of international cooperation with its 1996 Benefits Declaration, which sought to add a better definition of how states should share the benefits of outer space activities.[3] This resolution states that "States are free to determine all aspects of their participation in international cooperation in the exploration and use of outer space on an equitable and mutually acceptable basis."[4] As a result, cooperation can be said to be required on a best effort basis. Therefore, despite the fact that international cooperation is a legal obligation, it is one that is seemingly unenforceable. Instead, international cooperation is meant to support the security regime in outer space by encouraging states to behave in a multilateral manner.

It is important to remember that while International Cooperation is a legal obligation, it is, at the same time, a political tool. Since states are able to determine the terms on which they will cooperate

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3 UNGA Res. 51/122 Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of All States, Taking into Particular Account the Needs of Developing Countries (1996).

4 *Id.* at Annex para. 2.

with other states, such cooperation is often offered as a carrot to allies and can be withheld from adversaries as a stick. That is not to say that it can not have a role in fostering friendly relations among adversaries. Examples such as the *Apollo-Soyuz* mission, which saw the docking of an American and a Soviet Spacecraft in the midst of the Cold War, show that states can use international cooperation as a way to diffuse adversarial relations. However, such missions remain the exception rather than the rule. Rather, states tend to engage in cooperative space activities with their allies.

ANTI-COOPERATIVE ACTIVITY IN SPACE

While the space law regime places international cooperation center stage, states have begun to move international cooperation to the sidelines. Though the United States and the USSR consistently cooperated in space activities throughout the Cold War, adversarial states have slowed in their cooperative activities. This can be seen in a number of international bodies that work on space activities.

The first of these is the United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS). Scholars have long noted that UNCOPUOS has slowed in its activities of positive lawmaking. UNCOPUOS has transitioned from a lawmaking body to a body mostly concerned with multilateral communication.[5] While it is debatable as to whether this represents ineffectiveness

[5] *See generally*, Sergio Marchisio, "The Evolutionary Stages of the Legal Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS)," *J. Space L.* 31 (2005): 219.

in the body,[6] it is a marked contrast from its first 30 years of its activities.[7] UNCOPUS' lack of movement in addressing emerging technologies and new paradigms of space activities is indicative of an inability to gain consensus within the body, which works on a principle of consensus. This is certainly attributable to the changed dynamics in the body in the post Cold War context, which has led to multipolarity I the negotiations in the body. Indeed, the globalized context might be a strong reason for the retraction from cooperation as it has resulted in the branching of state interests away from those held by superpowers. This is not to say that this new context is somehow less desirable than the Cold War context, but rather than that, it has made it more difficult to gain consensus despite the known challenges facing the space environment.

A more salient example may be international engagement in establishing a regime for the non-weaponization of space or the prevention of an arms race in outer space (PAROS). The Conference on Disarmament (CD) has been central to the efforts to establish such a regime. It is the sole international body for negotiating multilateral disarmament agreements, and it also works on a consensus method. Consensus has its drawbacks in this context as well, and the CD has been deadlocked for close to two decades due to an inability to adopt an agenda, which must occur

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6 *See generally*, Brian Israel, "Treaty Stasis [Agora: The End of Treaties?]," *AJIL Unbound* (blog), May 8, 2014, https://www.asil.org/blogs/treaty-stasis-agora-end-treaties.

7 Brian Israel, "Treaty Stasis [Agora: The End of Treaties?]," *AJIL Unbound* (blog), May 8, 2014, https://www.asil.org/blogs/treaty-stasis-agora-end-treaties.

on an annual basis and is a precursor for the work of the CD. This deadlock has effectively put an end to any hope of progress being made on a treaty banning weapons in space, and formal discussions on PAROS in this forum have been stilted.

A third failed forum is the European Union's attempt to pass a Code of Conduct for space activities. This Code of Conduct was first introduced in 2008.[8] The idea underpinning this initiative was to escape the deadlock of CD and open up a new forum for discussion of space security issues. Thus, the Code of Conduct was designed as a nonbinding, political agreement, which freed it from the constraints of the CD. As such, the European Union hoped to advance the discussion over space security and provide a mechanism through which states could agree to rules of the road that may serve as a foundation for positive law. After several rounds of negotiations, the European Union called for a negotiation of the instrument in 2014. The high hopes for this negotiation were dashed on the first day of the negotiation as states objected to both the procedure of the negotiations and the substance of the Code of Conduct.

In all three of these cases, one of the central problems is that the major space powers are becoming more divided on space cooperation and functioning as spoilers rather than leaders. These states seem to be more interested in maintaining the permissive but

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[8] Paul Meyer, "The Diplomacy of Space Security: Whither the International Code of Conduct?," Simons Papers in Security and Development, 8 (Vancouver: Simon Fraser University, 2014), http://summit.sfu.ca/item/14921.

unstable status quo than leading cooperative efforts to secure and stabilize outer space. The case of the United States is emblematic in this sphere. During the George W. Bush administration, the policy of the US was not to negotiate any new rules that may restrict United States action in outer space.[9] This policy, in part, led to the deadlock of the CD as the United States refused to agree to an agenda containing PAROS as an item for work by the CD. Further, this led to the United States voting against United Nations General Assembly resolutions on the PAROS, despite the fact that these resolutions were nearly unanimously adopted with only one to two allies voting in concert with the United States. While this explicit policy of the Bush administration has been retracted, it still seems to be part and parcel of the United States' approach to space diplomacy. Further, though the United States still cooperates with Russia on the *International Space Station* (*ISS*), cooperation between the two states has cooled substantially as the two states have retrenched into adversarial positions. Additionally, the United States refrains from cooperating with China on space activities entirely, and there is US legislation that bars the National Aeronautics and Space Administration from pursuing cooperative activities with China – the United States' biggest trading partner.[10]

China and Russia, on the other hand, often rely on the United States' willingness to break consensus but seem just as unlikely to

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9 NSPD 49: U.S. National Space Policy (2006).

10 Consolidated and Further Continuing Appropriations Act, 2012Public Law 112-55, Sec. 539 (2012).

adopt leadership positions in space. These states jointly introduced a draft treaty on the Prevention of the Placement of Weapons in Outer Space to the Conference on Disarmament, which can be seen as a substantive move towards advancing the debate on space security. However, these two states also led the movement to block the negotiations on the EU's Code of Conduct. They both argued that the negotiation on such an agreement should be held an established multilateral forum rather than an *ad hoc* forum. Predictably, they endorsed the CD as the proper forum for the negotiation despite the CD's inability to move forward on any substantive work.

These three states seem more concerned with maintaining the status quo than pursuing international cooperation likely because they see it as their strategic advantage to maintain a permissive space environment. This can be indicated by the lukewarm response of these three states to the Indian Anti-satellite (ASAT) test in 2019. All three of these states have reliance and thus vulnerability on their space assets, none of them condemned the Indian ASAT demonstration despite the fact that it was a debris creation event. President Modi of Indian stated after the test that

> *Today March 27, a short while ago, India has achieved remarkable success. India has today established itself as a global space power. So far, only three countries in the world - USA, Russia and China had this capability. Today, India has become the fourth country to acquire*

> *this status as a space power. There can be no bigger moment of pride for every Indian than this.*[11]

This characterization by President Modi is significant in that it reveals an international perception that space power comes from military might and demonstrations rather than from the civil achievements that characterized space power in the Cold War. This perception is not without its foundations. Current US rhetoric surrounding the planned space force shows US President Trump openly discussing the deployment of offensive weapons in space.[12]

This situation is not likely to change in the near term as there is a significant movement globally for states to retract from multilateralism and the international community. The United States and parts of Europe have made moves towards populist politics, and Russia has continued a shift towards authoritarianism under President Putin. The unraveling of the international global order could have dramatic effects on space security as the space regime is based on cooperative coordination of space activities. The lack of leadership by space powers will continue to see the domain further destabilized.

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11 "Mission Shakti: Read PM Narendra Modi's full speech announcing how India took down satellite," *India Today*, (27 March 2019) https://www.indiatoday.in/india/story/mission-shakti-narendra-modi-full-speech-1487838-2019-03-27.

12 Space Policy Directive-4: Establishment of the United States Space Force (19 February 2019) https://www.whitehouse.gov/presidential-actions/text-space-policy-directive-4-establishment-united-states-space-force/

INCREASING SPACE SECURITY THROUGH COORDINATION AND COOPERATION

Much of the reason that states have turned away from multilateralism is that they are retracting in pursuit of their own perceived national security goals. These states see the international community and globalization as a threat to their national interests. These short-sighted views ignore the lessons of WWII, which was also driven by populist politics and nationalism. The post-World War II order founded by the Charter of the United Nations was an attempt to keep such politics in check and prevent conflict by opening truly multilateral fora for interstate relations. While this project has not been perfect, it for decades, held back enmity among states and had a significant role in ensuring that the Cold War did not turn hot. The reemergence of populism and nationalism is in part, attributable to the deficiencies in the United Nations system, but it fails to recognize the role of multilateralism in international peace and security in a world of advanced technologies that are changing the face of conflict.

The space domain is an excellent example of how multilateralism can lead to increased security. An accident or intentional attack in outer space affects all space actors by creating instability in space through the creation of space debris. Space itself depends on cooperation and coordination for effective use by national security actors, civil actors, and commercial actors. For example, the effective and efficient use of the geostationary orbit requires that

states cooperate in its use and in coordinating their activities in this region of space. Without multilateral efforts by states to preserve this orbit, its use could be ruined for all states leading to insecurity not just in space but terrestrially. This is not a new lesson. Early in the Space Age, both the United States and the Soviet Union recognized the destabilizing effects that their space activities could have on the environment. In the early 1960s, these states were both pursuing military and civil space programs, and they both came to the conclusion that weaponization and destructive activities in space were inimical to their civil aspirations. Specifically, both states came to the conclusion that nuclear testing in the space domain was untenable if human exploration was to be sustainable.[13] This conclusion led to the negotiation of the Partial Test Ban Treaty of 1963, which banned nuclear tests in outer space, the atmosphere, and underwater.[14]

This lesson and the need for coordination and cooperation is still very important for outer space, which is increasingly characterized as congested, contested, and competitive. Importantly, this characterization has military roots, and indicates the concern of militaries that their space activities are put at risk not just by other military actors, but by civil and commercial actors as well. While military activities make up a substantial portion of space activities,

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13 See James Clay Moltz, *The Politics of Space Security: Strategic Restraint and the Pursuit of National Interests*, Chap. 4 (Stanford, CA: Stanford Security Studies, 2008).

14 "Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space, and under Water," October 10, 1963.

in a globalized world, more states are engaging in space activities, and there has been a marked proliferation of commercial actors. As a result, the entire environment will be dependent on international cooperation to coordinate if those space activities are to be sustainable. Space is a domain in which unilateral action can have a marked effect on the stability of the entire environment. If states remove themselves from the international multilateral legal and political system governing space, such coordination will become increasingly difficult. A lack of coordination will place military activities at risk and also place at risk a multibillion-dollar industry.

An example of this need for coordination is the area of Space Traffic Management (STM). STM is the technical and legal framework for coordinating space activities so that they avoid interference with other space activities. To date, outside of the previously mentioned Geosynchronous orbit, there is no multilateral system for coordinating space activities. This is problematic for both military and nonmilitary users of space since unilateral action by a state cannot protect one's space activities from external actors. While there is wide agreement that an STM system of some sort is needed, there seems to be a little international movement towards the development of such a system, despite the fact that it would be in the interest of all actors. This lack of movement is primarily the result of security concerns. States are reluctant to share space situational awareness (SSA) data on their military assets with other states as they feel like it will

place these assets at an increased targeting risk, and states are currently reluctant to negotiate new rules governing space activities. Despite these concerns, cooperative efforts at coordination could present a way to alleviate some of these concerns by presenting clear communication channels through which states and coordinate activities. Such a system would fall below the level of "management" of the space environment but could increase stability in the absence of formal and binding law.

Such systems of cooperation may be an important way forward in the development of space law. By providing clear rules for communication – rather than clear rules of control – such systems can increase stability without trampling perceived state interest. Further, these systems can become incubators for gaining a better understanding of responsible and sustainable space activities. As practice within coordination systems evolve over time, we will have a clearer picture of how the law and policy of space should develop in light of emerging actors and emerging space technologies.

CONCLUSION

The world relies on space, and international cooperation is a critical component to ensuring space security. More importantly, international cooperation is a key component instilled in the UN Charter regime to ensure terrestrial security. States should remember the lessons of the past and that putting themselves

"first" does not always lead to being "great." Indeed, in domains such as space, it can lead to global insecurity.

As space activities continue to develop and proliferate, there is a need for increased cooperation t ensure that the space environment is preserved for future generations. The benefits that are achieved from space are important to global society, and if the space environment is degraded these benefits and their ability to be shared with humanity will be markedly decreased. It is time for an increased understanding of the space environment and retrenching of international cooperation. The international space law regime was not built to serve nationalistic politics. Instead, it was created to ensure that space benefitted all humankind, and the infusing of populist politics into the space domain is contradictory to the basic ethical and legal principles governing outer space.

Cooperation presents a way forward as it can create the structures that are needed for states to coordinate their space activities. Cooperation, however, will require leadership in space and it is unclear as to where that leadership will come from in the current state of geopolitics. The major space players seem more focused on blocking substantive steps forward than developing the system to serve the interests of all. This is a folly, and hopefully, it can be overcome before the space environment is destabilized beyond repair.

DISTINCTION BETWEEN ACTUAL CARRIER AND CONTRACTING CARRIER

Mini Gupta[*]

INTRODUCTION

The Warsaw Convention 1929 (WC29) was made, keeping in view only one carrier. However, with the proliferation of the aviation industry and the changes in the way business is conducted, there arose many situations in which there were more than one carrier.[1] Carriers took advantage of the fact that the carrier in WC29 was supposed to be the actual carrier.[2] The carrier with whom the contract of carriage was made was not required to have his aircraft.[3] Thus actual carriage could be performed by anyone the carrier mandated, though it was difficult to attribute liability to them. This led to a need to expand the liability regime to both - the carrier with whom the passenger or consignor contracted to perform the contract of carriage (contracting carrier), and also the carrier who actually performed the carriage (actual carrier).

The distinction between these two types of carriers is the crux of this paper. The paper tries to analyze how does one distinguish between actual and contractual carrier? Why is there a need to

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1 See for example *Ericsson & Anr*. v. *KLM Dutch & Ors*., [2006] 1 HKLRD 584 where there was an actual carrier, a contracting carrier, a freight forwarding agent and a party handling the handing over of cargo.

2 *Best* v. *BWIA West Indies Airways Limited*, 581 F. Supp. 2d 359.

3 Elmar Maria Giemulla and Ronal Schmid (eds.), *Montreal Convention* (Kluwer Law International, Alphen aan den Rijn, 2006), p. 39-2.

make this distinction? And how does this distinction resolve issues relating to - codesharing, freight forwarding, and multimodal transportation?

The paper is divided into five parts. Chapter I deals with how the provisions have been analyzed under MC99. It covers the definition of the actual and contracting carrier, their mutual liability, and the contract between them. Part II briefly summarises the problems that existed before a distinction between actual and contracting carrier was made. Part III deals with the historical debates surrounding the actual and contracting carriers. Part IV differentiates between actual and successive carriage. Part V applies the principles discussed to codesharing, freight forwarding and multimodal transportation, before proceeding with the conclusion.

DEFINING THE CONCEPTS

This chapter would discuss how the distinction between actual and contracting carriers is dealt with under the Montreal Convention, 1999 (MC99).

Defining Contracting and Actual Carrier

While it deals with the liability of the carrier in great detail, the MC99 does not define the term carrier. For this paper, the carrier is the person with whom the passenger or the consignor contracts to perform the contract of carriage. The contracting carrier is the principal in the contract and, as mentioned above, he is the one

who enters into the contract of carriage with the passenger or the consignor[4]. The persons who enter into the contract of carriage as agents, subordinates, or intermediaries are not the contracting carriers because they are not acting as 'the principal' as required by the MC99.[5] Wherever carrier is mentioned without any qualification in the MC99, some authors believe it is the same as a contracting carrier,[6] while in a case, it has been held to be the actual carrier.[7] The actual carrier, on the other hand, is the one who performs, either part or whole of, the contract of carriage on authority from the contracting carrier.[8] Thus we have the contracting carrier who is the principal and the actual carrier who acts on authority from him. As an authorization is required, anyone acting without authorization is not an actual carrier.[9] The determination of actual and contracting carriers depends on the facts of each case.[10] There can be a situation with more than one actual carriers.[11]

The distinction, however only applies to carriage by air, and in *Yeomans* v. *Carbridge Pty Ltd (No 2),* a transporter who carried

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4 Article 39, MC99.

5 *Supra* note 3 at p.39-8.

6 *Supra* note 3 at p.39-4. Thus provisions of Chapter III dealing with Liability of Carrier and Extent of Compensation for Damage deal with the liability of the contracting carrier.

7 *Supra* note 2, that states that under Warsaw Convention, 1929 carrier meant only actual carrier.

8 Article 39, MC99. For a correct application of the distinction, see the case of *Ahra Hangyuk, Inc.* v *Marine Jewelry, Inc*., Supreme Court 2002 Da 32523.

9 An example of this would be where the contracting carrier first asks party A to perform the contract of carriage an then asks a party B to carry on the contract. In such a case the contract with party A is said to have been set aside.

10 *Supra* note 3 at p.39-5.

11 *Supra* note 1.

passengers from the plane to the terminal by bus was not considered a concurrent/actual carrier. The Australian Supreme Court held in this case that the distinction envisaged the situation of carriage by air and that cannot be extended to combined carriage or carriage here by land of the passenger.[12]

Liability of Actual and Contractual Carriers

The actual carrier does not have a direct contractual relationship with the passenger or consignor. Contractual relations exist only between the actual carrier and contracting carrier on the one hand and between the passenger or consignor and the contracting carrier on the other. Thus who can the passenger or consignor sue in case of an accident, loss of baggage or cargo, or delay?

A false connection is created by law to allow the passenger or consignor to sue the actual carrier. According to the MC99, the liability of the actual carrier to the contracting carrier and vice versa is mutual; that is they are liable for the acts of each other.[13] However, the contracting carrier is liable for the whole of the carriage, while the actual carrier is liable only for the part of the carriage it performs.[14] Also, the acts and omissions of the servants and agents of one create liability for the other.[15] Thus the passenger or consignor can sue both the actual carrier or the

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12 The case was decided under the Guadalajara Convention which now is the Chapter V of the MC99.
13 Article 41, MC99.
14 Article 40, MC99.
15 Article 41, MC99.

contracting carrier or either one of them.[16] If the action is brought against only one of the carriers, the defendant carrier may require the other carrier to be joined in the proceedings. The procedure of joinder is governed by the law of the jurisdiction in which the suit is brought.[17]

Contract between the Actual and Contracting Carrier

The contracting carrier and the actual carrier can have contractual provisions about their mutual relationship.[18] This contract need not be written and a tacit contract gauged from the circumstances can also suffice.[19] The actual carrier need not have the knowledge of the content of the contract between the contracting carrier and the passenger or the consignor. [20]

FRAMING THE PROBLEM

Taking a step back, while liability is attributed to both the actual and contracting carrier. How exactly is it done? That is, there exists a contract only between the passenger or the consignor and the contracting carrier and not with the actual carrier. Thus the privity of the contract dictates that the actual carrier cannot be directly sued by the passenger or consignor. The actual carrier was not known to the passenger or consignor either; thus there was also

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16 Article 8 of Guadalajara Supplementary Convention.
17 Article 45, MC99 and Praveen M. Singh, "International Air Charter Transportation in Australia", *Air Law*, 1980, 5(4), 219.
18 Article 48, MC99.
19 *Supra* note 3.
20 *Supra* note 3.

a problem of consent.[21] Can then the actual consignor be sued as the agent of the contracting carrier? These were the problems that had differing answers and grappled jurists before the liability regime (discussed in section I) was introduced. The section below would explain the history of the distinction between actual and contracting carrier.

HISTORICAL RESOLUTION OF THE PROBLEM

According to the preparatory material of the WC29, it is intended to apply only to one carrier and the situation of the multiple carriers was not contemplated.[22] In situations involving more than one carrier, the position of the countries was varied.

In Civil law countries, the courts held liable for the carrier who had the contract with the passenger. While in Common Law countries, the carrier who performed the carriage was held liable.[23] In 1952 the US courts changed their common law position and held that the Warsaw Convention did not provide a cause of action against the actual carrier, adding to the confusion.[24] Although there were provisions relating to successive carriage in the Warsaw

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21 Richard Gardiner, "Revising the law of carriage by air: mechanisms in treaties and contract", *International & Comparative Law Quarterly*, 1998, 47(2), 278.

22 R. H. Mankiewicz, "Charter and Interchange of Aircraft and the Warsaw Convention. A Study of Problems Arising from the National Application of Conventions for the Unification of Private Law" *The International and Comparative Law Quarterly*, 1961, 10(4), 707.

23 *Id* and Jacob W. F. Sundberg, "The Guadalajara Convention live from Cyprus", *Air and Space Law*, 1975, 1(2), 83.

24 This position was only overruled in 1978 . *Supra* note 22.

Convention, they did not apply to the case of concurrent multiple carriers.[25]

The jurists were also divided in their opinions. It was believed by some scholars that the distinction between the actual and contracting carrier was not required. They believed that in civil law, the actual carrier was covered under the prepose of the contracting carrier. The prepose covered servant and agents of a principal. Hence the actual carrier was though not directly covered by courts, would be covered as a prepose.

Similarly, some scholars believed in common law the actual carrier as covered under tort while the contracting carrier would be liable under the contract. Hence the carriers would not be able to escape liability in the existing system.[26]

It was, however, a confusing state of the law, and the contracting carrier was becoming a shield to prevent liability of the actual carrier.[27]

Thus the Guadalajara Supplementary Convention, 1961 was executed which distinguished between the actual carrier and contracting carrier and ascribed liability to both the actual as well as the contracting carrier.[28] The drafters also put in place

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25 *Supra* note 21.

26 See the opinion of Rene H Mankiewicz, in Rene H. Mankiewicz, "From warsaw to Montreal with certain intermediate steps", *Air Law*, 1989, 14(6), 239.

27 *Id.*

28 *Supra* note 21.

provisions to prevent the carriers from exempting themselves from liability by way of contract.[29]

It was also considered to put these terms in the form of a new treaty but the agreement was to create a supplementary Convention so that the changes could be absorbed within the existing system.[30] The Convention was signed on September 18, 1961, and it entered into force on 1 May 1964.[31]

The Guadalajara Convention is applicable only if both the state in which the carriage commences and the state in which the carriage ends are High Contracting Parties of the Guadalajara Convention and the Warsaw Convention.[32]

Many saw the need that the Guadalajara Convention be added to the main Convention given the code-sharing practices or operation of special contracts.[33] This was accomplished through Chapter V of the MC99.

ACTUAL CARRIAGE IS NOT SUCCESSIVE CARRIAGE

A question arises about the distinction of the successive and actual carriage. This is because, as would be seen in the specific instances of code sharing and multimodal transportation below, confusion still persists as to which contract of carriage is the successive carriage and which is an actual carriage.

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29 Article 47, MC99.
30 *Supra* note 21.
31 *Supra* note 23.
32 Case Law Digest, *Air Law*, 1986, 11 (4/5), 167.
33 Richard Gardiner, "The Warsaw Convention at Three Score Years and Ten", *Air and Space Law*, 24(3), 144.

While actual carriage is a *concurrent* carriage[34], the successive carriage is where multiple *consecutive* carriers carry passengers or cargo for specific legs of the journey.[35] Successive carriage, unlike actual carriage, needs to be recorded in the documentation of carriage.[36] Under MC99, it is specifically stated that carriage by persons other than the contracting carrier is not the successive carriage.[37]

Legally the distinction is also important because in the successive carriage there are different contracts each of which the passenger or consignor is a party to. While in case of actual carriage the passenger or consignor is not a party to the subsequent arrangements of carriage. There is also just one single contract and not multiple contracts. [38] Thus if the passenger or consignor can influence the carriage it is a successive carriage, while where the contracting carrier has more of a say, it is an actual carriage.[39]

APPLICATION TO DIFFERENT SITUATIONS

This chapter would discuss the implementation of the distinction of the actual and contracting carriers to various kinds of situations, namely - codesharing, freight forwarding and multimodal

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34 Some authors call it substitute carriage - Thomas J. Whalen, "The Warsaw Convention: Historical Background and International Efforts to Modernize the Liability Regime for Air Carriers," *Uniform Law Review*, 2 (2), 1997, 320.

35 Wolf Muller Rostin "Article18 Damage to Cargo" in *Supra* note 3.

36 Article 1(3) and Article 36, MC99. Also, if a carrier, not named in the air waybill, undertakes part of a successive carriage, it is not a successive carrier but an actual carrier according to the GSC.

37 Article 39, MC99.

38 *Supra* note 3.

39 *Supra* note 3.

transportation and it would be analysed whether the current legal measures provide the solutions for these situations.

Code sharing

Airline designator codes are assigned by IATA. Each airline has its own unique code. The codes are used in 'reservations, schedules, timetables, telecommunications, ticketing, cargo documentation, legal documents, tariffs, and for other commercial and traffic purposes'.[40] Codesharing means that an airline by agreement uses its two-letter designator code on flights operated by another carrier. In codesharing, there is an operating partner - the one on whose flight the tickets are sold. And there is the marketing partner or codesharing partner who sells the tickets but does not use his own flight for it. Thus he markets it but not operates the carriage hence the name. Codesharing allows a carrier to sell the flight as if it were an online connection rather than an interline connection. Codesharing is also called 'interlining under the airline's own code'. It is not the code that is shared but the flight capacity.[41]

It has been held in the case of *Best* v. *BWIA*[42] that codesharing is a matter of actual carriage and not the successive carriage. Thus the carriers are mutually liable for the acts and omissions of each other. In the case of codesharing, the airline that sells the flights as a marketing carrier is the contracting carrier. While the actual

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40 Jan Ernst C. de *Groot*, "Code-Sharing United States' policies and the lessons for Europe" *Air and Space Law*, 1994, 19(2).

41 *Id*.

42 *Supra* note 1.

carrier is the operating carrier or the codeshare partner who performs the actual carriage[43]. It is important to note that codesharing is not a successive carriage because the contract remains a single contract and not a series of contracts as in the case of successive carriage. Secondly, the is executed between the passenger and the contracting carrier and the identity of the actual carrier may or may not be known at the time of making the contract, while for successive carriage, the passenger contracts with each of the consecutive carriers.

In the case of a codeshare involving three airlines, the actual carrier is the airline that operates the aircraft. As we have seen previously, 'the actual carrier must provide the carriage.'

The codeshare is a case of actual carriage and has also been upheld in Germany.[44] In this case, the passenger waited in line for check-in for about one hour in front of the desk of the contracting carrier. Before, he was informed that the actual carrier was different and that he was supposed to wait in line before the actual carrier's counter. When the passenger reached the actual carrier's counter, the gates had been closed, resulting in the passenger missing his flight. It was held that there is a presumption that there was a relationship between the actual carrier and contracting carrier and that in a codeshare flight, the contracting carrier had an obligation to inform the passenger of who the actual carrier would be. The

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43 *Supra* note 3.

44 Landgericht Frankfurt, 27 January 2005, case no. 2/26 O 416/03, 2005 Case Law Digest, *Air and Space Law*, 2005, 30(4/5), 374.

contracting carrier was held liable because it did not sufficiently inform the passenger about the codeshare arrangement.[45] There is currently, however, no legal right internationally for the passenger to be informed of the identity of the air carrier actually performing the service.[46]

Freight Forwarding

Can freight forwarders be considered as carriers under the MC99? Some authors believe the Convention intends that freight forwarders be covered through Chapter V.[47] This is especially the case when the freight forwarder issues an airway bill to the consignor, and then charter an aircraft to perform the carriage. In this case, the freight forwarder is the contracting carrier with respect to the consignor and consignor with respect to the actual carrier.[48] Freight forwarder thus on his own may sue the consignor. While the consignor may sue both the freight forwarder as the contracting carrier and the person who performs the carriage as the actual carrier.[49]

In *Organon* v. *Seaboard,*[50] NLC was a freight forwarding establishment that used to gather cargo and then use the services of

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45 However the court also held the passenger to be have displayed contributory negligence because he could have looked at the information board to gather where his flight would be. Thus the contracting carrier was only made to compensate for 75% of the flight rescheduling.

46 Christian Conti, "Code-Sharing and Air Carrier Liability", *Air and Space Law*, 2001, 26(1), 4.

47 *Supra* note 35.

48 Wolf Muller Rostin ,"Enforcement of Rights of Consignor and Consignee" in *Supra* note 3. And *Supra* note 26.

49 *Supra* note 45.

50 [1974] ULR 354.

major airlines to ship the cargo. A Dutch company Organon wanted to ship two cargos to its subsidiary in New Jersey. An airway bill was created with Dutch Organon as a consignor and New Jersey Organon as the consignee. NLC then forwarded the cargo to Seaboard to ship the consignment from Schipol to JFK. Seaboard made an airway bill with NLC as a consignor and Schenker International forwarders in New York as consignees. The package disappeared somewhere during transit. In the case filed by Organon against the carriers, the Dutch Court held NLC to be the contracting carrier. The court based its reasoning on the fact that NLC had been named as the carrier in the airway bill and had also received payment for the carriage, which it did not pass on to Seaboard.[51] Thus a freight forwarding agent correctly was held to be a contracting carrier.

Multimodal Transportation

Multimodal transportation can be defined as 'the carriage of goods, by at least two different modes of transport, based on a single multimodal transport contract, from a place in one country where the goods are taken in charge by the carrier, to a place designated for delivery situated in a different country.'[52] Thus in case of multimodal transportation, there is a combined carrier for the whole of the carriage, and he can contract with an air carrier for

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[51] Jacob W. F. Sundberg, "The Changing law of air freight", *Air Law*, 1981, 50(4), 230.

[52] This definition is based on the 1980 Geneva Convention of the UN on Multimodal Transportation. Marian Hoeks, *Multimodal Transport Law* (Kluwer Law International, Alphen aan den Rijn, 2010) 6.

part of the carriage. 'Since the carriage of goods by air occurs between airports only, many contracts for the carriage of goods by air are part of a multimodal contract.'[53] The question now arises on the nature of the relationship between the multimodal contractor and the carriers (in this case, the air carrier) he engages.

The first issue to resolve is what law applies in the case of the air leg of a multimodal contract? To resolve the issue, the central fact accepted by the international community[54] is *Quantum* v. *Plane Trucking*[55] decided by the UK Court of Appeal in 2002. In this case, there was a carriage to be performed from Singapore to Dublin, with Singapore to Paris leg of the journey to be completed by air, and the Paris to Dublin's leg was to be covered by road. There was a theft of the truck in Paris to Dublin's leg. The court of appeal decided that the carriage was clearly in two parts - carriage by rail and carriage by road. Citing German and Dutch authorities, the court held that the multimodal carriage has to be broken into parts. Thus air law conventions apply to the air leg of the multimodal transportation.[56]

Secondly, one needs to see whether successive carriage better explains the carriage or actual carriage? There is a difference of opinion among authors about which type of contract of carriage

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53 *Ibid* at 219.
54 *Supra* note 53 at 31.
55 [2002] CLC 1002.
56 *Id.*

applies in multimodal transportation.[57] Given that there is a multimodal transport operator (MTO) who issues the airway bill to the consignor, and then he coordinates with the different modes of carriers to make the carriage a success, there seems to be more of a relationship of a principal-agent than that of a successive carriage. While the relationship of the carriers to each other can be a successive carriage, the relationship between the MTO and the air carrier would be one of actual carriage.

CONCLUSION

> "*We must give the public rules which it understands . . . The public is not going to go find the air carrier to ask him, "Give me your general conditions, so that I can see if I am protected!"*"[58]

This quote aptly applies to the situation of differentiating between an actual and a contracting carrier. The passenger or consignor, or the public as it says above, is not aware of the arrangements the carrier makes with others in the business. The carrier with whom the contract is made is not mandated to have his aircraft, and hence the actual carriage can be performed by anyone the contracting carrier mandates. It is a difficult task for the passenger or the

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[57] See for example, Gerald F. Fitzgerald, "Proposed Convention on the International Combined Transport of Goods: Implication for International Civil Aviation", *Canadian Yearbook of International Law*, 11, 1973, 166. Who discusses it as actual carriage and Marian Hoeks who discusses as successive carriage *supra* note 53.

[58] Mr. Pittard (Switzerland), Warsaw Conference on Private Aeronautical Law (translated record of 1929 proceedings), Horner and Legrez (eds),153 as cited in Richard Gardiner, "The Warsaw Convention at Three Score Years and Ten", *Air and Space Law*, 24(3), 144.

consignor to know with certainty who harmed him or who lost the consignment when all s/he has is the ticket or airway bill in hand to comprehend the situation.

As we have seen above, circumventing the problem of privity of contract and agency, the GSC and later Chapter V of MC99 creates a regime of mutual liability for the actual and contracting carrier. Unlike successive carriage, a regime of concurrent carriage is correctly established. This also assists in explaining the concurrent liability of the codeshare operator, the freight forwarder, and the MTO. Though in some cases as in the MTO, the actual carriage has not been fully established, an application of its principles can create a better liability regime.

The main feature of any reasonable legal provision is the certainty it can provide to the stakeholders. It should be clear before the formation of the contract who is liable and how the damages are to be repaired or repaid. Chapter V of MC99 succeeds in this regard and creates certainty where earlier much confusion existed. The fact that there is not much litigation arising from the provisions is again a testament to the clarity of the provisions.

COUNTERING CYBER-ATTACKS IN OUTER SPACE: CHALLENGES AND SOLUTIONS IN LAW AND POLICY

Keertana Venkatesh[*]

INTRODUCTION

In the last two decades, not only has there been rapid development in space sciences, but the use of space technology has expanded extensively to the military as well as civilian purposes such as monitoring the environment, collection of intelligence, meteorology, television, communications, radio and broadcasting.[1] No longer are our lives on Earth entirely independent of activities in space. While the international community is increasingly moving towards establishing an international legal order on Earth, it has also recognized the need for regulation in frontiers such as air and outer space.

Regulation of warfare can no longer be restricted to land, water, and air. Several recent studies indicate that space systems are highly vulnerable to cyber-attacks.[2] In fact, research organizations have particularly warned nations about the urgent need to study

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1 R. Gibson, *Space* (Oxford University Press 1992)

2 Gregory Falco, 'Job One for Space Force: Space Asset Cybersecurity' (*Belfer Center for Science and International Affairs, Harvard Kennedy School*, July 2018) <https://www.belfercenter.org/sites/default/files/publication/CSP%20Falco%20Space%20Asset%20%20FINAL.pdf> accessed 25 September 2019; David Livingstone & Patricia Lewis, 'Space, the Final Frontier for Cybersecurity?' (*Chatham House*, September 2016) <https://www.chathamhouse.org/sites/default/files/publications/research/2016-09-22-space-final-frontier-cyber-security-livingstone-lewis.pdf> accessed 27 September 2019

and address cyber-related challenges to strategic assets, particularly in outer space.[3]

The confluence of outer space and cyberspace thus poses a new challenge to law and policymakers across the globe. In this light, the essay will examine the existing framework under international law and international space law governing cyber-attacks in outer space. Highlighting the lacunae, the essay will propose recommendations in law and policy to increase the effectiveness of the subsisting system.

CYBER-ATTACKS AND THE THREAT TO OUTER SPACE: A CONTEXTUAL SETTING

Cyber-attacks and Outer Space

Cyber-attacks are known to denote deliberate actions to alter, disrupt, or deceive computer systems.[4] Most space objects and systems are comprised of a space segment, a ground segment, and a user segment – also known as an uplink, a downlink and a crosslink – that transmit telemetry data.[5] Since the fundamental component parts of these segments are generally computers, they are prone to deceptive attacks. Cyber operations can be employed

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3 Beyza Unal, 'Cybersecurity of NATO's Space-based Strategic Assets' (*Chatham House*, July 2019) <https://www.chathamhouse.org/sites/default/files/2019-06-27-Space-Cybersecurity-2.pdf> accessed 27 September 2019

4 William A. Owens and others (eds), *Technology, Policy Law and Ethics Regarding U.S. acquisition and Use of Cyberattack Capabilities* (2009); Herbert S. Lin, 'Offensive Cyber Operations and the Use of Force' (2010) 4 J. Nat'l Sec. L. & Pol'y 63

5 *NATO Space Handbook: Practical Considerations for Space Support to NATO Operations* (2013)

against any of these links in order to disrupt the functions of the space system as a whole.

