

THE LEGAL ASPECTS OF NEW ERA OF SPACE TRAVEL

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From*

*“The Earth is the cradle of humanity, but
mankind cannot stay in the cradle forever.”¹*

Abstract

Since the launch of the first object in space in 1957, humankind has been obsessed with exploration and exploitation of space. Owing to the development of technology, transportation of a large number of persons into outer space has been made possible. Space will no longer be available only for scientific research and development. Habitation of other planets is well within the foreseeable future. The existing legal framework for activities concerning air and space is not sufficient to deal the legal issues arising out of the upcoming developments in space activities. The article, primarily, aims to examine issues associated with habitation of outer space such as jurisdiction, property, security and how the treaties fail to address them. Certain key developments in space industry are also discussed. It is argued that the solution to such issues is primarily based on certain analogous situations while the basic legal framework for space activities will remain firm.

INTRODUCTION

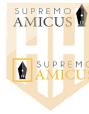
It has been over 47 years since man first set his foot on the moon and over the course of these years, the exploration of space has undergone a drastic change, while most of the laws and principles governing space travel and exploration have not developed much. The genesis of space law can be traced back to over 59 years back, when world’s first artificial satellite ‘Sputnik 1’ was launched by the Soviet Union in October 1957. This initiated the Space Race, between the Soviet Union and the United States of America for use and exploitation of space during the Cold War. Taking these aspects into consideration the United Nations established the Committee on the Peaceful Uses of Outer Space (hereinafter as COPUOS). The Legal Subcommittee’s main function was to provide a forum for discussion and negotiation on the use of outer space for peaceful purposes.

The General Assembly in its resolution of 1962² laid down the “Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space”, which was further expanded into five main essential treaties and other principles which govern international law related to space exploration and use. These treaties are Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies³ (hereinafter as the “Outer Space Treaty”), Agreement on the Rescue of Astronauts, the Return of Astronauts and Return of Objects Launched

¹Konstantin Tsiolkovsky Quotes, BrainyQuote.com, <https://www.brainyquote.com/quotes/quotes/k/konstantin183177.html> (last visited Oct. 26, 2017)

² G.A. Res. 1962 (XVIII), Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space (Dec. 13, 1963).

³ United Nations, Treaty Series, vol. 610, No. 8843.



into Outer Space⁴ (hereinafter as the “Rescue Agreement”), Convention on International Liability for Damage Caused by Space Objects⁵ (hereinafter as the “Liability Convention”), Convention on Registration of Objects Launched into Outer Space⁶ (hereinafter as the “Registration Convention”), and Agreement Governing the Activities of States on the Moon and Other Celestial Bodies⁷ (hereinafter as the “Moon Treaty”). So far these treaties have been sufficient to govern the peaceful use and exploration of space, but with the increase in privatisation of space sector in many space-faring States such as the United States, these treaties may become inadequate and obsolete to cater this new era of space travel and exploration which is inclined more towards commercialization of space-related resources in order to forward human space exploration and for private use.

While private companies have been trying to use space for commercial purposes since 1962⁸, the recent development in commercial space exploration by providing sub-orbital flights and supplying cargo to the International Space Station (hereinafter as the “ISS”) is responsible for the new spark of space exploration, which has been approved by domestic laws.⁹ A new frontier

of space is being explored by certain private agents such as SpaceX and Mars One, which aims at landing and establishing a human habitat on Mars and other Celestial Bodies in the next 15 years.¹⁰ This could be as revolutionary as the United States’ Apollo 11 mission. With the advancement of technology and interest in the use of space, such mission might become feasible according to NASA, by 2030s.¹¹ This will give rise to whole different aspects of laws and liabilities, which are not covered under any of the international treaties governing space law as of now. It might also go against few of the underlying principles of these treaties to accomplish this mission.

While the present space law and aviation law does answer some the questions which are raised in the case of interplanetary travel, such laws, in the long run, are more likely to create confusion and not provide adequate remedies for all the challenges. This is why we need to define these new aspects of space law and amend some previously held beliefs and laws to accommodate this new era. This paper aims to understand the issues which are likely to arise in this new era of space exploration and how the present international space law framework, while it can provide a basic foundation for the new framework, it is inadequate to address those

⁴ Ibid., vol. 672, No. 9574.

⁵ Ibid., vol. 961, No. 13810.

⁶ Ibid., vol. 1023, No. 15020.

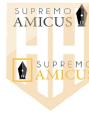
⁷ Ibid., vol. 1363, No. 23002.

⁸ Adam Mann, *Telstar 1: The Little Satellite That Created the Modern World 50 Years Ago*, WIRED, (Jul. 10, 2012, 1.39 PM), <https://www.wired.com/2012/07/50th-anniversary-telstar-1/> (last visited Oct. 26, 2017)

⁹ Sarah Fecht, *Senate Votes to Legalize Asteroid Mining*, POPULAR SCIENCE, (Nov. 12, 2015), <https://www.popsci.com/congress-votes-to-legalize-asteroid-mining/> (last visited Oct. 26, 2017)

¹⁰ Adario Strange, *Dutch Group Planning for Mars Settlement by 2023*, PC MAGAZINE, (Jun. 01, 2012), <http://in.pcmag.com/robotics-automation/85141/news/dutch-group-planning-for-mars-settlement-by-2023> (last visited Oct. 26, 2017)

¹¹ Karla Lant, *It’s Official. Humans Are Going to Mars. NASA Has Unveiled Their Mission.*, FUTURISM, (Apr. 28, 2017), <https://futurism.com/its-official-humans-are-going-to-mars-nasa-has-unveiled-their-mission/> (last visited Oct. 26, 2017)



issues, while it can provide a basic foundation for the new framework.

