

ISSUES CONCERNING OUTER SPACE INVESTMENTS IN INTERNATIONAL LAW¹

Abstract

Recent improvements in technology have in essence increased the viability of outer space as the next frontier for international investment and development. In addition to the current commercial applications of outer space usage such as remote sensing and direct television broadcasting, real possibilities now exist for mining mineral deposits on the surface of the moon and nearby asteroids, among other things. Degradation and dissipation of most natural/mineral resources on Earth, steady increase in world population and the possibilities of exploring and exploiting outer space through advancements in technology make outer space investments not just necessary but inevitable. As an international arena, coupled with financial and technological costs of such ventures, outer space investments would require a number of issues tackled first. This article therefore sets to discuss these issues which include the need for cooperation among nations for robust outer space investments and the need to circumvent current legal and logistical barriers to such investments by putting in place a more enabling international legal regime to that effect. Doctrinal method is adopted in this research and the result reveals that several barriers—legal, logistical and economic, inhibit outer space investments. We examined relevant statutes, text books, journal articles, case law and the internet materials. The work recommends inter alia that an outer space property legal system that creates both incentives and predictability must be established to remove major barriers inhibiting outer space investments.

Key words: *Outer Space, Investments, International Law, International Space Station*

I. Introduction

It is really mindboggling and so, the first question that arises whenever discussion on investment in outer space is raised is “why”? Why are individuals, States, transnational corporations, and other entities interested in developing areas of the universe that involve great risk to the developers in terms of human and financial costs, especially when there are many areas eager for investment and ripe with potential on the Earth itself? There are varied answers of course, for the question: from the adventurous explanation used for mountain climbing (because it's there), to that of technological growth (because we can) to the scientific rationale (because it may offer new solutions and create wealth). Regardless of the reason, investment in outer space is not only necessary but inevitable and, in fact, has already begun. States, corporations, and other entities have launched satellites into the Earth's orbit to provide links for telecommunications, including cellular phones, global positioning systems, and direct television broadcasting. States and other organizations use these satellites to conduct remote sensing to gather data concerning weather patterns, environmental changes, and Earth-based natural resources, as well as man-made facilities.² These investments have been for purely scientific uses, national security or military reasons, commercial and consumer purposes, and a combination of these.

It is safe to argue that the most ambitious project concerning international investment in outer space to date is the joint effort of fifteen nations³ to construct the International Space Station

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²E J Reinstein, ‘Owning Outer Space’ (1999) 20 *NW. J. INT'L L. & BUS.*, 59.

³See Agreement Among the Government of Canada, Governments of Member States of the European Space Agency, the Government of Japan, the Government of the Russian Federation, and the Government of the United States of America Concerning Cooperation on the Civil International Space Station, *opened for signature* Jan. 29, 1998, United States Space Law: National & International Regulation” 98-1 (S Gorove, ed., 1998) [hereinafter

(ISS). The stated objective of the ISS is to "enhance the scientific, technological, and commercial use of outer space."⁴The signatories to the main agreement governing its construction and usage are realizing the advantages of sharing the risks and rewards of undertaking such a monumental effort of investing in outer space. Partners in building the ISS each contributed or will contribute a section or component of the facility. The value of the facility is estimated to be ninety-five billion dollars, a cost said to be prohibitive even to the wealthiest nation on its own.⁵

Although the ISS is exemplary in many respects, it also underscores many of the problems associated with the disparities between States in the North and those in South and does not focus on the environmental consequences of outer space development activities.⁶ Furthermore, the International Space Station, as one of the first manned structures located in the Earth's orbit, raises a number of difficult legal issues, which until now have been the subject of purely academic debate. Questions such as the attribution of liability for activities in outer space and where territorial air space ends and outer space begins, are a few of the subjects contemplated by the extant international outer space treaties; but which questions are not sufficiently answered⁷

There is no gainsaying that outer space and investments therein hold great potentials for the international wealth and economy although the hopes of profiting from such investments are still futuristic. There is need however to have the logistical and legal difficulties in relation to outer space investments dissolved if the hope of profitable investments in outer space will ever be actualized. Countries participating in these potential future ventures may look to the International Space Station and its constitutive document as a model for international cooperation, but should also consider the difficulties of living up to the ideals expressed in the Charter of the United Nations and the Outer Space Treaty with regard especially to the need for peaceful co-existence among nations.