The possibility of a computer user on Earth taking over a satellite system orbiting the planet and affecting the critical infrastructure of that nation is highly likely.[6] Such a threat indicates the pressing need to address the status and regulation of cyber-attacks in outer space.

Cyber-attacks and Sovereignty

The Charter of the United Nations recognizes all nations as "sovereign equals."[7] The Drafting Committee 'deemed it fit, acceptable and practical to include in the Charter these principles and purposes which are fundamental.'[8] An examination of the drafting history indicates that the emergence of equal sovereignty can be traced to the conception of international legal order on Earth.

But the question then arises as to the application of this principle to cyberspace, a frontier which is characterized by its intangible nature and lack of demarcation, unlike discrete territorial divisions on Earth. Fortunately, the authors of both the Tallinn Manuals, which are considered as the most authoritative legal texts providing legal frameworks for cyber-attacks, agreed unanimously that the principle of sovereignty proscribes certain cyber operations

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6 Beyza Unal (n 3)

7 Bruno Simma (ed), *The Charter of the United Nations: A Commentary* (Oxford University Press 2012) 122

8 United Nations Conference on International Organization, Report of the rapporteur of Committee 1 to Commission I, U.N. Doc. 969 I/1/39, vol 6 (14 June 1945) 448

conducted by States against other States. This was incorporated in Rule 4 of the Tallinn Manual 2.0, which reads – "States must not conduct cyber operations that violate the sovereignty of another State."[9]

Even State practice is in line with this interpretation. The United States regards an unauthorized electronic intrusion into another nation's computer systems that may very well end up being regarded as a violation of the victim's sovereignty. It may even be regarded as equivalent to a physical trespass into a nation's territory".[10] The principle of sovereignty, something that is so fundamental to the theory of State and functioning of nations in the world, is applicable in the context of cyberspace. The application is supported keeping in mind the extensive capabilities of permeation that cyber operations possess in this day and age.

Outer Space and Sovereignty

The activities of States in outer space are governed by five international treaties and five sets of principles, as noted by the United Nations Committee on the Peaceful Uses of Outer Space.[11] These include *arms control*, *non-appropriation of outer space*,

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9 Michael N. Schmitt & Liis Vihul (eds), *Tallinn Manual 2.0 on the International Law Applicable to Cyber Operations* (2017); Michael N. Schmitt (ed), *Tallinn Manual on the International Law Applicable to Cyber Warfare* (2013); Michael N. Schmitt & Liis Vihul, 'Respect for Sovereignty in Cyberspace' (2017) 95 Tex. L. Rev. 1639

10 U.S. Department of Defense, Office of General Counsel, 'An Assessment of International Legal Issues in Information Operations', in Michael N. Schmitt & Brian T. O'Donnell (eds), *Computer Network Attack and International Law* (2002) 463-65

11 United Nations Office for Outer Space Affairs, 'Space Law Treaties and Principles' (*UNOOSA*) <https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties.html> accessed 29 September 2019

liability for damage caused to space objects, and the *freedom of exploration and use*, amongst others. Sovereignty, a principle at the very heart of space law, is also recognized as a corollary of jurisdiction.

The most widely accepted treaty governing outer space, the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies of 1967, popularly referred to as the Outer Space Treaty, sets forth under Article VIII that a space object is subject to the 'jurisdiction and control' of the State on whose national registry the object is carried.[12]

Although States are disallowed from exercising sovereignty over outer space, they continue to exercise sovereignty over their space objects. This aspect of the law is particularly important in the context of cyber-attacks carried out on space objects since such attacks could amount to a violation of the sovereignty of the State on whose registry an object launched into outer space is carried.

FRAMEWORK UNDER INTERNATIONAL LAW

Over the years, States have emphasized the need to make States internationally responsible for cyber operations which are in contravention of law. This debate became particularly important after the cyber-attack against Estonia. The Distributed Denial of Service (DDoS) attacks resulted in the temporary degradation or

[12] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies (27 Jan. 1967) 610 U.N.T.S. 205 (1967) Art VIII

loss of service on many commercial and government servers.[13] The attacks were spread across 22 days – from 27 April to 18 May 2007. These attacks sent shockwaves across the world since it was now clear that any country with a sufficiently well-developed network infrastructure is vulnerable to these attacks. Primitive cyber-attacks take very little time and effort to organize while defending against them is becoming more and more difficult.[14]

Quite recently, in the International Conference on Cyber Conflict of 2019, the Estonian President, while stressing on the wide acceptance of the application of international law to cyberspace,[15] said that States cannot waive their responsibility by carrying out malicious cyber operations via non-state actors. "*If a cyber operation violates international law, this needs to be called out*", he highlighted.[16]

In the context of outer space, Article III of the Outer Space Treaty, 1967, extends the scope of application of principles of international law to the realm of outer space.[17] Although there has been an

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13 Rain Ottis, 'Analysis of the 2007 Cyber Attacks against Estonia from the Information Warfare Perspective' (*Cooperative Cyber Defence Centre of Excellence*, 29 June 2019) <https://ccdcoe.org/uploads-/2018/10/Ottis2008_AnalysisOf2007FromTheInformationWarfarePerspective.pdf> accessed 28 September 2019

14 Ibid; C. Wu, 'An Overview of the Research and Development of Information Warfare in China', in Edward Halpin and others (eds), *Cyberwar, Netwar and the Revolution in Military Affairs* (Palgrave MacMillan 2006) 173-195

15 Patrick Tucker, 'NSA Chief: Rules of War Apply to Cyberwar, Too' (*Defense One*, 20 April 2015) <http://www.defenseone.com/technology/2015/04/nsa-chief-rules-warapply-cyberwar-too/110572/> accessed 28 September 2019

16 'President of the Republic at the opening of CyCon 2019' (*Office of the President*, 5 May 2019) <https://president.ee/en/official-duties/speeches/15241-president-of-the-republic-at-the-opening-of-cycon-20-1-9> accessed 29 September 2019

17 Outer Space Treaty (n 12) Art III

extensive academic debate as to whether all the principles of international law would apply in their totality to outer space, which is governed by a *lex specialis*, it is undeniable that certain integral norms of international law, customary international law, and *jus cogens* are applicable to activities of States in outer space.

Owing to the inextricable link between space law and public international law, the structural principles relating to the prevention of war and the use of force enshrined in Articles 2(4) and 51 of the Charter of the United Nations, for instance, will apply to outer space activities.

Noting that the debate about the application of international law principles to cyberspace and outer space is settled to a great extent, it can be inferred that the confluence of the two will be governed by the international law framework. But, even if the States have agreed to apply the principles to these arenas, there are several grey areas that continue to persist in practice.

Use of Force

Article 2(4) of the Charter of the United Nations makes it clear that any use of armed force is prohibited under international law. It states that all Members to the Charter *shall refrain from the threat or use of force against the territorial integrity or political independence of any State, or in any manner inconsistent with the purposes of the United Nations.*[18]

[18] U.N. CHARTER, art. 2, para. 4

To date, neither international law scholars nor State practice has been able to clarify the exact ambit and scope of the provision. This definitional problem has intensified as a result of the increasing innovation in warfare technology. At the time of the formulation of the Charter, the drafters could not possibly imagine a technologically-driven war.

Several times, a restrictive definition has been adopted by authors. They believe that the term 'force' is to be read to mean 'armed force.'[19] However, this would necessarily mean that any form of non-traditional force is excluded from the ambit of this provision, despite it being in contravention of international law. In the past, States have considered only those cyber operations that trigger nuclear plant meltdowns, open a dam above a populated area causing destruction or disable air traffic resulting in airplane crashes, constitute 'uses of force.'[20] This practice imposes an extremely high threshold for cyber-attacks to be considered as uses of force.

Fortunately, now there seems to be general agreement that the prohibition of the use of force, even though it was conceived around kinetic principles, also applies to cyber conduct.[21] The

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19 Marco Roscini, 'World Wide Warfare Jus ad bellum and the Use of Cyber Force', in *Max Planck Y.B of United Nations* (Martinus Nijhoff Publishers 2010) 85, 104-6; Albrecht Randelzhofer & Oliver Dörr, 'Article 2(4)', in Bruno Simma (ed), *The Charter of the United Nations* (Oxford University Press 2012)

20 Harold Koh, 'International Law in Cyberspace', (2012) 54 Harv. Int'l L. J. <http://www.harvardilj.org/wp-content/uploads/2012/12/Koh-Speech-to-Publish1.pdf> accessed 28 September 2019

21 Marco Roscini, *Cyber Operations and the Use of Force in International Law* (2014) 115

Schmitt Analysis, conceptualized by Michael N. Schmitt, deals with the different factors to be taken into account while determining whether a cyber-attack amounts to prohibited use of force.[22] These include severity, immediacy, directness, invasiveness, measurability, presumptive legitimacy and responsibility.[23] These characteristics incorporate features of both the instruments-based and effects-based tests used in international law.

Three approaches have been employed by scholars and States to determine where the use of force threshold lies. They are – (1) Target-based approach (*Critical Infrastructure test*), (2) Instruments-based approach, and (3) Effects-based approach.

(1) Target-based approach (The Critical Infrastructure test)

Governmental and privately-owned infrastructures, whose destruction can impact the welfare or social security of a nation, are generally referred to as "Critical Infrastructure."[24] Since this definition is quite vague, it has been subject to interpretation. In fact, international law allows for States to determine their own

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22 Michael N. Schmitt, 'Computer Network Attack and the Use of Force in International Law: Thoughts on a Normative Framework' (1999) 31 Colum. J. Transnat'l L. 1998

23 ibid

24 Ministry of Defence, *Estonia: Cyber Security Strategy* (2008); The White House, *The National strategy to secure Cyberspace* (2003); The White House, *The National Strategy for the Physical protection of Critical Infrastructures and Key Assets* (2003); General Assembly, Rep. of the Secretary General on Developments in the Field of Information and Telecommunications in the Context of International Security, U.N. Doc. A/60/95/Add.1, vol 4 (2005); *Federal Ministry of the Interior, Cyber Security Strategy for Germany* (2011).

critical infrastructure.[25] Owing to the sheer subjectivity involved, the categorization of such infrastructure is subject to the peculiarity of that nation. For instance, for a country whose telecommunications are dependent on satellites, space would constitute a critical infrastructure. For a State which does not rely on its own satellites, space may not feature as critical infrastructure.

In this approach, those cyber-attacks which disrupt the critical infrastructure of a nation are considered as unlawful uses of force.[26] This approach has a major drawback – since each country is allowed to determine what constitutes its critical infrastructure, at the time of dispute arising between two States as a result of a cyber-attack, it may be confusing for Courts which State's categorization to take into consideration, especially if they are dissimilar.

For instance, the United States,[27] India,[28] Belgium,[29] France,[30] and the United Kingdom[31] are some of the many countries that give the

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25 A /RES/58/199 (2003).

26 Tallinn Manual 2.0 (n 9)

27 M. Hesse & M. Hornung, 'Space as a Critical Infrastructure', in K. U. Schrogl and others (eds), *Handbook of Space Security* 187 (Springer 2014)

28 Puneet Bhalla, 'Investments in the Space and Cyber Realm for India's National Security', (2016) 1 CLAWS J. 51 <https://www.claws.in/images/journals_doc/273305959_1742641027_PuneetBhalla.pdf> accessed 28 September 2019

29 Centre for Cyber Security Belgium <https://www.ccb.belgium.be/en/critical-infrastructure> accessed 29 September 2019

30 Legi France <https://www.legifrance.gouv.fr/jo_pdf.do?numJO=0&dateJO=20060604&numTexte=1&page-Debut=08502&pageFin=08502> accessed 29 September 2019

31 Centre for the Protection of National Infrastructure, 'Critical National Infrastructure' <https://www.cpni.gov.uk/critical-national-infrastructure-0> accessed 29 September

status of critical infrastructure to outer space-related assets. On the other hand, nations such as Sweden[32] and Switzerland[33] do not explicitly recognize the outer space sector as critical infrastructure. This disparity in State practice has led to many definitional problems. Since such a determination can never be truly objective, this approach is not the best-suited for cyber-attacks in space.

(2) Instruments-based approach

The instruments-based approach focuses on the mode by which an assault takes place.[34] Adopting such an approach to characterize a cyber operation as a use of force is not of great use since the use of computers cannot be compared to that of traditional weapons – they do not in any way resemble an atom bomb or other ammunition.

The stance taken by the International Court of Justice in the *Nuclear Weapons Advisory Opinion* is important in this respect. The Court stated that Article 2(4) of the U.N. Charter applies to "any use of force, regardless of the weapons employed."[35] It was recognized, therefore, that just because a certain nature of weapon

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2019; *Joint Committee on the National Security Strategy, Cyber Security of the UK's Critical National Infrastructure* (2018) 6

32 Swedish Civil Contingencies Agency, *Action Plan for the Protection of Vital Societal Functions & Critical Infrastructure* (2014)

33 'The Swiss Programme on Critical Infrastructure Protection' (*Switzerland Government Portal*, 10 June 2019) <https://www.babs.admin.ch/internet/bs/en/home/themen/ski.parsysrelated1.82246.download-List.18074.Down-loadFile.tmp/factsheete.pdf> accessed 29 September 2019

34 Reese Nguyen, 'Navigating Jus Ad Bellum in the Age of Cyber Warfare' (2013) 101 CLR 1079

35 *Legality of the Treat or Use of Nuclear Weapons*, Advisory Opinion, I.C.J. Rep. 1996 (July 8), p. 226.

was not employed does not mean that such use of force is not prohibited. This position implicitly did away with the narrow application of the instrument-based approach in determining the nature of the attack.

(3) Effects-based approach

The most acceptable test in order to determine the lawfulness of a cyber-attack is the effects-based approach. The foundation of this approach can be traced back to the judgment of the International Court of Justice in the *Case Concerning Military and Para-Military Activities in Nicaragua*. The Court concluded that arming and training guerrillas amounted to prohibited use of force, even though it did not rise to the level of an armed attack.[36] Implicitly, the Court clarified that emphasis must not be supplied to the mode of attack, but the resulting consequences of such an attack.

This means that if the *scale and effects* of a cyber-attack can be compared to that of a traditional kinetic weapon, it is to be categorized as prohibited use of force. Rule 69 of the Tallinn Manual incorporates this principle.[37]

Professor Schmitt himself acknowledged, as state practice emerges, other considerations and normative approaches – such as the greater emphasis on consequences – may come to dominate the

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[36] *Military and Paramilitary Activities in and against Nicaragua (Nicaragua v. United States of America)*, Merits, Judgment, I.C.J. Rep. 1986 (June 27), p. 14.

[37] Tallinn Manual 2.0 (n 9) 330

analysis.[38] Keeping in mind the events in Estonia and Stuxnet attack in Iran, it appears that such a time has come.[39]

Aggression

The distinction between different standards of warfare and conflict in international law has always been the subject of debate. One such is the distinction between *unlawful use of force* and *an act of aggression*. An act of aggression is perceived as *the most serious and dangerous form of the illegal use of force*.[40] In particular, the General Assembly defined it to include the use of armed force against, *inter alia*, the sovereignty of another State.[41]

If the illustrations given by the General Assembly in the Resolution are examined closely, it is clear that for an act to be termed as an act of aggression, the required damage has to be of a grave nature. The extension of this definition to the realm of cyber-attacks might be practically difficult since cyber-attacks do not always result in the damage that would be comparable to that occurring in a traditional war.

The Tallinn Manual also specifically excludes the application of *jus ad bellum*, the principles justifying war, to those cyber operations which do not or are not expected to cause injury, death, or destruction.[42]

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38 Schmitt on Computer Network Attack (n 22)
39 Andrew C. Foltz, 'Stuxnet, Schmitt Analysis, and the Cyber "Use-of-Force" Debate' (2012) 67 JFQ 8
40 A/RES/3314 (XXIX 1974).
41 ibid
42 Tallinn Manual 2.0 (n 9)

What can be considered a breakthrough in this respect is the categorization of the Stuxnet Virus Attack against Iran as an "armed attack" by several States and international law scholars.[43] The cyber-attack in question disrupted the process of uranium enrichment, causing devastating and irreversible damage to at least a thousand centrifuges in Natanz.[44]

While in the case of Estonia, there was no actual destruction of lives or property, the Stuxnet virus resulted in physical damage to infrastructures. This might have been the main reason why the classification of Stuxnet as an armed attack was accepted more easily than that of the Estonia cyber-attacks.

The principle of Non-Intervention

Merely because a cyber-attack does not meet the threshold for unlawful use of force or an act of aggression under international law does not make it lawful *per se*. It may amount to the violation of the sovereignty of the target State or be in contravention of the principle of non-intervention.[45] But, surprisingly, scholars have asserted that "mere intrusion into another State's systems does not violate the non-intervention principle."[46] Certain norms have even

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43 ibid

44 Christopher Williams, 'Barack Obama ordered Stuxnet Cyber Attack on Iran' (*The Telegraph*, 1 June 2012) <http://www.telegraph.co.uk/technology/news/9305704/Barack-Obama-ordered-Stuxnet-cyber-attack-on-Iran.h-tml> accessed 29 September 2019

45 Tallinn Manual 2.0 (n 9) 330

46 Collin Anderson & Karim Sadjadpour, *Iran's Cyber Threat: Espionage, Sabotage and Revenge* (Carnegie Endowment for International Peace 2018); Carmen-Cristina Cîrlig, 'Cyber Defence in the EU: Preparing for Cyber Warfare?' (*European Parliament*, October 2014) <http://www.europarl.europa.eu/-EPRS/EPRS-Briefing-542143-Cyberdefence-in-the-EU-FINAL.pdf> accessed 29 September 2019

recognized the validity of espionage and information collection by utilizing cyber technology. This means that some form of coercion is still necessary for qualifying a cyber-attack to be in violation of international law.

FRAMEWORK UNDER INTERNATIONAL SPACE LAW

The Outer Space Treaty

The drafting history of the Outer Space Treaty, 1967 exemplifies the emphasis given by all States to establish peace in outer space. During the Cold war era, the launching of *Sputnik I* marked the beginning of the space race between the USA and the Soviet Union. The biggest fear among States was the beginning of an arms race in outer space.

In order to prevent war in space, Article IV of the Outer Space Treaty was inserted. This provision clearly lays down that the Moon and other celestial bodies shall be used by all States Parties to the Treaty *exclusively for peaceful purposes*.[47] This Article is commonly regarded as the focal point in the Treaty dealing with the military uses of outer space.[48]

The first paragraph of the Article makes reference to the prohibition on placing certain kinds of weapons in orbit or on satellites. In fact, a close examination of the provision indicates that the reference made within it are mostly restricted to traditional

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47 Outer Space Treaty (n 12) Art IV

48 Kai-Uwe Schrogl & Julia Neumann, 'Art. IV', in Stephen Hobe and others (eds), *Cologne Commentary on Space Law*, vol 1 (2013) 71

forms of weapons, perhaps because the drafters, at the time of drafting the Treaty, could not have envisaged the sort of extensive expansion warfare technologies have undergone in the past few decades.

However, this means that the interpretation of the words "exclusively for peaceful purposes" becomes extremely relevant to the framework governing cyber-attacks. The standard of aggression is particularly relevant in the context of outer space law since it is believed that only an aggressive use of outer space, within the meaning of the UN General Assembly Resolution 3314, as discussed, amounts to a violation of the peaceful uses of outer space.[49]

The Liability Convention

The Convention on International Liability for Damage Caused by Space Objects ("Liability Convention") of 1972 emerged as States recognized that space activities, being ultra-hazardous in nature, could pose an imminent threat to society in the event of space-related activities.[50] The Liability Convention can be considered as an extension of the principle of liability laid down in Article VII of the Outer Space Treaty.

The Liability Convention is relevant to the debate of cyber-attacks in space since it specifically provides for the application of the law

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[49] Stephan Hobe and Niklas Hedman, 'Preamble', in Stephen Hobe and others (eds), *Cologne Commentary on Space Law*, vol 1 (2013) 21-2

[50] Armel Kerrest & Lesley Jane Smith, 'Historical Background and Context', in Stephen Hobe and others (eds), *Cologne Commentary on Space Law*, vol 2 (2013) 94

in case *damage is caused to an object in outer space*. While Article II of the Liability Convention addresses the damage caused to a space object on the surface of Earth or in flight,[51] Article III applies to damage that is *caused to a space object elsewhere other than the surface of Earth*.[52] The framework governing cyber-attacks in outer space are thus heavily dependent on the interpretation of Article III.

Article I of the Liability Convention provides the definitions of certain terms employed for the purposes of the Convention. The following are crucial in the context of cyber-attacks:[53]

1. **Damage –** The term "damage" means the loss of life, personal injury or other impairment of health; or loss of or damage to property of States or of persons, natural or juridical, or property of international intergovernmental organizations.

2. **Launching State –** The term "Launching State" means:

   (i) A State which launches or procures the launching of a space object;

   (ii) A State from whose territory or facility a space object is launched.

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51 Convention on the Liability for Damage Caused by Space Objects (29 Mar. 1972) 961 U.N.T.S. 187 (1972) Art II

52 ibid Art III

53 ibid Art I

3. **Space Object –** The term "space object" includes component parts of a space object as well as its launch vehicle and parts thereof.

CHALLENGES TO THE EXISTING FRAMEWORK

Imposing State Responsibility: The problem of attribution

A breach of any obligation under international law when attributable to a State attracts State responsibility.[54] The biggest challenge in the case of a cyber-attack is the fact that such an attack against a satellite can be undertaken by private actors of a different State or even nationals of the same State.

State responsibility is dealt with under Article VI of the Outer Space Treaty. Responsibility is borne to the appropriate State.[55] According to this provision, an activity in outer space is considered to be a "national activity" even if it is undertaken by a private agency or different agencies of two or more countries. As a result, two or more States might be internationally responsible under the Treaty for violating an international obligation.[56]

Put simply, this means that if any person from Earth develops or uses any technology to attack a space object, responsibility is attracted. The nationality of the attacker then becomes relevant. Such a State will be made responsible in accordance with the provision, even if there is no State involvement. In the public

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54 A/RES/56/83, Art 2 (2002)

55 Michael Gerhard, 'Art. VI', in Stephen Hobe and others (eds), *Cologne Commentary on Space Law*, vol 1 (2013) 104

56 ibid 110

international law framework, this position is slightly different. Unless specific State involvement is traced, State responsibility is not attracted.

To a great extent, therefore, the problem of attribution in the space law regime is not as complicated as the one in public international law. However, since it is possible that the attacker of a space object might be a national of the same State, it becomes imperative for countries to develop their domestic laws to penalize such persons. If not, then such actions would go punished, despite being in contravention of international law.

Moreover, owing to the development of encryption technology, anonymity is a rising challenge to the legal framework. Unlike in traditional warfare, there is hardly any physical evidence in the realm of cyberspace. If it is difficult to trace the source of the cyber-attack, then consequently attribution to a State becomes impossible.

Imposing Liability: The problem of Space Object, Launching State and Damage

Liability under Article III of the Liability Convention is imposed on the *launching State* of the *space object* that caused *damage* to another space object. A reproduction of the same provision is also found in Article VII of the Outer Space Treaty, which deals with the strict liability regime.

Space Object: The definitional problem

The Convention envisages only those situations in which damage is caused *by a space object*. At the time of drafting the Convention, the formulation underlines that the damage must be caused by the space object itself and not by the product or application emanating from its operation.[57] This means that a State cannot be made liable under Article III of the Convention if the cyber-attack arises from a system that is not present in a space object, although it has caused damage to one.

With the advancement in technology, it should not be a surprise if hackers from Earth are able to attack systems situated in outer space. The increasing interconnectedness of satellite and terrestrial networks presents a significant vulnerability and a possible gateway for hackers.[58]

Satellites can be subject to two kinds of attacks in outer space – jamming and spoofing. Jamming, considered the easiest way of hacking, refers to disrupting radio frequency signals by transmitting other signals so as to prevent the real signal from reaching the target.[59] Spoofing, on the other hand, provokes the

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57 Armel Kerrest & Lesley Jane Smith, 'Art. I', in Stephen Hobe and others (eds), *Cologne Commentary on Space Law*, vol 2 (2013) 111

58 Tereza Pultarova, 'Battle in Cyberspace' (*Satellite Today*, November 2018) <http://interactive.satellitetoday.co-m/via/november-2018/battle-in-cyberspace/> accessed 29 September 2019

59 Jeff Coffed, 'The Threat of GPS Jamming, the Risk to an Information Utility' (*Exelis Magazine*, January 2014) <https://www.chronos.co.uk › ThreatOfGPSJamming_V2.0_January2014.pdf> accessed 1 October 2019

receiver system to accept false signals by mimicking the actual signals.[60]

Jamming and spoofing attacks need not arise from objects that *have been launched into outer space*. The term 'space object' does not leave room for damage resulting from a non-material origin in outer space.[61] Under the existing regime, therefore, if the attack is carried out from a computer on Earth against an object in outer space, there is no liability under Article III.

The Launching State Dilemma

The definition of a Launching State within the Convention reverts to the four criteria contained in Article VII of the Outer Space Treaty, 1967, and Article I of the Liability Convention.[62] The concept of the Launching State was seen at all times as the key to imposing liability on the State that benefitted from the launch undertaking.[63]

In consideration of the preliminary problem existing with the strict requirement of the presence of a space object to impose liability, the difficulty with determining the Launching State becomes even more intensified. There is a clear, logical inconsistency in trying to determine the launching State to make it liable if such damage has not been caused by a space object in the first place.

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60 J. W. Rooker, 'Satellite Vulnerabilities' (*Defense Information Technical Center*, 18 February 2008) <http://ww-w.dtic.mil/dtic/tr/fulltext/u2/a507952.pdf> accessed 29 September 2019

61 Armel Kerrest & Lesley Jane Smith, 'Art. II', in Stephan Hobe and others (eds), *Cologne Commentary on Space Law*, vol 2 (2013) 129

62 Outer Space Treaty (n 12) Art VII; Liability Convention (n 51) Art I

63 Kerrest & Smith on Article I (n 58) 114

For example, if a spoofing attack is carried out by way of a computer situated on Earth, there is no involvement of a space object in the first place. Ordinarily, if the damage is caused to a satellite in outer space, liability under Article III would be imposed on the Launching State. Without the involvement of space objects; however, a Launching State cannot be identified. Consequently, the liability regime cannot be made applicable to such a situation.

Understanding damage in the context of cyber-attacks

The definition of damage given by the Liability Convention of 1972 refers to loss and damage to State property. In this regard, a clear understanding of what constitutes "loss" or "damage" in this context is crucial to determine whether liability can be imposed in case of a cyber-attack.

If a liberal approach is undertaken, then damage can be said to be caused when a space system is rendered unfit for its intended use.[64] Quite obviously, this rejects the application of the high thresholds of damage required for a cyber-attack to constitute an armed attack, whether a use of force or an act of aggression.

CONCLUSIONS AND RECOMMENDATIONS

Technological warfare could be extremely disastrous for several reasons – *first*, cyber-attacks are easy to undertake in comparison to traditional warfare; *second*, since technology is omnipresent, the threat is closer than it seems; *third*, the devastation caused to a

[64] Carl Q. Christol, 'International Liability for Damage Caused by Space Objects' (1980) 74 AJIL 346

single system can affect millions of people at once. Frederick Kagan, Director of U.S. Think Tank American Enterprise Institute, goes to the extent of saying – "*Could we have a massive 'Pearl Harbor' cyber-attack that did a huge amount of damage, and was a surprise? Yes, absolutely.*"[65]

On the basis of the analysis of the challenges to the prevailing legal framework, there exists a need to apply broad and inclusive definitions. Support can be sought from the drafting history of the space law treaties, wherein the drafters decided not to adopt exhaustive definitions because they feared that this would largely restrict the scope and application of the law. Moreover, such a decision was made keeping in mind the fact that since outer space is a developing avenue for most States and is dependent on science and technology to a great extent, it would be impossible to envisage all the situations that could arise in the future.

In fact, the *travaux preparatoires*[66] to Article III of the Liability Convention specifically makes reference to the victim-oriented approach of the Treaty.[67] Simply put, a State must not be allowed to take advantage of the grey area existing in the cyber and outer

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65 Frederick W. Kagan & Tommy Stiansen, *The Growing Cyber Threat from Iran: The Initial Report of Project Pistachio Harvest* (2015); Frederick Kagan, 'The Threat is Real' (*British Broadcasting Corporation*, 6 May 2015) <https://www.bbc.com/news/world32534923> accessed 29 September 2019

66 Bruce A. Hurwitz, *State Liability for Outer Space Activities in accordance with the 1972 Convention on International Liability for Damage caused by Space Objects* (Springer 1992) 16-7; Bin Cheng, *Studies in International Space Law* (Clarendon Press Oxford 1997) 320

67 Christol (n 65) 346; Peter Malanczuk, 'Haftung Die völkerrechtliche Haftung für Raumfahrtschäden', in Karl-Heinz Böckstiegel (ed), *HANDBUCH DES WELTRAUMRECHTS* (1991) 782

space laws to carry out cyber-operations, which would defy the basic concept of sovereignty established under international law.

Firstly, cyber-attacks must be recognized as weapons[68] if they produce effects equivalent to kinetic weapons, such as crippling the functioning of space objects.[69] The traditional definitions of use of force and aggression are not always relevant in the context of a technological war.

Secondly, there is a need to relax the rigid approach taken by States and scholars while understanding the meaning of space objects. For instance, with respect to the question of damage being caused by a "space object," flexibility can be adopted by extending the liability regime even if cyber-attacks do not necessarily arise out of a space object, but occur in outer space and cause damage to a space object. The liability regime can be extended to include damage caused to any property in outer space, even if a jamming or spoofing attack is initiated from Earth.

In fact, consultations have been undertaken to address the need for a special liability regime governing satellite-operated electromagnetic radio-waves.[70] Currently, the only recourse a victim State has is under Article VI of the Outer Space Treaty, if it

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68 Robert G. Hanseman, 'The Realities and Legalities of Information Warfare' (1997) 42 A. F. L. Rev. 173; U.S. Joint Chiefs of Staff, *Joint Vision 2020, America's Military: Preparing for Tomorrow* (2000)

69 Christopher M. Petras, 'The Use of Force in Response to Cyber-Attack on Commercial Space Systems – Reexamining Self-Defense in Outer Space in Light of the Convergence of U.S. Military and Commercial Space Activities' (2002) 67 J. Air L. & Com. 1213

70 Kerrest & Smith on Article II (n 62) 128

can prove that there existed a breach of an obligation under international law.

Thirdly, the intention of the drafters of the law must be given weight while interpreting a provision. The definition under Article I of the Liability Convention is linked to the principle of *restitutio in integrum*. Based on the principles recognized in the *Chorzow Factory Case*[71] and *Corfu Channel Case*,[72] it means that a victim should be compensated in a manner that he is reinstated to the position he was in before the damage occurred. Since the nature of damage caused by a cyber-attack to a space object may not resemble the damage caused by a kinetic weapon in all senses, a strict comparison must be avoided.

Fourthly, States must cooperate while addressing issues of cyber warfare. Acknowledging the parity in technological development, a system can be evolved to increase assistance for strengthening ICT systems and developing better cybersecurity policies. It cannot be assumed that only space-faring nations have the ability to launch cyber-attacks. Threats can arise from all fronts – so inclusion is key.

Regional associations such as the ASEAN and EU have attempted to formulate cybersecurity policies, addressing the lacunae in policy and governance. Some strategies adopted by these associations include increasing cyber resilience and developing the

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71 *Chorzow Factory Case* (1928), Merits, P.C.I.J. Series A, No. 17.

72 *Corfu Channel (United Kingdom v. Albania)*, Merits, Judgment, I.C.J. Rep. 1949 (Apr. 9), p. 4.

industrial and technological resources for cybersecurity.[73] In the future, the leading space powers can lead the formulation of a global convention to address the issues relating to cyber-security in outer space, considering its increasing importance.

Fifthly, on a policy front, it is imperative for nations to adopt their national space cybersecurity policies. The regulatory framework must be such that it prescribes minimum standards of protecting these critical assets. There is a need to increase the effectiveness of sharing information between sectors and strengthening the systems against malicious attacks.

The wars on Earth have devastated nations in the past and the last thing that the world community needs today is an arms race in space. A united front to strengthen law and policy in the realm of cyberspace in outer space will secure critical assets on Earth and benefit all States.

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[73] 'Overview of Cybersecurity Status in ASEAN and the EU' (*Project Yaksha*, May 2019) < https://www.project-yaksha.eu%2Fwp-content%2Fuploads%2F2019%2F05%2FD1.1Overview-of-Cybersecurity-Status-in-ASEAN-EU_vf.pdf&usg=AOvVaw2xMDCilc_MpuRgeZH9lN6V> accessed 2 October 2019

'BRINGING A PIECE OF MOON TO YOUR HONEY': THE LEGAL CHALLENGES RELATING TO MINING OF THE LUNAR RESOURCES

Ishita Das[*]

INTRODUCTION

Naveen Jain, the co-founder, and chairman of the Moon Express, the only private organization which has received official permission from the government of the United States to venture beyond the Earth's orbit,[1] has his eyes set on the Moon, literally. He wants to utilize the lunar resources for the benefit of humankind[2] and make a trillion-dollars in the process.[3] While it may be surprising for several members of the international space law community, what he is claiming seems to be legal. The United States has not signed or ratified the Moon Agreement, the international instrument dealing with the exploration of the 'Moon and other celestial bodies.' It is, therefore, not bound by the provisions contained in the Agreement. However, it is bound by the Outer Space Treaty, the mother of all international legal tools that deal with outer space activities. The United States has enacted a law that allows private entities to utilize and procure outer space

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[1] Cecilia Jamasmie, 'Moon Express Ready for First Private Lunar Trip after Raising another $20M' (*Mining[dot]Com*, 31 January 2017) <http://www.mining.com/moon-express-ready-for-first-private-lunar-trip-after-raising-another-20-million/> accessed 25 October 2019.

[2] 'Our Mission' (*Moon Express*) <http://www.moonexpress.com/> accessed 25 October 2019.

[3] Lori Ioannou, 'Billionaire Closer to Mining the Moon for Trillions of Dollars in Riches' (*CNBC[dot]Com*, 31 January 2017) <https://www.cnbc.com/2017/01/31/billionaire-closer-to-mining-moon-for-trillions-of-dollars-in-riches.html> accessed 25 October 2019.

resources. The *Commercial Space Launch Competitiveness Act*[4] has been hailed by the private sector as a welcome move with regard to commercialization of the outer space and protection of the right to 'freedom of enterprise'.[5] Thus, the central question which arises is this: Are mining activities on the Moon legal? Can Naveen Jain lay claim upon the lunar resources that he mines in the near future?

The international space law community has taken some giant leaps for humankind with the creation of the Outer Space Treaty,[6] the Liability Convention,[7] the Registration Convention,[8] the Rescue Agreement,[9] and the Moon Agreement.[10] The Outer Space Treaty has been signed and ratified by a total of 132 countries, while the Liability Convention has been signed and ratified by a total of 115 nations as of 1 January 2019.[11] The total numbers with regard to

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4 The U.S. Commercial Space Launch Competitiveness Act 2015.

5 'Opening the Frontier for All of Us' (*Moon Express*) <http://www.moonexpress.com/> accessed 25 October 2019.

6 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 27 January 1967, entered into force 10 October 1967) 6 ILM 386 (1967) [The Outer Space Treaty].

7 Convention on International Liability for Damage Caused by Space Objects (opened for signature 29 March 1972, entered into force 1 September 1972) 10 ILM 965 (1971).

8 Convention on Registration of Objects Launched into Outer Space (opened for signature 14 January 1975, entered into force 15 September 1976) 14 ILM 43 (1975).

9 Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Space (opened for signature 22 April 1968, entered into force 3 December 1968) 7 ILM 149 (1968).

10 Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (opened for signature 18 December 1979, entered into force 11 July 1984) 18 ILM 1434 (1979) [The Moon Agreement].