INTERPLANETARY TRAVEL AND RELATED ASPECTS

While the concept of interplanetary travel has been one of the most discussed subjects in science fiction, this dream of mankind as space-faring species might soon be a reality. This raises not only technical, economic and social questions about the feasibility of such travel but also legal and moral questions as to what will be the responsibility of such space-faring nations towards others and the future of mankind.

There is immense development in the Space sector. The huge vacuum of space is now becoming more and more plausible to discover and the existing laws are found to be inadequate to deal with the present and probable future situations to secure the safety of passengers and spacecraft among other things. Although the regime relating to space exploration has been developing for several decades, there is still no clearly articulated system of legal rights relating to exploration and economic exploitation of outer space.

Under this chapter, we try and understand the concept of interplanetary travel and the present developments under international space law framework which relate to interplanetary travel.

Differences between Interplanetary Travel and Space Tourism

Space tourism is recreational space travel, either on established government-owned vehicles such as the Russian Soyuz and the International Space Station (ISS) or on a growing number of vehicles fielded by private companies. Since the flight of the

world's first space tourist, American businessman Dennis Tito, on April 28, 2001, space tourism has gained new prominence as more suborbital and orbital tourism opportunities have become available.¹² 'Space Tourism' has been defined as "any commercial activity offering customers direct or indirect experience with space travel".¹³ A "Space Tourist" is someone who tours or travels into, through or to, or travels to a celestial body for the purpose of recreation.¹⁴ By this definition, it is clear that space tourism can be of various types depending on whether the spaceflight traverses at an orbital speed or at a sub-orbital speed. In orbital spaceflight, the flight traverses at an orbital speed and reaches a particular destination, for example, the International Space Station, where the space tourists spend a certain number of days. In a sub-orbital spaceflight, the flight does not attain an orbital velocity, it reaches an altitude of 100-200 miles above the sea level and then stays there for 3-6 minutes after which it falls back to Earth.¹⁵ Another hybrid that is possible is the launch of a spaceflight through another vehicle from the airspace, so a part of the journey is in their and a part in space.¹⁶ The prospects of space

¹²Erik Seedhouse, *Space Tourism*, ENCYCLOPAEDIA BRITANNICA, (Oct. 31, 2014), <https://www.britannica.com/topic/space-tourism> (last visited Oct. 26, 2017)

¹³Tanja Masson-Zwaan & Steven Freeland, *Between Heaven and Earth – The Legal Challenges of Human Space Travel*, 66, (Feb. 1, 2010)

¹⁴See *Id.*

¹⁵See also, Fabio Tronchetti, *Spinger Briefs in Space Development; Fundamentals of Space Law and Policy*, (2013).

¹⁶Steven Freeland, *Up, Up and back- the Emergence of Space Tourism and its impact on International*



tourism, give rise to some interesting and conceptually difficult legal questions.

For this purpose, it is pertinent to draw a distinction between “Space Tourism” and “Interplanetary Travel”. Interplanetary spaceflight or interplanetary travel is travel between planets, usually within a single planetary system.¹⁷ It is clear that the idea of “Space Tourism” in the present day is limited to the extent of reaching the Earth’s Orbit and the International Space Station. “Interplanetary travel”, inherently involves reaching another planet’s orbit or landing on its surface. An interplanetary spacecraft spends most of its flight time moving under the gravitational influence of a single body – the Sun. Only for brief periods, compared with the total mission duration, is its path shaped by the gravitational field of the departure or arrival planet.¹⁸ The definition of “Space Tourism” can be extended to interplanetary travel as it is defined as ‘any commercial activity offering an experience with space travel’. Therefore, there is a scope for extension of ‘Space Tourism’ to include interplanetary travel in the near future, considering the recent demand¹⁹ and developments²⁰ in space tourism.

Law of Outer Space, Chicago International Journal of Law, 6, 1 at Art. 4

¹⁷Arthur C. Clarke, *Interplanetary Flight: An Introduction to Astronautics*, London: Temple Press, (1950).

¹⁸Interplanetary Flight- Compiled, edited and written in part by Robert A. Braeunig, 2012, 2013. <http://www.braeunig.us/space/interpl.htm> (last visited Oct. 26, 2017)

¹⁹ A poll conducted in May 2002 indicated that 19 percent of affluent American adults would be willing to pay one hundred thousand dollars for a fifteen-minute suborbital flight, while 7 percent would be prepared to pay

However, for the purpose of this paper, we are drawing a clear distinction between space tourism and interplanetary travel. The definition of interplanetary travel for the purpose of this paper is long-term stay on any celestial body other than the Earth or the ISS. The intention of interplanetary travel is not just for recreational purpose but with an intention of establishing a human habitat on other celestial bodies for a long-term.