2. Outer Space Regimes in International Space Law

The term "outer space" generally refers to the entire universe. In other words, it refers to any area beyond the earth's atmosphere. However, since spaceflight can be undertaken in only a very limited part of outer space, this general meaning is too broad for legal purposes. In a legal sense therefore, "outer space" refers to that part of the universe where human activities are practically possible or feasible.⁸ Some activities which are based on earth are, however, intrinsically linked to outer space activities and the question remains whether space law should also be applicable to these activities or not.

Space Station Treaty] noting that partners to the treaty include Canada (through the Canadian Space Agency), Belgium, Denmark, France, Germany, Italy, Netherlands, Norway, Spain, Sweden, Switzerland, and the United Kingdom (through the European Space Agency), Japan, Russia (through the Russian Space Agency), and the United States (through the National Aeronautics and Space Administration) "NASA".

⁴*Ibid*, Art. 1, para.1.

⁵ 'Russia Plans More Space Tourism' <<http://www.cnn.com/2001/TECH/space/04/29/shuttle.tourists/index.html>> accessed on 29 January 2014.

⁶T David, "Towards a New Regime for the Protection of Outer Space as the "Province of All Mankind"" (2000) 25

YALE J. INT'L L., 145.

⁷E J Reinstein, (n.2) pp. 59, 61-62. According to Reinstein, many people identify a lack of legal certainty as the reason for the rather limited investment in outer space to date.

⁸ 'Delimiting outer space' <www.saflii.org/za/.../5.html> accessed on 22 January 2014.

The politics of outer space are not as ‘out there’ as some may think. Issues regarding human activity (real and imagined for the future) in the cosmos include satellite regulation, collision liability between space objects, reconnaissance legality, weaponisation, the governance of the International Space Station, and celestial ‘territory’ ownership. Although these issues are mainly ‘played out’ roughly 70 miles above the earth’s surface, they are very much embedded in terrestrial politics, developed in the meetings, memoranda and minds of actors on earth.⁹ As a transnational and norm-governed area, outer space has the characteristics of a global common.¹⁰ As in other local and global common scenarios, nations of the world with interests in outer space have pursued coordination in order to establish ‘governance without government’ of the cosmos, and over the last 50 years human activity in outer space has come to be constrained by a complicated array of regimes.

2.1 The 1967 Outer Space Treaty

Modern space law emerged mostly in the 1960s and 1970s, in the midst of the Cold War, and has seen little revision since. This backdrop made sure that the legal regime addressed concerns over claims to national sovereignty in space by prohibiting national appropriation, and aimed at preventing tensions between the United States and the Soviet Union as they advanced in the field of space exploration.¹¹ There are four principal reasons why both the US and Soviet Union sought to create a legal regime prohibiting sovereign claims and encompassing Cold War concerns:

- they wanted to prevent an expansion of conflict to outer space;
- they sought to preserve the doctrine of free access to space;
- they knew that delineating boundaries in space would cause tension, and;
- they wanted to enhance their prestige vis-a-vis Third World States who would be pleased with a prohibition on sovereign claims in space.¹²

The Outer Space Treaty (OST) of 1967 was the first major ‘formal’ regime for outer space, in that it was explicitly written into a treaty by the UN Committee on the Peaceful Uses of Outer Space, and subsequently widely ratified by States worldwide.¹³ The Treaty established outer space as neutral territory, the ‘province of all mankind’, and declared that it remains free of nuclear weapons and other weapons of mass destructions (WMDs). This language is normative, but was born in part from hard Cold War politics. Neither the US nor the USSR felt they could ‘control’ outer space over the other, and hence it was better to require the other submit to it being free from appropriation and weaponisation. Also both countries wanted free over-flight for the purposes of launching reconnaissance satellites to pass over the others’ territory.¹⁴

However, over time, this regime has become part of the pre-constitutive framework through which nations and other actors understand their activity in outer space. Actors approach activity

⁹*Ibid.*

¹⁰A common is a resource to which no single decision-making unit holds exclusive title. See Vogler J. ‘The Global Commons: A Regime Analysis’ (1995) <www.jstor.org/stable/222/83> p.369-395; It is an “environmental object” which should not be appropriated to any individual group. See L Crowe ‘The Tragedy of the Commons Revisited’ (1969) <www.sciencemag.org/site/feature/misc/.../166-3909-1103pdf> accessed on 29 January 2014

¹¹L LRisley, ‘Examination of the Need to Amend Space Law’ (1999) <heinonlinebackup.com/nol-cgl-bin/get-pdf.cgl?handle=hein...6> accessed on 29 January 2014.

¹²N Wayne, ‘White, “Implications of a Proposal for Real Property Rights in Outer Space,” Proceedings’ (2000) *42nd Colloquium on the Law of Outer Space*, 366.