11 UNOOSA, 'Status of International Agreements relating to Activities in Outer Space as at 1 January 2019' UNCOPUOS Legal Subcommittee 58th Session A/AC.105/C.2/2019/CRP.3 (1 April 2019) <

the Registration Convention and the Rescue Agreement are 72 and 121, respectively.[12] However, the total number of countries which have signed and ratified the Moon Agreement only stands at 22.[13] The 18 nations which have ratified the Moon Agreement include Armenia, Australia, Austria, Belgium, Chile, Kazakhstan, Kuwait, Lebanon, Mexico, Morocco, the Netherlands, Pakistan, Peru, Philippines, Saudi Arabia, Turkey, Uruguay, and Venezuela.[14] The 4 countries which have signed the Moon Agreement comprise India, Guatemala, Romania, and France.[15] It is surprising that some of the most advanced space-faring nations such as the United States of America, Russia, and China, have neither signed nor ratified the Moon Agreement. India has ratified all the four international agreements concerning outer space except the Moon Agreement.[16] Therefore, it is pertinent at this stage to consider the reasons behind the so-called 'failure' of the Moon Agreement.

The General Assembly adopted the Moon Agreement during the late 1970s following much discussion among the Legal Subcommittee members.[17] The agreement required the ratification of at least 5 states to enter into force. Therefore, after the

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http://www.unoosa.org/documents/pdf/spacelaw/treatystatus/AC105_C2_2019_CRP03E.pdf> accessed 25 October 2019.

12 ibid.

13 ibid.

14 ibid.

15 ibid.

16 ibid.

17 'Agreement Governing the Activities of States on the Moon and Other Celestial Bodies' (*United Nations Office for Outer Space Affairs*) < http://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/intromoon-agreement.html> accessed 25 October 2019.

ratification by the fifth country, Austria, it entered into force in July 1984.[18] The United States was ironically one of the first few countries to propose the creation of the Moon Agreement. The Permanent Representative of the United States placed a letter before the United Nations Committee on the Peaceful Uses of the Outer Space (UNCOPUOS) in 1966 and requested that an early session of the Outer Space Legal Subcommittee should be convened.[19] The purpose that was indicated in the letter pointed towards the drafting of an agreement regarding the exploration of the 'Moon and other celestial bodies.'[20] By 1969, the UNCOPUOS had convened a few sessions dedicated to the discussion of drafts submitted by countries such as the United States, Argentina, France, Poland and Russia.[21] Argentina was a proponent of the 'common heritage of mankind' approach and their draft reflected their desire to designate the 'Moon and the other celestial bodies' in such fashion.[22] While the Nixon Administration in the United States supported Argentina's draft, the later regimes felt and expressed otherwise.

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18 ibid.

19 UNOOSA, 'USA: Proposal' UNCOPUOS Legal Subcommittee A/AC.105/C.2/L.12 (11 July 1966) < http://www.unoosa.org/pdf/limited/c2/AC105_C2_L012E.pdf> accessed 25 October 2019.

20 ibid.

21 Antonella Bini, 'The Moon Agreement: Its Effectiveness in the 21st Century' (2008) 14 ESPI Perspectives < https://www.files.ethz.ch/isn/124689/espi_%20perspectives_14.pdf> accessed 25 October 2019.

22 Scott F. Cooper, 'The 1979 Agreement Governing the Activities on the Moon and Other Celestial Bodies: Does it Create a Moratorium on the Commercial Exploitation of the Moon's Natural Resources?' (1990) 5 JLT 63,73.

The United States, under the leadership of President Nixon, believed that it should take the lead regarding the Moon Agreement's negotiations to effectively prevent the Soviet Union from being the 'benefactor' of the future Agreement.[23] During these discussions, the influence of the Cold War on the two countries was evident, creating an atmosphere of suspicion and uncertainty. By such time, the National Aeronautics and Space Administration (NASA) had published several findings stating that valuable resources such as aluminum, iron ore, magnesium, silicon, and titanium were abundant on the Moon.[24] While the United States did not seek to develop immediate plans to exploit the resources that the NASA referred to, it wanted to safeguard its options from a 'national security point of view.'[25] The main difference between the perspectives espoused by the Soviet Union and the United States stemmed from the concept of the 'common heritage of mankind.' While the United States wanted the resources on the 'Moon and other celestial bodies' to be available for commercial use and scientific investigation, the Soviet Union rejected the use and exploitation of the resources found on the Moon.[26] The United States became increasingly cautious of the

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23 U.S. Senate, 'Agreement Governing the Activities of States on the Moon and Other Celestial Bodies: Hearings Before the Subcommittee on Science, Technology and Space of the Committee on Commerce, Science, and Transport 96th Congress, 2nd Session (1980) 115 [U.S. Senate Moon Treaty Hearings].

24 ibid 145.

25 ibid 146.

26 Office of Technology Assessment, 'Study of the United Nations Moon Treaty' (unpublished study, 1980) reprinted in the U.S. Senate Moon Treaty Hearings 313.

'common heritage of mankind' approach, and the pressure exerted by the South added to its dilemma.

The South pursued an agreement on a pre-treaty moratorium, which would prevent the member states from engaging in exploration activities before the treaty came into existence. Broadly, the South was advocating the 'common heritage of mankind' approach and wanted to ensure that no country could exploit the resources of the 'Moon or other celestial bodies' while the Moon Agreement was still under negotiation.[27] The United States vehemently opposed this move and stated that the imposition of a pre-treaty moratorium was not fair and could stifle any incentive towards the development of technology which could make the harnessing of lunar resources a reality in the future, either for experimental uses or commercial purposes.[28] Christol notes that the Moon treaty did not legitimize the imposition of such a moratorium.[29] The United States gradually moved towards the rejection of the provisions which required the member states to share the benefits derived from such exploration activities. By the time there was a change in the United States Administration, it was getting frustrated with the efforts of the South to expand the concept of 'common heritage of mankind'. It was getting increasingly difficult to push forward its restrictive interpretation

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27 Carl Q. Christol, 'The Common Heritage of Mankind Provision in the 1979 Agreement Governing the Activities of States on the Moon and Other Celestial Bodies' (1980) 14 IL 470.

28 ibid 462.

29 The U.S. Senate Moon Treaty Hearings 185.

of the concept, and President Ford even remarked that the United Nations platform was being used for gaining undue political leverage.[30]

The subsequent Carter Administration could not gather enough support or courage to sign the Moon Agreement and send it to the Senate for ratification. The political climate at that time did not enable the government to pursue the signing of an agreement that several sceptics, including senators, felt could prove disastrous for their nation's interests.[31] The United States was also faced with the worry that the inclusion of the Soviet Union's draft in the final text of the agreement could cast aspersions on its negotiating efforts.[32] Groups such as the L-5 and the Space Futures Society argued that the treaty provisions undermined the interests of the United States and instead favoured that of the Soviet Union.[33] These groups, along with several representatives from the business and industry sectors, were able to significantly dissuade several members of the Senate from signing or ratifying the Moon Agreement. They felt that capitalistic principles were being trumped by socialistic ideals and, therefore, the country could not cave into the demands of the international community.[34] The election of President Reagan, recognized as a non-internationalist, drove the final nail into the

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30 J. M. Spectar, 'Elephants, Donkeys, or Other Creatures? Presidential Election Cycles & International Law of the Global Commons' (2000) 15 AUILR 975, 1021.

31 Phillip Quigg, *A Pole Apart: The Emerging Issues of Antarctica* (McGraw Hill Book Company 1983) 175 [Quigg].

32 The U.S. Senate Moon Treaty Hearings 11.

33 ibid 233.

34 Arthur W. Blaser, 'The Common Heritage in its Infinite Variety: Space Law and the Moon in the 1990s' (1990) 5 JLT 79, 91.

coffin.[35] The Moon Agreement was effectively dead for the United States and very few governments after the Reagan administration has made successful attempts at the revival of the same. Ironically, even Russia did not sign or ratify the Moon Agreement.

THE PROBLEMS WITH THE INTERNATIONAL SPACE LAW INSTRUMENTS

In order to carry out mining activities on the Moon, it is imperative for the countries engaging in such practice to adhere to international obligations. Such activities involve questions of property and ownership, and there are two international legal instruments that can throw light on these issues: the Outer Space Treaty and the Moon Agreement. The Outer Space Treaty was designed to provide the basic framework regarding outer space activities and declares that the outer space shall be utilized by the nations for the 'benefit of humankind' while asserting that it would be 'free for exploration' by all states.[36] The Outer Space Treaty supports the 'province of mankind' approach and underscores that the outer space is not subject to 'national appropriation'.[37] It also emphasizes that the 'Moon and other celestial bodies' shall be utilized 'exclusively for peaceful purposes'.[38] The Moon Agreement elaborates upon the principles elucidated in the Outer

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35 Quigg 175.

36 '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*) < http://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introouterspacetreaty.html> accessed 25 October 2019.

37 ibid.

38 ibid.

Space Treaty with regard to the use of the Moon.[39] It affirms that the 'Moon and other celestial bodies' shall be considered as the 'common heritage of mankind.' It also seeks to establish an international regime for regulating the utilization of resources found on these bodies when it will become practically feasible in the future.[40]

An important question that may arise at this stage is this: Is there any difference between the two concepts of 'province of mankind' and 'common heritage of mankind'? Earlier, the United States used the two notions interchangeably due to their linkages with another concept, 'res communis', meaning that the object in question cannot be subject to claims of national appropriation.[41] The Soviet Union was always sceptical about the 'common heritage of mankind' concept and came to distinguish between this and the 'province of mankind' approach.[42] There is a strategic distinction that can be recognized between these two concepts. While the 'province of mankind' in the Outer Space Treaty refers to space systems or activities in general, 'common heritage of mankind' in the Moon Agreement relates to the materials or objects in

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39 'Agreement Governing the Activities of States on the Moon and Other Celestial Bodies' (*United Nations Office for Outer Space Affairs*) < http://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/intromoon-agreement.html> accessed 25 October 2019.

40 ibid.

41 G. S. Robinson and H. M. White, *Envoys of Mankind: A Declaration of Five Principles for the Governance of Space Societies* (Smithsonian Institution 1986) 187.

42 I. L. V. Dekanozov, 'Juridical Nature of Outer Space, including the Moon and Other Celestial Bodies' (Proceedings of the Seventeenth Colloquium on the Law of Outer Space, 1974) 200, 201.

question.[43] The 'province of mankind' approach supported by the Outer Space Treaty essentially denounces any claim of sovereignty over the outer space. This concept seemed to provide the perfect balance for both the Soviet Union and the United States so that they could work towards the development of an international system that would allow them to realize their individual interests without conceding too much.[44] The 'common heritage of mankind' approach faced tremendous criticism owing to its inherent nature of mandating all the countries to share the fruits of exploitation irrespective of whether they have the ability to participate in space missions or programmes.[45] This is one of the reasons why the Outer Space Treaty is the most popular instrument among the several international legal tools while the Moon Agreement is one of the least popular.

The Outer Space Treaty

The Outer Space Treaty's Article II specifies that outer space, including the 'Moon and other celestial bodies,' would not be amenable to national appropriation by 'claim of sovereignty.'[46] Therefore, states cannot lay such claims to the outer space resources as they are entities that can exercise sovereignty. However, what about private enterprises or individuals? Frans von

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43 J. I. Gabrynowicz, 'The Province and Heritage of Mankind Reconsidered: A New Beginning' (The Second Conference on Lunar Bases and Space Activities of the 21st Century, 1992) 692, 693 [Gabrynowicz].

44 ibid 693.

45 Karin Mickelson, 'Common Heritage of Mankind as a Limit to Exploitation of the Global Commons' (2019) 30 EJIL 635, 637.

46 The Outer Space Treaty, art. II.

der Dunk argues that while it is not open to the countries to mine outer space resources, private industry players may do so.[47] The Outer Space Treaty, thus, does not expressly prohibit the mining of outer space resources by the private entities. This gap has been utilized by a few countries to come up with their own domestic frameworks regarding outer space mining. The *Commercial Space Launch Competitiveness Act* allows the 'commercial exploration' and 'commercial recovery' of outer space resources by the citizens in the country while ensuring that the United States adheres to its international obligations.[48] While there are grey areas in both the Outer Space Treaty and the United States law, it is evident that the country intends to make the commercialization of the outer space an economic reality for its citizens. With companies such as the Moon Express aspiring to mine precious resources available on the Moon,[49] the days leading to an outer space mining race are not very far.

Luxembourg, for instance, wanted to ensure that it was not left behind after the enactment of the United States law. It drafted a law on the exploration and use of space resources to allow commercial use of outer space resources at a national level.[50] While the Luxembourg law has managed to gain the confidence of

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47 Frans G. von der Dunk, 'THE DARK SIDE OF THE MOON The Status of the Moon: Public Concepts and Private Enterprise' (Space, Cyber, and Telecommunications Law Program Faculty Publications, 1997) 122.

48 The Commercial Space Launch Competitiveness Act, § 51302.

49 'Why the Moon?' (*Moon Express*) < http://www.moonexpress.com/> accessed 25 October 2019.

50 The Luxembourg Law on the Exploration and Use of Space Resources 2017.

the private sector, the law relates to a grey area in international space law. Allen and Overy argue that the international legal instruments do not clarify whether a country can grant property rights to resources mined on the 'Moon or other celestial bodies.'[51] Both the countries which have enacted national laws regarding this area are parties to the Outer Space Treaty and, therefore, the lack of clarity on this issue is extremely problematic. Other space-faring countries such as Russia are interested in cooperating with Luxembourg to use the resources mined in space.[52] Luxembourg's global positioning with regard to the law has attracted tremendous attention from across the world, and several companies have registered in this country since the enactment of this law. One such company is space which aims to develop an entire resource industry on the Moon if they succeed in harnessing the valuable resources.[53]

The Moon Agreement

As one would expect, the Moon Agreement is an attempt to elaborate upon the provisions relating to the 'Moon and other celestial bodies' as provided in the Outer Space Treaty. It

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51 'Luxembourg Space Resources Act: Paving the Legal Road to Space' (*Allen & Overy*, 28 September 2017) < http://www.allenovery.com/publications/en-gb/Pages/Luxembourg-Space-Resources-Act-Paving-the-legal-road-to-space.aspx> accessed 25 October 2019.

52 Vladimir Soldatkin, 'Russia Wants to Join Luxembourg in Space mining' (*Reuters*, 6 March 2019) <https://www.reuters.com/article/us-luxembourg-russia-space/russia-wants-to-join-luxembourg-in-space-mining-idUSKCN1QN1OQ> accessed 25 October 2019.

53 Justin Calderon, 'The Tiny Nation Leading a New Space Race' (*BBC[dot]Com*, 16 July 2018) <https://www.bbc.com/future/article/20180716-the-tiny-nation-leading-a-new-space-race> accessed 25 October 2019.

emphasizes that the 'Moon and other celestial bodies' shall be used 'exclusively for peaceful purposes' and that their environments should not be subject to any form of disruption, and further, any state that seeks to establish any station on the 'Moon and other celestial bodies' has to inform the United Nations of the same.[54] Article 11 of the Moon Agreement states that the resources found on the Moon shall be the 'common heritage of mankind' and emphasizes that the Moon is not subject to 'any claim of national appropriation by a sovereign body,' while also stating that no governmental or non-governmental body or natural person shall lay claim on any 'natural resource in place' on the Moon.[55] This provision has led to the creation of another grey area in international space law. What is truly meant by 'natural resource in place'? The United States has maintained a position that even though the Moon is subjected to non-appropriation, exploitation of the resources found is in fact, 'encouraged' and that the non-appropriation principle would only apply to those natural resources which are 'in place' on the Moon.[56] Therefore, as per this argument, those lunar resources which are no longer 'in situ' or have been removed from the Moon, maybe owned.

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54 'Agreement Governing the Activities of States on the Moon and Other Celestial Bodies' (*United Nations Office for Outer Space Affairs*) < http://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/intromoon-agreement.html> accessed 25 October 2019.

55 The Moon Agreement, art. 11.

56 Melissa K. Force, Esq., 'Space Law Principles That Encourage Extraterrestrial Resource Extraction and Investment' (*SpaceRef[dot]Com*, 2013) <http://images.spaceref.com/docs/2013/CSCA2013/Mellisa-K-Force-presentation.pdf> accessed 25 October 2019.

Another problem with the Moon Agreement relates to the lack of a clear international regime that would govern the exploitation activities on the Moon. Article 11 of the Moon Agreement provides that the state parties shall seek to establish an appropriate international regime to deal with the exploration and utilization of natural resources on the Moon as and when such activities become 'feasible.' It states that Article 18 would guide the implementation of this provision.[57] Article 18, in turn, deals with the review of the Moon Agreement after ten years of its entry into force. This review would be done by means of a conference with the state parties.[58] The constitution of this international regime is, of course, not a part of the Moon Agreement, leading to speculations among the major space-faring nations that countries that do have the expertise to deal with space missions or programmes would take advantage of this provision to place an unnecessary burden on them. For instance, the latter group of countries may impose high taxes on space activities, knowing fully well that they would not have to pay the taxes while filling up their treasuries with such tax payments.[59] They could also make poor business decisions as they would not bear the risks associated with such decisions.[60] Overall, the smaller and lesser developed countries may use the major space-faring nations to gain monetary and technological traction in

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57 The Moon Agreement, art. 11.
58 The Moon Agreement, art. 18.
59 Thomas Gangale, *The Development of Outer Space: Sovereignty and Property Rights in International Space Law*: *Sovereignty and Property Rights in International Space Law* (ABC-CLIO, 2009) 172.
60 ibid.

a way that could cause damage to them.[61] As most of the major space-faring nations have neither signed nor ratified the Moon Agreement, the development of robust international rules and procedures in the area of exploration and utilization of lunar resources remains stunted.

CONSIDERING THE ANALOGOUS INTERNATIONAL LEGAL INSTRUMENTS

International space law is not the only area which has been mired with controversies and debates. Another area of international law that has witnessed similar trends relates to maritime activities. Earlier, until the late 20th century, the waters beyond the territorial sea were treated as high seas that were open for fishing, navigation, overflight, and any other lawful purpose.[62] By the 1940s, various countries had started to realize the importance of offshore resources which were located on the continental shelf. Various states, led by the United States, started to assert ownership of resources on the continental shelves extending from their territories, giving rise to a new principle in customary international law.[63] However, by the 1970s, activities such as commercial over-fishing started to irk these states and they began to question the 'free-for-all high seas system.'[64] The United Nations Convention

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61 Sarah Coffey, 'Establishing a Legal Framework for Property Rights to Natural Resources in Outer Space' (2009) 41 Case Western Reserve JIL 119, 128.
62 Vaughan Lowe, *International Law: A Short Introduction* (OUP, 2015) 90 [Lowe].
63 ibid 91.
64 ibid.

on the Law of the Sea[65] was an attempt by the state parties to change the status quo and create an international regime that would safeguard the economic interests of the members while also ensuring that the marine ecosystem was not deeply compromised. The Antarctic Treaty[66] is an international instrument that stipulates that Antarctica shall be reserved for international scientific research and preservation of the environment. As the basic instrument did not address issues regarding the mining of resources found in Antarctica, several additional arrangements[67] have been created to support the founding document.

The Law of the Sea Convention

The Third United Nations Conference on the Law of the Sea, popularly known as UNCLOS III, created the foundation of the Law of the Sea Convention. The document is a result of negotiations between 150 countries for over 14 years.[68] The Convention provides that its aim is to establish an international legal order that would ensure that the seas and the oceans are used peacefully, the marine resources are utilized equitably, the living resources are conserved effectively, and the marine environment is

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65 The United Nations Convention on the Law of the Sea (opened for signature 10 December 1982, entered into force 16 November 1994) 21 ILM 1261 (1982) [The Law of the Sea Convention].

66 Antarctic Treaty (opened for signature 1 December 1959, entered into force 23 June 1961) 19 ILM 860 (1980) [The Antarctic Treaty].

67 'The Antarctic Treaty System' (*Scientific Committee on Antarctic Research*) < https://www.scar.org/policy/antarctic-treaty-system/> accessed 25 October 2019.

68 'United Nations Convention on the Law of the Sea of 10 December 1982: Overview and Full Text (*United Nations, Office of Legal Affairs, Division for Ocean Affairs and the Law of the Sea*) < https://www.un.org/Depts/los/convention_agreements/convention_overview_convention.htm > accessed 25 October 2019.

preserved efficaciously.[69] It provides that the breadth of the territorial waters would extend to 12 nautical miles from the baselines as stipulated in the Convention.[70] The states can exercise complete ownership over their territorial waters. The Convention also provides that each country can lay claim to 200 nautical miles as an exclusive economic zone, adjacent to its coasts.[71] This zone is not a part of the territory of the state but allows it to exercise limited jurisdictional authority over the economic resources, both living and non-living, found in such an area.[72] The state can exercise jurisdiction with regard to the establishment of 'artificial installations,' 'scientific research,' and 'preservation of the marine environment'. The state is also empowered to make laws for the exploration and utilization of natural resources.[73]

While the Law of the Sea Convention has been signed and ratified by 166 states, the United States is not one of those countries which have ratified this international instrument. The major reason behind its scepticism is linked with the concept of 'common heritage of mankind.'[74] Part XI of the Convention specifies that the Area, including the seabed, ocean floor, and subsoil thereof, and the resources found in the Area are to be treated as 'common heritage of mankind'. It provides that the Area and its resources are

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69 ibid.
70 The Law of the Sea Convention, art. 3.
71 ibid. art. 56.
72 Lowe 92.
73 The Law of the Sea Convention, art. 56.
74 Carol R. Buxton, 'Property in Outer Space: The Common Heritage of Mankind Principle vs. the "First in Time, First in Right" Rule' (2004) 69 JALC 689, 693 [Buxton].

to be excluded from the claims of sovereignty by a state and non-appropriation by a state, private player or a natural person.[75] The Convention also establishes an International Seabed Authority, which is in charge of ensuring that the financial and economic benefits derived from the exploitation activities in the Area are distributed equitably among the member states.[76] The United States has expressed that the adoption of the 'common heritage of mankind' approach and the establishment of the Authority withdraws incentives from those states which are capable of exploiting the Area for extracting valuable resources. It, instead, grants unfair advantages to the countries which lack the technological capacity to engage in such practices.[77] This argument is very similar to the United States' contention regarding the drawbacks of the 'common heritage of mankind' concept under the Moon Agreement. The fact that the Moon Agreement is facing similar hurdles and in a more serious manner, there is a need to consider the lessons that could be drawn from such similarities.

The Antarctic Treaty

The Antarctic Treaty is an international legal instrument that was realized as a result of several rounds of negotiation between 12 countries. It was signed in 1959 and entered into force in 1961 and it is interesting to note that 7 out of the 12 countries had laid territorial claims on Antarctica. These 7 countries were Australia,

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75 The Law of the Sea Convention, art. 137.

76 Edward Guntrip, 'The Common Heritage of Mankind: An Adequate Regime for Managing the Seabed' (2003) 4 MJIL 17.

77 Buxton 693.

Chile, Argentina, New Zealand, Norway, France, and the United Kingdom. Some of the factors cited by these countries to stake claims on the continent related to geographical proximity, discovery, and establishment of bases for conducting scientific research.[78] By the mid-1950s, the United States and Russia had begun to realize the value of Antarctica from a military point of view, and work towards the drafting of the treaty was initiated soon after. As the countries gradually learnt about the potential mineral resources that could be mined from the continent, they started to lean towards the development of a new international regime regarding Antarctica: the Antarctic Treaty System.[79] One of the instruments under this system was the Convention on the Regulation of Antarctic Mineral Resource Activities which sought to enable the countries to explore and mine the mineral resources available on Antarctica while also preserving its environment. As Australia and France did not ratify the Convention, it was not effectively realized.[80]

This Convention was later replaced by the Protocol on Environmental Protection to the Antarctic Treaty, which declared that Antarctica was a 'natural reserve, devoted to peace and

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78 'The Antarctic Treaty' (*Secretariat of the Antarctic Treaty*) https://www.ats.aq/e/antarctictreaty.html> accessed 25 October 2019; Christopher Joyner, *Governing the Frozen Commons: The Antarctic Regime and Environmental Protection* (University of South Carolina 1998) 14, 19.

79 Donald R. Rothwell, *The Polar Regions and the Development of International Law* (CUP 1996) 63, 66.

80 Chavelli Sulikowski, 'The French Connection: The Role of France in the Antarctic Treaty System' in Anne-Marie Brady (ed.), *The Emerging Politics of Antarctica* (Routledge 2013) 172.

science' and exploitation activities for the purpose of extracting mineral resources were to be prohibited except for 'scientific research.'[81] A period of 50 years from the date of its entry into force has to pass before the terms of the Protocol can be reviewed.[82] Therefore, any mining activity in Antarctica is not possible until 2048. The Antarctic Treaty does not contain the concept 'common heritage of mankind' explicitly, but it does provide that Antarctica shall be used 'exclusively for peaceful purposes' in the 'interest of all mankind.'[83] This provision is similar to the choice of words employed for the Outer Space Treaty. The 'province of all mankind' approach under the Outer Space Treaty is declaratory in nature and has been effectively developed by some major space-faring countries to create an alternative to the 'common heritage of mankind' principle.[84] Irrespective of their political and strategic distinctions, both these concepts can be utilized to ensure that mining on the Moon is properly regulated. After all, there is only one Earth and one Moon that serves both as a natural satellite of the planet and as a muse for its artists.

CONCLUSION AND SUGGESTIONS

The author has highlighted that the negotiating history of the Moon Agreement has not been smooth, and in fact, it had to face quite a

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81 Protocol on Environmental Protection to the Antarctic Treaty (opened for signature 4 October 1994, entered into force 14 January 1998) 30 ILM 1455 (1991), art. 2.
82 ibid, art. 25.
83 The Antarctic Treaty, Preamble.
84 Gabrynowicz 694.

few hurdles. The most controversial obstacle which the Moon Agreement had to face related to the provision declaring the Moon as the 'common heritage of mankind.' This has effectively prevented the participation of several powerful space-faring nations such as the United States, Russia, and even China. The change in administration in the United States also led to the dilution of the country's resolve to adopt an international regime that would set the pace for future actions with regard to the exploration of the Moon. Unlike the Moon Agreement, the Outer Space Treaty is one of the most popular international space law instruments. The difference in the choice of words has allowed the big countries to create a system that could be beneficial for both their overall well-being and individual interests. The author has emphasized that lessons can be drawn from analogous international legal instruments such as the Law of the Sea Convention and the Antarctic Treaty. Mining the Moon can be a reality in the near future and it is imperative for India to play a major role in the establishment of a coherent international legal regime with regard to the same.

India's recent mission to the Moon, Chandrayaan 2, has received tremendous attention from the international community.[85] The main purpose of this mission was to explore the relatively unexplored South Pole of the Moon which remains in the shadows.

[85] Elizabeth Howell, 'Chandrayaan-2: India's Orbiter-Lander-Rover Mission' (*Space[dot]Com*, 8 October 2019) < https://www.space.com/40136-chandrayaan-2.html> accessed 25 October 2019.

Therefore, the South Pole can possibly hold the key to records that would allow humankind to trace the origin of the solar system as the region has not been touched by sunlight in billions of years. The craters in this part of the Moon could also be home to several million tonnes of water. It could also house valuable mineral deposits such as ammonia, hydrogen, methane, mercury, silver, and sodium, which could be very beneficial to the entire humankind.[86] The fact that the Vikram Lander could not communicate back with the Indian Space Research Organization team[87] does not take away from the significance of the mission. The Chandrayaan 2 Orbiter has been successfully placed in the desired orbit of the Moon and has been sharing high-resolution images of the lunar surface to help in a better understanding of its environment.[88] India does not have a national law which deals with regulation of space activities by its juridical or natural persons, yet, and therefore, the provisions relating to the exploitation of the 'Moon and other celestial bodies' can be added before the enactment of *The Draft Space Activities Bill*.[89]

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86 'Chandrayaan 2: Why the Moon's South Pole is so Special' (*The Economic Times*, 5 September 2019) < https://economictimes.indiatimes.com/news/science/chandrayaan-2-why-the-moons-south-pole-is-so-special/unexplored-south-pole/slideshow/70990002.cms> accessed 25 October 2019.

87 'Chandrayaan 2: Mission Info' (*Government of India, Department of Space, Indian Space Research Organization*) < https://www.isro.gov.in/chandrayaan2-mission#> accessed 25 October 2019.

88 'Chandrayaan 2 Orbiter Photographs Illuminated Moon, Measures Sunlight Reflections (*India Today*, 17 October 2019) <https://www.indiatoday.in/science/story/chandrayaan-2-orbiter-illuminated-moon-variations-sunlight-reflection-1610460-2019-10-17> accessed 25 October 2019.

89 The Draft Space Activities Bill 2017.

As one of the few signatories to the Moon Agreement, India is in a unique position to influence the international community positively. *First*, it can utilize its scientific research capabilities to highlight how the natural resources on the Moon can be extracted in a manner that would not lead to over-exploitation. It is imperative that the states which have the technology and the capability to mine such resources give prime importance to the international principles stipulated in the Outer Space Treaty. Therefore, if, for example, a private player or an individual wants to mine the Moon for obtaining Helium 3 to power the entire country, there should be sufficient awareness and respect for the international limitations. While a forthright ban on the exploitation activities similar to the Antarctic Treaty Protocol is not desirable, it is important for the international legal community to come up with an effective international legal framework that would allow commercialization of the Moon without compromising its environment. In order to establish a resource industry on the Moon, as claimed by space, it is vital to conduct adequate scientific research so that the private sector knows how to deal with the tough climatic situation of working on the lunar surface. India can lead the way towards this form of international cooperation.

Second, India should work towards the elimination of the strategic and political distinctions that exist between the two concepts of 'province of mankind' as stipulated in the Outer Space Treaty and the 'common heritage of mankind' as contained in the Moon Agreement. India can draw support from the International Law

Association's articulation of the current scope of the 'common heritage of mankind' approach. The Association maintains that in the contemporary setting, the concept of 'common heritage of mankind' can also make room for commercial activities in the interests of mankind while noting that a few changes could be made to Article 11 of the Moon Agreement which deals with the establishment of the international regime. For instance, the revised Article 11 of the Agreement could state that any exploration activity for extracting the natural resources of the Moon would be allowed, even for commercial purposes, as long as the basic international principles are adhered to. Finally, when Naveen Jain claims that one can bring a piece of the Moon to his/her honey in the near future,[90] he may not be legally wrong. The international space law community has to collaborate effectively to ensure that the right balance is struck between the protection of the Moon's environment and the 'freedom of enterprise'. Further, as articulated by Dr. APJ Abdul Kalam, a sense of 'righteousness' should guide all of us.[91] This is how we can ensure that the Moon truly brightens the lives of the human species on Earth.

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90 Naveen Jain, 'We'll be Honey-mooning on the Moon' (*NaveenJain[dot]Org*) <http://www.naveenjain.org/well-be-honey-mooning-on-the-moon/> accessed 25 October 2019.

91 Dr. APJ Abdul Kalam, 'Dynamics of Unity of Nations' (President's Address to the European Parliament at Strasbourg, Government of India, Press Information Bureau [PIB], 25 April 2007) < https://pib.gov.in/newsite/erelease.aspx?relid=27125> accessed 25 October 2019.

NEED FOR REVISITING THE REGISTRATION CONVENTION, 1975

Vani Kaushik[*]

INTRODUCTION

The Convention on the Registration of Objects Launched into Outer Space (*hereinafter* "Registration Convention" or "RC") was adopted by the United Nations General Assembly ("UN GA") vide Resolution 3235(XXIX), 12 November 1974 and was opened for signature on 14 January 1975.[1] The RC was enforced on 15 September 1976.[2] It overrides the UN GA Resolution 1721(XVI), 20 December 1961.[3] The Registration Convention prescribes rules pertaining to the registration of objects launched into outer space.[4] It flows from Article ("Art.") VIII of the Principles Governing the Activities of States in the Exploration and Use of Outer Space Including the Moon and Other Celestial Bodies ("Outer Space Treaty" or "OST").[5] The RC has been ratified by 62 states and 4

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1 Frans G. von der Dunk, *The Registration Convention: Background and Historical Context*, Proceedings of the 46th Colloquium on the Law of Outer Space 450-453 (2003). **[**"Frans G. von der Dunk"].

2 United Nations Committee on the Peaceful Uses of Outer Space, *Practice of States and international organisations in registering Space Objects*, ,*Background paper prepared by the Secreterait*, para 8, A/AC.105/C.2/L.255 (Janurary 25, 2005). ["UNCOPUOS, Background Paper"].

3 UNCOPUOS, Background Paper, *supra* note 2**,** para 11.

4 The Convention on the Registration of Objects Launched into Outer Space, September 15, 1976, 1023 UNTS 15, Preamble. ["Registration Convention"].

5 Principles Governing the Activities of States in the Exploration and Use of Outer Space Including the Moon and Other Celestial Bodies October 10, 1967,18 UST 2410, Art.VIII ["Outer Space Treaty"].

states are signatory to it.[6] Further, the European Organization for the Exploitation of Meteorological Satellites ("EUMETSAT") and the European Space Agency ("ESA") (they are international organizations) are also parties to the RC.

Art.X of the RC provides that after 10 years of the RC being in operation it shall be included in the agenda of UN GA for consideration whether any review of the RC is required.[7] After the stipulated time period elapsed, the UN GA in 1986 considered it in the agenda and concluded that no revision of the RC was required.[8] However, in times such as these where there is a steady increase in the number of space activities, there are concerns whether the RC is adequate to deal with the issues presented by commercialization and privatization of space activities.[9] Art.X of the RC also states that at any point of time after 5 years of the enforcement of the RC, it can be reviewed at the behest of 1/3 rd of state parties along with the concurrence of the majority of state parties.[10] This project will highlight the gaps that exist in the RC in light of the advancement in technology and space activities and entry of private players in the market. The RC has borne the brunt of criticisms from various fronts as being inadequate to deal with the problems of space

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6 United Nation Office of Outer Space, *Registration of Space Objects with Secretary General*, IISL-ECSL Symposium "40 years of entry into force of the Registration Convention - Today's practical issues", 55th Legal Subcommittee, 4-15 April 2016.

7 Registration Convention, Art.X.

8 UNCOPUOS, Background Paper, *supra* note 2, para 10; Zhao Yun, *Revisiting the 1975 Registration Convention- Time for Revision?*, Australian Journal of International Law, 11 Aust. I.L.J. 106-127 (2004) ["Zhao Yun"].

9 Zhao Yun, *supra* note 8, pg 107.

10 Registration Convention, Art.X.

debris, and transfer of ownership. In the course of this project, various possible solutions to the shortcomings of the RC will be suggested which include stronger implementation of the existing principles of the RC, enforcing these provisions through national legislations and also harmonizing the provisions of RC.

ARTICLE II OF THE REGISTRATION CONVENTION

Art.II:1 of the RC states that a launching state shall maintain a national register for objects launched into the earth orbit or beyond. As of now, 56% of those who are parties to the RC have informed the UN Secretary General of establishment of national registers.[11] The RC requires the 'launching state' to fulfill certain obligations in regard to their 'space objects' ("SO").[12] Art.VIII of the OST provides that the state of registry shall retain jurisdiction and control over SO which is launched into outer space.[13] In the presence of multiple launching states, a problem arises as to which state will act as state of registry. Art.II:2 of the RC provides that in the presence of multiple launching states, they can jointly determine which of them will act as state of registry.[14] This should conform to the provisions of Art.VIII of the OST and also must not be prejudicial to any agreements concluded (or to be concluded in the future) between the concerned launching states with regard to

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11 United Nation Office of Outer Space, *Registration of Space Objects with Secretary General*, IISL-ECSL Symposium "40 years of entry into force of the Registration Convention - Today's practical issues", 55th Legal Subcommittee, 4-15 April 2016.

12 Kay-Uwe Horl & Julian Herminda, *Change of Ownership, Change of Registry? Which Objects to Register, What Data to be Furnished, When and Until When?*, Proceedings of the 46th Colloquium on the Law of Outer Space, 454 (2003).

13 Outer Space Treaty, Art.VIII.

14 Registration Convention, Art.II:2.

jurisdiction and control of SOs or any personnel.[15] Thus, there is a possibility of having an agreement which is contrary to the mandate under Art.VIII of the OST. The provisions of the RC the primary aim of which is only to facilitate the identification of state of registry to help in ascertaining the claims of liability against them, [16] must not be in contradiction to the mandate under the OST which is a law-making treaty.