Astrolaw and its application to future of Space Law

"Astrolaw is the jurisprudence of living in space for prolonged periods. It focuses on relations between and among persons, both natural and legal, living, functioning and working in space for such prolonged periods."²¹ It is a revolutionary new field of law which is a new branch of space law. While Space Law analyses the various idiosyncrasies of the treaties that govern space activities of sovereign nations, Astrolaw involves those aspects that apply to people living and working in space who represent the various nations, rather than

twenty million dollars for a two-week flight to an orbital space station, with that figure rising to 16 percent if the price were reduced to a "mere" five million dollars. *See Space Cowboys Ready to Pony Up*, SPACE DAILY, (May. 20, 2002), <http://www.spacedaily.com/news/tourism-02i.html> (last visited Oct. 26, 2017)

²⁰ Significant resources are being directed towards the continued advancement of Reusable Launch Vehicle ("RLV") technology, a vital element in the development of the space tourism industry. *See, Charity Trelease Ryabinkin, Let There Be Flight: It's Time to Reform the Regulation of Commercial Space Travel*, 69J Air L & Comm 101, 103 (2004).

²¹Kunihiko Tatsuzawa, *The Regulation of Commercial Space Activities by the Non-Governmental Entities in Space Law* (1988)



being restricted to nations themselves. This term is used to designate the future creation and practice of law in orbit by space settlers themselves.

It is pertinent to understand the distinction between Astrolaw and Space Law. Astrolaw is distinguished from Space law by reason of the difference of the subjects and sources of law. Space law is primarily treaty-based and applicable to the Earthly political concerns of sovereign governments. It deals with outer space as a legal regime and is a branch of Public International Law. The subjects of Space law are sovereign governments and public international organizations. Astrolaw, on the other hand, is not treaty-based and focuses upon extraterritorial applications of municipal laws for or in outer space. Astrolaw deals with the rights and obligations of both natural and legal persons in space as a place. When compared to Earth-bound environments and experiences, space as a place is physically and legally unorthodox and unusual. Thus, irrespective of legislative intent by terrestrial lawmakers, space as a place will compel some unforeseen departures from domestic laws applied there, whether in civil, criminal, military, or other traditional fields. Astrolaw is distinct from current concepts of Space law, a body of international treaty law seeking to govern and regulate relationships between nations during their exploration of space. Astrolaw is concerned with relationships between people as they live, work and grow in outer space.

In its ultimate development, Astrolaw is not perceived as a field or variant of some existing body of municipal or international law, but rather as a new and evolving distinctive system of jurisprudence

originating from the uncharacteristic physical properties of outer space itself. Consequently, both the physical and psychological environments and the dangers inherent in the confines of large manned space objects and future lunar and planetary settlements dictate that any unreasoned extension into outer space of adversarial systems of law will prove to be revulsion to the well-being, safety, and even lives of all who constitute a discrete space-faring community.

From the standpoint of mission integrity and self-preservation, the dispute in space between two space-farers or factions of them becomes the legitimate concern of all in the space-faring community whose collective interests will require rapid resolution of disputes on behalf of the community at large. These perceptions compel the conclusion that law in space is destined to evolve into the craft of a helping profession rather than an adversarial one. This concept is the key player of Astrolaw jurisprudence.²²

Astrolaw does not focus upon "space as a legal regime," but instead upon "space as a place" accommodating diverse permanent industries, spacefarers on missions of long duration and domiciles. The jurisprudence of Astrolaw also comprehends that an entirely new class of persons, with no counterpart on Earth, will emerge in space where it may be difficult even to determine whether the breach precipitating them trenches upon a public or private duty.²³

²² Lance Frazer, *Lawyers in Space: The Next Generation*, 15 *Barrister* 5, 31 (1988)

²³ J. Henry Glazer, *Astrolaw Jurisprudence in Space as a Place: Right Reason for the Right Stuff*, 11 *Brook. J. Int'l L.* 1, 44 (1985)



THE NEED TO CHANGE OUR POSITION ON INTERPLANETARY TRAVEL

The present big five treaties which govern international space law were entered into after a time of war and conflict due to which these treaties were naturally more inclined towards maintaining peace and harmony at that time of exploration of space. Due to this influence of cold war era, these treaties fail to answer most of the new questions which are likely to arise in this new era of space travel and exploration. The legal framework for outer space law poses many obstacles for development and growth of privatized space travel and exploration. The circumstances and pace of development at that time was vastly different from the times now. They were mostly based on the principle of 'res communis',²⁴ and 'res nullius',²⁵ which are beneficial only in an idealistic world.²⁶ Although this is a highly intellectual ideology, it is incongruent with the market conditions that will promote privatization of space-related activities.²⁷ Also, there was no

²⁴Res communis is a Latin term derived from Roman law that preceded today's concepts of the commons and common heritage of mankind. See Kemal Baslar, *The Concept of Common Heritage of Mankind in International Law* (1997).

²⁵Res nullius is not yet the object of rights of any specific subject. Such items are considered ownerless property and are free to be acquired by means of occupation. See Randall Lesaffer, *Argument from Roman Law in Current International Law: Occupation and Acquisitive Prescription*, 16 EUR. J. INT'L L. 25, (2005).