¹³ ‘Delimiting outer space’ (n.8)

¹⁴*Ibid.*

in space with a set of norms, rules, principles and decision-making procedures based on this treaty, which is already constraining their interests and behaviour. Further regimes for outer space have equally been framed which are all within the context of the OST. Even when more radical challenges to outer space governance have been made, they have been made in the *context* of the OST. For example, in the 1970s, a group of Equatorial States¹⁵ claimed sovereignty to a particular satellite orbit (Geostationary Orbit) in what was called the Bogota Declaration. Yet instead of saying that the OST was illegitimate, the contending States maintained that this orbit was *exempt* from the Outer Space Treaty. Outer Space Treaty (Treaty of Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies) is therefore viewed as general legal basis for the peaceful uses of outer space, providing a framework for developing law of outer space. Article I of this Treaty states that:

The exploration and use of outer space... shall be carried out for the benefit and in the interest of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind. Outer space... shall be free for exploration and use by all states without discrimination of any kind...

Article II enshrines the principle of non-appropriation when it states that “Outer Space, including the Moon and other celestial bodies, are not subject of national appropriation by claim of sovereignty, by means of use or occupation...” Article III extended the *corpus iuris spatiallis* by stipulating that “States parties to the Treaty shall carry activities in the exploration and use of outer space ... in accordance with international law and the Charter of the United Nations...”

Close examination of the Treaty reveals that it contains two principal concepts to wit: the non-appropriative nature of the outer space and the idea of humankind as a whole being entitled to the subsequent benefits of space exploration. The Treaty has however been criticized for obvious limitations in that it principally lacks any development in the entitlement of all nation to the benefits of space exploration, and having established the regime of *res extra commercium* for outer space, fails to settle an appropriate mechanism to fulfill the idea that later will become the concept of common heritage of mankind.

2.2 The 1979 Moon Treaty

The Agreement Governing the Activities of States on the Moon and other celestial Bodies within the Solar System other than the Earth, also known as the 1979 Moon Treaty, was the second attempt to make a body of law directed to human activities and investments in outer space. The Moon Treaty was developed as a result of the pressure from non-space-faring nations on the distribution of the potential profits derived from space exploration.¹⁶ The legacy of the 1967 Outer Space Treaty was clear enough to infer that several changes were necessary if the idea of the shared benefits of lunar resources were to be fulfilled. As a result, the Moon Treaty was drafted and presented for signature in December 1979 though, till date the Treaty still lacks sufficient signatories and none of space-faring nations has joined it.¹⁷

¹⁵Brazil, Columbia, Congo, Equador, Indonesia, Kenya, Uganda and Zaire.

¹⁶B Cheng, *Studies in International Space Law*, (Oxford: Oxford University Press, 1997) p. 125.

¹⁷<www.thespaceview.com/article/1954/1> accessed on 29 January 2014.

In its Article XI, the 1979 Moon Treaty, unlike the 1967 treaty states clearly that the Moon and its resources are Common Heritage of Mankind and called for establishment of a legal regime in order to accomplish the principle of common heritage with reference to the United Nations Convention on the Law of the Sea. Article XI of the 1979 Moon Treaty specified that:

The Moon and its natural resources are the common heritage of mankind. The Moon is not subject to national appropriation. Nor the surface nor the subsurface of the Moon shall become property of any State, International Intergovernmental or non-governmental organization, entity or any natural person...

The 1979 Moon Treaty was drafted not only as an improvement of the 1967 Outer Space Treaty, but also as a new legal regime intended to protect the interest of humankind regarding the Moon and its resources as part of outer space. Though it is somewhat true that the key question of how this treaty planned to enforce the principle of Common Heritage of Mankind is not fully answered, it is obvious to infer from the very text of the Treaty¹⁸ that a similar system to the one governing the deep seabed area needs to be established as soon as exploitation become feasible. In this case, a Moon authority and a Moon enterprise would work in the same context as the deep seabed area regime and a parallel system of exploitation intended to distribute the profits of the Moon's natural resources.

3. The International Space Station (ISS)

The International Space Station (ISS) is the most complex international scientific and engineering project in history and the largest structure humans have ever put into space. It is a high-flying satellite and laboratory for new technologies and an observation platform for astronomical, environmental and geological research.¹⁹ As a permanently occupied outpost in outer space, the ISS serves as a stepping-stone for further space exploration and investment.