THE DEFINITION OF SPACE OBJECT ("SO")

Art.I of the RC defines space object ("SO") as *"component parts of a space object as well as its launch vehicle and parts thereof"*.[17] There is ambiguity regarding the fact if the term SO includes only covers functional objects within its ambit or even non-functional or those which were functional at a prior time. If we observe the data provided to the UN, approximately 56% of the registered SOs are non-functional in nature.[18] There is also inconsistency in practice of states regarding registration of SO under the RC.[19] Some states (primarily those which provide launch service facilities to others) provide information regarding all the SOs which are utilized during a launch and these include payloads or SOs produced as a result of an explosion, collision or breakup.[20] Out of the 7 states which provide launch service facilities, it is the United States ("U.S.") and France which provide information in regard to non-

15 Registration Convention, Art.II:2.
16 Registration Convention, Preamble; Frans G. von der Dunk, *supra* note 1.
17 Registration Convention, Art.I(b).
18 UNCOPUOS Background Paper, *supra* note 2, para 23.
19 UNCOPUOS Background Paper, *supra* note 2, para 24.
20 UNCOPUOS Background Paper, *supra* note 2, para 24.

functional SOs as well.[21] Some other states, such as India and China and the international organization ESA follow the practice of providing information to the UN about functional SOs and non-functional SOs – only those which are produced during the launch or just after it.[22] They do not furnish to the UN information for non-functional objects produced after the launch stage.[23] States like Russia, Israel and Japan which have their own launch facilities/capabilities provide information regarding functional SOs only.[24] There is also the issue regarding the registration of re-usable SOs. An example of this issue is highlighted by the fact that the U.S. Space Shuttle which is a re-usable SO is registered as per each mission and as a result, it has been registered 19 times.[25]

In light of the inconsistency in the state practice with respect to registering SOs under Art.II of the RC, a review of the definition of SO is required at this stage.

Definitional aspect of Space Object ("SO")

As stated in the Convention on International Liability for Damages Caused by Space Objects ("Liability Convention") and the RC, the term SO includes *"includes component parts of a SO as well as its launch vehicle and parts thereof."*[26] However, this is a mere clarification of the ambit of SO- the definition refers to the term

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21 UNCOPUOS Background Paper, *supra* note 2, para 26.
22 UNCOPUOS Background Paper, *supra* note 2, para 26.
23 UNCOPUOS Background Paper, *supra* note 2, para 26.
24 UNCOPUOS Background Paper, *supra* note 2, para 27.
25 UNCOPUOS Background Paper, *supra* note 2, para 28.
26 Registration Convention, Art. I(b).

'space object' itself, thus leaving unanswered the issue as to what a SO is.[27] SO in general terms covers satellites, space vehicles, equipment, stations/installations, facilities, spacecrafts or any object that humans launch into outer space or attempt to do so.[28] The definition of SO is also stated to mean an object launched into outer space.[29] However, this also does not resolve the ambiguity surrounding the definition of SO as there is no consensus on the definition of the term outer space.[30] Consequently, it has been suggested by scholars that the usage of the functional or orbital theory is the only way to define a SO.[31] Space activity refers to putting/placing an object into earth's orbit or on the moon/other celestial body or their movement around the earth's orbit or their subsequent return to the earth or any celestial body.[32] An object which performs this activity specified above is said to be a SO.[33] Using this, a SO can be defined as a *"man-made object launched into orbit round the earth or other celestial body, or put on surface of celestial body other than the earth."*[34] In this definition, the important aspect is that the orbital motion is either actually carried

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27 Laura Rut Skopowska, *Is an object built in Outer Space a 'space object' under the Liability Convention?*; Stefen Gorove, *Definitional Issues Pertaining to "Space Object"*, Proceedings of the 38th Colloquium on the Law of Outer Space, 88 (1995) ["Stefen Gorove"]. .

28 BIN CHENG, STUDIES IN INTERNATIONAL SPACE LAW 463 (1997).

29 Registration Convention, Preamble; BIN CHENG, *supra* note 29, pg 472.

30 BIN CHENG, *supra* note 29, pg 472.

31 Gyulla Gal, *Space Objects- "While in Outer Space"*, Proceedings of the 38th Colloquium on the Law of Outer Space, 85 (1995) ["Gyulla Gal"]

32 Gyulla Gal, *supra* note 32.

33 Gyulla Gal, *supra* note 32.

34 Gyulla Gal, *supra* note 32.

out or the same is intended.[35] Using this functional/orbital theory, Intern Continental Ballistic Missiles (ICBM) and sounding rockets (rockets which are designed to take measurements and perform experiments during their sub-orbital flight) which cross the lowest perigee of the earth are not said to be indulging in any space activity and therefore are not included within the definition of SO.[36] Just due to the fact that certain man-made objects cross a certain altitude which is inarguably considered to be outer space does not qualify them as SOs.[37] This interpretation is also supported by the practice of states which are parties to the RC as rocket launches are not registered under it.[38] This practice is also not considered to be a violation of the states' obligations under the RC.[39]

Interpretation of 'Component Parts' and 'Parts'

The definition of SO includes *'component parts'* and *'launch vehicles and part thereof'*.[40] It is necessary to determine to what extent parts of SOs are regarded as component parts or parts thereof. On a prima facie basis, substances of a SO or its pieces or fragments are considered as part of that object.[41] An issue which is of relevance today is whether space debris is within the ambit of the definition of SO. Space debris is formed as a result of

35 Gyulla Gal, *supra* note 32.
36 Gyulla Gal, *supra* note 32.
37 Gyulla Gal, *supra* note 32. .
38 Gyulla Gal, *supra* note 32.
39 Gyulla Gal, *supra* note 32.
40 Registration Convention, Art.I(b).
41 Stefen Gorove, *supra* note 29, pg 88.

collisions, separation, misplacement/loss or desertion of a SO.[42] Including space debris within the ambit of ' SO' will have a monumental impact on the liability regime as the launching state will be absolutely liable for any damage caused by the space debris on earth[43] and fault based liability for the damage caused by it in space.[44] There has been no resolution on the issue whether space debris can be qualified as a SO. Some scholars are of the view that a faulty SO or a broken part of SO (i.e. space debris) which cannot be monitored/supervised any longer will not be regarded as a SO.[45] On the contrary, others such as Bin Cheng suggested that bits and pieces of SOs ought to be given the same status as the SO had it remained as a whole and adopting a different interpretation would go against the intention of the drafters of the RC and Liability Convention.[46] At present, the definition of SO in any of the space treaties is not qualified by the size of the SO and whether it is being monitored or not.[47] Interpreting the term 'SO' according to its ordinary meaning reveals that space debris and non-functional SOs are indeed included within the ambit of the RC.[48] This is due to the reason that at one point, non-functional satellites/ SOs were also functional and the same is applicable to 'component parts'

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42 Stefen Gorove, *supra* note 29, pg 89.

43 Convention on International Liability for Damage Caused by Space Objects, September 1, 1972, 961 UNTS 187Art.II ["Liability Convention"].

44 Liability Convention, Art.III.

45 Stefen Gorove, *supra* note 29, pg 89

46 Stefen Gorove, *supra* note 29, pg 89; Bin Cheng *"Space Objects", "Astronauts" and "Related Expressions"*, Proceedings of the 34th Colloquium on the Law of Outer Space, (1992).

47 Stefen Gorove, *supra* note 29, pg 90.

48 Kay-Uwe Horl & Julian Herminda, *supra* note 12, pg 455.

which at a point were a part of the SO. Scholars argue that the partial definition of the term ' SO' includes 'component parts' and therefore failure of SOs or their separation was meant to be included.[49] Interpreting the RC on the basis of the objective with which it was implemented i.e. ease of identifying SOs- this objective would not met if non-functional SOs and space debris are excluded from its ambit.[50]

If this approach is followed then the issue that arises is whether the space debris that is created requires a separate registration apart from that of the SO.[51] The RC is silent on this subject but general principles of international law can be utilized for the same.[52] The issue of jurisdiction and control also crops up when we consider the legal status of space debris. At present, a state does not have a right to remove the non-functional SO of another state (except perhaps in a situation of action taken in pursuance of self-defense).[53]

THE USE OF 'INTO EARTH ORBIT OR BEYOND'

Instead of using the term 'outer space', the terminology 'into earth orbit or beyond' is used in Art.II(1) of the RC,[54] perhaps due to no

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49 Id.
50 Id.
51 Id.
52 Id.
53 Kay-Uwe Horl & Julian Herminda, *supra* note 12, pg 456.
54 Registration Convention, Art.II. It states: *When a space object is launched into earth orbit or beyond, the launching State shall register the space object by means of an entry in an appropriate registry which it shall maintain.*

clarity being available on the definition of 'outer space'.[55] The usage of this term follows from UN Resolution 1721(XVI)[56] from which the RC emerged. The purpose of inclusion of this phrase was to limit the registration of SOs which were launched into 'earth orbit or beyond'.[57] The use of this terminology has also given rise to certain issues. The first amongst these is whether launch from a celestial body or from free outer space would warrant the application of the RC. The launch of a space objet from a celestial body would not be *'into'* earth orbit or beyond and instead would be 'in' and 'from' outer space.[58] Another aspect which requires clarification is whether the payloads which are on-board SOs are required to be registered under the RC. NASA's response to this issue is to determine whether the payload has to be 'separated in the earth's orbit from the Shuttle'.[59] Following this position, NASA presented opposition to the ESA's Spacelab which was inside the shuttle at all times and drew its supplies from it as well.[60] Registration under Art.II of the RC would be required to be done by the respective state or international organization if the payload would separate from the shuttle.[61] Otherwise the payload

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55 Ram S. Jhaku, Bhupendra Jasani and Jonathan C. McDowell, Critical Issues related to registration of space objects and transparency of space activities, Acta Astronautica 143, 407 (2018) ["R.S. Jhaku"]; BIN CHENG, *supra* note 29, pg 472.

56 G.A. Res. 1721(XVI), U.N. Doc. A/RES/1721(XVI)A-E (December 20, 1962).

57 BIN CHENG, *supra* note 29, pg 494.

58 BIN CHENG *supra* note 29.

59 BIN CHENG, *supra* note 29, pg 501.

60 Id.

61 BIN CHENG, *supra* note 29, pg 501.

would be considered as '*property on board'* under Art.III of the Liability Convention.[62]

THE ISSUE OF TRANSFER OF OWNERSHIP OF SATELLITES/ SOS

Art. I(c) of the RC states that a 'state of registry' is *"a launching State on whose registry a space object is carried in accordance with article II*".[63] Art.I(a) of the RC defines 'launching state' as *"a state which launches or procures the launching of a space object; a state from whose territory or facility a space object is launched."*[64] It is evident from the abovementioned definitions that there can only be a single state of registry while multiple launching states can exist. In case of more than one launching state, they can agree amongst themselves as to which state shall act as state of registry for the purpose of Art.II of RC.[65] An example of the same is the registration of the Greece-Cyprus geostationary communication satellite ("GECS") named HellasSat 2 (2003-020A) by Greece with the UN[66] (after it held consultations with Cyprus).[67]

Problems have now surfaced because of existence of private entities in the conduct of space activities and due to transfer of ownership of SOs. The existence of multiple launching states has also led to ineffective implementation of the RC. There are 16 SOs

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62 BIN CHENG, *supra* note 29, pg 501.
63 Registration Convention, Art.I(c).
64 Registration Convention, Art.I(a).
65 Registration Convention, Art.II(3).
66 UNCOPUOS Background Paper, *supra* note 2, para 32.
67 Id.

which have been registered by more than one state.[68] Examples of the same are INSAT 1A which has been registered by India and U.S., IRS 1A registered by India and Russian Federation, BSB 1 registered by Sweden and United Kingdom, amongst others.[69] Further, there are situations in which one state party registered a SO under the RC and the same SO was registered by another state in pursuance of UN Resolution 1721 B(XVI).[70]

Existence of multiple launching states also leads to the SO not being registered at all.[71] An illustration of this is the case of SES-3 which was jointly launched by US and UK in 2011. During the launch, the satellite was owned by a subsidiary of SES which was incorporated in the U.K., but thereafter, its operations were transferred to the subsidiary of SES based in the U.S. Neither the U.S. nor U.K. has registered the same with the UN.[72]

Transfer of ownership of satellites is not envisaged under the RC. This is common a phenomena for GECS which are either sold or leased for a long period such that the state of registry does not have control over the concerned satellite.[73] Generally, these transfers are not notified to the UN. One off examples of transfers of ownerships being informed to the UN is of the United Kingdome ("U.K.") when their satellites Asiasat-1, Asiasat-2, Apstar-1 and Apstar-1A were transferred to China. U.K. also notified the UN

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68 UNCOPUOS Background Paper, *supra* note 2, Annex IV.
69 Id.
70 UNCOPUOS Background Paper, *supra* note 2,para 34.
71 UNCOPUOS Background Paper, *supra* note 2,para 35.
72 R.S. Jhaku, *supra* note 57, pg 413.
73 UNCOPUOS Background Paper, *supra* note 2, para 36.

regarding the fact that it had removed the abovementioned satellites from its national register and China stated that they had included them in theirs.[74] Instances have also come to light where states have not regarded themselves as 'state of registry' when an in-orbit transfer of satellite has been done in favour of a commercial company/entity incorporated in its jurisdiction. Examples of these include: U.K.'s notification to the UN that it was not the 'state of registry' for SOs of Inmarsat Ltd.- incorporated under U.K.'s jurisdiction (INMARSAT was previously an intergovernmental organization). However, U.K. did provide information to the UN as per the format under Art.IV of the RC.[75] Netherlands also made the same statement for SOs operated by New Skies Satellites (a company incorporated under Netherlands' law, to which NSS6 and NSS7 were transferred- they were launched from French territory and transferred to New Skies in 2002[76]) but stated that it bore responsibility for them under Art.VI of OST.[77] Some years after that, NSS6 and NSS7 featured in the Netherland's national registry in accordance with Art.XI of OST, but it was mentioned the abovementioned satellites were not registered under the UN registry.[78]

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74 UNCOPUOS Background Paper, *supra* note 2, para 37.
75 UNCOPUOS Background Paper, *supra* note 2, para 38.
76 R.S. Jhaku, *supra* note 57, pg 412.
77 UNCOPUOS Background Paper, *supra* note 2, para 39.
78 R.S. Jhaku, *supra* note 57, pg 413.

This shows that the there is no clarity regarding the compliance with the provisions of the RC in case of transfer of ownership of a SO/satellite.

Art.VIII of OST provides that a state *"on whose registry an object launched into outer space is carried"* will possess *"jurisdiction and control over such object"*. This is the provision which establishes the connection between the state and its SO.[79] Registration of a SO eases the identification of at least one launching state (which cannot be disputed) for the purpose of establishing liability- this is the reason due to which only one launching state can act as state of registry.[80]

Transfer of ownership of SOs can occur in two ways: *first*, transfer to a launching state; *second*, transfer to a non-launching state or any of its private/commercial.[81] An example of the first instance is the transfer of two Asia Sat satellites from U.K. to Hong Kong (after Hong Kong was transferred to China). Thereafter, the satellites were taken off from the UK registry and inserted in the Chinese national registry. This transcription was also reflected in the UN registry. The purpose of identifying a state of registry is to establish liability on a state which cannot be contested. This transfer has the following legal implications: *one*, the property i.e. satellites and all the rights/obligations associated with it has been

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79 Armel Kerrest, *Legal Aspects of Transfer of Ownership and Transfer of Activities*, International Institute of Space Law (2012) ["Armel Kerrest"].

80 Armel Kerrest, *supra* note 81, pg 796.

81 Kay-Uwe Horl & Julian Herminda, *supra* note 12, pg 457.

transferred; *two,* for the purpose of Art.VI of OST[82] (the connecting factor here is nationality), the responsibility lies with the 'appropriate state' to continuously supervise and control every 'national activity' or activity conducted 'non-governmental entities'; *three*, the liability of the launching state does not shift/change as determination of which state is a launching state occurs at the time of launch;

However, in the second instance, if the national state of the new owner is not a launching state, it cannot become the 'state of registry'.[83] The following repercussions occur if SO is transferred to a non-launching state: *one*, the original launching state is remains liable (it still is the state of registry) irrespective of the fact that it no longer exercises control over the SO; *two,* the nation state of the private/commercial entity to which the SO is transferred is responsible for the 'national activity' under Art.VI of OST, even though it is not the state of registry and cannot exercise jurisdiction and control in terms of Art.VIII of OST.[84] This is the reason why certain states have national legislations in place which require a prior authorization before a SO's (which has been licensed under the national legislation) ownership or control is transferred.[85] Art.13 of the legislation of Belgium provides that authorization is needed before rights or obligations related to a SO

82 Outer Space Treaty, Art.VI.
83 Armel Kerrest, *supra* note 81, pg 797.
84 Armel Kerrest, *supra* note 81, pg 797.
85 Armel Kerrest, *supra* note 81, pg 797.

are transferred to a third party.[86] Further, the law also states that authorization for transfer to a third state's operator may be refused in the absence of an agreement between Belgium and third state which facilitates the state of Belgium claiming indemnity from the third state in case any action is taken against the former under the international liability regime.[87] This provision enables the original launching state to get indemnified from the state to which ownership of the SO has been transferred as the former remains liable until the SO returns back to earth.[88]

The solution to the issue of transfer of ownership to a launching or non-launching state can be dealt with by making it possible for a third state or the state of the private entity to which the SO has been transferred to register the SO and exercise jurisdiction and control over it. However, under the current legal regime under the RC, this is not possible as according to Art.II(1) of the RC *"when a SO is launched,"* the launching state shall register the SO in its national registry.[89] Thus, the LS has to register the SO at the time of the launch. Art.II does not provide for a situation where the state of registry can be changed subsequently, thereby giving rise to the dichotomy that the state which is the new owner does not have jurisdiction or control over the SO in terms of Art.VIII of the OST. It is therefore suggested that the definition of 'state of registry' be amended to also include states which currently maintain

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86 Armel Kerrest, *supra* note 81, pg 798; The Belgian Space Law, Art.5
87 Armel Kerrest, *supra* note 81, pg 798; The Belgian Space Law, Point 5.
88 Armel Kerrest, *supra* note 81, pg 798.
89 Registration Convention, Art.II(1).

'jurisdiction and control' or operations over the SO.[90] This can be determined by analyzing which state reaps the profits arising out of space activities or with the help of the transfer of ownership agreements. [91]

However, the amendment of the RC might not be the most effective way to find a solution, as negotiations for amending a treaty take years to complete.[92] Instead, the focus must be placed on having bilateral agreements between states for indemnification of the original launching state/state of registry in case the original launching state's liability is invoked under the space treaties.[93]

AMENDING THE DEFINITION OF THE TERM 'LAUNCHING STATE'

Another solution to the problem of transfer of ownership is rethinking the definition of 'launching state.' As stated above, a launching state is a state which launches, procures the launch, or provides its territory or facilities for the launch.[94] The same definition is reflected in the OST[95] and Liability Convention.[96] At the international level, there have been many efforts to amend the definition of launching state. This was in consideration in UNISPACE III and also was part of the agenda of the Working Group of the UN Committee On Peaceful Uses of Outer Space

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90 Zhao Yun, *supra* note 8, pg 118.
91 Id.
92 An example can be no amendment to definition of launching state even after so many discussions.
93 Armel Kerrest, *supra* note 81, pg 799.
94 Registration Convention, Art.I(c).
95 Outer Space Treaty, Art.VII.
96 Liability Convention, Art.I.

("COPUOS") – the Legal Subcommittee could not authoritatively determine how to amend the definition of 'launching state.'[97]

An ambiguous part of the definition of 'launching state' is identifying the state which procures the launch. This phrase has been subject to various misinterpretations and now more so as private entities have started actively participating in space activity.[98] Some scholars have suggested that the term 'to procure' signifies that the state which procures the launch takes a substantial part in the launch of the SO.[99] This is in consonance with Art.31 of Vienna Convention of the Law of Treaties ("VCLT") which provides that an ordinary interpretation must be accorded to the terms of a treaty. Experts from NASA also suggested that when a third state conducts a launch on its territory for another state's SO, the latter has substantial say in decision making and is said to procure the launch.[100] However, which state will be considered to be the one which procures the launch is ambiguous if all parties involved in the space activity are private players. As Art.VI of OST states that a state must have constant control and supervision over national activities and also those of non-governmental entities, necessary agreements must be signed to indemnify in case the state is held liable.[101] The delegate from the U.K. proposed in

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97 Dr.Maureen Williams, *Perceptions on the Definition of a "Launching State" and Space Debris Risks*, Proceedings of the 45th Colloquium on the Law of Outer Space, 282 (2002) [Dr. Maureen Williams"].

98 Id.

99 Id.

100 Id.

101 Id. at pg 283.

the UN COPUOS Working Group that the most effective way to address the loophole existing in the law at present is to implement national legislation to deal with these issues.[102] The delegate stated that the British Outer Space Act, 1986 covered within its ambit nationals of UK which included entities, corporations, individuals and activities carried outside the UK as well.[103] A license had to be obtained by the person/entity carrying out the space activity and also agreed to indemnify the government (it was responsible under Art.VI of OST) for any liability that might arise.[104] The French delegate expressed concern that using some other state's territory could lead to forum shopping and this could be dealt with by having agreements signed between the private entities taking part in the space activity.[105] At large, the majority of the Working Group was against amending the current definition of 'launching state'.[106]

ART.IV OF THE RC

Art.IV of the RC places upon the state of registry to inform the UN Secretary-General as soon as practicable the information listed therein regarding the launch of a SO.[107] However, this requirement is slightly different from the one mentioned in UN Resolution 1721

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102 Id.
103 Id.
104 UNCOPUOS, Registration Statistics, Note by the Secretariat, para 23, U.N. Doc. A/AC.105/C.2/2001/CRP.10 (April 14, 2005).
105 Id.
106 Dr.Maureen Williams,*supra* note 100, pg 284.
107 Registration Convention, Art.IV(1).

B(XVI) which provides that information must be 'promptly' made available to the UN.[108]

No time period has been prescribed for a state to register the launch of a SO with the UN, and generally, the time taken for this ranges from a few weeks to years post the launch.[109] According to data, at least 140 SOs have been registered after a period of ten years or more from the date of launch.[110] In an era where technology has developed by leaps and bounds 'as soon as practicable' should be interpreted to mean hours or days not weeks, months or years.[111] A proposal was made to the UN COPUOS regarding imposing a twenty-four hour time period for reporting the launch of SO, with some extension being allowed for legitimate concerns.[112] It was also suggested that the RC be amended to prescribe that the UN Secretary-General must be promptly notified about the launch of a SO.[113]

Further, under Art.IV(3) of RC, it has been mandated that the state of registry has to inform the UN 'to the greatest extent feasible' information regarding a SO previously launched which is not in earth's orbit anymore.[114] Out of the 16 state parties whose SO's have returned in atmosphere of the earth, only 8 of them have

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108 G.A. Res.1721(XVI), para 1, U.N. Doc. A/RES/1721(XVI)A-E (December 20, 1962).
109 UNCOPUOS Background paper, *supra* note 2, para 48.
110 R.S. Jhaku, *supra* note 57,pg 409.
111 R.S. Jhaku, *supra* note 57,pg 409.
112 Zhao Yun, *supra* note 8, pg 120.
113 Zhao Yun, *supra* note 8, pg 121.
114 Registration Convention, Art.IV(3).

provided information regarding the same to the UN.[115] Further, state parties also do not mention the exact date of re-entry of the SO and just provide that the SO did not exist by the time the month ended.[116]

In regard to information about the date, location or territory of the launch, the majority of state parties use the Greenwich Mean Time ("GMT"), but others such as Russia use Moscow time.[117] This can result in difference of + or – 1 day in the UN Registry.[118] Major inconsistency exists in providing date of launch for a SO which is deployed from another SO (the parent SO). Herein, some states give information regarding the launch date of parent SO and others provide the date of release of SO from its parent. For instance, Canada provided the date of deployment of the Canadian Target Assembly from Space Shuttle Columbia and the orbital parameters at which it was deployed.[119]

There is also no consensus on providing details regarding orbital parameters as some states provide details about the SO's initial orbit, others about intermediate orbit or about the final/operational orbit.[120] Further, the units in which such information needs to be given are also not specified.[121] Information related to apogee and

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115 UNCOPUOS Background paper, *supra* note 2.
116 Id.
117 UNCOPUOS Background paper, *supra* note 2, para 60-61.
118 Petr Lala, Joint United Nations/International Institute of Air and Space Law Workshop on Capacity Building in Space Law, available at http://www.unoosa.org/pdf/publications/st_space_14E.pdf.
119 UNCOPUOS Background paper, *supra* note 2, para 63.
120 UNCOPUOS Background paper, *supra* note 2, para 66.
121 UNCOPUOS Background paper, *supra* note 2, para 66.

perigee is also inconsistent. Generally, it is in terms of distance from the Earth's surface; however, some states give information from the Earth's centre which can result in a difference of approximately 6378 kilo meters.[122]

Art.IV(1) also places an obligation upon states to provide information regarding the general functions of the SO. This information can be an extremely short statement or detailed accounts of the activities to be carried out by the SO.[123] This is particularly problematic in case the SO has a nuclear power source ("NPS") on board. The Principles Relevant to the Use of Nuclear Power in Outer Space, 1992 obliges states to provide information regarding an NPS on board a SO when there's a risk of them falling on the earth due to malfunctioning.[124] However, there is no binding mandate under the RC regarding the same perhaps merit the conclusion that the 1992 Resolution is the only directory in nature and does not have the effect of amending the RC which is legally binding.[125] Information regarding an NPS on board can be given under Art.IV(2) of the RC which provides that the state of registry has the discretion to furnish additional information about the SO to the UN Secretary-General.[126] However, this is not mandatory, but voluntary and some states have provided

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122 Petr Lala, Joint United Nations/International Institute of Air and Space Law Workshop on Capacity Building in Space Law, available at http://www.unoosa.org/pdf/publications/st_space_14E.pdf.

123 UNCOPUOS Background paper, *supra* note 2, para 78.

124 Zhao Yun, *supra* note 8, pg 119.

125 Id.

126 Registration Convention, Art.IV(2).

information related to SO carrying NPS like Cosmos 1402, 1900 and Mars-96[127] However, recently positive state practice has been seen and according to reports all SOs having NPS have been registered.[128]

The UN Resolution 62/101 strives to harmonize the differing state practices while providing information under Art.IV of the RC and also urged states to ratify the RC.[129] It provides the units/parameters in which the information under Art.IV of RC must be furnished to the UN.[130] Further, it also provides that states must provide information regarding a change of supervision of a space object under the provision for providing additional information to the UN Secretary-General. [131] So far, the implementation of this resolution has been successful as a positive change in the attitude of the states in registration has been seen, which include harmonization of information that is submitted.[132] Additionally, many states of registries (20 in number) have developed a registration format similar to that provided under this resolution.[133] States have also started providing the precise date on which the SO re-entered into the earth's atmosphere.[134]

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127 UNCOPUOS Background paper, *supra* note 2, para 89.

128 United Nation Office of Outer Space, *Registration of Space Objects with Secretary General*, IISL-ECSL Symposium "40 years of entry into force of the Registration Convention - Today's practical issues", 55th Legal Subcommittee, 4-15 April 2016.

129 G.A. 62/101, U.N. Doc. A/RES/62/101 (December 17, 2007).

130 Id.

131 Id.

132 United Nation Office of Outer Space, *Registration of Space Objects with Secretary General*, IISL-ECSL Symposium "40 years of entry into force of the Registration Convention - Today's practical issues", 55th Legal Subcommittee, 4-15 April 2016.

133 Id.

134 Id.

ART.VII OF THE RC

Art.VII of the RC provides that an international intergovernmental organization ("IIO") can undertake rights and obligations under the RC if majority of the states who are a part of it are parties to the RC and OST.[135] The acceptance and non-acceptance of rights by an IIG under the RC leads to certain issues. *First*, an IIO which accepts the right/obligations under RC has to maintain a registry as per Art.II(1) of the RC.[136] This institutional register would be irrelevant as an IIG cannot exercise state jurisdiction over a SO in terms of Art.VIII of the OST. This is so because IIG's neither have the enforcement mechanism or the legislative power which enables them to exercise quasi-territorial jurisdiction over a SO.[137] If in the future they do possess these powers, they would be converted into federal states and thereafter accede to the RC as any other state party.[138] Perhaps, the IIG should register the SO which it launches with one of the States party to it, to resolve this issue. *Second*, non-acceptance of right/obligations leads to the problem of non-registration of SOs under the RC. Due to the extremely complicated division of responsibility among the IIG state parties, non-registration of a launch of a SO is preferred.[139] If no

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135 Registration Convention, Art.VII(1).
136 BIN CHENG, *supra* note, pg 421.
137 Id.
138 Id.
139 Dr. Bernard Schmidt Tedd and Dr. Michael Gerhard, *How to Adapt the Present Regime for Registration of Space Objects to New Developments in Space*

agreement has been reached with respect to registration of the SO, the host state should register it.[140] This is in line with the rationale that the first operator's state/or the economic beneficiary registers the SO.

CONCLUSION

The Registration Convention has over the course of its operation proved to be effectively implemented to a certain extent, with only 8% of functional SOs not being registered from 1975 till 2016.[141] However, the problem arises due to differing state practices regarding registration of non-functional SOs and also due to a lack of consensus on whether space debris falls within the ambit of SO. Consequently, an amendment to the RC is required wherein there is express clarity regarding this issue. Further issues arise due to transfer of ownership of SO to a launching or a non-launching state post the launch due to which the state having jurisdiction and control under Art.VIII of OST is different from the state which actually operates it. Thus, an amendment to the definition of state of registry is required which mentions that it can be a state that currently maintains jurisdiction and control/operation over the SO. The definition of 'launching state' also needs to be relooked at,

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Application?, Proceedings of the 48th Colloquium on the Law of Outer Space, 361 (2005).

140 Id.; Committee OnPeaceful Uses of Outer Space, *Registration of space objects: harmonization of practices, non-registration of space objects, transfer of ownership and registration/non-registration of "foreign" space objects Note by the Secretariat*, para 10, U.N. Doc.A/AC.105/867 (19 January 2006).

141 United Nation Office of Outer Space, *Registration of Space Objects with Secretary General*, IISL-ECSL Symposium "40 years of entry into force of the Registration Convention - Today's practical issues", 55th Legal Subcommittee, 4-15 April 2016.

with particular emphasis being given on clarifying the term 'procures the launch.' In light of the inconsistency in providing information to the UN Registry under Art.IV of the RC, a harmonized system for the same must be adopted at the earliest. The UN GA resolution 62/101, to an extent, has attempted to harmonize the parameters according to which information must be provided to the UN. However, there is a need for such model parameters to be included in the RC vide an amendment to ensure that all states are legally bound to comply with the same. All states must agree to use the GMT for providing information, providing the exact date of re-entry of SO into the earth's atmosphere. Further states must come to a consensus regarding which orbital parameter information must be provided- initial, intermediary or final orbital position and mutually agree that details regarding specific functions of a SO have to provided to the UN, most importantly mandatorily including information about an NPS being on board a SO. Art.VII of the RC also requires to be amended in light of the issues surrounding it which have been highlighted above.

Therefore, due to the lack of effective implementation of the RC and the problems existing owing to steep increase in the number of private players involved in space activities, it is time that an amendment of the RC is proposed by 1/3rd state parties (with the concurrence of majority of state parties) under Art.X of the RC.

THE LEGALITY OF TERRAFORMING OF CELESTIAL BODIES UNDER THE OUTER SPACE TREATY

Bholenath[*]

INTRODUCTION: THE NEED TO STUDY TERRAFORMING

Ever since Elon Musk, the Chief Executive Officer of aerospace company SpaceX, revealed his plan to terraform Mars, the debate regarding the legality of such an activity under the aegis of the Outer Space Treaty is gaining momentum. For a common man, it seems to be a fascinating endeavor, but for space lawyers, it poses new and fascinating legal questions.

"Terraforming" means to alter or transform the atmosphere of another planet to have the characteristics of landscapes on Earth.[1] Musk's plan is to alter the entire environment of Mars so as to make it habitable for humans. He has long been an advocate of colonizing Mars, and in order to make humans an inter-planetary species, he wants to detonate thermonuclear devices over the poles of Mars. His plan poses a serious space law problem that needs further deliberation. Unfortunately, only a handful of articles have been written on the issue and academic literature fails to answer whether such a terraforming activity would be lawful under the Outer Space Treaty regime.

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[1] Thomas J. Herron, 'Deep Space Thinking: What Elon Musk's Idea to Nuke Mars Teaches Us about Regulating the Visionaries and Daredevils of Outer Space' (2016) 41 Colum. J. Envt'l. L. 553, 554.

Thomas J. Herron has explained how the detonation of thermonuclear devices on the poles of Mars will help create an environment for human survival on Mars:

"*In theory, generating large amounts of heat over the Martian poles could vaporize and release carbon dioxide contained in Mars' polar ice caps, thickening the atmosphere. A thicker atmosphere could trap heat from the Sun, which normally is absorbed by the planet and then released as infrared radiation. Retaining more heat from the Sun could trigger a cascading greenhouse effect by releasing more carbon dioxide and continuing to heat up Mars until the surface pressure increased enough for liquid water to exist. Formation of liquid water could be very favorable for oxygen-producing plants, and thus, human survival.*"[2]

Outer Space Treaty is considered to be the Magna Carta in international space law. It guarantees certain freedoms of outer space but at the same time, provides for the restrictions on such freedoms as well. There is a need to evaluate the legality of terraforming activity to better understand as to whether it falls within the scope of the freedoms provided by the Outer Space Treaty and whether or not it falls outside the scope of the restrictions prescribed by the treaty.

Several fascinating questions arise regarding the legality of such terraforming activity. Does terraforming of a celestial body fall

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[2] Herron (n 1) 555.

within the ambit and scope of the rights in space provided by Article I of the Outer Space Treaty? Does it run contrary to the restrictions that have been put on the rights in space by virtue of Articles II, IV and IX of the Outer Space Treaty?

This paper is an attempt to establish the lawfulness of terraforming activity under the Outer Space Treaty. This paper has been further divided into two chapters. The second chapter attempts to establish the legality of terraforming activity under the current Outer Space Treaty regime by tackling rival and counter interpretations that have been formulated in the academic literature against terraforming activities. It is argued that how such an activity may be lawful under the provisions of the Outer Space Treaty and why the counter interpretations against it should not be accepted. Attempt has been made to establish the legality of terraforming under Article IV, IX, II and I of the Outer Space Treaty since these provisions are concerned with the freedoms of space as well as the prescribed restrictions on those freedoms. In the third and last chapter, relevant conclusions are drawn and suggestions have been given.

JTERRAFORMING THROUGH THE LENS OF OUTER SPACE TREATY

Legality under Article IV of the Outer Space Treaty

The detonation of the poles of Mars through nuclear explosion raises the rather obvious question that whether such an activity would be considered as the use of outer space including the Moon and other celestial bodies for peaceful purposes. Could such

detonation be considered as the "peaceful" use of outer space? Could such detonation qualify as the "militarization" and "weaponization" of outer space?

Is Detonating Nuclear Weapons on Celestial Bodies Prohibited?

At this juncture, the provision that provides guidance is Article IV of the Outer Space Treaty. The text of Article IV explicitly prohibits placement in orbit around the Earth any objects carrying nuclear weapons or any other weapons of mass destruction, installation of nuclear weapons or weapons of mass destruction on celestial bodies and stationing of nuclear weapons or weapons of mass destruction in outer space.[3] Moreover, the establishment of military bases, installations, and fortifications, the testing of any type of weapons and the conduct of military manoeuvres on celestial bodies shall be forbidden.[4]

The Outer Space Treaty however, does not prohibit the "actual use" of nuclear weapons in outer space or celestial bodies. Musk's plan is not to place nuclear weapons in orbit around the Earth or install such weapons on celestial bodies. The use of nuclear weapons on celestial bodies has not been explicitly prohibited by Article IV of the Outer Space Treaty. Under international law, what is not explicitly prohibited is permitted.[5] This implies that the

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3 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, (entered into force 10 October 1967) 610 UNTS 205 art 4 [Outer Space Treaty]

4 ibid.