²⁶Outer Space Treaty, United Nations Treaty Series, 1967, Vol. 610, U.N.T.S. 8843

²⁷Thomas, J., Privatization of Space Ventures: Proposing a proven regulatory theory for Future Extra-terrestrial appropriation, Birmingham Law Review; (1), at A7

place for the issues and claims arising out of privatized space activities owing to the stunted pace of developments at that time. Therefore, there is a need to amend these laws in such a way that it catalyses the development in private space activities. With the increase in privatization and commercialization of space activities, there will be many more space objects which increase the susceptibility of accidents/mishaps. Some of these issues which are likely to arise are discussed here in this chapter.

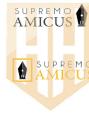
Issue of Jurisdiction

Jurisdiction is the capacity of a State under International law to make and enforce the law.²⁸ It can be defined as the power, recognised by international law, of a State 'to perform the functions of a State'.²⁹ A State's jurisdiction is derived from State sovereignty and constitutes its vital and central feature. In *Palmas Case*,³⁰ it has been laid down that each State enjoys exclusive competence to exercise governmental authority over all persons, objects, and activities within its territory. This jurisdiction power is not restricted to a territorial limit but States can also exercise such power over persons and things which have a State link. These are based upon principles by which States gets such power to assert its jurisdiction beyond its territorial limits. There are essentially three types of Jurisdiction which are recognised under International law. (1) Territorial jurisdiction,

²⁸Bledsoe, Robert L., Boczek & Boleslaw A., *The International Law Dictionary* (Clio Dictionaries in Political Science, No. 11), (1987)

²⁹*Island of Palmas (United States v. Netherlands)*, ICGJ 392, (Perm. Ct. Arb. 1928)

³⁰*Id.*



which means that a State has jurisdiction over all events taking place in its territory regardless of the nationality of the person responsible. (2) Quasi-territorial jurisdiction, which means that a State has jurisdiction over its vehicles, vessel, or ship and overall events and persons in any territory (even in no man's land, 'res nullius'). (3) Personal jurisdiction, which means that a State has jurisdiction over all its individuals, corporate bodies, and business enterprises regardless of wherever they may be.

According to Bin Cheng³¹ a State jurisdiction by its nature has two distinct elements; Jurisdiction, the normative element, which represents the power of a State to adopt valid and binding legal norms, and Jurisdiction, the physical element which denotes the power of a State, at any given time or place to perform any governmental function. From this perspective, the validity of Jurisdiction presupposes Jurisdiction, but it is possible to have Jurisdiction without Jurisdiction.³² According to principles of international law, territorial jurisdiction supersedes both quasi-territorial jurisdiction and personal jurisdiction. Quasi-territorial jurisdiction gives way to territorial jurisdiction but supersedes personal jurisdiction. However, personal jurisdiction gives way to both territorial jurisdiction and quasi-territorial jurisdiction.

It can be logically concluded that the State will not have any kind of territorial jurisdiction in space, as it has been clearly

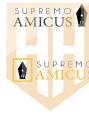
enumerated in the Outer Space Treaty that no State can claim sovereignty over Moon or any celestial bodies. However, according to the Registration Convention and Article VIII of OST, the State shall retain jurisdiction and control over the object, and over any personnel launched in space. This means that due to the absence of territorial jurisdiction in space, the quasi-territorial jurisdiction will take precedence in outer space.

While applying principles of the maritime law might seem like the obvious solution to the issue of jurisdiction, there are way more variables involved in the case of space travel which cannot be adequately addressed by the present maritime law without making some major modifications or implementing completely new principles for space travel.

Let's consider an illustrative case to understand this hierarchy of jurisdiction and to point out the flaws in these principles. Company X, which has been registered in State A has established a colony on Mars. All the personnel will be under the jurisdiction of State A, as long as they are in the Spacecraft which will transport them to Mars regardless of their own nationality. However, when they land on Mars and leave the Spacecraft the question that arises is: which form of jurisdiction will take precedence, whether State A will exercise jurisdiction even after leaving the spacecraft or will the personal jurisdiction take precedent in the absence of both territorial jurisdiction and quasi-territorial jurisdiction. Another issue which is likely to arise is whether the State will retain quasi-territorial jurisdiction over buildings or facilities established on the surface of Mars or whether such exercise of jurisdiction

³¹Cheng B. The Extraterrestrial Application of International Law. In: *Studies in International Space Law*. Oxford University Press; 1997. <http://www.oxfordscholarship.com/view/10.1093/acprof:oso/9780198257301.001.0001/acprof-9780198257301-chapter-5>. (last visited Oct. 26, 2017)

³²*Id.*



violates the very basic principles of international space law. Further, if such space colony or facilities are established by corporation of more than one State then issue of which State will exercise its quasi-territorial jurisdiction has to be determined before establishing such facilities as has been observed in the case of ISS.

Due to such conflict of jurisdiction, it is necessary to amend the treaties to establish which State will retain jurisdiction over personnel in outer space without national appropriation or without claiming sovereignty over any celestial bodies.