5 *S.S. Lotus Case (France v. Turkey)* (Merits) [1927] PCIJ Rep Series A No 10.

detonation of nuclear weapons on the poles of Mars shall be lawful through the lens of Article IV of the Outer Space Treaty.

Is Terraforming of Mars a Peaceful Use of Celestial Body?

The question, however, remains whether such detonation of the poles of Mars is contrary to the "peaceful purpose" provision of Article IV of the Outer Space Treaty. The second paragraph of Article IV of the Outer Space Treaty determines that "the Moon and other celestial bodies shall be used by all States Parties to the Treaty exclusively for peaceful purposes."[6]

The treaty does not define what a "peaceful purpose" is and hence gives the impression that the drafters intended this term to evolve over time. It is not completely clear which activities would be considered as peaceful uses of celestial bodies.[7] The term "peaceful purpose" is a subjective term and is wide open for legal interpretation. Depending on the restrictive interpretation of Article IV, one may argue that the enumerated prohibitions are either a closed list or merely examples of the type of activities that may be prohibited in outer space.[8]

Taking into consideration the acute lack of resources for human beings to survive on the earth for long, it may be argued that the creation of habitable environment on other celestial bodies to make humans an inter-planetary species shall not be construed as

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6 Outer Space Treaty art 4.

7 A Ferreira-Snyman, 'Selected Legal Challenges Relating to the Military Use of Outer Space, with Specific Reference to Article IV of the Outer Space Treaty' (2015) 18 Potchefstroom Elec. L. J. 488, 496.

8 ibid 497.

contrary to the "peaceful purpose" provision under Article IV of the Outer Space Treaty. The ultimate goal and aim of the Outer space Treaty is the "benefit of all countries" and there can be circumstances when the ultimate benefit of all countries is to search for other planets as habitats for human beings.

As regards the military uses of outer space, the authors argue that the term "peaceful" must rather be interpreted to mean non-military, thereby prohibiting all military uses of outer space.[9] However, Musk's plan to detonate poles of Mars prima facie does not reflect any military use of outer space as it does not involve the use of any military power of the State. The object of the activity is not to establish any military base on Mars but rather to create a habitable environment for humans.

Legality under Article IX of the Outer Space Treaty

The Outer Space Treaty does not have a dedicated provision for celestial environmental protection, but the obligation to protect and preserve the outer space and celestial environment can be derived from the terms of Article IX of the treaty. Terraforming activity, which will transform the entire atmosphere of Mars, must be consistent with the obligations incumbent by virtue of Article IX of the Outer Space Treaty.

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9 ibid.

Is Terraforming of Mars a "Study" or "Exploration" of Celestial Body?

Article IX of the Outer Space Treaty directed nations to "*pursue studies of outer space, including the Moon and other celestial bodies, and conduct exploration of them so as to avoid their harmful contamination*." This sentence speaks of "*study*" and "*exploration*." The States are under an obligation to avoid harmful contamination only while "pursuing studies" of outer space including the celestial bodies and conducting "exploration" of it. When interpreting statutes, we should presume things not mentioned were excluded by deliberate choice, not inadvertence.[10] No space activity other than "*study*" and "*exploration*" is covered by the second sentence of Article IX. This interpretation finds support in the ILA Report[11] and the work of an author.[12] And the International Court of Justice has also emphasized that "interpretation must be based above all upon the text of the treaty".[13]

Exploration is the general finding out of something yet to be explored.[14] Terraforming mission will be a pre-meditated activity to make Mars environment habitable for humans and thus qualify as the "*use*" of celestial body. The obligation to avoid the harmful

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10 Ian Brownlie, *Principles of Public International Law* (6th edn, OUP 2003) 604.

11 ILA, Report of the International Space Law Committee on the work of its 64th Session' (1990) 154, 162.

12 Dr Ulrike M. Bohlmann, 'Connecting the Principles of International Environmental Law to Space Activities' (2011) 54 Proc. L. Outer Space 301.

13 *Territorial Dispute Case (Libyan Arab Jamahiriya v. Chad)* (Merits) [1994] ICJ 6.

14 Stephan Hobe, *Cologne Commentary on Space Law* (Berliner Wissenschafts-Verlag 2009) 195.

contamination of celestial bodies does not apply while carrying the "*use*" of the celestial body.

Since, the terraforming activity planned by Elon Musk does not qualify as a "*study*" or "*exploration*", thus the obligation to avoid harmful contamination cannot enter into discussions in the first place.

Is Terraforming of Mars a "Harmful Contamination" of Celestial Body?

It is hard to digest that a terraforming mission that would alter an entire planet's environment would not run counter to the "*harmful contamination*" provision of the Outer Space Treaty. Harmful contamination of Mars describes not just loss of resources or amenities of economic value, but also any destruction of the intrinsic worth of the Martian atmosphere, including biological diversity and natural areas of aesthetic significance.[15] The Planetary Protection Policy of the Committee on Space Research [COSPAR] might give some indication from the international scientific community about what it means to avoid harmful contamination on Mars,[16] but it did not address the issue of terraforming *per se*. However, the existing procedures in the policy

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15 Patricia Birnie and Alan Boyle, *International Law of the Environment* (3rd edn, OUP 2009) 184.

16 Committee on Space Research, International Council for Science, COSPAR Planetary Protection Policy, <https://cosparhq.cnes.fr/sites/default/files/pppolicy.pdf> accessed 28 October 2019.

suggest that a terraforming mission, which could alter the whole planet, falls within the ambit of harmful contamination.[17]

Furthermore, the evolutive interpretation of Article IX of the treaty also supports the contention that terraforming would qualify as "harmful contamination" of the celestial body. In this light, the ICJ noted that nothing prevents it from taking into account "the present-day state of scientific knowledge when interpreting a treaty."[18] The VCLT provides that a state is mandated to refrain from acts that would defeat the object and purpose of the treaty.[19] Article IX implies that celestial bodies should be preserved in their pre-existing conditions.[20] Although the treaty does not contain any explicit reference to the terraforming of celestial body but if one was to do the evolutive interpretation of the treaty, taking into consideration the present-day state of scientific knowledge and the object and purpose of Article IX, it can be argued that, deliberate transformation of the Martian atmosphere by whatever means is inconsistent with the OST.

On the contrary, the author believes that there are profound reasons as to why the arguments against terraforming activity should not be accepted.

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17 Thomas J. Herron, 'Deep Space Thinking: What Elon Musk's Idea to Nuke Mars Teaches Us About Regulating the Visionaries and Daredevils of Outer Space' (2016) 41 COLUM. J. ENVTL. L. 553, 569.

18 *Kasikili/Sedudu Island Case, (Botswana v. Namibia)* (Merits) [1999] ICJ 1045.

19 Vienna Convention on the Law of Treaties (adopted on 23 May 1969, entered into force 27 January 1980) 1155 UNTS 331(VCLT) art 18.

20 Michael Gerrard and Anna Barber, 'Asteroids and Comets: U.S. and International Law and the Lowest Probability, Highest Consequence Risk' (1997) 6 N.Y.U. ENVTL. L. J. 4, 34-35.

First and foremost, it should be noted that **t**he definition of the term "harmful contamination" has not been provided in the treaty which renders this term wide open for legal interpretation and makes it redundant. Since the term is not defined in the treaty, recourse may be taken to other relevant sources for its legal interpretation. The Committee on Space Research [COSPAR] guidelines restricts the interpretation of the term "*contamination*" to "*biological contamination*."[21] This interpretation is also supported by the *travaux* of Outer Space Treaty. Forward contamination takes place through the introduction of undesirable elements into outer space by some form of human intervention.[22] Since the COSPAR guidelines restrict the interpretation of the term "*contamination*" to "*biological contamination*", it can be concluded that the terraforming activities certainly do not fall within the notion of biological contamination. Terraforming not only does not fall in the definition of biological contamination but is outside the scope of the term "contamination" itself.

Furthermore, whether a terraforming activity is "harmful" or not is also a difficult line to draw. Article IX of the Outer Space Treaty does not put a blanket prohibition on all kinds of contamination of celestial body. Only "*harmful*" contamination is prohibited. However, the degree of contamination that would be considered harmful to another state's interest is not stated in the treaty.

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21 Philippe Achilleas, 'Planetary Protection: Legal Issues' (2003) 46 I.I.S.L. Proc. L. Outer Space 214, 215.

22 Stephen Gorove, 'Pollution and Outer Space: A Legal Analysis and Appraisal' (1972) 5 N.Y.U. J. INT'L L. & POL. 53, 54.

Whether this provision favors protection to safeguard science or to safeguard pristine planetary environments for their own sake, independent of research, is not clear.

In the absence of any established threshold to determine when a 'contamination' becomes "harmful contamination", it would be inappropriate to assume that the terraforming activities will be causing harmful contamination of the celestial environment.

It is the view of the author that a terraforming activity could qualify, under certain circumstances, as an "adverse change" in the celestial environment. But there is no such legal obligation in the treaty to avoid adverse change in the celestial environment, which eventually makes the terraforming activity lawful under Article IX. A plain reading of Article IX reflects that "*harmful contamination*" and "*adverse changes in the environment*" are two distinct concepts. "*Adverse changes in the environment*" of Earth are explicitly prohibited, but adverse changes in the environment of celestial bodies are not. Under international law, states may do whatever is not expressly forbidden.[23] Thus, in the absence of explicit prohibition to that effect, the terraforming activities seem to be lawful.

A Hypothetical Claim

Imagine a situation where Elon Musk instead of detonating nuclear weapons on Mars, plans to install huge mirrors on the poles of Mars in order to concentrate the sun rays falling on the poles of

[23] *Lotus* (n 5).

Mars which will eventually heat up the atmosphere and cause the solid CO2 caps to melt. This activity will also be considered as terraforming as there is an alteration of the celestial environment for making it habitable for humans.

But, since no weapons are used, the legality of installing such mirrors cannot be put in question with reference to Article IV of the Outer Space Treaty. Also, since nothing externally is added to the celestial environment through human intervention, therefore, such an activity would clearly fall outside the scope of "contamination" under Article IX of the treaty.

Therefore, it seems that just because one way to terraform Mars is considered unlawful under the treaty does automatically imply that all other ways will be unlawful too. Just because terraforming of Mars by detonating nuclear devices on its poles is held unlawful does not imply that the installation of Mars on the poles of Mars for its terraforming would also be unlawful.

Legality under Article II of the Outer Space Treaty

Article II of the Outer Space Treaty dictates that "Outer space, including the Moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means." This provision presents some interesting legal problems for Elon Musk. The level of exploitation that Musk envisions for Mars affects its whole ecosystem and puts

a planet under the control of all parties involved in the project, could run afoul of the letter and spirit of non-appropriation.[24]

Additionally, there is a dilemma relating to property rights on celestial bodies. Whether Elon Musk's company, as a private entity, can conduct such an activity on Mars which is expected to transform the entire atmosphere of the celestial body? If the celestial body is the province of all mankind then by what rights a single private entity is carrying out such an activity? Whether such an overall transformation of a planet would fall within the scope of the term "national appropriation"?

Article II does not directly address the "property rights of private individuals and companies, which is understandable because at the time of drafting only government entities were involved in space activities."[25] However, whether Musk's plan will eventually qualify as an appropriation of the celestial body needs to be examined.

Is Terraforming of Mars a "National Appropriation" of a Celestial Body?

Outer Space Treaty Article II prohibits the appropriation of celestial bodies "*by the claim of sovereignty, by means of use or occupation or by any other means"*. There are arguments that are pursued by some scholars in the relevant literature that the

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24 Herron (n 1) 567.

25 Gabriele Wohl, 'Student Work, Outer Space, Inc.: Transmitting Business, Ethics, and Policy "Across the Universe,"' (2008) 3 W. VA. L. REV. 311, 330.

transformation of a celestial environment would run counter to the "non-appropriation" principle.

One such argument is that such a terraforming mission would qualify as "national appropriation" by means of "use." The "*use*" in Article II is the use of the celestial body in such a way that it makes use by other countries impossible. "*Use*" means economic and non-economic use of outer space which includes the exploitation of celestial bodies with the goal of making economic profit.[26] The non-appropriation doctrine includes but not limited to the location and physical dimensions of a facility and related installations.[27] A substantial alteration of a celestial environment would deny other entities the right to use and explore the pristine balance previously existing on that body.[28]

Furthermore, some scholars make reference to the Space Act of USA to demonstrate state practice which further provides evidence as to the unlawfulness of terraforming activity. Under the Space Act of USA, for the US government to assert authority over such project on Mars could amount to *de facto* appropriation because the entire planet and not just the fractional *in situ* resources obtained for private use would be subject to its regulatory control.[29] Proclaiming that kind of legal power would violate the

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26 Hobe (n 14) 195.

27 Patricia M. Sterns and Leslie I. Tennen, 'Utilization of Extraterrestrial Resources: Law, Science and Policy' (1992) 35 I.I.S.L. Proc. L. Outer Space 499, 501.

28 Patricia M. Sterns and Leslie I. Tennen, 'Current U.S. Attitude Concerning Protection of the Outer Space Environment' (1985) 27 I.I.S.L. Proc. L. Outer Space 398.

29 Herron (n 1) 596.

letter and spirit of Article II, even if continuous use does not technically amount to or justify appropriation.[30]

Moreover, such authors formulate arguments that in any event; such a mission would fall under the scope of "national appropriation by any other means." They argue that the phrase "*by any other means*" in Article II represents a catch-all phrase designed to ensure that there are no other methods giving rise to national appropriation.[31] Christol suggested that the negotiating history of Article II, as evidenced by the *travaux preparatoires* of the OST, indicates that the phrase "*by any other means*" was designed to impose the same restrictions on individuals and private entities.[32]

All these arguments against the lawfulness of a terraforming activity shall be discarded based on the fact that the Outer Space Treaty does not prohibit terraforming activities explicitly. To the extent that interpretation of Article II is given to prove the unlawfulness of terraforming activity, reliance must be place on Article 31 of the Vienna Convention on the Law of Treaties. A treaty shall be interpreted according to the ordinary meaning given to the terms of treaty in their context.[33] Being *res communis omnium,* the purpose of Article II was to declare the traditional ways of acquiring a territory under general international law,

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30 ibid.
31 Hobe (n 14) 247.
32 Carl Q. Christol, 'Article 2 of the 1967 Principles Treaty Revisited' (1984) 9 ANNALS AIR & SP. L. 217, 263.
33 VCLT art 31.

namely discovery, *occupacio* and effective possession,[34] inapplicable in Outer Space.[35] It is the national appropriation of a celestial body as a sovereign territory belonging to some polity of Earth that is unacceptable.[36] In the absence of any such sovereignty claims over the Martian surface, the question of "*national appropriation*" cannot enter into discussions.

Modification of the celestial environment does not imply acquiring of territory in the traditional sense. Thus, to say that transforming of celestial environment would constitute national appropriation is simply not true.

In this vein, it should be noted that a greater incompatibility with a strict reading of the non-appropriation article will be tolerable if it is solving a larger problem.[37] Multi-planetary presence can safeguard the survival of humanity, especially if a catastrophic event occurs on Earth.[38] To have any chance of survival on Mars, humans would have to manufacture all the basic necessities of life

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34 Fabio Tronchetti, 'The Non-Appropriation Principle Under Attack: Using Article II Of The Outer Space Treaty In Its Defence' (2007) 50 I.I.S.L. Proc. L. Outer Space 526, 527.

35 Ogunsola Ogunbanwo, *International Law and Outer Space Activities* (Martinus Nijhoff 1975) 63.

36 Kenneth M. Weidaw, 'A General Convention on Space Law: Legal Issues Encountered in Establishing Lunar and Martian Bases' (2004) 47 I.I.S.L. Proc. L. Outer Space 272, 275.

37 Timothy Justin Trapp, 'Taking up Space by Any Other Means: Coming to Terms with Non-Appropriation Article of the Outer Space Treaty' (2013) U. ILL. L. REV. 1681, 1710.

38 Ross Andersen, 'Exodus: Elon Musk Argues that We Must Put a Million People on Man if We Are to Ensure that Humanity Has a Future' <http://aeon.co/magazine/technology/the-elon-musk-interview-on-mars/> accessed 25 October 2019.

on their own.[39] In anticipation of the resource problem on Earth in the near future, such terraforming activity might be our only hope for the future.

As far as the question of the private company carrying out such an activity is concerned, reference must be made to the negotiating history of the Outer Space Treaty. Article II does not refer explicitly to private entities even though the extension of the non-appropriation doctrine to private entities is "firmly established in space law."[40] The negotiating history of the Outer Space Treaty shows that most of the delegates participating in those discussions were generally of the opinion that article II prohibited both public and private appropriation.[41] This reading of the Outer Space Treaty could support an argument that Musk may not carry out a terraforming project on Mars, which would, in effect, put the fate of an entire planet under his control.[42]

On this point, Cologne Commentary on Space Law states that,

"During the discussions on the treaty, the United States was of the view that in addition to States, private companies must be allowed to undertake the exploration and use of outer space. On the other hand, the Soviet Union was adamantly opposed to any such involvement by private entities. Eventually, however, it

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39 Ed Regis, 'Let's Not Move to Mars' <http://www.nytimes.com/2015/09/21/opinion/lets-not-move-to-mars.html> accessed 25 October 2019.

40 Ricky J. Lee, 'Article II of the Outer Space Treaty: Prohibition of State Sovereignty, Private Property Rights, or Both' (2004) 11 Austl. Int'l L.J. 128, 129.

41 Hobe (n 14) 237.

42 Herron (n 1) 566.

accepted such a role by the private sector, after being assured that the non-governmental entities would participate only when they were authorized by appropriate States, which would also continuously supervise their activities."[43]

It is thus clear that a private company is entitled to carry out any lawful activity in space as long as it is authorized and continuously supervised by the State. Therefore, if the United States authorizes SpaceX to conduct terraforming of Mars and continuously supervise it in this regard, then there is no law that prohibits SpaceX from carrying out such an activity based on the mere fact that it is a private company.

Legality under Article I of the Outer Space Treaty

Article I of the Outer Space Treaty provides for the freedoms of outer space. These freedoms include that there shall be freedom of exploration and use of outer space including celestial bodies, there shall be free access to all areas of celestial bodies and that there shall be freedom of scientific investigation in outer space including celestial bodies.[44] In addition to the freedoms of space, Article I prescribes certain restrictions on those freedoms as well. Article I determines one such restriction that the exploration and use of outer space, including the Moon and other celestial bodies shall be carried out for the benefit and in the interests of all countries.[45]

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43 Hobe (n 14) 239.
44 Outer Space Treaty art 1.
45 ibid.

As regards the legality of terraforming of Mars is concerned, the question arises as to whether such activity is the exercise of the freedoms provided by virtue of Article I of the Outer Space Treaty? Or whether such activity shall be prohibited as it falls within the ambit of the restrictions provided by Article I of the treaty?

Is Terraforming of Mars a Lawful "Use" of Outer Space and Celestial Body?

There is a freedom of exploration and use of outer space, including the Moon and other celestial bodies.[46] Reference to the *travaux preparatoires* of the Outer Space Treaty clarifies "exploration" to be an activity aimed at gathering knowledge of the outer space while "use" is the application of such knowledge.[47]

The term "use" in the legal sense refers to the enjoyment of property which results from the occupancy, employment, or exercise of such property and includes an element of profit, benefit, or some other measure of advantage accompanying the use.[48] It is pertinent to note here that some of the "uses" of outer space and celestial bodies are specifically prohibited by the treaty, while others are specifically not prohibited.[49]

The terraforming of the celestial body has not been prohibited by the treaty which indicates that such an activity would be

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46 ibid.
47 U.N.Doc. A/PV.792, 615.
48 Stephen Gorove, 'Freedom of Exploration and Use in the Outer Space Treaty: A Textual Analysis and Interpretation' (1971) 1 Denv. J. Int'l L. & Pol'y 93, 98
49 ibid.

considered lawful under the treaty. Arguments may be formulated that terraforming of celestial body could not have been envisaged by the drafters of the treaty. Thus it must qualify the test of "benefit and interests of all countries" so as to be considered as the lawful use of outer space.

Is Terraforming of Mars in the "Benefit and Interests of All Countries"?

The Treaty contains no clue as to what constitutes "benefit" and "interest."[50] What is in the benefit and interest of all countries at the relevant time is not an easy determination. Whether the terraforming of celestial bodies is in the benefit and interests of all countries requires a detailed analysis of the provision.

Firstly, the obligation to carry out space activities for the benefit and in the interests of all countries is too vague to be self-executing.[51] The "*benefit*" and "*interests*" provisions only states a general principle without creating a specific duty.[52] The only acts unequivocally prohibited by the provision are aggressive acts that violate the principle that outer space may only be used for peaceful purposes.

This inherent vagueness of the provision implies that there is no specific legal obligation on the States to carry on their activities

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50 Gorove (n 48) 100.

51 Edwin W. Paxson, 'Sharing the Benefits of Outer Space Exploration: Space Law and Economic Development' (1993) 4 MICH. J. INT'L. L. 487, 492.

52 Bin Cheng, *Studies in International Space Law* (Clarendon Press Oxford 1997) 404; Carl Q. Christol, *Modern International Law of Outer Space* (Pergamon Press 1982) 41-45.

precisely in the "benefit" and "interests" of all countries. Moreover, the terraforming of celestial bodies is not explicitly prohibited by the law which further supports the contention that such activity shall be considered to be in the "benefit" and "interests" of all countries.

Secondly, "benefit" refers to some advantage or indulgence, as opposed to detriment or deprivation and the word "interest" although it has similar connotations but has been defined as a pattern of demands and its supporting expectations.[53] Scholars have opined that as long as an activity in space benefits all nations in some general sense, even if the benefit is indirect, then the activity is permitted under the Outer Space Treaty.[54] Something that is in line with a nation's demands and expectations would be expected to convey some benefit to that nation and it may involve not only actual but also potential benefit, that is, a chance for some future benefit.[55]

This interpretation suggests that the terraforming mission of Mars by Elon Musk would be lawful as the transformation of the Martian atmosphere will facilitate access to the planet for others and constitute a major benefit for anyone who goes to Mars thereafter.[56] Since, the natural resources on Earth are depleting, building human settlements on Mars will lower the pressure on

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53 H. Lasswell and A. Kaplan, *Power and Society* (Routledge 1950) 23.

54 Milton L. Smith, 'The Commercial Exploitation of Mineral Resources in Outer Space', in Space Law: Views of the Future, 46-47 (Kluwer 1988).

55 Gorove (n 48) 101.

56 Herron (n 1) 567.

Earth's resources and, in a way, will help mankind. This way, arguments may be formulated that the terraforming of Mars would be in the benefit and interests of all countries.

Thirdly, the phrase "shall be carried out" could be interpreted in two different ways. It may mean simply that the activities of the signatories, whenever undertaken, must be in accordance with international law, or possibly, it could mean that all parties to the Treaty pledge themselves to carry on such activities in the described manner.[57]

The terraforming of celestial bodies does not appear to be prohibited by Article IV, IX and II of the Outer Space Treaty. The mere fact that the activities are carried out inconsistency with the provisions of the Outer Space Treaty could be interpreted to mean that it is in the benefit and interests of all countries. The activity is lawful under Article IV, IX and II of the Outer Space Treaty and thus can be considered to be in the benefit and interests of all countries. The treaty vaguely states that the activities should be in the 'benefit" and "interests" of all countries without specifying how these benefits should be conferred.

CONCLUSION AND SUGGESTIONS

The author recently had the opportunity to discuss the legality of terraforming of celestial bodies with one of the most prominent space-lawyer Professor Dr. Stephan Hobe. Professor Hobe was of the opinion that the pristine celestial environment shall not be

[57] Gorove (n 48) 95.

touched and that we should solve all earthly problems on earth itself. But the question remains do we have laws which can prohibit terraforming. As of now, the answer remains negative.

Space is one such domain where the law should precede man. It is high time for the international community to shift their focus from space tourism, suborbital flights and space force to the terraforming of celestial bodies. Towards the end of the next decade, we are most likely to witness efforts from private companies to terraform celestial bodies or significant alteration of the celestial environments but unfortunately, terraforming is yet to receive the requisite attention in space law debates and discussions today.

However much we console ourselves that we have planetary protection laws in space or that we should not disturb the pristine celestial environment, the fact of the matter is that without stringent laws we cannot do much. The Outer Space Treaty regime is too weak to prohibit terraforming. It is the need of the hour for the international space law community and the States to decide whether they want a blanket prohibition on terraforming activities in the future or whether they want regulations in place to supervise such activities. The international community should now focus on making laws for terraforming. International co-operation is now required for drafting laws to counter or regulate terraforming activities.

Until then, the author believes that Elon Musk was well within his rights to make such an announcement on national television regarding his plan to detonate Mars to make it habitable for humans and to make human beings an interplanetary species. The *de lege lata* is incapable of holding Musk responsible for carrying out such an activity

INTERNATIONAL LAW ON CYBER TERRORISM IN OUTER SPACE AS A SPECIAL REGIME

Paniz Bahmani[*]

INTRODUCTION

The Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, known as the Outer Space treaty of 1967, is considered to be the foundation of space law (http://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introouterspacetreaty.html). This treaty covers different subjects, of which the most remarkable are: I. the exploration of the outer space, the moon, and other celestial bodies must be carried out for the benefit and in the interest of all countries II. Freedom of exploration for all countries based on the principle of equality III. Outer space is not subject to sovereignty and will never be and IV. Activities conducted in outer space must be in accordance with international law.[1]

Space law, however, was founded in 1967 with the Outer Space Treaty, followed by some other treaties which continue to come to existence until the late 1970s, but it seems like once the Space Race fever subsided, no one cared about the need for space law anymore. The outcome of this is the shortcomings of what we today call Space Law. Space law was enough and adequate in the

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1 He Qizhi, 'The Outer Space Treaty in Perspective' (1997) 25 [2] JSL 93

20th century when there not many actors in outer space (mainly the United States and the Soviet Union), but today, as the number of space actors has increased, space law seems to be inadequate.

Furthermore, there are no 21st-century main legal documents on space law, and that is a huge fallacy for something that is changing and growing at a rapid pace. Besides, not all countries are parties to the conventions forming space law and there is not enough State practice with *opinion juris* to consider it a part of international customary law. For instance, article 2 (4) of the Charter of the United Nations states that 'all members shall refrain in their international relations from the threat or use of force against the territorial integrity or political independence of any state, or in another manner inconsistent with the purpose of the united nations.' This provision is reflected in article IV of the Outer Space Treaty, which puts forward that …' The Moon and other celestial bodies shall be used by all States Parties to the Treaty exclusively for peaceful purposes.' Regarding this provision, one may conclude that performing terrorist operations are prohibited, as they are a threat to universal peace and security, but there are no provisions in outer space treaties regarding terrorism in outer space. This lack of legislation about outer space terrorism can be counted as one of the fallacies of space law.

One matter here, however, is that the 'members' of the United Nations are States, and extending the said provision to terrorism is only possible in the cases of terrorism attributable to States.

Terrorism is a very controversial concept in international law, lacking an official, specific, and extensive definition.[2] This is because each time the United Nations tries to hold a conference with the purpose of proposing a definition of terrorism, some of the countries object a part of the suggested definition for different reasons, namely political and national matters. This can be a result of the fact that 'one who is considered a terrorist from one's point of view is a fighter for freedom in someone else's opinion.'[3] Other organizations and conventions, however, regarding their needs to function have put forward definitions of terrorism. Terrorism, in general, can be described as the deliberate use or threat of violence to create terror in order to attain political or ideological objectives.[4] The concept of terrorism varies in a wide spectrum, from one person shooting the crowd in the street to highly organized terrorist groups with headquarter and financial support, performing very carefully planned operations,[5] groups like the Taliban or ISIS. One must keep in mind that an act of terrorism occurs during the time of peace, as during an armed conflict, any of such acts are considered a war operation[6]. Terrorist activities can be operated with different types of weapons: a knife, gun, biological agents released in air and water, and lately, cyber weapons. But what type of use of cyber weaponry falls into the

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2 Myra Williamson, *Terrorism, war and international law: the legality of the use of force against Afghanistan in 2001* (Ashgate Publishing 2009)

3 Hossein Mirmohammad Sadeghi 'Observations on Terrorism' (2001) 33 [4] JLR 199

4 Edward C Luck 'How Not to Reform the United Nations' (2005) 11 [4] GG 14 <http://www.jstor.org/stable/27800582>

5 *ibid*

6 Robert Mackey 'Can Soldiers Be Victims of Terrorism?' (2010) NYT

category of cyber terrorism? Once cyber operations are elaborated on, this concept will be clarified.

One way of classifying cyber operations is to divide them into peaceful operations and operations without peaceful purposes. The latter may have two forms: cyber operations without peaceful purposes that have reached the threshold of armed conflicts, and those which have not reached such a threshold and are not considered cyberwar. To understand this one needs to be reminded that in international law, any activity needs to reach a certain threshold of hostility in order for it to be an act of war. This means that the tension between the two parties is not considered war as long as that certain threshold is not reached. Thus, the former falls into the realm of armed conflicts, to which the Tallinn Manual on the International Law Applicable to Cyber Warfare can provide some assistance. This Manual covers issues such as State responsibility and conduct of hostilities. According to the mentioned Manual, in the case of a cyber operation meeting the criteria of cyberwar, self-defense is legitimate.[7] But if the operation does not meet such criteria, self-defense is off the table. So what measures could the victim State take? The answer to this question is discussed in the Tallinn Manual 2.0 on International Law Applicable to Cyber Operations.

Terrorism has a very long history, but terrorism in the sense we know came into existence during the French revolution of 1789.

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7 Charter of the United Nations Art 51

Keeping in mind that terrorism per se is elusive, cyber terrorism, being what it is, is a vastly vague area in international law. It is a very young phenomenon, without any specific rules or any hard law governing it. The Tallinn Manual 2.0 is more of a guiding mean than a legislation device; a 'manual' after all: soft law without a binding characteristic. Our problem is clear now: an international reality (a threat, if you will) without hard law governing it.

What this paper discusses, however, is a much more complex issue: what if a cyber operation, directed by a non-State actor, is conducted in outer space? The outer space has its own rules and regulations, of which some may differ with rules of international law governing terrestrial matters, but still comply with jus cogens.

CONCEPT FRAMEWORK

Description of the Subject

Regarding different opinions on this matter, most definitions of outer space are based on accepting that the realm of the outer space is between 80 to 120 kilometers above sea level. The 1967 Outer Space Treaty has not provided a clear criterion to specify necessary factors needed in order to put forward an exact and fixed definition of the outer state which would be accepted by all States. Hence, the borders of outer space have always been a matter of debate between the United Nations, States, and scientific associations. Article 2 of the Outer Space Treaty states that no State has sovereignty in outer space and such a right would never be accomplished .

The matter of cybersecurity in outer space is not a main priority of States, and as specialists say, it will not be until a disaster takes place. Rules of international law and space policies have not affected cybersecurity in outer space. Debating whether international law governs cybersecurity, and if it does, how it is applied, impacts said policies. Meanwhile, some non-governmental organizations have taken action in order to clarify the application of international law to cyberspace, of which the Tallinn Manual 2.0 on the International Law Applicable to Cyber Operations can be referred to .

Spreading the sovereignty of international law to cyber weaponry at the time of peace encompasses matters such as sovereignty, international responsibility of States, human rights, law of the sea, and space law. Chapter 10 of Tallinn Manual 2.0 concerns cyber activities in, from and through outer space. Such activities range from civilian use and navigation to military activities. Space activities must be in accordance with international law, including the Charter of the United Nations, in order to maintain international peace and security. Space law governs activities and exploration in outer space, and activities conducted on earth are counted as space activities when they are related to outer space. Of all these activities, control is most related to cyber activities as most cyber activities that use or affect space data are controlled from the Earth .

Cyber operations may be used against space-related cyberinfrastructures, especially satellites. Such operations are conducted by altering data, deranging space to space communication, partial or total destruction of space system hardware or software and altering satellite control. Some of these operations are conducted to gaining access to a satellite's sensor in order to acquire information gathered by satellites for financial or military purposes. In addition, a great part of space technology has a dual nature, i.e., a lot of civilian space capabilities originate from military technology, and a lot of civilian functions can be used for military purposes.

Article IV of the Outer Space Treaty puts forward some restrictions about military activities in outer space, in a way that the establishment of military bases, installations and fortifications, and the testing of any type of weapons and the conduct of military maneuvers on celestial bodies are prohibited. Some cyber activities may not be completely in accordance with Article III (1) of the Outer Space Treaty, but would not violate its article IV either. In other words, cyber operations violate the rules of international law if conducted in (or through) outer space cross the threshold and enter the realm of the use of force. On the other hand, according to rule 58 of Tallinn Manual 2.0, a) cyber activities conducted on the moon and other celestial are for peaceful purposes only and b) are subject to international law and restrictions of use of force. However, activities and operations discussed are neither peaceful nor are counted as aggressive acts and cyberwar. In fact, the status

of cyber operations which are lower than the use of force but do not have peaceful purposes, is unspecified. Furthermore, referring to international law, including the Charter of the United Nations in Article III of the treaty, prevents the obligation to abstain from cyber activities in outer space, in a more extensive way than stated by international law; hence it does not affect cyber operations in outer space which do not violate a primary rule of international law .

Regarding the discussion, how does international law govern cyber sabotage in outer space? Do we need to compose space law with other legal regimes? And are currently existent rules and principles in this area able to comply with the daily development of modern techniques and instruments in outer space ?

Questions

Main Question: Regarding the fact that in some cases space legal regime has not provided a commandment and is silent, which law can be applied to cyber operations in outer space that has not reached the threshold of use of force?

Subordinate Question: If cyber operations in outer space enter the realm of the use of force and cyberwar breaks out in outer space, can rules and principles governing cyberwar be applied to this category of conflicts ?

Theories

Main Theory: Regarding the fact that the 1967 treaty is silent, the rules and principles of general international law, including the Tallinn Manual 2.0 as soft law, could be applied to cyber operations in outer space, which have not reached the threshold of armed conflict but do not have peaceful purposes .

Subordinate Theory: The 1967 treaty has commandments about weapons of mass destruction and non-cyber military use of the outer space and is silent about cyber armed conflict in outer space; hence the rules of general international law could be applied to cyber armed conflict in outer space.

DEVELOPMENT OF TECHNOLOGY AND ITS IMPACT ON MODERN WEAPONRY

Man's access to technology has been rapid and nonstop. However, the law has always been behind this swift development. This is simply proven by the fact that years after certain technologies have been put to use, legislators decided to regulate them. For instance, biological weapons have been around since antiquity, and their first use dates back to the Hittites,[8] but the first time the international community decided to regulate the use of biological weapons was in the 1925 Geneva Protocol which only prohibited using them but did not mention their ownership. This proves that from the very early days, weapons have been a concern to human

[8] M Wheelis 'Biological warfare at the 1346 siege of Caffa' (2002) 8[9] EID 971

beings, and the law is always needed to regulate and when necessary, ban them.

Homo sapiens first used spears made of very basic objects of nature, namely sticks and stones. After that, somewhere around northern Africa, an early version of the bow and arrow appeared. Daggers and swords were developed during the Bronze Age.[9] With the development of humans and their societies being enlarged, the need for more complex weaponry arose, and never settled down. It has come down to recent centuries, introducing modern warfare means, e.g. lethal mines, biological and chemical weapons, nuclear weapons and the latest ones – cyber weapons.

A cyber weapon is, in a broad sense, a malware utilized to manipulate, deny, disrupt, degrade, or destroy targeted information systems or networks,[10] or spoofing, jamming, phishing, and even physical theft. Stuxnet is one of the best known cyberweapons developed and used by the United States of America and Israel from 2007 to 2010, which resulted in the physical destruction of Iran's nuclear program.[11] Cyber technology has a dual nature, i. e. technology used for developing welfare, medicine, and education can be used as weapons for cyberwar or malicious cyber operations.

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9 Michael Marshall 'Timeline: Weapons Technology' (2009) 3221 NSM

10 Tom Uren & others 'Defining Offensive Cyber Capabilities' [2018] ASPI https://www.aspi.org.au/report/defining-offensive-cyber-capabilities

11 Joshua Alvarez 'Stuxnet: The world's first cyber weapon' [2015] SU https://cisac.fsi.stanford.edu/news/stuxnet

TERRORISM

Terrorism has existed for a long time. However, the term as we know it was first used during the years of the French Revolution to describe the Robespierre's regime.[12] The United Nations describes terrorism as an act 'intended to cause death or serious bodily harm to civilians or non-combatants with the purpose of intimidating a population or compelling a government or an international organization to do or abstain from doing any act.'[13] Terrorism happens during the time of peace, for if it is conducted during an armed conflict it is considered a war operation.