Issues of Property and Ownership of Space Resources

It is a well-established principle in international law that outer space and the celestial bodies are not subject to appropriation or sovereignty by any nation. It declares space as a 'province of mankind' based on the principle of 'res communis', free to be explored and used by all for benefit of all nations. This principle of non-appropriation is a backbone of international space law. Also, Articles I³³, IV³⁴ and VIII³⁵ of the OST confirm the open access to space and the general view that space or parts of it cannot be claimed by any country. Strict as it may be in this prohibition, it lacks in certain aspects such as defining what is outer space and celestial bodies. This principle of non-appropriation which extends only to State Parties stands as an issue when we talk about interplanetary

travel and habitation. The principal leaves out non-signatory, private organisations and persons. Could this mean that private organisations and individuals who are the subjects of interplanetary travel may not be bound by this provision?

However, in order to own, a property needs a superior authority to enforce it. Therefore, without an authority, a person would be in 'possession' of the land, rather than ownership.³⁶ Property cannot exist outside the sphere of state sovereignty.³⁷ In this context, the problem that could arise in case of Martian habitation is the manner in which the occupation will be done. And when it is done, there is a need for an authority to govern such settlements. This may be considered as a far-fetched dream, but there is a need to develop a strong legal framework to address these problems that are likely to arise in future.

Another problem that is likely to arise is regarding the ownership and exploitation of natural resources. The moon, Mars, and other celestial bodies contain resources that are scarce or non-existent on Earth and which could have immense value. One example is helium-3, a substance common on the moon but exceedingly scarce on Earth.³⁸ Energia, a Russian space corporation, announced that it intends to

³³ Outer Space Treaty, Art. I, Oct. 10, 1967, 8843 U.N.T.S 610

³⁴ Outer Space Treaty, Art. IV, para. 2, Oct. 10, 1967, 8843 U.N.T.S 610

³⁵ Outer Space Treaty, Art. VIII, Oct. 10, 1967, 8843 U.N.T.S 610

³⁶ Gray K., *Property in Thin Air*, 50, Cambridge L. J., 252, (1991)

³⁷ Virgiliu Pop, *Appropriation in Outer Space: The Relationship Between Land Ownership and Sovereignty on the Celestial Bodies*, 16, Space Policy, 275-282, (2000)

³⁸ Sarah Coffey, *Establishing a Legal Framework for Property Rights to Natural Resources in Outer Space*, 41 Case W. Res. J. Int'l L. 119, 120 (2009), Available at:

<http://scholarlycommons.law.case.edu/jil/vol41/iss1/6> (last visited Oct. 26, 2017)



build a permanent base on the moon by 2025 and to begin industrial-scale delivery of helium-3 by 2030. There is no proper framework in the current international space law regarding usage and exploitation of natural resources and States, as well as, private companies are desperate to pursue exploitation of natural resources. Although Article I³⁹ of OST implies that the resources and wealth gained from exploitation of all resources have to be redistributed, it does not provide a strict framework as to how this has to be done. It is argued that providing real property rights to private parties in celestial bodies would prevent wasteful use of such land and also allow exploitation of natural resources while preserving the environment.

At this juncture, the analogy may be drawn from the existing situation of Antarctica. For this, reliance may be placed on the Convention for Regulation of Antarctic Mineral Resource Activities (CRAMRA), 1988, which was entered into after 7 years of negotiations which allowed nationally sponsored mineral exploitation and mining and provided for regulation and collection of fees while protecting the environment. A similar framework has to be entered into for exploitation of celestial natural resources in order to avoid issues arising out of the loopholes in such treaties.

Another debatable issue is regarding the intellectual property rights in outer space. It is a well-established notion that intellectual property rights are territorial in nature and national laws are applicable to inventions and products of human creativity on earth. World Intellectual Property Organization (WIPO) was established to regulate

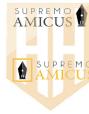
intellectual property rights on an international level. However, it is unclear whether such rights extend to outer space as well. It is also unclear about the legal situation in case of infringement of intellectual property rights in outer space, i.e., what law will be applicable and who will have the jurisdiction to decide upon such matters as outer space is free from sovereignty. Let's assume that an invention has been made by the inhabitants of such a body, now it is impossible to decide what law will be applicable to such intellectual property in such highly international environment where the separation of the territory is difficult to achieve. The ISS model can be relied on with respect to this issue. The IGA and the NASA Directive on Space Station Intellectual Property contain regulations settling the matter among the Member States. The approach of the ISS IGA to industrial proprietary rights and other intellectual property is consistent with the situation that the space treaties create, i.e. it follows the territorial principle. As a result, the legal regime governing intellectual property on board the ISS corresponds with the rules relating to the ownership of space objects. The sovereignty of each launching State is extended to the parts of ISS which are on its registry.

As all components of ISS are distinct and identifiable it is possible for determining which laws will govern such intellectual property, such might not be the case where there is a collaboration between more than one State for establishing a space colony.

Issues related to Safety and Security

The OST in Article VII provides that the State Party which launches or procures the

³⁹*Supra* note 33.



launching of an object into outer space, including the Moon and other celestial bodies, and from which State such launch is facilitated shall be internationally be liable for damage caused to another State Party or any natural or judicial persons on the Earth, in air space or in outer space, including the Moon and other celestial bodies.