Terrorist operations may fall under the jurisdiction of the International Criminal Court (ICC).[14] According to Article 5 of the Rome Statute, the Court has jurisdiction over crimes of most serious concern for the international community as a whole. According to this article, genocide and crimes against humanity are among the crimes under ICC's jurisdiction. Article 6 describes genocide as killing or 'causing bodily or mental harm' to members of 'a national, ethnical, racial, or religious group' with the intention of their whole or partial destruction. Article 7 puts forward the fact that murdering[15] and ' Other inhumane acts of a similar character intentionally causing great suffering, or serious injury to body or to

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12 P R Palmer, *The Age of the Democratic Revolution: A Political History of Europe and America, 1760-1800* (Updated Princeton Press 2014)

13 Edward C Luck *ibid*

14 Peter J Wertheim ' Should “Grave Crimes of International Terrorism” be included in the Jurisdiction of the International Criminal Court?' (2003) 22[2] P&S 1

15 The Rome Statute Art 7.1 (a)

mental or physical health'[16] are considered crimes if committed as ' part of a widespread or systematic attack directed against any civilian population, with knowledge of the attack.' It can be concluded that if a terrorist operation is directed against a certain national, racial, ethnic or religious group leading to their death or bodily harm with the intention to do so, such an operation may fall under the jurisdiction of the ICC. The same measures apply to terrorist operations that meet the criteria of crimes against humanity. It is notable that crimes such as genocide and crimes against humanity may take time to take place. Terrorism which identified as one of these crimes may take several attempts during a period of time.

CYBER TERRORISM

The matter of terrorist operations combined with the use of a cyber weapon can cause some complications. The operator could be sitting in a café, thousands of kilometers away from the target, and direct an operation against it. The terrorist may or may not be working for one or more than one States, may be located in the territory of one country, using the facilities of another State, targeting the third State.

To avoid confusion, distinguishing between cybercrime, cyberterrorism and cyberwar would be helpful here: cyberwar is an armed conflict in which cyber weapons are used,[17] the actors could

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16 The Rome Statute Art 7.1 (k)

17 James Green, *Cyber Warfare: A Multidisciplinary Analysis* (1st edition Routledge 1981)

be States and non-States, and the conduct of the hostility is governed by the Geneva and Hague conventions. Cybercrimes can be defined as 'Offences that are committed against individuals or groups of individuals with a criminal motive to intentionally harm the reputation of the victim or cause physical or mental harm, or loss, to the victim directly or indirectly, using modern telecommunication networks such as Internet (networks including chat rooms, emails, notice boards and groups) and mobile phones.'[18]

Cyberterrorism is a different concept. What distinguishes cyber 'terrorism' from ordinary cyber 'crimes' is a very narrow line: the intention. Like terrorism, cyberterrorism is conducted with the intention of gaining political or ideological goals through horror, threat, and panic but uses computers, networks, and public internet rather than regular weaponry[19]. The next section will discuss cyber terrorism in outer space.

CYBER TERRORISM IN OUTER SPACE

Cyber activities conducted in outer space range from civilian communication and navigation to military operations.[20] Cyber terrorism is a situation where the cyber operation, conducted at the time of peace, has not reached the threshold of armed conflict, but its purpose is not peaceful. This means that altering a satellite's

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18 Debarati Halder & Karuppannan Jaishankar, *Cybercrime and the Victimization of Women: Laws, Rights, and Regulations* (1st edition Hershey 2001)

19 *Encyclopedia of Terrorism* (1st edition Facts on File 2007)

20 Tallinn Manual 2.0 p 270

data or altering the sensors in order to gain information are not considered warfare activities but are not done for peaceful purposes either.

The outer space has a self-contained regime,[21] consisting of the Outer Space Treaty, The Moon Agreement, The Liability Convention, and so on. Article III of the Outer Space Treaty puts forward that 'States Parties to the Treaty shall carry on activities in the exploration and use of outer space, including the Moon and other celestial bodies, in accordance with international law, including the Charter of the United Nations, in the interest of maintaining international peace and security and promoting international cooperation and understanding'. Referring to the Charter of the United Nations, one might keep in mind its Article 2 (4) stating 'all members shall refrain in their international relations from the threat or use of force against territorial integrity or political independence of any state, or in another manner inconsistent with the purpose of the United Nations'. Regarding these provisions, such operations are not in accordance with international law, specifically the Outer Space Treaty and the Charter of the United Nations.

Another point in such operations is the damage they may cause. Operations in which data is altered or stolen may not cause physical damage, but some other types of operations may. 'Consider the case of a satellite that is capable of rendezvous and

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[21] H A Wassenbergh, *Principles of Outer Space Law in Hindsight* (1st edition 2001 Martinus Nijhoff Publishers)

proximity operations (a space rendezvous and proximity operation is an orbital manoeuvers during which two spacecraft deliberately arrive at the same orbit and approach to a very close distance for a specific purpose). It connects with another satellite in orbit and transmits code that permanently disables or otherwise causes that satellite to permanently cease performing its intended function. Or consider the example of a cyber operation that causes the shutter of a photo-reconnaissance satellite to close permanently. The Experts agreed that such consequences would qualify as 'damage''.[22]

Chapter 10 of the Tallinn Manual, titled Space Law, governs cyber operations in, through, and from outer space. The Manual has elaborated on the cases of cyber operations in, from or through outer space, and has somehow put forward a commentary for the Liability Convention. Article I (a) of the Liability Convention defines damage as 'loss of life, personal injury or other impairment of health; or loss of or damage to property of States or of persons, natural or juridical, or property of international intergovernmental organizations,' and Articles II and III apply when the damage is done. The Tallinn Manual, however, is not ratified by states, and although some jurists argue that similar to the Draft Articles on State Responsibility, the Tallinn manual has become a part of customary international law, no State practices are proving this argument. Hence, the Tallinn Manual can rely on only as much as soft law can be relied on.

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[22] Tallinn Manual 2.0 p 283

Article 38 of the statute of the International Court of Justice puts forward the sources of international law, which is applicable to space law as one of its branches:[23] the article first presents conventions, of which the Outer Space Treaty and the Liability Convention were referred to. Then it moves forward to custom, which does not have much to say in the realm of space law as there has not been much practice accompanied with *opinio juris* in outer space in order to establish a custom. The third source is the 'general principles of law,' which would come to assistance when regulation is needed. 'Today, principles fulfill the function that at one time was fulfilled by Roman rights: they tend towards the fusion of system diverse in tradition and internal history. Principles fulfill the function of 'policy': they express the policies of the rights of the legislator and, in general, of the interpreter which, in a more or less conscious way, operates according to a table of values….In any case, principles appear as a factor that cannot be eliminated in the art and in the process of creating norms and of interpreting them; or, what amounts to the same thing, they are indispensable instruments in the evolution of rights.'[24]

Due diligence is one of the principles that could come to assistance. The concept of due diligence understood as a standard of conduct required to discharge an obligation can be traced to

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23 Seyyed Hadi Mahmoudi, *International Space Law* (1st edition SAMT Publications 2014)

24 Alpa Gudio 'General Principles of Law' (1994) 1 [1] ASICL 36

Roman law.[25] The standard of diligence paterfamilias influenced the development of the tort of negligence in many legal systems. The tort of negligence has common elements across different legal systems – duty, breach, causation, and harm – although they are often classified differently.[26] The principle of due diligence can be applied in the outer space in different ways. For instance, a State must be careful no harm is caused to another State's territory, sovereignty or belongings from inside its territory, and such belongings include the States' space objects. So basically, a State must take all needed measures to make sure harms it knows may happen or should have known about their occurrence will not befall other States, e.g. no one directs a terrorist attack towards another State's space objects, whether they cause physical harm to the mentioned objects or alter or steal data. Or one State must be careful; such operations are not directed through its servers. Not preserving this principle is considered an internationally wrongful act as it is against a general principle of law .

Another principle that can regulate this matter is the precautionary principle. This principle was first enforced when the World Charter for Nature was adopted by the United Nations General Assembly in 1982. The precautionary principle governs uncertain issues and implies that when scientific investigation has found a plausible risk, a social responsibility to protect the public from exposure to

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25 R Zimmerman, *The Law of Obligations: Roman Foundations of the Civilian Tradition* (Oxford Scholarship Online 2012)

26 Jonathan Bonnitcha & Robert McCorquodale 'The Concept of 'Due Diligence' in the UN Guiding Principles on Business and Human Rights' (2017) 28[3] EJIL 899

harm exists. For instance, when a State becomes aware that a space object is going to fall due to cyberattack – whether of a terrorist nature or not - it is obliged to warn countries in which's territory the object may fall so that they can evacuate dangerous areas .

The non-intervention principle can also be used to determine State responsibility. This principle is characterized by the absence of 'interference by a state or states in the external affairs of another state without its consent, or in its internal affairs with or without its consent.'[27] It can be deduced that interfering altering and deleting a space object's data, regardless of physical damage to it, maybe considered a case of intervention in a State's affairs. Consider a case in which the data of a satellite is altered in a way that disrupts countries broadcast by distributing political content that would eventually lead to revolt. Here the nonintervention principle has been breached, for which one or more States would be responsible. The 'no-intervention in national technical facilities principle' was included in the Intermediate-Range Nuclear Forces Treaty.[28]

CONCLUSION

Space law came into existence with the Outer Space Treaty in 1967. However, this legal regime was adequate 50 years ago, but not today, with all the advancement in space technology, activities, and actors. It has many shortcomings, some of which are the matters of terrorism and cyberterrorism in outer space. Although

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[27] Henry G Hodges, *The Doctrine of Intervention* (Facsimile Publisher 2016)
[28] Seyed Hadi Mahmoudi, *ibid*

cyberterrorism is a very young phenomenon, it still needs legislation, specifically in vulnerable frontiers like the outer space. There are instances of soft law like the Tallinn Manual, but no hard law and binding regulations. Some instances of terrorism may fall under the jurisdiction of the International Criminal Court in very rare situations, e. g. when the cyberterrorism operation leads to a crime against humanity or genocide – on the condition, the required *mens rea* is proven to be existing- but nothing explicitly governs this issue. Such fallacies in space law can be temporarily be fixed by referring to general principals of international law or adhering to soft law, but actual legislation will be needed in the near future.

ESPIONAGE FROM OUTER SPACE AND AIRSPACE

Rupal Gupta[*]

INTRODUCTION

The discovery and exploration of space technology led to a revolution in the way things were traditionally done and the earliest use of satellite technology was for espionage. The development of spaceflight and technology has been powered by military considerations and hence the strategic value of an observation platform in space was recognized immediately. The most evident advantage was to observe without being seen in the most concealed places. For espionage or reconnaissance, a high ground resolution gave the ability to depict small objects is important.[1]

Radar technology, independent of weather conditions, enables obtaining images. However, before this, the earliest reconnaissance system used was surprisingly a simple method like satellites, such as the Corona series, took photographs and sent the film rolls in small buckets back to Earth. Other satellites developed the photographic film onboard and sent a scan of each image to the ground. Encrypted data transmission is used by such missions. Over recent decades, Technology has improved and multiplied so much that even civil satellite systems, operated by private entities,

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1 Christol, 'Innocent Passage in the International Law of Outer Space' (1965) 7 AFJAGLRev 20, 22.

can have strategic value. While espionage is a "negative" word, the effectiveness of satellite observations in the much broader range of "security" has proven to be an important tool for governments and organizations around the world. In the name of "verification and control," imagery from space is used.[2]

The collection of intelligence data from land areas by naval vessels, either on the high seas or under certain circumstances in territorial water, is regarded as validly obtained under international law. This practice has resulted in the development of a customary rule of the international law of outer space authorizing the collection of such data. Current space practices appear to support the view that such observational activity might be carried on by space vehicles while engaged in innocent passage.[3]

BEGINNING OF RECONNAISSANCE FROM AIR SPACE AND OUTER SPACE

In 1959, the first spy satellite, Corona was launched by the United States. In the 1960s, they launched the SAMOS program, in which reconnaissance satellites were launched and between 1990 and 1996 MIDAS was launched which was a system of 12-early warning satellites that warned about Soviet intercontinental ballistic missiles.[4] However, it is argued by legal experts and scholars that the protection and legitimization of spy satellites by

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2 ibid.
3 ibid.
4 Christian Brünner and Alexander Soucek, *Outer Space in Society, Politics and Law* (8th edn, SpringerWienNewYork 2011) 22.

international treaties remain limited and international law remains ambiguous regarding Anti- Satellite (ASAT) testing.[5]

Origin of remote sensing from space, similar to most space technology,[6] is directly related to its military use and implications. In the early years of the space age, the two superpowers, the United States[7] and the Soviet Union, developed remote sensing technology for defense and security-related purposes, such as intelligence gathering and defense planning. Throughout the Cold War, the Soviet Union and the United States kept observing each other's territory by means of reconnaissance satellites, which highlighted the advantages provided by satellites in the military field. The shooting down of two United States aircraft by the Soviet Union, the U–2 on 1 May 1960, 1,250 miles inside the Soviet Union, and the RB–47 on 1 July 1960, over the Barents Sea, demonstrates the position in international law of two different types of reconnaissance: penetrative and peripheral.[8]

This distinction is that penetrative reconnaissance involves unauthorized entry into the territory of the foreign State concerned,[9] or at least espionage in the course of an otherwise legitimate flight, while peripheral reconnaissance is carried out by

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5 ibid 522.

6 K.U. Schrogl and J. Neumann, *Article IV in Cologne Commentary on Space Law,* vol 1 (S. Hobe 2009) 70.

7 D.A. Day, J.M. Logsdon and B. Latell, 'Eye in the Sky: The Story of the Corona Spy Satellite' (1998) 1 Washington DC Smithsonian Institution Press 1.

8 Bin Cheng, *The United Nations and Outer Space* (Clarendon Press Oxford, 1997) 10.

9 Bin Cheng, 'International Law and High Altitude Flights: Balloons, Rockets and Man-Made Satellites' (1957) 6 *ICLQ* 480, 487.

means and devices situated outside the boundary that is the periphery of that State's territory. Such devices need not necessarily, be an aircraft or a satellite. The United States for more than two years had been 'tapping' Russia's missiles secrets with powerful long-range radar and other equipment based near the Black Sea resort of Samsun in Turkey. The range of the equipment was said to be up to 1,000 miles.[10]

Penetrative Reconnaissance

On 1 May 1960, Soviet Air Defense shot down United States U-2 spy plane while performing photographic aerial reconnaissance deep into Soviet territory. The single-seat aircraft was hit by an S-75 Dvina surface-to-air missile and crashed near Sverdlovsk (present Yekaterinburg). The Pilot, Francis Gary Powers, parachuted safely and was captured.[11]

Earlier the United States denied any international violation of the sovereignty of the Soviet Union, and the same was believed by the Soviet Union as depicted in the speech of Mr. Khrushchev on 7th May.[12] Later the same afternoon a statement was issued by the United States Department of State which not only admitted that the U–2 was on an intentional espionage flight but also acclaimed that such flights had been made regularly during the past four years:

"As a result of the inquiry ordered by the President, it has been established that in so far as the authorities in Washington are

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10 Cheng, *The United Nations and Outer Space* (n 8) 11.
11 ibid.
12 ibid 12.

concerned, there was no authorization for any such flight as described by Mr. Khrushchev. Nevertheless, it appears that in endeavoring to obtain information now concealed behind the Iron Curtain a flight over Soviet territory was probably undertaken by an unarmed civilian U–2 plane. It is in relation to the danger of surprise attack that planes of the type of unarmed civilian U–2 aircraft have made flights along the frontiers of the free world for the past four years."[13]

The U-2 incident dramatically illustrated the point of international law that penetrative reconnaissance is an infringement of the legal rights and sovereignty of the State spied on remains highly relevant even after the discontinuation of the U–2 flights. This was made obvious from the following passage in President Eisenhower's broadcast on 25th May 1960 to the American people, after his return from the abortive Summit Conference in Paris:

"In fact, before leaving Washington, I had directed that these U–2 flights be stopped. Clearly their usefulness was impaired…Furthermore, new techniques, other than aircraft, are constantly being developed."[14]

These new techniques that were referred to by President Eisenhower refer to reconnaissance satellites such as MIDAS and SAMOS, then the confusion whether their flights over the Soviet Union constitute penetrative or peripheral reconnaissance can

[13] ibid.
[14] ibid 13.

again only be solved if it is known what the precise upper limit of Soviet national space is.[15]

Peripheral Reconnaissance

Another United States unarmed military aircraft clearly engaged in carrying out reconnaissance over military installations along the Soviet coast bordering on the Barents Sea, but the difference with the U–2 incident was that the RB–47 was never sent with the intention to penetrate into Soviet airspace. First, Peripheral Reconnaissance was involved. Second, the United States aircraft was shot down over the high seas by Soviet fighters after they had failed to force it into Soviet airspace and it never penetrated into Soviet airspace.[16]

Peripheral Reconnaissance's legality was implicitly acknowledged by both the United States and the British delegates to the United Nations, and not disputed by the Russians. Thus, during the debate on the RB-47 incident, Sir Pierson Dixon, said that the Security Council would have to be 'in virtually permanent session' if Britain were to make an issue of every different occasion when she was 'overlooked, or overheard by the Soviet Union.'[17] He mentioned in particular:

"We in the United Kingdom have for a long time known that Russian reconnaissance aircraft carry out intelligence-gathering flights. Similarly, we in the United Kingdom are

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15 ibid.
16 ibid.
17 UNSC Verbatim Record (25 September 1960) UNSC(XV) S/PV/881.

frequently subjected to the annoyance of seeing Soviet trawlers, which we know are fitted up with electronic and technical equipment required to intercept radio transmissions in the United Kingdom, in close proximity to our own territorial waters, or in close proximity to areas where naval exercises or Western military research activity is carried out. The same thing applies to the numerous unidentified submarines recently found lurking in the neighborhood of United Kingdom naval exercises and, indeed, in suspicious circumstances which suggest that they are carrying out electronic intelligence operations within fifty miles of the coast of the United Kingdom."[18]

Furthermore, Mr. Lodge, a United States delegate, in his speech on 26 July with the aid of maps and photographs, pointed out:

"The Soviet Union has been sending these electronic reconnaissance planes regularly off the coast of Alaska, as close as five miles from our territory, to gather intelligence on our radars and other electronic signals…The difference between the United States and the Soviet Union is that we shoot their aircraft with cameras; they shoot ours with guns and rockets and kill or imprison our crews."[19]

The difference in the legality of penetrative reconnaissance and peripheral reconnaissance again points towards the fundamental importance of clearly delimiting the upper limits of national space,

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[18] ibid.

[19] UNSC Verbatim Record (26 September 1960) UNSC(XV)S/PV/883

a problem deliberately avoided by the United Nations *Ad Hoc* Committee on the ground that it is not essential to the continued peaceful use of outer space[20] for reconnaissance by means of an artificial satellite is lawful if the latter's orbit lies outside the national space of the State spied on, but illegal if it penetrates within.[21]

The North in the US Civil War used tethered balloons to observe the landing of cannonades, particularly at the Petersburg trenches.[22] At the time of the Siege of Paris in the Franco–Prussian War of 1870–1871, some bold individuals made their escape at night by over-flying the German lines in 'free' balloons but were threatened as spies if brought down. In the years after that, 'dirigible balloons' were created by various inventors, allowing some degree of control through the carriage of an engine able to power a suitable propeller. Of these the products of the German company founded by Graf von Zeppelin, the 'Zeppelins' in 1898, are the most famous example. Prime Minister Clemenceau of France in 1909 introduced duties on balloon imports from abroad.[23] However, by then, the regular crossing of balloons and dirigibles across international boundaries and governments were becoming concerned.

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20 ibid.

21 Cheng, *The United Nations and Outer Space* (n 8) 22.

22 Francis Lyall and Paul B. Larsen, *Space Law: A Treatise* (1st edn, Ashgate 2019) 157.

23 P.H. Sand, G.M. Pratt and J.T. Lyon, *An Historical Survey of the Law of Flight* (Montreal Institute of Air and Space Law, McGill University 1961) 5.

The launch of Sputnik I in 1957 by the then USSR caused a crisis in the psychology of Western military.[24] The possibility of a surprise attack from outer space became obvious. Equally obvious was the advantage of reconnaissance or espionage from outer space.[25]

The United States Air Force and the National Reconnaissance Office in late 1963 began work on the Manned Orbiting Laboratory (MOL) program. MOL quickly progressed into a spying satellite with a large camera system, promptly named DORIAN, that would operate in orbit for approximately one month. Two astronauts were supposed to ride inside a Gemini spacecraft at the front of the MOL on the top of a powerful Titan IIIM rocket launched from California's Vandenberg Air Force Base into a polar orbit. The astronauts would look at targets on the ground that MOL was about to pass over through spotting scopes and feed instructions into a computer which would, in turn, direct the DORIAN camera to take high-resolution photographs. As MOL moved forward, 17 astronauts were selected by the Air Force to fly aboard it during multiple missions. By mid-1969, as MOL was behind schedule and the budget had exceeded President Richard Nixon cancelled it. Although some parts of MOL were public, its main mission and most of its technology and systematic operations were highly classified. It was not until October 2015

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[24] D.R. Terrill Jr., *The Air Force Role in Developing International Outer Space Law* (Maxwell AFB, AL: Air UP 1999).

[25] G. Zhukov, 'Space Espionage Plans and International Law' (1960) 6 International Affairs 50, 53.

that the National Reconnaissance Office (NRO) made public a large number of documents about MOL and allowed the surviving MOL astronauts to talk about the program.[26]

It is quite evident that space espionage was designed to prepare a preventive rocket nuclear war against the Soviet Union and other Socialist Countries, and the Soviet Union also had everything necessary to defeat U.S. military espionage in both the air and in outer space.[27]

The space espionage schemes fostered by U.S. ruling circles are a concrete declaration of their extensive plans for the use of outer space to prepare a destructive rocket nuclear war.[28] This shows how artificial are the statements of U.S. officials about American interest in the peaceful uses of outer space, as provided in Article 4 of the Outer Space Treaty, 1967. In consideration of the plans to launch and develop satellites for military reconnaissance. The United States has in recent years has tried extensively to prove the "legality" of space espionage. United States has also given the opinion that consistent with their appeal for 'open skies,' they might as well recommend that reconnaissance by an orbiting satellite be accepted in international law[29]

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26 Courtney V.K. Homer, *Spies in Space: Reflections on National Reconnaissance and the Manned Orbiting Laboratory* (Government Publishing Office, 2019).

27 Zhukov, 'Space Espionage Plans and International Law' (n 25) 55.

28 Maj. Gen. M. Miletin, 'The U.S.A. Plans Military Use of Outer Space' (1959) 5 International Affairs 44.

29 Zhukov, 'Space Espionage Plans and International Law' (n 25) 55.

The activities of states in outer space must conform to the ideology and principles of the United Nations Charter. The U.N. Charter demands that states should refrain from the threat or use of force against the territorial integrity or political independence of any state, must also extend to outer space. It means that each state has a right to use outer space at its own discretion, but without causing any damage or harm to other states. This was also mentioned in a resolution on sovereignty over air space and the legal regime of the cosmos, adopted in August 1960 by a Conference of the International Law Association.[30]

The reasons discussed are sufficient ground for recognizing as unlawful, the attempts of some U.S. ruling circles to utilize outer space for military purposes from the point of view of the existing rules of international law. Therefore, the efforts of the leaders of the U.S. military to employ or the collection of intelligence data or artificial satellites are unlawful. Moreover, in this case, it is possible to draw a parallel with the rules of air law which proclaimed aerial espionage illegal and expressly prohibit the use of photographic equipment for these purposes. For instance, Article 36 of the Chicago Convention of 1944, which specifies that each contracting state may regulate or prohibit the use of photographic apparatus in aircraft over its territory.[31]

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30 ibid 56.
31 ibid.

In this regard, the American journal Missiles and Rockets wrote in May 1960 that:

"The only real difference between the concept of Samos and U-2 was the altitude. One flies 15 miles high and the others at 300." In their attempt to justify espionage from space U.S. leaders tried to take advantage of the fact that the altitude limit to which state sovereignty exists is a clear demarcation between the altitudes of national airspace and outer space has not been settled in international law.[32]

The Space Treaties provide that the use of space should be for peaceful purposes and for the benefit of mankind. *Article 1* of the Outer Space Treaty, 1967, provides that:

"The exploration and use of outer space, including the Moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind"

Further, Article 4 provides that:

"States Parties to the Treaty undertake not to place in orbit around the earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction, install such weapons

[32] ibid.

on celestial bodies, or station such weapons in outer space in any other manner."[33]

The Soviet stance on the use of outer space is well known. The Soviet sputniks have only peaceful scientific purposes. Another cogent example of this is the recent orbiting and return to earth of the second Soviet space ship.[34]

REASON BEHIND RECONNAISSANCE FROM OUTER SPACE BECOMING PREVALENT

Outer Space means[35] the void between celestial bodies (including the earth and their atmospheric space), constitutes, under the present international customary law, res extra commercium in that it is not subject to appropriation by any state.

The dilemma that then arises is as to what is the present limit between territorial space over which the subjacent State exercises jurisdiction and territorial sovereignty and outer space, which is res extra commercium. The territorial space, in the absence of any express international agreement specifying such a demarcation, must be deemed to be at least sharing a common boundary with territorial airspace that is the atmospheric space over which States territorial sovereignty is exercised undoubtedly. At a time before space flights started, on the basis of geophysical factors, the upper

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33 Gennady Zhukov and Yuri Kolosov, *International Space Law* (2nd edn, Statut Publishing House 2014) 73.

34 Zhukov, 'Space Espionage Plans and International Law' (n 25) 55.

35 Bin Cheng, 'Recent Developments in Air Law' (1956) 9 CLP 208, 215-217; Cheng, 'International Law and High Altitude Flights: Balloons, Rockets and Man-Made Satellites' (n 9) 492–494; Bin Cheng 'From Air Law to Space Law', (1960) 13 CLP 228, 234.

limit of airspace was estimated to lie at a height of between 500 and 1,000 kilometers that is between 310 and 620 miles above the surface of the earth.[36] Since then, it has come into sight that a general practice has come up among States of interpreting airspace as meaning space in which navigation by conventional aircraft is possible and outer space as space where artificial satellites are able to orbit, thus bringing the boundary down to approximately 50 miles that is 80 km, with a margin possibly of about 25 miles that is 40 km either way.[37] This progress can be regarded either as the interpretation of an existing rule of international law by the States practice[38] or the coming to light of a new rule of customary international law altering a previous one.[39]

The proof for saying that States now accept a fairly low limit of territorial space is their attitude towards the issue of the right of passage of orbiting satellites and, especially, towards reconnaissance satellites. A careful and critical examination of the discussions on outer space in the United Nations shows that States appear to be in general agreement that orbiting satellites in their orbits never enter airspace and, therefore, the problem of the right of passage through foreign territorial airspace does not arise, except possibly during re-entry and launching.[40] Moreover, even

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36 ibid.

37 G. Zhukov, 'Conquest of Outer Space and Some Problems of International Relations' (1959) 5 International Affair 88.

38 Temple of Preah Vihear (Cambodia v. Thailand) [1962] ICJ Rep 6.

39 Bin Cheng, *The Extraterrestrial Application of International Law* (Clarendon Press Oxford, 1997) 6.

40 ibid.

though the Soviet delegates vehemently attacked United States reconnaissance satellites,[41] they never questioned the premise of Western delegates who defend their use, that the operations of these satellites take place in outer space outside the territorial space of any State.[42] The arguments of the Soviet delegates were either that espionage itself violates international law and the United Nations Charter,[43] even if executed from the high seas, or that it is against the friendly relations among nations.[44] Some delegates have also made use of the argumentum ad hominem of the presence of the United States Air Defense Identification Zones (ADIZ) over the high seas.[45] Although such espionage activities are perpetrated in zones which are undoubtedly subject to the sovereignty of the subjacent State, these Identification Zones are themselves established over the high seas and are only legal to the extent to which they do not violate the principle of the freedom of the high seas.[46] However, even the existence of ADIZ off the Alaskan coast could not seem to have prevented Soviet reconnaissance aircraft from flying sometimes as close as 5 miles from the territory of the United States.[47] The absence of significant incidents in such situations, and the return of the two survivors from the RB–47 incident which was shot down off the Soviet coast in 1960, are largely due to the existence of well-defined outer

41 Cheng, *The Extraterrestrial Application of International Law* (n 39).
42 Zhukov, 'Space Espionage Plans and International Law' (n 25) 53.
43 UNOOSA Verbatim Record (17 April 1963) A/AC.105/C.2/SR.17.
44 Cheng, *The Extraterrestrial Application of International Law* (n 39).
45 UNOOSA Verbatim Record (3 December 1962) A/C.1/SR.1289.
46 Bin Cheng, 'The Right to Fly' (1956) 42 Groutius Society Transactions 99, 102.
47 Bin Cheng, 'The United Nations and Outer Space' (1961) 14 CLP 247, 272.

limits of the territorial seas off the coasts of Alaska and of the Kola Peninsula.[48]

The use of and access to outer space are the inclusive rights of all States on the basis of equality. In any Space Treaty, nothing has been mentioned about freedom of passage of spacecraft through the territorial airspace of a foreign State to reach outer space. In this connection, it should be brought out that, even with regard to an aircraft, the right of freedom of passage through the airspace above territorial waters in order to reach the free airspace above the high seas has neither been recognized.[49] Similarly, the right of passage even if innocent of spacecraft through foreign national airspace is not recognized.[50]

The very different status which these two types of reconnaissance that are penetrative and peripheral, have in international law further stresses the key importance of a clear demarcation between the space of a State forming part of its territory or national airspace and outer space over which its territorial sovereignty no longer extends.[51]

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48 Cheng, *The Extraterrestrial Application of International Law* (n 39) 7.

49 Ogunsola O. Ogunbanwo, *International Law and Outer Space Activities* (1st edn, Martinus Nijhoff 1975) 27.

50 Imre Anthony pg 115. Imre Anthony Csabafi, *The Concept of State Jurisdiction in International Space Law: A Study in the Progressive Development of Space Law in the United Nations*, (1st edn, Martinus Nijhoff 1971)115.

51 Cheng, *The United Nations and Outer Space* (n 8) 13.

STATUS AND TREATMENT OF THE ASTRONAUTS INVOLVED IN ESPIONAGE MISSIONS FROM OUTER SPACE

The status of the legality of espionage from outer space is still uncertain, however, if any person of the State conducting reconnaissance activity lands whether intentionally or unintentionally in the territory of the State over whose territory reconnaissance was being conducted, that person is treated very harshly and is given the status of a spy. However, there still lies a controversy as to whether such a person would be given the benefits given to the astronauts in the Rescue and Return Agreement (ARRA), 1967.

When the personnel of a spacecraft (a reconnaissance spacecraft would be included) have been found under any of the circumstances of Articles 1,2 or 3 of the Rescue and Return Agreement, 1967, they are to be promptly and safely returned to representatives of the launching authority as provided in Article 4 of the ARRA. The obligation to return is unconditional. Apparently there have been discussions earlier as to whether return could be refused on the basis that the personnel had committed a crime (e.g. spying) or had claimed asylum, but these issues were not considered necessary to pursue in the negotiation of the text of the treaty. The obligation to return is clear.[52]

[52] J.W.Doolittle, 'Man in Space: The Rescue and Return of Downed Astronauts' (1967) 9 USAFJAGRev 4, 7.

Article 4 of the ARRA imposes an absolute and unconditional obligation to return the personnel of a spacecraft whose landing on the territory of a Contracting Party or outside the jurisdiction of any state is unintended or due to accident, distress, or emergency. Agreement on the unconditional obligation to return astronauts became a major victory for the United States on an issue that had plagued the Legal Subcommittee's discussions on assistance and return for many years. The Soviet Union had previously wanted to put the condition on the duty to return astronauts on compliance by the launching authority with the Declaration of Legal Principles. Therefore if the cognizant authorities of the state on whose territory an unintended or emergency landing is made were to believe that the astronaut is engaging in espionage or aggressive military activities, they would not be obliged to return the personnel of the spacecraft. Taking on the Soviet proposal would have weakened the humanitarian intention of returning astronauts found in distress by subjecting it to the condition of international politics. Although Article 4 of the ARRA largely puts away the subjective conditions sought to be imported into the return obligation by the Soviet Union, a Contracting Party may still seek to assert that a landing on its territory is not unintended, and no duty to return the astronaut arises.[53]

'Envoys of mankind', a phrase given in Article 5 of the Outer Space Treaty, 1967 attributed to the astronauts seems to suggest

[53] Dembling and Arons, 'Treaty on Rescue and Return of Astronauts and Space Objects', (1968) 9 William and Mary L. Rev 630.

that they are given the legal status of diplomats.[54] However, they should be regarded as "envoys of mankind" of the act in outer space only on behalf of the whole of mankind and that they have no right to act on behalf of individual states. Only on this condition, an astronaut is entitled to claim immunity.[55]

The word 'astronaut' applies to all humans in space[56] and that the word envoy makes no differentiation between military and civilian astronauts. It is still a contentious issue that whether the astronauts who were involved in espionage should be given the diplomatic immunity and depends on the discretion of the State in whose territory the astronauts land to a large extent and if it is the same State on which espionage or reconnaissance was being carried on, however as the obligation to treat astronauts as "envoys of mankind" and duties are given under Rescue and Return Agreement, 1967 are unconditional and absolute. The issue is whether different kinds of space vehicles are to be treated in a different way, or space vehicles by default enjoy a certain extent of privileged treatment. The exercise of jurisdiction is to be in accordance with international law every time asserted by a State. In this sense practice of various States is suggestive of international law. The practice of the United States is to claim plenary jurisdiction; the practice of the French is to base its claim on the criteria of order, peace and good government of the port.

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54 Major Robert A. Ramey, 'Armed Conflict on the Final Frontier: The Law of War in Space' (1999) 48 AFLREV 1, 151.

55 Zhukov and Kolosov, *International Space Law* (n 33).

56 Ramey, (n 54).

The practice of the Soviet Union is similar to the United States and adopts the criteria of "state security."[57]

Under Article 5 of the Outer Space Treaty, 1967 the privileged treatment of astronauts as "envoys of mankind" is limited to the occurrence of "accident, distress, or emergency landing on the territory of another State Party or on the high seas." As a norm, the extent of immunity and its purpose must correspond. The dilemma still remains as to what a State should and can do when acts of espionage are directed against it, not from the airspace but from outer space. From the standpoint of State security, it makes no difference at all that from what altitude espionage over its territory is conducted.[58] International law does not forbid observation from outer space. As reconnaissance or spying satellites operate in an area that does not belong to anyone. As has been correctly stated by *Professor Goedhuis*, that:

"*Their legal status is not different from that of an aircraft or trawler plying outside the territorial waters of another State in order to see what is going on*".[59]

CONCLUSION

Espionage is an old measure of preparing against surprise attacks and building up one's defense. Now with development in technology the methods of conducting espionage is changing. However, such new methods might prove to be threatening for

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57 Professor Zhukov, 'Space Espionage Plans and International Law', (n 25) 53.
58 ibid.
59 Ogunbanwo, (n 49) 30.

some underdeveloped states and it also violates their sovereignty. As espionage operations on land can easily be thwarted and even through Air now, States have started to conduct reconnaissance from Outer Space as no State has sovereignty over Outer Space. There are certain questions that have yet not been solved regarding reconnaissance from airspace and outer space and hence that creates difficulty for the State on whose territory reconnaissance was being conducted to take actions against the State doing so. Therefore, these issues should be resolved at the earliest. Certain aspects which can be looked into are:

i. There should be a clear demarcation between the altitudes of airspace and outer space as has been observed in many instances as that of the U-2 incident and RB- 47 that the type of reconnaissance whether penetrative or peripheral can only be ascertained after a clear demarcation between national air space and outer space.[60] Further, the difference between reconnaissance conducted by an aircraft and a satellite can only be made if such demarcation exists. Such a demarcation would help in categorizing such reconnaissance activities and take suitable actions thereof by the concerned State. Such a delimitation has been done in case of territorial waters and high seas. Similarly, such a delimitation can be made in the case of national

[60] Cheng, *The United Nations and Outer Space* (n 8) 13.

airspace and outer space, especially now when outer space is being used extensively for military purposes by many states.

ii. Article 1 of the Outer Space Treaty 1967 provides:

"*The exploration and use of outer space, including the Moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind."*

Since the activities in space are only supposed to be done for the benefit for the whole mankind and irrespective of the level of development of a country, therefore, espionage over a country who is not developed enough to combat such reconnaissance attempts like Russia was capable of against the United States it would be at a disadvantage. Such information if collected then it should be for a peaceful purpose which will benefit the whole mankind and such information should be shared with other nations as well for whom this collected information would be beneficial.