Privatisation of Space related activities is still a new and underdeveloped concept even in space-faring nations such as the USA, where alternatives to government-provided space launch services began in the 2000s. Wired magazine in 2012 declared it as “the year of private space,” because of the success of SpaceX in conducting two launches to the ISS using their Falcon 9 vehicle.⁴⁰ The US law related to space was updated with the passage of the SPACE Act⁴¹ of 2015 in November 2015.⁴² This Act explicitly allows “US citizens to engage in the commercial exploration and exploitation of 'space resources' [including ... water and minerals].” The right does not extend to biological life, so anything that is alive may not be exploited commercially.⁴³

The SPACE Act includes the extension of indemnification of US launch providers for extraordinary catastrophic third-party losses of a failed launch through 2025, while the previous indemnification law was scheduled

to expire in 2016. The Act also extends, through 2025, the “learning period” restrictions which limit the ability of the FAA to enact regulations regarding the safety of spaceflight participants.⁴⁴

The Federal Aviation Administration (FAA) of the United States published “Safety Approval: Guide for Applicants” in 2009⁴⁵ which provides “procedures for identifying appropriate safety standards and obtaining a safety approval” for commercial launches in space.⁴⁶ While FAA doesn’t provide for industrial standard safety requirements under those guidelines, it establishes that it will evaluate the safety standards for each vehicle on a case by case basis based on established federal launch range practices and other industry safety standards.⁴⁷

It is essential to draw parallels between the safety standards and regulations followed by most of the Nations under the Chicago Convention and ICAO, which can be used as the basis for establishing proper safety regime for the space age as these treaties under the guidance of ICAO has been beneficial to the civil aviation.⁴⁸

⁴⁰Adam Mann, *The Year’s Most Audacious Private Space Exploration Plans*, WIRED, (Dec. 12, 2012, 6.30 AM),

<https://www.wired.com/2012/12/audacious-space-companies-2012/> (last visited Oct. 26, 2017)

⁴¹Spurring Private Aerospace Competitiveness and Entrepreneurship Act of 2015, § 102 H.R.2262 § 117

⁴²*Id.*

⁴³K.G. Orphanides, *American Government Could Soon Mine Asteroids for Profits*, WIRED, (Nov. 12, 2015), <https://www.wired.co.uk/article/how-to-mine-asteroids-for-fun-and-profit>

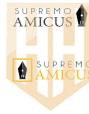
⁴⁴Jeff Foust, *Congress launches commercial space legislation*, THE SPACE REVIEW, (May 26, 2015), <http://www.thespacereview.com/index.html> (last visited Oct. 26, 2017)

⁴⁵SAFETY APPROVAL GUIDE FOR APPLICANTS, version 1.1, FAA, (Jul. 20, 2012), available at: https://www.faa.gov/about/office_org/headquarters_offices/ast/licenses_permits/safety_approvals/media/Safety_Approval_Guide_1.1.pdf (last visited Oct. 26, 2017)

⁴⁶*Id.* at Preface (iii)

⁴⁷*Id.* at 11

⁴⁸ While it has been argued by few authors that amending the Chicago Convention to include commercial space activities under it should be sufficient, it is argued that such a method is only a temporary fix and as both the subjects are vastly different from each other both should be governed



Article 3 of the Convention provides and recognises that every State must refrain from using weapons against civil aircraft in flight and that in the case of such an interception, the lives of the civilians on board and the safety of such aircraft must not be endangered. A similar provision can be adopted for commercial spacecraft's which will prohibit other State Party from using any weapons which will compromise the safety of passengers on board and the spacecraft, in case any such spacecraft during its flight or landing stage breaches the sovereignty of any State. Further, every State can be required to publish its regulations in force regarding the interception of civil spacecraft's similar to the requirement under Article 3 to publish such rules in case of interception of civil aircraft.

Further, the Convention provides for various issues faced in commercial civil aviation and provide appropriate solutions for the same. As it will be difficult and too tedious to adopt new Annexures to the present Convention, which could also lead to many difficulties⁴⁹ it is therefore suggested that a new treaty should be adopted for setting standards and regulating the conduct of civil commercial spacecraft by using the present Convention as the basis for the same.

under separate international treaties. This however, doesn't mean that Chicago convention and other guidelines laid down by ICAO cannot be used as basis for building upon the safety regime for commercial space activities. See Ruwantissa Abeyratne, *Regulation of Commercial Space Transport* (2015)

⁴⁹ Such as countries losing their status if they don't amend their domestic laws to support those new changes.

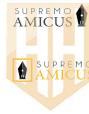
Issues related to conduct of humans during interplanetary travel

The next issue which should be addressed is how to regulate the behaviour of persons travelling and what measures should be adopted to govern them. This regulation should not only be limited to outer space or on celestial bodies but should also lay down a code of conduct which shall govern travel time or time spent in spacecraft. It is essential to regulate and govern the socio-political behaviour of individuals coming from different nationalities to ensure cooperation and success of each mission. In the development of space law, it has been observed that such regulation is possible in neutral territory where no state exercises its sovereignty. The most prominent example of such international cooperation and volunteerism is the International Space Station. Understanding the framework of ISS will play a very important role in framing laws governing the future of interplanetary travel as it is the most prominent man-made object in space right now.