These aspects, if worked on in the field of international air and space law, would bring certainty in cases of espionage from airspace and outer space and would secure the rights and protect the sovereignty of many states. It will resolve the issues regarding

the entry of the space object of one state in the territory of another at the time of launching and re-entry more as boundaries now would be well defined. This would lead to better international cooperation between States which is the main motive of International law and Space law.

SPACE DEBRIS: AN EVOLVING CONCERN

B.K. Sudarshan & S.R. Bhumika[*]

INTRODUCTION

Space exploration has gathered momentum over the past six decades. Sputnik, in October 1957, being the first launch into space, the competition for space exploration has reached far and wide. What started merely as a part of the larger Cold War between two powers has widespread reach. Many countries have successfully launched satellites into the space carrying orbiters, missions, rovers, and so on to explore space and exploit its secrets. So, what particularly does all this space exploration do to space? Obviously, there are certain consequences resulting from space exploration. Space too, has certain laws framed about it and its constituents. Space laws consist of National and International laws governing the activities in the outer space. The international lawyers have accepted that 'outer space', starts from an approximate of 100 kilometers above the sea level.

The primary activity in outer space is the launch of satellites, mission rovers, and so on. This mandates the use of a launch vehicle which will launch the satellite and carry it out of the Earth's orbit. What happens to these once their purpose is fulfilled? What about those satellites which have exceeded their

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mission lives and are currently defunct? Also, what about those missions which were not completely successful?

All such objects lay afloat in space and form what is popularly called ‘space debris’ or ‘orbital debris.’ Space debris primarily consists of:

- Satellites that are not active and no useful change can be expected to see in the future.
- Hardware released from rockets during normal manoeuvres
- Collision generated debris.
- Pollution ejected
- Orbital explosions or accidents
- Abandoned satellites.

Basically, anything man-made that has been launched into the space, that has either served its purpose or floating around without any use, which may cause harm to future space endeavors, the astronauts aboard the International Space Station (ISS), the upcoming onslaught of space tourism and space debris pollutes the space environment and also endangers the lives on earth by the re-entry of dead satellites into the earth’s atmosphere.

Space debris is significant in as much that a flake of paint measuring in millimeters has the potential to puncture an astronaut’s spacesuit or to even damage a spaceship.

The ability of countries to carry out space exploration missions has undoubtedly grown over the years. But what is in question is their responsibility and roles played in tidying up the mess left behind after such activities of space exploration.

There are quite a number of treaties, conventions and such other documents that act as laws for the peaceful use of space. These include the most famous 'Outer Space Treaty' (OST), nicknamed the *'Magna Carta of Space Law,'* 'Liability Convention,' 'Registration Convention,' the United Nations Committee of Peaceful Uses of Outer Space (COPUOS), the United Nations Office for Outer Space Affairs, along with their subcommittees. There are also various acts, provisions, and committees formed by independent States to streamline the use of outer space. However, the laws contained in these documents are, to a large extent, voluntary, non-binding in nature and are constantly being overridden by rapid advancements in technology. Moreover, most of the laws and provisions contained in them are related to the use of space and not about the mitigation of space debris.

This essay will deal with what space debris constitutes, the harm caused by them, provisions related, their effectiveness, and better ways to deal with it.

SPACE DEBRIS – WHAT IS IT?

Before dwelling into the dangers posed by space debris, the efforts of States towards mitigating it, we briefly discuss what space debris actually is.

Space debris is defined as all non-functional, human-made objects, including fragments and elements thereof, in Earth orbit or re-entering into Earth's atmosphere.

The Outer Space Treaty does not contain the term 'space debris' anywhere in its text. The only close mention to this effect in the said Treaty is "…States party to the Treaty shall pursue studies of outer space, including the moon and other celestial bodies, and conduct exploration of them so as to avoid their harmful contamination and also adverse changes in the environment of the Earth resulting from the introduction of extra-terrestrial matter and, where necessary, shall adopt appropriate measures for this purpose…".[1]

However, the Scientific and Technical Subcommittee of the UN Committee on Peaceful Uses of Outer Space has defined space debris as: "*all manmade objects, including their fragments and parts, whether their owners can be identified or not, in Earth orbit or re-entering the dense layers of the atmosphere that are non-functional with no reasonable expectation of their being able to assume or resume their intended functions or any other functions for which they are or can be authorised.*"[2]

Orbital debris includes non-operational spacecraft, spent rocket bodies, material released during planned space operations, and

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1 Outer Space Treaty, Article IX, 1967. Available at: https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/outerspacetreaty.html

2 Scientific and Technical Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space, Technical Report on Space Debris A/AC. 105/720, United Nations Publications, New York 1999.

fragments generated by satellite and upper stage breakup due to explosions and collisions.[3]

The number of successful rockets launches since 1957 is about 5450. Out of these, about 5000 still remain in space and only about 1950 of these are still functioning. Space Surveillance Networks have tracked and catalogued about 22,300 debris objects. There has been an estimate of about 500 collisions, break-ups, and explosions or other events resulting in fragmentation.[4]

HOW FATAL IS SPACE DEBRIS?

As discussed above, space debris largely constitutes defunct satellites, spent rocket bodies and even flakes of paint. All these junk orbits around the earth at velocities of over thousands of kilometers per hour, and this rate, even a flake of paint, could damage a satellite or a spaceship. These floating debris in space pose a great risk to other spacecraft as collisions among these would not only destroy the satellite approaching but also cause an enormous increase in the population of space debris. Debris begets debris. This phenomenon is called the Kessler effect. This can be defined as, "*two colliding objects in space generate more debris that then collides with other objects, creating more shrapnel and litter until the entirety of LEO is an impassable array of super-*

[3] International Academy of Aeronautics, Position Paper on Orbital Debris, 1999, Page 2, https://iaaweb.org/iaa/Studies/orbitaldebris.pdf (Last Accessed on: 30 October, 2019)

[4] ESA's Space Debris Office at ESOC, Darmstadt, Germany. Data correct as of January, 2019. Available at https://www.esa.int/Safety_Security/Space_Debris/Space_debris_by_the_numbers (Last Accessed on 29th October, 2019)

swift stuff. At that point, any entering satellite would face unprecedented risks of headfirst bombardment". Two such recent events, having largescale political and legal implications, are discussed here

China's Anti-satellite Test, 2007

Possibly the biggest debris generating event took place on the 11th of January, 2007, when China carried out an anti-satellite test (ASAT) by deliberately destroying its defunct weather satellite, the Fengyun- 1C (FY-1C). China performed this test to demonstrate its ability to conduct strikes in space. Upon the successful completion of this test, China joined the USA and Russia in the list of countries to carry out anti-satellite tests. However, what followed this test by China was unprecedented. This strike left behind a cloud of debris created by the fragmentation of FY-1C. The explosion reportedly created more than 3,000 trackable objects and an estimated 15,000 debris particles.[5]

This test increased the quantity of debris in the earth's orbit by about 10 percent.[6]

A piece of the destroyed satellite that was being monitored by NASA reportedly approached the ISS within a distance of 6.07 kilometers or 3.77 miles.[7]

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5 "ISS crew take to escape capsules in space junk alert" - https://www.bbc.com/news/science-environment-17497766 (Last Accessed on 29th October, 2019)

6 'China's Anti-Satellite Test'(Council on Foreign Relations, 22nd February, 2007) https://www.cfr.org/backgrounder/chinas-anti-satellite-test (Last Accessed on 28th October, 2019)

There have also been reports of a likely collision, in 2013, between the Russian Ball Lens In Space (BLITS) nanosatellite and a piece of orbital debris from the anti-satellite test carried out by China. In this incident, China could have been made responsible under the Liability Convention as well. But for that to succeed, Russia would have to prove China's negligence in producing the fragment of debris that destroyed the BLITS and also that the collision could not be avoided in any way by Russia. Before any of this, it should be proved with absolute certainty that the space junk responsible for the destruction of the BLITS satellite was indeed from the fragmentation of the FY-1C satellite, resulting from China's anti-satellite test.

Cosmos 2251 collision with Iridium 33

A long-defunct Russian Satellite, the Cosmos 2251 collided with active Iridium 33, managed by the US-based Iridium Satellite LLC is the first accidental hypervelocity collision on the 10th of February, 2009 at an altitude of 790 km. The US Space Surveillance Network tracked more than 1800 new debris in the orbital planes of the two spacecrafts.[8] This collision also created a flurry of political and legal pin-pointing between the two States. The Russian Federation took the defense of their satellite being

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7 "NASA: Space junk passes less than 4 miles from space station" (CNN, 5th April, 2011) http://edition.cnn.com/2011/US/04/05/space.station.debris/index.html?hpt=T2 (Last Accessed on 28th October 2019)

8 "The Collision of Iridium 33 and Cosmos 2251: The Shape of Things to Come" (60th International Aeronautics Congress Daejeon, Republic of Korea, 16th October 2009) https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/20100002023.pdf (Last Accessed on 29th October, 2019)

defunct and thus incapable of being manoeuvred and also stood their ground, stating that they had no obligation under any of the international laws to dispose of the Cosmos 2251 once it became defunct. They went on to blame Iridium LLC for not manoeuvring their satellite to avoid a collision. Iridium LLC, however, on the contrary, took the stance that it was under no obligation to avoid the collision even if it was aware of the same.

The Outer Space Treaty, 1967, under Article IV, expressly prohibits the carrying out of any nuclear weapons or weapons of mass destruction and their installations in space. It also forbids the testing of any type of weapon or the conduction of military manoeuvres on celestial bodies.[9]

Article VII of the said Treaty lays out that each State party to the Treaty if it launches, procures to launch or whose territory is used for launching an object into space shall be internationally liable for the damage to another State party to the Treaty, in air or outer space, including the moon and other celestial bodies.[10]

A further elaboration of this Article can be seen in the Convention on International Liability for Damage Caused by Space Objects (Liability Convention). But there is a limitation in this regard as well. Article III of the Liability Convention reads thus: "In the event of damage being caused elsewhere than on the surface of the earth to a space object of one launching State or to persons or

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[9] Outer Space Treaty, 1967, Article IV. Available at: https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/outerspacetreaty.html

[10] Outer Space Treaty, 1967, Article VII, ibid.

property on board such a space object by a space object of another launching State, the latter shall be liable only if the damage is due to its fault or the fault of persons for whom it is liable."[11]

No claim for compensation was forwarded by either of the parties in the clash between Cosmos 2251 and Iridium 33. While Iridium Satellite LLC could hold the Russian Federation liable for damage caused under the Liability Convention, they can only succeed if they are able to prove the fault on the part of the Russian Federation in causing the damage. The latter, however, took the right stand by maintaining that their satellite was derelict, therefore, could not manoeuvred and also pointed out that they were under no international obligation to dispose of it once it became derelict. This finger-pointing at each other's fault continued and there was no claim for compensation placed.

All these difficulties in the legislation related to space debris have resulted in such incidents being forgotten without any sanctions being imposed on the nations responsible for causing the spread of debris and pollution in space.

MAJOR STEPS TAKEN TOWARDS DEBRIS MITIGATION

We discuss below some of the important technical steps taken towards the mitigation of orbital debris. The legal provisions are discussed subsequent to this.

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[11] Liability Convention, 1971, Article III. Available at: http://www.unoosa.org/pdf/gares/ARES_26_2777E.pdf

Guidelines according to the UN

The UN has prescribed certain measures to combat space debris in its Space Debris Mitigation Guidelines of the Committee on Peaceful Uses of Outer Space. These guidelines are applicable to mission plannings and the operation of newly designed spacecraft and orbital stages and, if possible, to existing ones. These are a number of guidelines to minimize the space debris, such as, to limit debris released during spacecraft / orbital stages of operations; to minimize the potential for break-ups during operational phases; to limit the probability of accidental collision in orbit; to avoid intentional destruction and other harmful activities; to minimize the potential for post-mission break-ups resulting from stored energy, and to limit the long-term presence of spacecraft and launch vehicle orbital stages in the low-Earth orbit (LEO) region / geosynchronous Earth orbit (GEO) region after the end of their mission".[12]

The United States' take on Debris Mitigation

The Department of Defence (DOD) and National Aeronautics and Space Administration work hand in hand to mitigate the debris population in space and avoid the further creation of debris. "Orbital debris poses a risk to continued reliable use of space-based services and operations and the safety of persons and property in space and on Earth. The United States shall seek to

[12] "Space Debris Mitigation Guidelines", UN COPUOS. Available at page 56: https://www.unoosa.org/documents/pdf/spacelaw/sd/Space_Debris_Compendium_COPUOS_5_sep_2018.pdf (Last Accessed on 28th October, 2019)

minimize the creation of orbital debris by government and non-government operations in space in order to preserve the space environment for future generations." – National Space Policy, 2010.[13]

The recent Space Policy Directive-3, 2018 also addresses the issue of orbital debris, "Orbital debris presents a growing threat to space operations. Debris mitigation guidelines, standards, and policies should be revised periodically, enforced domestically, and adopted internationally to mitigate the operational effects of orbital debris."[14]

NASA, along with the DoD, has been tracking and cataloguing orbital debris with as much precision as possible. NASA has a strong set of guidelines that analyze the risk of any debris passing by a satellite or the International Space Station. These guidelines essentially draw an imaginary box, known as the "pizza box" because of its flat, rectangular shape, around the space vehicle. This box is about a mile deep by 30 miles across by 30 miles long (1.5 x 50 x 50 kilometers), with the vehicle in the center. When predictions indicate that the debris will pass close enough for concern and the quality of the tracking data is deemed sufficiently

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13 "Frequently Asked Questions" (Astromaterials Research & Exploration Science; Orbital Debris Program Office). https://orbitaldebris.jsc.nasa.gov/faq/# (Last Accessed on 28th October, 2019)

14 Ibid.

accurate, Mission Control centres in Houston and Moscow work together to develop a prudent course of action.[15]

Debris avoidance manoeuvres are performed based on the threat posed by the approaching space junk. In 2007, NASA extended the conjunction assessment process to all NASA manoeuvrable satellites within low Earth orbit and within 124 miles (200 kilometers) of geosynchronous orbit.[16]

Inter-Agency Space Debris Coordination Committee

The Inter-Agency Space Debris Coordination Committee, made up representatives from the European Space Agency (ESA), Russian Space Agency, space agencies from Japan and the NASA, has been instrumental in setting out and implementing guidelines for reducing space junk. Several spacefaring nations have established their standards for debris mitigation which may be different in tone but adhere to the basic principles laid out by IDAC. These guidelines are:

1. Prevention of on-orbit break-ups.
2. Removal of spacecrafts at orbital stages that have reached the end of their mission operations from the useful, densely populated regions.

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15 Space Debris and Human Spacecraft (NASA 27th September, 2013) https://www.nasa.gov/mission_pages/station/news/orbital_debris.html (Last Accessed on 28th October, 2019)

16 Ibid.

3. Limiting the objects released during normal operations.[17]

The operational orbit regimes, spacecrafts should be designed not to release debris during normal operations. Any release of such debris should be avoided or, at least, minimized. Any experiment that will release such debris should be verified that the hazardous effect of it is very low to nil in the long term. On-orbit break-ups should be prevented by taking up adequate measures. All space systems should be designed so to prevent collisions and accidental explosions in the space.

Indian Space Research Organisation (ISRO)

In the wake of claims being made of India adding to the debris population in space through its Mission Shakti anti-satellite test in March 2019, India too has to take effective steps to deal with orbital debris. Taking into account the increasing nature of risks posed by the debris to future space missions, and threats of further collisions, ISRO has set up a Directorate of Space Situational Awareness and Management (SSAM) and a centre for operating the same is being established in Bengaluru. The control centre would enable research activities pertaining to active debris removal, space debris modeling and mitigation.[18]

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[17] "IADC Space Debris Mitigation Guidelines" (September 2007) https://www.unoosa.org/documents/pdf/spacelaw/sd/IADC-2002-01-IADC-Space_Debris-Guidelines-Revision1.pdf (Last Accessed on 29th October, 2019)

[18] "Foundation Stone of Space Situational Awareness Control Centre by Chairman, ISRO" (Department of Space, Indian Space Research Organisation, 3rd August, 2019). https://www.isro.gov.in/update/03-aug-2019/foundation-stone-of-space-situational-awareness-control-centre-chairman-isro (Last Accessed on 31st October, 2019).

These guidelines largely deal with manoeuvring spacecrafts, space stations, and satellites so as to avoid collisions, preventing space debris from being created by reducing rocket breakups and keeping the LEO and GEO altitudes safe. During the operational phase, a spacecraft should be monitored to detect malfunctions in the orbital stage that could lead to break-ups or loss of control. Adequate measures should be taken to prevent such malfunctions which could cause more space debris.

The IADC also says that these guidelines should be updated as and when there are new developments available regarding the space and their influence on the space environment. Now, we proceed to discuss the available international legal remedies on this matter.

Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, 1967 (Outer Space Treaty)

The Outer Space Treaty came into force on the 10th of October, 1967. Currently, 109 countries are parties to the treaty while 23 other countries are signatories but have not completed its ratification.

The Outer Space Treaty does not make any mention of space debris in its text. However, there has been an implied interpretation under Article VII which creates an international liability on the part of a State party to this Treaty for any damage caused by its

space object or any space object launched from its territory.[19] Article IX further talks about States party to the Treaty to use the space so as to not harmfully contaminate it or the cause harm to the Earth's environment by the introduction of extraterrestrial matters.[20] Additionally, Article VIII of the Outer Space Treaty lays down that the States party to the treaty shall be the owners and controllers of objects launched into outer space, including the objects landed or constructed on any celestial bodies. All such objects would have to be entered into the State's registry before being launched into space.[21]

However, the limitation with regards to this treaty is that it expressly prohibits only the use of space for military activities or the launching of any space objects that carry nuclear weapons. Therefore, the States that have carried out anti-satellite tests over the years can take the defense of there being no prohibition to that effect.

Convention on International Liability for Damage Caused by Space Objects (Liability Convention)

The Liability Convention was brought into force on the 1st of September, 1971. Currently, 96 States have ratified this convention, and 19 States are signatories but have not ratified.

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19 Outer Space Treaty, Article VII, supra note 10

20 Outer Space Treaty, Article IX, supra note 1

21 Outer Space Treaty, 1967, Article VIII https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/outerspacetreaty.html?lspt_context=gdpr

This Convention is popularly considered to be an elaboration of Article VII of the Outer Space Treaty. Articles II, III, and IV of the Space Liability Convention deal with the damage caused by space objects. The word "damage" has been, under this Convention, defined to mean "loss of life, personal injury or other impairment of health; or loss of or damage to property of States or of persons, natural or juridical, or property of international intergovernmental organizations;"[22] and the term 'launching State' includes the State that launches or procures the launching of a space object and also a State from whose territory, a space object is launched[23].

Article II makes a State, whose space object causes damage to the surface of the Earth or an aircraft in flight, absolutely liable to pay compensation to the extent of that damage.[24]

Article IV(a) also creates an absolute liability on the part of States who have jointly caused damage to a third State on the surface of the Earth.[25]

However, Articles III and IV(b) deal with damages caused elsewhere than on the surface of the Earth. These are qualified by "fault liability". In the case of Article III, if a damage is caused by a launching State to the space object of another State or persons or property aboard such a space object, the launching State shall be liable only if the damage was caused by its fault or the fault of

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22 Space Liability Convention, 1971, Article I(a) Available at: https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/liability-convention.html

23 Article I(b), ibid.

24 Article II, ibid.

25 Article IV(a), ibid.

persons for whom it is responsible.[26] Taking this in the context of space debris, a State whose derelict satellite or orbital debris coming from its space object can only be made liable if : (i) it causes damage to the space object, persons or property aboard such an object; (ii) such a damage was caused by the fault of the launching State and not otherwise. Although most of the spacefaring nations have sufficiently accurate debris tracking mechanisms, it would be difficult to prove the fault of the launching State without a speck of doubt.

Article IV(b) deals with damages caused to a third State's space object, persons or property aboard such an object, jointly, by two launching States. To illustrate this in the light of orbital debris, let us take the collision between Cosmos 2251 and Iridium 33 discussed earlier. If the debris resulting from this collision were to cause damage to the space objects of another State, both the States (the Russian Federation and the United States of America, respectively in this case) will be liable to pay compensation. But this is again qualified by the 'fault-based liability.' The State claiming compensation would have to prove the fault on the part of the launching States involved in causing the damage. Here too, the launching States are liable only to the extent of their respective faults.

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[26] Article III, ibid.

Article X[27] of this Convention lays down a minimum time limit of one year, after getting to know the damage caused, to file a claim for compensation.

Convention on Registration of Objects Launched into Outer Space (Registration Convention)

This Convention came into force on 12th November 1976 and has currently been ratified by 69 States. This Convention mandates the registration of any objects being launched into space in the appropriate registry and to inform the Secretary-General of the UN of such launch.[28] This is done to provide a record of objects launched into space and their origin to make the concerned State accountable in case damage is caused by an object launched by it.

Provisions by International law association

Orbital debris is not explicitly addressed in any of the international laws. Those which have addressed this had to face a number of debris-related issues. The UN treaties have three major treaties with potential relevance to orbital debris issues. It mainly speaks about how the States party to this treaty shall bear international responsibility for national activities carried out in outer space. It also speaks about the Party internationally liable for damages caused by the object/ objects that are launched into space.

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27 Space Liability Convention, 1971, Article X, supra note 21.

28 Registration Convention, 1978, Article II. Available at https://www.unoosa.org/pdf/gares/ARES_29_3235E.pdf

Lastly, it talks about how the States can 'request consultation' concerning activity or experiment that they believe would cause harmful interference with other space activities.

DRAWBACKS

Though there are such measures taken by the UN, there are so drawbacks to these treaties too. Many debris-related issues are not addressed. The treaties don't address the need for measures to reduce the creation of new debris, instead only speaks about how the States should take 'consultation' if there is any potential harm to other space activities.

Another drawback is that it only speaks about the liability of the space debris and its ownership of the objects but the origins of most of the debris are not determined. Even the legal definition of 'space debris' is not completely clear.

As observed above, international laws on this matter are coupled with limitations and certain difficulties. All these laws have been called as "soft laws" as they have no binding effect and are left to the voluntary discretion of the States party to these laws to implement them or not.

CONCLUSION AND RECOMMENDATIONS

"The exploration and use of outer space, including the moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of

economic or scientific development, and shall be the province of all mankind."[29]

This is the underlying principle on which the Treaties and Conventions related to space laws have been framed. Every State, in one way or another, benefits from space exploration missions, it is only sensible for all the nations to take an active part to protect the space environment. Effective steps are to be taken for the detection and tracking of space debris, sound warning and manoeuvring systems need to been in play so as to avoid further creation of debris through collisions. Measures also need to be taken to prevent space junk from re-entering the Earth's atmosphere and causing damage to our planet.

The Earth is currently orbited by an estimated 34,000 objects larger than 10 cm in diameter, 900,000 objects between the range of 1 cm to 10 cm in size, and 128 million debris objects measuring between 1 mm to 1 cm[30]. These, at any given time, have the potentiality to -

- destroy other satellites, that are functioning and orbiting in the space;
- pose a threat to the International Space Station that operates at an altitude of 400 kilometers above Earth;

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[29] Outer Space Treaty, 1967, Article I

[30] " Image: Visualization of orbital space debris" (European Space Agency, 14th February, 2019). https://phys.org/news/2019-02-image-visualization-orbital-space-debris.html (Last Accessed on 28th October, 2019)

- damage and destroy spacecrafts launched on space missions and the astronauts aboard them;
- destroy the widely used geostationary satellites;
- hamper the use of space for commercial purposes, particularly the emerging field of 'space tourism.'

Apart from these, there is the added threat of such debris re-entering the Earth's atmosphere. Though a majority of such space junk entering the Earth's atmosphere is said to burn down into harmless dust, there still remain certain fragments that could still prove fatal.

In 1978, the Soviet Union's nuclear-powered Cosmos 954 crashed, resulting in a spread of radioactive material across a wide area of frozen ground of the Canadian Arctic. A compensation of $3 million was agreed to over diplomatic negotiations. The famous US Space-station, which was launched into orbit in May 1973, ended its operations prematurely in July 1997 and plummeted through the atmosphere and rained chunks of debris over an area covering the Indian Ocean and a section of Western Australia. In 1997, a woman in Oklahoma was grazed by a fragment woven material which was later identified as debris from a Delta 2 Booster which had re-entered the Earth's atmosphere. The Russian space station, Mir, can be considered as the heavyweight in this regard. Its re-entry to the Earth's atmosphere occurred in March, 2001, above the Pacific Ocean near Fiji. Although most of the

station, about 130,000 kilograms, burned up in the atmosphere, about 1,500 fragments reached the Earth's surface.

These are only a handful of many such incidents. Though no one has been killed by such re-entries so far, the fact that these pieces of space junk range from 10cm to even 1 mm in size and that their numbers are only growing increases the probability of lethal harm being caused to the Earth and its residents. Hence, there is a need, apart from avoiding collisions in space to avoid further creation of debris, to tidy up the mess that is cluttered up there, way above our heads. This would require strict legal guidelines and corresponding sanctions to be imposed on States if they exhibit omission.

Space law has progressed enormously since the launch of the first satellite, Sputnik. Space exploration missions are no more the monopoly of the State alone. Many private enterprises such as SpaceX, Blue Origin, Virgin Galactic amongst others have also launched satellites into space and are preparing to send commercial flights to space shortly. At this stage, the existence of debris will hamper such space explorations as it poses great risks to life and space property. Most of the existing treaties are being overtaken by rapid advancements in technology and are also not legally binding. Nothing in any of the international space laws prevents a State from destroying its own satellite, nor does it prescribe any guidelines for shooting down a satellite that is defunct and poses a threat to the space environment. Therefore, the debris created from such acts remains unregulated.

The debris mitigation guidelines discussed earlier in the essay, to be effective, should be backed by strong legal provisions and sanctions.

There is a strong need for the geostationary orbit, which is a limited and valuable resource currently housing a number of satellites, to be protected from potential collisions with space debris. Satellites that have served their mission life and are no longer functioning need to be decommissioned in a way so as to not create additional debris. A streamlined process for this needs to be formed and implemented. A proper procedure of research and cataloguing of orbital debris should also be done so they can be efficiently tracked, and warnings can be sounded precisely to avoid accidents in space.

In conclusion, the need for mitigating orbital debris should be highly prioritized to protect the valuable assets in space and the safety of future space missions.

THE LEGALITY OF SPACE MINING AND ITS IMPACT ON THE ECONOMY AND OUTER SPACE

Sheena Rajpal & Sameera Kagita[*]

INTRODUCTION

Over the years, due to the advancements in science and technology, it has been discovered that the Outer Space has a lot to offer for the progress and growth of humanity. It has become a well-known fact that Space is rich in a variety of resources that are very valuable on the earth. As the earth's resources are limited and gradually depleting, people can't help but look towards the infinite amount of raw materials, useful minerals, and even precious metals that space has in its possession. In the earlier years, the idea of taking resources from space to utilize on land was almost deemed as absurd or impossible, because people could never fathom that technology would evolve so greatly as to make this feat possible. Nevertheless, a countless number of researches are undertaken every day by scientists to find ways to extract that wealth from celestial (extraterrestrial) bodies. Unsurprisingly, space technology has been flourishing for quite a few years and it is observed that there is plenty of potential for Space Mining to be a real thing. Although the attempts made to accomplish this task have not been completely successful so far, immense efforts and commitments are still put in by scientists and engineers in building tools and devices that could bring this plan to fruition. It could be safely said

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that Space Mining is very close to becoming a reality in the near future. As the quantum of growth that is achieved in the space industry today was never imagined by the states and lawmakers, the space policy in existence may prove to be inadequate to handle the issues that would arise out of the ambitious endeavors of various states and also private companies to extract space resources. Many questions have emerged about Mining in Space, such as, *'is it even legal?', 'who has the authority to extract these resources and why?', 'what would be the impact of Space mining on the Earth and Space itself?', 'whom do the Space resources belong to in the end?', 'how would this affect the economy?' 'what laws would regulate these projects and the resulting increase in space traffic?'* etc. So, there is a need for a settled international law with new policies or treaties or amendments in the existing ones to make them relevant to today's situation and to regulate these activities.

If, or rather when, Space Mining comes into play, it is likely to begin from the asteroids. Asteroid mining refers to the extraction of minerals and other raw materials from minor planets and asteroids in outer space.[1] The near-earth asteroids can be easily tapped because of their closeness to the earth, and exploring them would be more cost-effective and just as advantageous as compared to other natural satellites or faraway planets. The idea of

[1] Amber Pariona, 'What is Asteroid Mining?' (*World Atlas*, 25 April 2017) <https://www.worldatlas.com/articles/what-is-asteroid-mining.html> accessed 31 October 2019

mining asteroids is safer as the scientists have enough evidence of the wealth they contain due to the detailed examination of these huge extraterrestrial pieces of rock when they fall to the earth. The asteroid belt is brimming with metals – everything from iron and nickel to gold and platinum. It's estimated there is at least $700 billion worth of mineral wealth in the belt, and companies are being set up all around the world to plunder these resources in a gold rush for the 21st century.[2] There are approximately 150 million asteroids in the Solar System. These can be divided into three main groups: C-type, S-type, and M-type, which correspond to those that are largely composed of clay and silicates, silicates and nickel-iron, and metals.[3] The majority - about 75% of asteroids - fall into the category of C-type; S-types make up another 17%; while M-type and other varieties make up the remainder.[4] These latter two groups are thought to contain a huge amount of minerals, including gold, platinum, cobalt, zinc, tin, lead, indium, silver, copper, iron, and various rare-Earth metals.[5] This kind of extraction would a viable solution to the decreasing natural resources and increasing needs of human society.

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2 Elizabeth Pearson, 'Space mining: the new gold rush' (*Science Focus*, 11 December 2018) <https://www.sciencefocus.com/space/space-mining-the-new-goldrush/> accessed 29 October 2019

3 Matthew S. Williams, 'Asteroid Mining: What Will It Involve and Is This the Future of Wealth?' (*Interesting Engineering*, 1 August 2019) <https://interestingengineering.com/asteroid-mining-what-will-it-involve-and-is-this-the-future-of-wealth> accessed 29 October 2019

4 *Ibid*

5 *Ibid*

The possibility of Asteroid Mining actually happening was noticed when not only governments of states but private players had also entered the space race for this purpose. A few private companies that have formed with the interest in asteroid exploration raised a lot of funds with the help of billionaire investors to venture into Space. Their aim was to gather power and fuel from Asteroids and explore Space further and to open opportunities for actual utilization of the collected raw materials. An extremely high risk is anticipated in a project of this level due to the expenses involved in it, but the endeavors have already begun. The first asteroid company, Planetary Resources, was founded in 2012 by Diamandis, Chris Lewicki and others in Washington. Within a year the US company Deep Space Industries was set up by Rick Tumlinson, Stephen Cover and a host of others.[6] A handful more firms have since been established, and while some are admittedly are less serious than others, the race to the riches of space is on.[7]

The first successful attempt at Space Mining is predicted to occur in a decade's time and the international space law should be dynamic, well equipped and prepared to tackle the circumstances surrounding the issues that people may come across. International Space Law, similar to Law of Sea, is the combination of Treaties, conventions, declarations, agreements, etc and the National or State Laws. For now, the *United Nations Committee on the*

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6 Andrew Glester, 'The asteroid trillionaires' (*Physics World*, 11 June 2018) <https://physicsworld.com/a/the-asteroid-trillionaires/> accessed 30 October 2019

7 *Ibid*

Peaceful Uses of Outer Space (COPUOS) functions as the body which initiates the treaties and conventions and the *Outer Space Treaty (1967), the Moon Agreement (1979), the Rescue Agreement (1968), the Liability Convention (1972), the Registration Convention (1975),* etc. are treated as the laws that countries that ratified them adhere to while conducting business and research in Outer Space. There are also a few legal principles and Declarations as well, such as *The Declaration of Legal Principles (1963), The Broadcasting Principles (1982), The Remote Sensing Principles (1986), The Nuclear Power Sources Principles (1992)* and *The Benefits Declaration (1966).* The 'United Nations Office for Outer Space Affairs' oversees the activities of the states and ensure that they are in accordance with the international policy. These policies are doing their best to keep Space safe and keep a check on the activities done in space, but they would not be sufficient once space mining commences.

The initial doubt that comes to mind when the term space mining is heard, is that whether it is legal. The answer to the question is a little complicated. It is an accepted view that Space is *res nullius* and it belongs to no one and everyone at the same time. No entity shall claim any ownership over Space or its resources. According to the *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies,* usually referred to as the Outer Space Treaty of 1967, as mentioned in *Article II, 'Outer space, including the moon and other celestial bodies, is not subject to national*

appropriation by claim of sovereignty, by means of use or occupation, or by any other means.' This is followed by *Article III*, which states *'States Parties to the Treaty shall carry on activities in the exploration and use of outer space, including the moon and other celestial bodies, in accordance with international law, including the Charter of the United Nations, in the interest of maintaining international peace and security and promoting international co-operation and understanding.*' If these two provisions are analyzed, then it can only be understood that nothing in outer space can be owned or claimed by any state or any private person belonging to any state, but the persons and states are free to explore and use Space resources in compliance with international law and for the benefit of all mankind, as vividly stated in *Article I* of the *Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of All States, Taking into Particular Account the Needs of Developing Countries*, commonly known as the Benefits Declaration 1966, in these specific words *'International cooperation in the exploration and use of outer space for peaceful purposes shall be conducted in accordance with the provisions of international law, including the Charter of the United Nations and the Treaty on the Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies. It shall be carried out for the benefit and in the interest of all States, irrespective of their degree of economic, social or scientific and technological development, and shall be the*

province of all mankind. Particular account should be taken of the needs of developing countries.' Despite these, no direct conclusion can be drawn that space resources cannot be owned by private persons at all. Yes, property in space cannot be owned, as in, celestial bodies shall not be the subject matter of ownership rights, but the law is not clear about whether the resources extracted from Space could be held as private property or not. But what if a mining company captured an asteroid, changing its orbit to bring it closer to Earth and thus make a return of extracted materials easier? Would the entire asteroid belong to the mining company because the asteroid, as a whole, was "extracted" from its "natural" orbit — becoming more like a single rock or an artificial satellite than a moon or a planet?[8]

The Moon Agreement, which is not exclusively about the Moon and mentions other celestial bodies as well, tried to provide a little more clarity to the articles concerning national appropriation of the moon and other celestial bodies in the Outer Space Treaty, but it failed in doing so and as this agreement was not ratified by many states, it is not considered as full-fledged international law. There is no settled agreement on the matter and it is only an inference drawn when it is said that property from Space can be owned after it is extracted and brought to the ground for the utilization of resources.

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[8] Berin Szoka and James Dunstan, 'Space Law: Is Asteroid Mining Legal?' (*Wired*, 5 January 2012) <https://www.wired.com/2012/05/opinion-asteroid-mining/> accessed 29 October 2019

It cannot be denied that there are conflicting opinions regarding property rights in Space. So, as Space Mining began transitioning from fiction to reality, the United States decided to take the initiative to bring about clarity in the subject, and set some rules. They enacted the *U.S. Commercial Space Launch Competitiveness Act* which is also referred to as the *Spurring Private Aerospace Competitiveness and Entrepreneurship (SPACE) Act* in 2015, which made Space Mining legal. This Act proves to be controversial, as U.S. is a signatory to the Outer Space Treaty, and despite being so, allows the citizens of the U.S. certain rights over space resources. The Act clearly states '*A United States citizen engaged in commercial recovery of an asteroid resource or a space resource under this chapter shall be entitled to any asteroid resource or space resource obtained, including to possess, own, transport, use, and sell the asteroid resource or space resource obtained in accordance with applicable law, including the international obligations of the United States*', and on the contrary, it also gives a disclaimer at the end, stating, '*It is the sense of Congress that by the enactment of this Act, the United States does not thereby assert sovereignty or sovereign or exclusive rights or jurisdiction over, or the ownership of, any celestial body.*' It could be said that the Act is a bit inconsistent with international law, where a clear consensus had not yet been formed.