The ISS programme is a joint project among five participating space agencies: NASA, Roscosmos, Japan Aerospace Exploration Agency (JAXA), European Space Agency (ESA) and Canadian Space Agency (CSA).⁵⁰ The working and functioning of the space station are established by intergovernmental treaties and agreements.^{51 52} Various bilateral

⁵⁰GARY KITMACHER, REFERENCE GUIDE TO THE INTERNATIONAL SPACE STATION 71-80 (Apogee Books, 2006)

⁵¹*International Space Station Legal Framework, Human Spaceflight*, EUROPEAN SPACE AGENCY, http://www.esa.int/Our_Activities/Human_Spaceflight



Implementing Arrangements between the space agencies have been established to implement the Memoranda of Understanding. These arrangements enumerate guidelines and tasks among the national agencies. The importance of Intergovernmental Agreement (IGA) and various arrangements is that they show the possibility of regulating human conduct in outer space if there is cooperation among individual States by their own consent and would further facilitate the objectives of international law of using space for peaceful purposes. Some of the essential concepts which have been developed under these agreements are discussed here briefly.

Article 9 of IGA provides for 'utilisation rights'⁵³, the philosophy behind this approach is that goods and services are exchanged by space agencies without exchange of funds. This bartering system has enabled the process of standardisation and commonality in the Space Station Programme.

The Crew Code of Conduct, (hereinafter 'the Code') agreed on by the Partners in September 2000, sets specific rules and a

chain of command for the astronauts and cosmonauts. Further, the Code establishes the relationship between ground and on-orbit management, standards for work, responsibilities with respect to elements and equipment, disciplinary regulations, along with physical and information security guidelines. In order to develop a code of conduct for people going for interplanetary travel, it is necessary to ensure that such code is based on inter-cultural values and valuable contributions from spacefaring nations along with nations which are still in initial stages of space exploration. One of the necessary aspects provided under the Code that ISS crew member has a right to know about the different requirements under all the agreements and regulations applicable and that he or she will be educated as to the applicable rules.

The Multilateral Crew Operations Panel (MCOP), a cooperative body established through Article 11 of the MOUs will exercise a central role, such as the procedure required for submitting a statement asserting violation of a prescription of the Code by a crew member, examining and making determination on this statement, the manner in which a decision may be revised, and the type of disciplinary measures that could be imposed depending on whether the violation occurred on Earth or during flight, etc. A similar international body can be established under the new space law regime to determine the necessary actions to be taken in violation of any of the principles enumerated under international law or agreements among different space agencies. Section II of the Code calls for the need to 'maintain a harmonious and cohesive relationship among the crew and assure an

http://International_Space_Station/International_Space_Station_legal_framework (last visited Oct. 26, 2017)

⁵²Zachary Boren Davies, *Russia and the US will build a new space station together*, THE INDEPENDENT (Mar. 28, 2015),

<http://www.independent.co.uk/news/science/russia-and-the-us-will-build-a-new-space-station-together-10140890.html> (Roscosmos and Nasa also intend to collaborate on a mission to Mars, according to Russian state media) (last visited Oct. 26, 2017)

⁵³Intergovernmental Agreement ISS of 1998, Art 9, (2006); (See also, other relevant parts of MoUs), available at:

http://www.esa.int/About_Us/ECSL_European_Centre_for_Space_Law/ISS_IGA_English_French (last visited Oct. 26, 2017)



appropriate level of mutual confidence and respect.’ In other terms, any interpersonal or group harassment would make the application of sanctions possible in a case where the MCOP determined that harassment had taken place.

One of the issues which were determined after a lot of discussions was the issue of ‘use of force.’ The following interpretive statement was included in the Code, ‘In the case where necessary to ensure the immediate safety of the Crew Members of the ISS, reasonable and necessary means may include the use by the ISS Commander of proportional physical force or restraint’ It is necessary to understand that in case immediate safety is jeopardised and after exhaustion of other possibilities only the Commander of ISS can use proportional physical force and not the crew members of ISS. In case of long-term space missions, it will be necessary to regulate the use of force and to determine who can exercise force if required without violating any rules.

While the IGA and MOUs already govern such conduct these agreements are only binding on the partner states and for the purpose of ISS, there is a need for having a similar code of conduct on an international level to ensure maximum compliance with all the States. The fastest mission to Mars is projected to take 2022,⁵⁴ it is very much necessary to impose proper rules to govern the conduct of humans not only after landing but also during travel time. The United Nations Office for Outer Space Affairs can

draft a model code of conduct to be followed during and after interplanetary missions and the parties to the same can implement the same principles in the internal legal systems to ensure a solid legal basis in order to persuade astronauts, crew, and passengers to abide by the rules outlined in the model code.

Other Issues

The new age of space exploration is like opening the Pandora’s box, it will not only raise legal issues which have been discussed above but will also raise a number of other social, cultural and economic questions, which must be discussed as well.