Two years after the U.S., Luxembourg became the second country in the world, and the first in Europe, to come up with a legal framework of its own relating to the possession and utilization of

Space Resources. This law is drafted originally in French and came into effect from 1 August 2017. The Article I of *Commentaire des articles* (Commentary of Articles) of the *Projet de loi sur l'exploration et l'utilisation des ressources de l'espace (Bill on the Exploration and Use of Space Resources)*, gives similar rights to companies and firms that have been granted in the SPACE Act, 2015 to U.S. citizens. It reads as '*La notion d'appropriation inclut tous les attributs classiques du droit de la propriété et notamment celui de posséder, transporter, utiliser et vendre les ressources visées en conformité avec les dispositions du présent projet de loi et des textes internationaux applicables en la matière. (The concept of ownership includes all the classic attributes of property law, to own, transport, use and sell the resources referred to in accordance with the provisions of this draft law and the relevant international texts.)'* The law in Luxembourg, though quite similar to that of the U.S., has some differences, for instance, this law has imposed several requirements that the firms or companies have to meet in order to get their space operations within the protection of the legal framework. The requirements are as follows: the Operator must either be a public company limited by shares (*société anonyme* (SA)), a corporate partnership limited by shares (*société en commandite par actions* (SCA)), a private limited liability company (*société à responsabilité limitée* (SARL)) or a European Company (*société européenne* (SE)); the Operator must seek a written authorisation from the appropriate minister(s) in Luxembourg; the Operator's place of central administration and

registered office must be located in Luxembourg, and satisfactory evidence shall be given with respect to, notably (i) the administrative and accounting structures of the Operator to be authorised, (ii) the required financial, technical and statutory procedures and arrangements through which the exploration and utilization mission (including the commercialisation of space resources) are planned and implemented and (iii) the internal governance scheme of the operator; the Operator shall demonstrate a sound and prudent operation; the application for the authorisation must be accompanied by a risk assessment of the mission, and is conditional upon the existence of financial resources appropriate to the risks associated with the mission; and the annual accounts of the Operator shall be audited by one or more independent auditors (réviseurs d'entreprises agréés).[9] Furthermore, the law does not require the company to be based in Luxembourg to take advantage of the law, and it does not provide any rights to a natural person. The passage of the law is the latest milestone for Luxembourg's SpaceResources.lu initiative, which seeks to make the country a key player in the emerging space resources industry. The country has committed to spend at least 200 million euros ($230 million) on the effort, including making investments in asteroid mining

[9] Laurent Thailly and Fiona Schneider, 'Luxembourg set to become Europe's commercial space exploration hub with new Space Law' (*Ogier*, 1 August 2017) <https://www.ogier.com/news/the-luxembourg-space-law#> accessed 30th October 2019

companies in exchange for them setting up offices in Luxembourg.[10]

In May 2019, a Memorandum of Understanding (MoU) on Space between the Governments of the United States of America and the Grand Duchy of Luxembourg designated both NASA and LSA to exchange information about prospective collaboration. [11] The joint statement signed on October 22, 2019 between NASA and LSA details a number of potential areas for future collaboration, including space applications, space exploration and utilization, including the sustainable utilization of space resources, as well as sharing of scientific data and education. [12] The agencies will continue to explore these areas through technical and programmatic discussions with the objective of identifying potential collaboration. In parallel, NASA and LSA intend to pursue a Framework Agreement as a means of facilitating future collaboration between the two agencies.[13]

The problem with these two laws which make appropriation of Space resources legal is that it would be an issue if rights of only the people, companies or firms that come within the purview of those laws are recognized by the states. The inconsistency that

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10 Jeff Foust, 'Luxembourg adopts space resources law' (*Space News*, 17 July 2017) <https://spacenews.com/luxembourg-adopts-space-resources-law/> accessed 30 October 2019

11 Luxembourg Space Agency, 'NASA and LSA to Further Deepen US-Luxembourg Co-operation in Space' (*Luxembourg Space Agency*, 23 October 2019) <https://space-agency.public.lu/en/news-media/news/2019/NASA_and_LSA_deepen_cooperation.html> accessed 31 October 2019

12 *Ibid*

13 *Ibid*

exists between the Outer Space Treaty and these laws makes it unfair for other countries. There are other space faring countries like India, China, Japan, Russia, etc. which venture into Space through various Space Missions and are also capable of claiming resources and extracting them if they were legally permitted to. This law is detrimental to the other states, especially to developing countries as Space resources are highly valuable and all are equally entitled to them. The Space is *res communis*, i.e, the common heritage of all mankind and by that fact, so are the celestial bodies and these laws allow the commercial exploitation of precious resources contained in those very extraterrestrial bodies that are extracted by the Space Mining companies or firms. The words "national appropriation" in the Outer Space Treaty are to be pondered upon to determine the legality of Space Mining laws. The problem arises when countries would recognize the rights of their nationals only and not others. But what if governments recognized the property claims of *any* individual or corporation which met specified conditions, regardless of citizenship or nationality? And what if governments did not promise to provide physical defense for these property claims? Under these circumstances, the argument that recognizing property rights counts as *de facto* national appropriation would be on much shakier legal ground.[14] The reason why the new Space Laws of U.S. and Luxembourg cannot be called illegal can be known if the

[14] Rand Simberg, 'Property Rights in Space' (2012) 37 The New Atlantis <https://www.thenewatlantis.com/publications/property-rights-in-space> accessed 31 October 2019

words “Outer space, including the moon and other celestial bodies” are considered, these words could be interpreted to mean the ‘whole’ celestial objects, and not the material that has been severed from the object. Additionally, both countries have mentioned in their laws that with the enforcement of such, they do not wish to exercise any ownership rights over Space or such other objects present therein. But it is desirable that the states and international authorities take a look into the matter regarding property rights in Space and reach a consensus that could become a settled international law for this purpose.

Another point that might surface from mining in Space is the challenges that could be faced by the economy of the entire world in respect of this. The ambitious research that is taking place for attempting to mine asteroids has been termed as the “gold rush” by many people. The Asteroids are made up plenty of commonly used metals and also precious metals, for example, gold and platinum. No wonder the extra minerals and raw materials brought from Space would be extremely beneficial to the earth and its people to replace the diminishing resources the earth has to offer. The Earth is limited and so are its contributions, but the Space is unlimited and things it offers would likely take an infinite amount of time to be exhausted. This seems like a viable option for a brighter future for several reasons, such as: The Earth’s natural resources are depleting, it would be necessary for sustainable development in the long run, it could prove to be a good business venture, the problem of exploitation of labour in actual mines could be curbed, etc. On

the flipside, there are some difficulties that could be faced in the event of asteroid mining, for example: the potential harm to the Space surrounding the Earth and increase in Space debris, the extravagant expenses involved with an equally high risk factor, the fluctuations in the global economy with the possible introduction of huge quantities of precious metals into the market and thus decreasing the value of metals like gold, which is a significant valuable asset that could be converted to money. These risks can be averted or mitigated by proper management or supervision and use high quality exploration equipment with the assumption of adequate responsibility.

The Space Industry has experienced a massive change in the recent years, with substantial number of private companies and firms having entered into the scene. Private companies have undertaken the activities of Space exploration, travel, and of course, space mining, but they are not limited to these, as there exist many other commercial businesses in the Space sector. A lot of startups have opened up with their willingness to invest in Space, because of its lucrative and exciting prospects. Companies have been involved in making and launching satellites, creating space crafts, etc. Renowned business persons have invested and started their own space exploration or space flight companies, such as Jeff Bezos's *Blue Origin,* Elon Musk's *SpaceX*, Richard Branson's *Virgin Galactic,* etc. Space Mining companies such as *Planetary Resources, Deep Space Industries, Tras Astronautica Corporation, Asteroid Mining Corporation ltd. U.K, Moon Express*

etc. are also working in the sector. Though both *Planetary Resources* and *Deep Space Industries* are acquired by *ConsenSys* and *Bradford Space* respectively as a result of financial setbacks, both may probably come back to continue with their Space Mining goal within a few years. With all these developments, Space Mining and Space Exploration could prove to be a profitable venture for businesses and as asteroids have a tendency to hit the earth and cause destruction, it may be advantageous to all if Space Mining could help in avoiding such destruction by exploiting such asteroids and preventing their fall to the Earth.

One more issue which goes hand-in-hand with Space Mining is the problem of Space Debris. Space debris, also called space junk, artificial material that is orbiting Earth but is no longer functional.[15] This material can be as large as a discarded rocket stage or as small as a microscopic chip of paint.[16] Much of the debris is in low Earth orbit, within 2,000 km (1,200 miles) of Earth's surface; however, some debris can be found in geostationary orbit 35,786 km (22,236 miles) above the Equator.[17] It is a very serious issue and could end up causing irreparable damage to the Space and even the atmosphere. The law regarding this is not clearly dealt with in the international law. Mining Asteroids would mean more Spacecrafts, equipment and tools for the extraction of the resources being launched into space and as a

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15 Erik Gregersen, 'Space Debris' (*Encyclopædia Britannica*, 27 March 2019) <https://www.britannica.com/technology/space-debris> accessed 31 October 2019

16 *Ibid*

17 *Ibid*

consequence, causes the amount of Space debris to escalate in the years ahead.

Right now, there is no fixed law about liability for space debris in law. Article VII of the Outer Space Treaty states, '*Each State Party to the Treaty that launches or procures the launching of an object into outer space, including the moon and other celestial bodies, and each State Party from whose territory or facility an object is launched, is internationally liable for damage to another State Party to the Treaty or to its natural or juridical persons by such object or its component parts on the Earth, in air or in outer space, including the moon and other celestial bodies.*' Despite the presence of this article, an evident liability of states cannot be established for the debris in Space. Article VI of the Outer Space Treaty says '*States Parties to the Treaty shall bear international responsibility for national activities in outer space, including the moon and other celestial bodies, whether such activities are carried on by governmental agencies or by non-governmental entities, and for assuring that national activities are carried out in conformity with the provisions set forth in the present Treaty.*' This particular article can be taken to imply that states could be held accountable for Space debris if it resulted from an object that a state has launched into Space. This poses a struggle, as accurately identifying which orbital debris belongs to which state in the masses of satellites and other debris could be too time consuming or even impossible. So, as the space is the property of all, it is also the responsibility of all states, it could be an option to assign

liability to a state proportionate to the amount of its new space expeditions and satellite launches and clear up Space debris that portion of the orbital debris. Space, no matter how vast, is a non-renewable resource which needs to be conserved and it is essential for international law to be amended to tackle the debris problem which may befall though asteroid mining. Compact and less polluting technology could be used for this purpose to limit any damage caused.

To summarize, it can be said that Space Mining has transitioned from science fiction to reality and could be a possible accomplishment within the next decade. Asteroids are the main objects holding valuable resources that could be extracted and used for the replacement of the Earth's diminishing resources and the development of humanity. It could also be utilized as fuel for further in-depth exploration of Outer Space. The Outer Space Treaty of 1967 is treated as the constitution of international space law. It is for a fact that Space is *res nullius* and *res communis,* so its resources belong to all mankind, but there is a lacuna in the law, so it is not clear whether space mining is in compliance with the Outer Space Treaty or not. The main point of contention is whether materials severed from the celestial objects are considered as celestial objects are not. The U.S. and Luxembourg have made laws declaring that Space Mining is legal and resources extracted can be owned and exploited by companies, firms, person, etc. on whom the laws are held to be applicable - their rights over space resources shall be recognized by these countries. Now, these two

countries have made plans for collaboration for the future of Space Mining. Many private Space Mining companies backed by billionaire investors have emerged, viewing this venture as lucrative and exciting, regardless of the high requirements of funds and high risk. Asteroid mining would certainly boost the economy, but it may also cause fluctuations in the economy if the resources from extraterrestrial objects come into the market, this needs to be dealt with care so that it does not affect the economy of the world all of a sudden and lead to collapse. The already existing Space Debris problem may intensify if Space Mining begins, causing the space to be cluttered and polluted. There is no settled law for liability for space debris, so there is a serious need for an international law governing this issue and as there is a duty of every state toward space, a system should be designed to determine the fair liability of states.

In conclusion, it can be said that Space Industry is a thriving sector. Space Mining is not far off and it cannot be denied that the Earth's natural resources are diminishing and there is an impending need for space mining to extract and compensate the exhausted non-renewable resources. The International Space Law does not clearly specify if space mining is legal or not. Therefore, the law is a bit lacking and is not enough to handle the issues that would materialize due to the advent of asteroid mining and there are also a few provisions in the law which demand more clarity. There is a need for a space law that is relevant to the times, one that everyone can adhere to. If Space Mining takes place, then it

would create a significant impact on the economy and outer space as well and there are no adequate laws to govern these aspects either, so it is a desperate requirement to amend the new or and establish a new law taking into account space mining and technological advancements.

CHANGING DYNAMICS OF THE AIRCRAFT MANUFACTURING MARKET: NEED TO ABORT LANDING AT WTO?

Syed Tamjeed Ahmad[*]

INTRODUCTION

Calvin Coolidge, the 30th President of the United States, had once said that the chief business of American people is business. And thus, according to him, the Government of the United States (hereinafter referred to as US) should go all the way to protect the business interest of its citizens. It appears that the US government has implemented his philosophy in letter and spirit in the case of Boeing International Corporation, well the same can also be said for the European Union (hereinafter referred to as EU) and their audacious support for Airbus SAS. The Boeing-Airbus dispute aka the US-EU dispute over subsidies in Large Civilian Aircraft[1] (hereinafter referred as LCA) has been one of the most "celebrated" and "costliest" dispute that ever came before the Dispute Settlement Understanding[2] (hereinafter referred as DSU) of World Trade Organization (hereinafter referred as WTO).[3]

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1 The seeds of this dispute were sown in 1978. Wherein Boeing had accused Airbus of predatory pricing, the deal involved Eastern Airlines and it was alleged by Boeing that Airbus had lobbied with European Governments to extend export credit to the ailing career. *See* Stephen Aris, *Close to the Sun: How Airbus Challenged America's Domination of the Skies*, (Agate, 1st American Edition)

2 Understanding on Rules and Procedures Governing the Settlement of Disputes, Apr. 15,1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 2, 1869 U.N.T.S. 401

3 David Gow, *Snubbed Mandelson Takes Boeing Fight to WTO*, THE GUARDIAN, May, 31, 2005.

The US alleged that Airbus has received nearly $ 22 billion as illegal subsidies from EU (Member States), and the US Government further estimates that the economic benefits of these subsidies are at more than $ 200 billion.[4] On the counterclaim, EU & Airbus allege that Boeing has been deriving preferential treatment in the form of tax breaks and government contracts, and EU estimates that the economic benefit of this "illegal" subsidization has caused airbus a loss of nearly $100 billion.[5]

Indeed, apart from the subsidies concerning the agricultural sector, there is no other sector, where the question of subsidy is so contentious as it is in the aircraft manufacturing sector.[6] The recent decision of WTO on appeal,[7] wherein it has authorized the US to impose $ 7.5 billion on EU imports in order to recover the subsidies granted to Airbus by EU[8], has again brought the dispute into the public eye, and with this, the issue of "State subsidies to LCA manufacturers" has gained back slot at primetime debates. It doesn't appear that the matter is going to see its culmination anywhere near soon, It appears that Airbus is preparing for another round of WTO litigation, and with Trump administration's

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4 Facts about Airbus subsidies *available at* http://www.boeing.com/company/key-orgs/government-operations/wto.page

5 "WTO Condemns Boeing's noncompliance and new subsidies" *available at* http://www.airbus.com/newsroom/press-releases/en/2017/06/wto-condemns-boeings-non-compliance-and-new-subsidies.html

6 Shane Spradlin, *The Aircraft Subsidies disputes in the GATT's Uruguay round*, 60 JALC 1191 (1995)

7 Report of the WTO Appellate Body on "United States Conditional Tax Incentives for LCA" (DS487) dated 4th September 2017

8 Peggy Hollinger, *What is at stake in WTO ruling on Airbus-Boeing trade dispute?*, FINANCIAL TIMES, October, 2, 2019

"America first policy," anyone can prophesize that there is an imminent trade war looming over the aviation industry.

This paper would analyze the regime governing subsidies in LCA and would also analyze the changing geopolitical conditions and its probable effect on the LCA manufacturing market, and lastly the paper would answer the question that, in the prevailing political scenario, WTO DSU is not the best option for resolving dispute for an industry as delicate as aviation.

REGULATION OF SUBSIDIES IN THE LCA SECTOR

As a general fact, aviation is outside the purview of WTO rules[9], but some aspects of aviation, like aircraft manufacturing, which are more industrial in nature are subject to WTO rules, and subsidies have always remained one of the most hotly debated topics under the WTO regime.

In an ideal world, there should be no subsidy, but in real-world subsidies are inevitable. Thus, as a matter of principle, subsidies, which can be defined as any kind of financial contribution by the Government or any other public authority within a territory,[10] are broadly classified under three categories, which is based on an

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[9] Air services between any two States are governed primarily by Bilateral Air Service Agreements, which are "bilateral" agreement between States, and historically, States were not willing to open their airspace to every other country, this resulted in the growth of the restricted air law regime. *For further inputs see* Pablo Mendes de Leon, *Introduction to Air Law*, (Wolters Kluwer, 10th edn. At 45)

[10] *See* Article 1, Agreement on Subsidies and Countervailing Measures, Apr. 15, 1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 1A, 1869 U.N.T.S. 14.

approach that many authors refer to as "traffic light approach".[11] Under this approach, subsidies are placed in three classes, the class in which subsidies are permissible, they are known as permissible subsidies, then there is a class where subsidies are actionable only when it is proved that they cast an adverse effect on free trade, they are referred to as actionable subsidies; finally there are subsidies that are entirely prohibited, this class of subsidies is known as prohibited subsidies.[12]

In the aircraft manufacturing sector, the first International *legal* document governing trade was the Agreement on Trade in Civil Aircraft,[13] which was signed at the culmination of the Tokyo Rounds of negotiations on General Agreement on Tariffs and Trade (hereinafter referred as GATT). The agreement *desired* that aircraft producers could participate in the expansion of the world civil aircraft market in an environment where there are free and equal competitive opportunities.[14] Though the agreement desired many good things,[15] it fell short of defining subsidies and further it was accused of being vague and unenforceable.[16] The US was certainly having a view that the agreement had not done a proper

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11 Gn Horlick, *A Personal History of the WTO Subsidies Agreement*, 47 JWT 447 (2013)

12 For prohibited subsidies refer to part 3 and for actionable subsidies refer to part 2 of *Supra* note 10

13 Agreement on Trade in Civil Aircraft, Apr. 12, 1979, 31 U.S.T. 619, T.I.A.S. No. 9620

14 *See* the Preamble, *Ibid*

15 The agreement in its Preamble had envisioned an environment of free trade and opportunities with fair competition for the aircraft manufacturing sector. *For more details* see *Supra* note 13, Preamble.

16 Daniel I. Fisher, "*Super Jumbo" Problem: Boeing Airbus, and the Battle for the Geopolitical Future*, 35 VAND. J. TRANSNAT'L L. 865, 867 (2002)

job in dealing with the issue of subsidies in the aircraft manufacturing sector. Indeed, one author went on to comment that "The language restricting European practices was left extremely vague and almost unenforceable."[17] To add to the anxieties of the US, the subsidies were *per se* not prohibited in the agreement but were simply brought within the overall framework of GATT.[18]

As was expected, the need was felt (primarily by the US) to renegotiate the agreement as to the aircraft manufacturing market went through a tremendous change. Boeing had lost customers to Airbus not only abroad but also at home.[19] In 1987 an apparent solution was reached wherein both the parties agreed to use GATT as a means for reaching any mutually acceptable solution. Then in 1991, US officially filed a complaint with GATT regarding German subsidies to Airbus[20], the US also threatened that if "direct Government subsidies are not abolished, it would be forced to impose a tax on airbus imports".[21] Thus, the Airbus feeling daunted by looming taxations and Boeing being uncomfortable with Airbus's increasing market presence compelled the US and

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17 Michael J Levick, *"The Production of Civil Aircraft: A Compromise of Two World Giants"*, 21 Transp. L.J. 434 (1993)

18 Nils Meier-Kaienburg, *"The WTO's Toughest Case: An Examination of the Effectiveness of the WTO Dispute Resolution Procedure in the Airbus-Boeing Dispute over Aircraft Subsidies*, 71 J. Air L & Comm. 191 (2006)

19 The launch of Airbus A320, which was a direct competitor to Boeing 737, in 1981 changed the fortunes of Airbus. The aircraft orders had around 400 confirmed customers, even before the first plane flew from the production line. *Also see Supra* note 17; Alan John Cook, *Boeing Versus Airbus: An Economic Analysis* (2008) (Unpublished Honor's Thesis, Miami University)

20 GATT/Airbus: U.S. Complaint against Germany to be Examined on February 28, 1991, Eur. Rep. (Eur. Info. Svc.) No. 1656, at 3

21 *Supra* note 17; Harvey Elliott, Fears Grow of U.S. Tariff on Airbus if Aid Persists, TIMES, May 29, 1991

the EU (then European Community) to enter into a new bilateral agreement on trade in manufacturing of LCA in 1992. The aim of the new bilateral agreement was to provide measures to strengthen the GATT's Agreement on Trade in Civil Aircraft of 1979.[22]

The bilateral agreement *inter alia* limited Government support to any aircraft up to 30% of its manufacturing cost, and indirect benefits were contained to 3% of the turnover of the manufacturers, the agreement also prohibited "back door diplomacy"[23] by trade officials of respective countries.[24] Specifically, in the case of EU, it permitted "Repayable Launch Investment"[25] for Airbus and for Boeing it allowed US government to finance research & development for the civil aerospace industry.[26] Nevertheless, the agreement failed on certain counts; for example, no consensus could be reached on the definition of subsidy, thus, the nucleus of the entire dispute was left undefined. Moreover, the agreement did not provide any

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22 David Pritchard & Alan MacPherson, The Trade and Employment implications of a New Aircraft Launch: The Case of the Boeing 717, 1, 5 (Canada-United States Trade Center, Occasional Paper No. 28, 2003).

23 "Back door diplomacy" means compelling or pressurizing any partner State for purchasing or doing a certain thing or brand. Hypothetical example: United States forcing KLM *via* the Netherlands to purchase Boeing planes in return of supporting the Netherlands at the United Nations on any motion that is brought by the Netherlands.

24 John Olienyk & Robert Carbaugh, *Competitionin the World Jetliner Industry*, 42 CHALLENG.E 60, 65 (1999).

25 Loans that are repayable at an interest on terms, which are specified in the agreement

26 *See* Background Fact Sheet: WTO Disputes EU/US LCA *available at* <http://trade.ec.europa.eu/doclib/docs/2010/september/tradoc_146486.pdf>

adjudication mechanism, it simply envisioned a consultative mechanism between both the parties.[27]

The agreement *survived* for 12 years and on 6th October 2004, the US withdrew from the agreement alleging subsidies to Airbus by EU. The withdrawal was followed by a complaint with WTO against EU's support to Airbus.[28]

Thus, the 1979 agreement again became the primary rule on trade-in LCA, which however now is augmented by the WTO agreement on subsidies and countervailing measures.[29] Thus, as of now, these two agreements form the basic regime for adjudicating disputes regarding trade in LCA at the WTO's DSU.

CHANGING DYNAMICS OF LCA MANUFACTURING INDUSTRY

It would not be wrong to say that the various rules regarding trade in LCA have developed due to the Boeing-Airbus rivalry, although the agreement on trade in LCA has always been regarded as a plurilateral document.[30] The reason for this duo centric approach has been that traditionally the aircraft manufacturing industry has been a duopoly,[31] although for a certain period it was a monopoly for Boeing.

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27 U.S. Gen. Accounting Office, International Trade: Long-Term Viability Of Us-European Union Aircraft Agreement Uncertain (1994), *available at* < https://www.gao.gov/archive/1995/gg95045.pdf>

28 *Supra* note 26

29 Agreement on Subsidies and Countervailing Measures, Apr. 15, 1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 1A, 1869 U.N.T.S. 14.

30 *Supra* note 24

31 Even now the principal market shares are held by Boeing & Airbus, though now this established order has started feeling certain tremors.

But in recent years, the LCA industry has seen a dynamic change, with the rising stature of certain players who were never regarded as member of the "exclusive club". This change in the established "social strata" of LCA has certainly not augured well with Boeing and the US, who always see an invisible state aid or subsidy behind every rising competitor.[32]

Boeing (indirectly the US) is now fighting wars at multiple fronts, gone are the days when Boeing was only competing with Airbus, the latest addition to this has been the Canadian firm, Bombardier. Last year, the US Department of Commerce imposed a 300% tariff on the import of Bombardier C series aircraft into the US.[33] The complaint was filed by Boeing, which had alleged that the Canadian firm was *dumping* its C series aircraft into the US market at a very low competitive price, as it had obtained huge subsidies from the Canadian Government, Provincial Government of Quebec, and the UK Government.[34] Indeed, the facts of the dispute (as stated by Boeing) *per se* indicated a case of "predatory pricing" against Bombardier, as Boeing alleged that Bombardier sold its C series aircraft at just USD 19.2 million, which was around 40% less than the actual cost of production,[35] and what was more

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32 Andrew B. Linter, *Subsidizing Large Civil Aircraft: Airbus and Boeing's Newest Dispute before the World Trade Organisation*, 86 Mississippi Law Journal Supra 41 (2017)

33 *See* US imposes 300% import tariff on Bombardier C series *available at* www.theweek.co.uk/trade/88867/us-imposes-300-import-tariff-on-bombardier

34 Hannah Boland, "US moves to impose further tariffs on Bombardier amid Boeing dispute", THE GUARDIAN, 6th Oct, 2017

35 Jon Ostrower, "Boeing vs. Bombardier: Tariff is now 300%", CNN MONEY, 6th Oct, 2017

troubling for Boeing was that the customers of Bombardier were not situated across the Atlantic or *even the Pacific* but just across the Great lakes, i.e., within the US itself.[36] On the counter, Bombardier termed Boeing's complaint as an example of "Pure hypocrisy," and claimed that Boeing had done the same with its 787 Dreamliner.[37]

This unilateral action on the part of US would have resulted in a tripartite trade war,[38] and Canada was even considering of moving to WTO against the US decision to impose import tariffs,[39] but to the surprise of many, this January, a US trade court annulled the order imposing import tariffs on Bombardier.[40] The court further held to the embarrassment of Boeing that it does not face any unfair competition from imports of Bombardier aircraft.[41] This line of reasoning that Bombardier does not directly compete with Boeing is shared by many experts,[42] as they argue that Bombardier's C series is optimized for 100-130 seat market

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36 *See* Delta Airlines and Bombardier Sign Largest C series order for up to 125 Aircraft *available at* www.bombardier.com/en/media/newsList/details.delta-air-lines-and-bombardier-sign-largest-c-series-order-for-u0.bombardiercom.html

37 Benjamin Zhang, "Bombardier slams Boeing lawsuit against it, says its pure hypocrisy" BUSINESS INSIDER, 20 Sep, 2017

38 The decision to impose tariffs on Bombardier C series had not gone well with Bombardier's home country Canada and also it wasn't appreciated by the United Kingdom, as Bombardier's C series line factory is situated in Belfast, UK, and import tariff would have resulted in less production that in turn would have resulted in layoffs in the UK.

39 Leah Schnurr, "Canada may take Bombardier-Boeing dispute to WTO, but no quick fix seen" REUTERS, 20 Dec, 2017

40 Lydia Smith, "Bombardier wins trade dispute with Boeing amid fears huge tariffs could cost UK jobs" THE INDEPENDENT, 26 Jan, 2018

41 *Ibid*

42 Based on inputs from the discussion on the Boeing-Bombardier dispute organized by the Aviation week. Audio transcript *available at* www.aviationweek.com/commercial-aviation/podcast-boeing-versus-bombardier

segment[43], and on the other hand Boeing's 737, which is Boeing's narrow-body plane, caters to 150-200 seat market segment.[44] But it is the history more than the market segment that haunts Boeing. As Boeing had never thought in the 1960s or '70s or even in 1980s that Airbus would become such a big competitor in its market, and it appears that Boeing does not want to take any chances with a predator eyeing at its market, sitting just across the Great lakes.

But this change in dynamics is simply not confined to the emergence of *new visible* competitors; this alteration has also resulted in a spree of mergers and takeovers from the two leaders in the LCA sector. Indeed, Airbus has also acknowledged the imminent threat that C series can pose to its A320, which is Airbus's most successful aircraft. Thus, Airbus took a majority stake in Bombardier's C series Programme.[45] It is argued that the biggest winner in this takeover is Bombardier itself,[46] but we cannot ignore the fact that Airbus has literally galloped the most competent competitor to its most successful Programme i.e. the Airbus A320 family.

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43 *See* Bombardier's official data on C series *available at* www.commercialaircraft.bombardier.com/en/cseries

44 *See* Boeing's official data on 737 NG *available at* www.boeing.com/commercial/737ng/

45 Airbus takes majority stake in Bombardier jet project *available at* www.theguardian.com/business/2017/oct/17/airbus-and-bombardier-to-partner-in-aircraft-programme

46 It is argued that by merging with Airbus Bombardier's C series would get a platform along with the infrastructure needed to market the equipment. For more inputs *See* Richard Aboulafia, "Winners and Losers as Airbus bails out Bombardier's C series" FORBES, 17th Oct, 2017

Boeing was not far behind, and in the last months of 2017, Boeing announced that it was in talks with the Brazilian aircraft manufacturer Embraer for a possible merger.[47]

It can be argued that these mergers and takeovers portray a sense of apprehension in the minds of the two market leaders, who are unwilling to share the cake with any new entrant. But, it is not these mergers and takeovers, which have the potential of causing a logjam in the WTO disputes, the most potent threat that can haunt big players may come from China or Russia, as companies from these countries have started to enter the aircraft manufacturing market, and *apparently* these firms have State backing.[48] Indeed, China's COMAC (Commercial Aircraft Corporation of China) has already conducted test flights on its C19 aircraft, which is a direct competitor to Airbus's A320 & Boeing's 737.[49] Similarly, Russia is investing hugely in its state-owned United Aircraft Corporation,[50] which has already conducted test flights of its single-aisle aircraft. Further, there are news that China and Russia have also entered into an agreement in the aircraft manufacturing sector,[51] and it appears that this Sino-Russian partnership is aiming at shifting the tectonics of aircraft manufacturing from west to east.

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47 Peggy Hollinger, "Boeing in deal talks with Brazil's Embraer", FINANCIAL TIMES, 21st Dec, 2017

48 *See* Jon Ostrower, "Russia & China are coming for Boeing and Airbus" *CNN*, May 23, 2017

49 *See* Yen Nee Lee, "China's rise in the aerospace industry is "a real plus for us" says Honeywell" *CNBC*, February 7, 2018

50 *Supra* note 7

51 *See* China and Russia have $ 20 billion partnership to replicate Airbus history and make competitive jets *available at* www.nextbigfuture.com/2018/01/china-and-russia-have-20-billion-partnership-to-make-airbus-and-boeing-competitive-jets.html

Further, the rise of these companies also has a geopolitical impact on the trade-in LCA, and this has the potential of disturbing the global aviation sector. It is evident from the recent developments that the LCA manufacturing sector would not remain a duopoly for long, and instances like that of Airbus-Boeing dispute could become more common, which in any case are not desirable for the aviation industry at large.

CHANGING DYNAMICS OF LCA MANUFACTURING SECTOR AND GROWING IRRELEVANCE OF WTO DSU

In the preceding part of the article, the paper has covered the changing dynamics of the sector and its probable impact on the market. In this part of the article, the paper would try to put forward arguments that with the changing scenario of the world LCA manufacturing sector, the dependence on DSU WTO for dispute resolution is not a viable option.

The present political world order that is witnessing a rise in populism cutting across the globe, which is being followed by the rise of protectionist trade measures[52], has started posing serious threats to the established world trade order. In the LCA manufacturing sector, there have been recent developments, which make it more vulnerable to disputes and thus warrant a more efficient dispute redressal mechanism.

[52] For example, the US has recently increased tariff imports on steel imports to US, this has caused serious concerns for exporters in EU, Russia, China etc.

Firstly, as it has been discussed before that the WTO litigation does not provide any finality or conclusion to the dispute, rather often the dispute lingers on. For example, the decision of WTO in DS487[53] was supposed to end the stalemate, but Airbus responded saying that "the game is far from over".[54] Even, the not so much famous, Bombardier-Embraer dispute has not reached its finality and though there has been a preliminary ruling, but the dispute is far from over.[55]

Secondly, the formation of a panel as required under DSU often becomes a challenging task, moreover WTO has no permanent panel, every time a new dispute comes in, a new panel needs to be constituted.[56] Further, parties often reject panels that is constituted and thus further prolong the dispute.[57]

Thirdly, the lawsuits that have been filed in WTO with regards to disputes in LCA manufacturing sector are more political in nature and are less economical. One author has gone to the extent of saying that "WTO seems poorly suited to resolve this case."[58] It is argued that WTO applies principles of economics in areas that have substantial political consideration.[59]

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53 *Supra* note 7

54 *Supra* note 8

55 Joe Leahy, "Brazil's Embraer backs WTO panel over Bombardier subsidy claim", FINANCIAL TIMES, 29th Sep, 2017

56 WTO Secretariat, A Handbook on The WTO Dispute Settlement System 13 (2004).

57 Lawrence D. Roberts, *Beyond Notions of Diplomacy and Legalism: Building a Just Mechanism for WTO Dispute Resolution*, 40 ANi. Bus. L.J. 511, 544 (2003).

58 Phillip L. Swagel, Comments on "Boeing vs. Airbus: An Examination of the Issues," Mar. 17, 2005, available at www.aei.org/publications/pubID.22140,filler.all/pubdetail.asp

59 *Ibid*

Fourthly, aviation is a highly specialized field having distinct peculiarities and to treat it at par with products like "fertilizers" or "iPad" or "pen drives"[60] is to trivialize the entire matter, further LCA manufacturing disputes are highly complex and have a large amount of money at stake and they require specialized procedures and principles.[61]

Finally, and most importantly, the emergence of China & Russia as combined competitors in the LCA manufacturing market makes WTO DSU much more irrelevant. In the past, though the US & EU have been at loggerheads with each other at WTO regarding subsidies in the LCA sector, apart from this US & EU both are trading partners and have a vested interest in each other and none of the blocs wants a trade war.[62] But the same does not apply fully for US & China or EU & Russia, and further, no industry can afford to have a trade war between two blocs, which are inherently at odds with each other and are also strategically equally powerful.

At this point, I am reminded of the words of Brazilian President Fernando Cardoso with regards to Embraer-Bombardier/Canada-Brazil dispute that "***if they(Canada) want war, war is war***".[63] It needs no mention that Mr. Cardoso was not Mr. Trump and

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60 WTO dispute resolution procedures are same for every product that falls within the ambit of WTO; *Supra* note 56

61 Uchenna Izundu, "The Battle over Aircraft Subsidies", FINANCIAL TIMES, Jan. 11, 2005

62 *See* EU-US trade statistics *available at* http://ec.europa.eu/trade/policy/countries-and-regions/countries/united-states

63 Joseph D'Cruz & Charles M. Gastle, "Canada-Brazil Trade Relations: An expedited Arbitral Mechanism May Be Required to Resolve the WTO Aircraft from Brazil/Canada Dispute", ESTEY CENTRE FOR L. & ECON. IN INT'iL TRADE, Feb. 2002,

Canada was not China. If a trade war breaks out between US and China or Russia, it will destroy the entire International aviation sector.

CONCLUSION

The need of the hour in the present global scenario is an open multilateral agreement between the major LCA manufacturing nations/bloc because adjudication at WTO level has not proven itself worthy for disputes involving higher stakes. Moreover, a multilateral agreement should acknowledge the political basis of subsidization and try to find a solution within, which diffuses a dispute and not prolongs it.