One of the most essential social/ethical questions which must be answered before we start exploring heavenly bodies is what will be our responsibility towards any other organic life form found on other planets? Any consideration of such extra-terrestrial life has to include both vegetation and intelligent life. In any discussion about future of space law, it is essential that we discuss what would be our duty to protect such life forms or to use them for the benefit of humankind. The discussion about the same can be carried onward from the UNISPACE III Conference organised by United Nations, which yielded in the adoption of “The Space Millennium: Vienna Declaration on Space and Human Development”.⁵⁵ This Declaration *inter alia* provides for protection of the space environment. There is no known principle of

⁵⁴Elon Musk Has a New Timeline for People Living On Mars, FUTURISM, (Feb. 19, 2017) <https://futurism.com/elon-musk-has-a-new-timeline-for-humans-living-on-mars/> (last visited Oct. 26, 2017)

⁵⁵ See Report of the Third United Nations Conference on the Exploration and Peaceful uses of Outer Space, United Nations Publication, Sales No. E.00.1.3. See also, A/RES/59/2 (30th Plenary Meeting, 20 October 2004) and A/RES/60/99 (62nd Plenary Meeting, 8 December 2005).



law which mentions “extra-terrestrial intelligence”. Therefore, there is no existing norm of international law which prohibits or regulates human interaction with such beings.

Another aspect which must be discussed is the impact of such breakthrough on human culture. The concept of culture is a unique and useful tool used by humans to understand their behaviour and relationship with their environment. On Earth, the human culture is incredibly diverse, so those who would operate in space perhaps with this multicultural society need to have skills for dealing effectively with cultural differences. The environment of outer space is completely different from Earth's which will provide for further growth in human culture as we try out new things in outer space. Only a handful of people have experienced true outer space but as this number grows it is evident that population in space will be multicultural and heterogeneous. As we establish human colonies on Mars or any other celestial body, there will be a need for cultural synergy, to ensure the differences between people foster cooperation and collaboration with others. Human culture is a product of harsh environments that people were exposed to, however, the case of interplanetary travel will be the first time that people will be able to consciously design the kind of culture we wish to create in this new frontier. A planned culture designed for outer space based on the data and insights of behavioural scientists will immensely benefit in cooperation.

Some of the other factors which have not been discussed in this paper but are nonetheless of equal importance for future

of humans in outer space are physical (medical-health/wellness), psychological (emotional behaviour), sociological (human systems/institutions), financial (economic resources and costs), political (government and other support systems), educational (preparation and training), management (organising/administering/leading projects), and communication (use of information technology for governing interpersonal and group interactions).

CONCLUSION

While interplanetary travel has always been a fascinating subject of science fiction, with the recent developments in space industry it is essential to recognise that interplanetary travel/habitat might become a reality sooner than we realise. The history of space law has been tainted by the overwhelming fear of war and this has greatly influenced the basic framework of international space law.

As the scope of interplanetary travel is wide, it is essential to define the present uses, which will overlap with interplanetary travel laws. The most prominent of these overlapping concepts are perhaps the development of space tourism as a recreational activity which might become a subject of interplanetary travel in the larger picture but is different from the fundamental concepts of interplanetary travel in the long term. The development of Astrolaw is perhaps an essential recent development under international law, which is still at an infant stage but is likely to grow with the further development of space industry and with the exploration and colonisation of the outer space and celestial bodies.



With the new era of space exploration, a number of social, political and cultural issues are likely to arise, while the present international law provides a strong framework to govern these issues on our planet, it might not be sufficient to cater to the needs of this complicated development of space law. The most prominent of the all the issues is the issue related to jurisdiction, which forms the basis of a sovereign state to exercise its power over its resources and persons. The development of space law was based on idealistic principles of *res communis* and *res nullius*. While these principles have been regarded as the most idealistic, it will be difficult to give importance to these principles with the development of humankind as space-faring species. The second most important issue is with respect to property and ownership of space resources. The present treaties and international law are not developed enough to regulate and govern the issues related to not only geological resources but also intellectual property rights issues. The present framework which can form the basis for the development of this concept is the International Space Station and the Antarctica Treaty. With a high learning curve for space-related activities due to technical and other aspects, it is essential that safety and security procedures to be followed in such case are based on universally accepted industrial standards and proper framework is established to resolve any issues with respect to damages or liabilities arising out of such cases. Although the Chicago Convention and ICAO are responsible for setting industrial safety standards for civil aviation, it is not clear whether the crafts used for

interplanetary travel will be governed under the same or newly adopted principles. Therefore, it is necessary to establish a new international organisation which will be responsible for setting safety standards and protocols with respect to outer space vehicles. The probability of failures at the initial stages is high, which makes it essential to amend the Liability Convention in order to provide a better mechanism to claim for any damages caused to any state or an individual due to such failure. Another important issue which must be addressed is regulating the conduct of crew and personnel on such crafts because of large travel time and other aspects of confining oneself in a limited space for a long period. The Crew Code of Conduct agreed by the Partners to the ISS project sets out well-established principles governing the conduct of astronauts during their stay in ISS. This Crew Code and the proposed Code of Conduct by the European Space Agency will provide a strong foundation for developing similar code governing not only the relationship between the crew and personnel on crafts but also during their stay on celestial bodies. There are many other ethical, moral and economic issues, which will arise with the increasing feasibility of interplanetary travel.

The first manned mission to Mars is projected to take place by 2022, therefore it is essential for the international community and the academic community to initiate discussions for addressing the issues which are likely to arise in case interplanetary travel becomes a reality in either the next 10 or 20 years.