The station flies at an average altitude of 248 miles (400 kilometers) above Earth and circles the globe every 90 minutes at a speed of about 17,500 mph (28,000 kph).²⁰ In one day, the station travels about the distance it would take to go from Earth to the moon and back.²¹ The space station can rival the brilliant planet Venus in brightness and appears as a bright moving light across the night sky. It can be seen from Earth without the use of a telescope by night sky observers who know when and where to look.²²

The International Space Station which cost about \$100-billion was built by five different space agencies²³ representing 15 countries, and continue to operate it today. The International Space

¹⁸The Moon Treaty 1979, art. 11, s. 5. It states thus, "States Parties to this Agreement hereby undertake to establish an international regime, including appropriate procedures, to govern the exploitation of the natural resources of the Moon as such exploitation is about to become feasible. This provision shall be implemented in accordance with article 18 of this Agreement".

¹⁹ 'Facts and History about ISS': <www.space.com/16748-international-space-station.html> accessed on 22 January 2014.

²⁰*Ibid.*

²¹*Ibid.*

²²*Ibid.*

²³NASA, Russia's Federal Space Agency (Roscosmos), the European Space Agency, the Canadian Space Agency and the Japan Aerospace Exploration Agency are the primary space agency partners on the project of ISS. See *ibid*

Station was taken into space piece-by-piece and gradually built in orbit.²⁴ It consists of modules and connecting nodes that contain living quarters and laboratories, as well as exterior trusses that provide structural support, and solar panels that provide power.²⁵ The first module, Russia's Zarya module, was launched in 1998. The International Space Station has been continuously occupied since Nov. 2, 2000.²⁶ Starting in 2015, changes to the ISS would be performed to prepare the complex for crewed commercial spacecraft, which will begin arriving as early as 2017. Current plans call for the space station to be operated through at least 2020. National Aeronautics and Space Administration (NASA) has requested an extension until 2024, but that proposal was complicated by a deterioration of U.S. relations with Russia in 2014 concerning Russia's military activities in Ukraine.²⁷ Discussions to extend the space station's lifetime are however ongoing among all international partners.

In size, the space station, including its large solar arrays, is said to span the area of a U.S. football field, including the end zones, and weighs 861,804 lbs. (391,000 kilograms), not including visiting vehicles. The complex now has more livable room than a conventional five-bedroom house, and has two bathrooms, a gymnasium and a 360-degree bay window. Astronauts have also compared the space station's living space to the cabin of a Boeing 747 jumbo jet.²⁸ With a full complement of six crewmembers, the station operates as a full research facility. In recent years, technology such as 3-D printing, autonomous Earth imaging, laser communications and mini-satellite launchers have been added to the station; some are controlled by crewmembers, and some controlled by the ground.²⁹ Research also reveals that there are dozens of ongoing investigations just to find out what would be the situation of the health of astronauts staying on the station for several months.

The Station is slated to host its first one-year crew in 2015-16, with NASA's Scott Kelly and Roscosmos' Mikhail Kornienko. The agencies have expressed interest in running more one-year missions in the future, though no serious commitment has been made to that effect to date.

3.1 Multinational Investment in the International Space Station

While the debates on the point of demarcation between air space and outer space still lingers, and might be an interesting academic question, its resolution is unnecessary to answer many of the issues concerning the ISS because it orbits the Earth at approximately 385 km (240 miles) above the Earth's surface.³⁰ This orbit is at a sufficient distance from Earth, under any definition, to squarely place the ISS within the ambit of the main treaties governing activities in outer space.³¹

The Outer Space Treaty does not, however, address the nuts and bolts of commercial development or exploitation of outer space, but rather preserves the area of outer space for the benefit of all mankind. The idea espoused by this Treaty has been interpreted differently by UN member States and a divide evolved between those States in the more-developed North

²⁴ 'Facts and History about ISS' (n.17)

²⁵ *Ibid.*

²⁶ *Ibid.*

²⁷ *Ibid.*

²⁸ *Ibid.*

²⁹ *Ibid.*

³⁰ International Space Station Treaty (29 January, 1998) art. 1, para. 3.

³¹ See generally, Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, (Moon Treaty) Dec. 18, 1979.

and those in the lesser-developed South. Most developed nations espouse the view that the development of outer space should benefit those who develop it, while most developing nations prefer an approach that shares the profits of the developing States with all nations.³²

From the title of its constitutive document, it is evident that only developed States are parties to the agreement creating the ISS. While the ISS is in many ways a model of multinational cooperation and in essence should provide platform for multinational investment, it is mostly an agreement among the more developed states of Europe, North America, Japan, and Russia.³³ Arguably therefore, developing States may not currently have sufficient resources to add to this particular international effort, but their virtual exclusion from the venture raises troubling questions in light of the ideals that the Charter of the United Nations and the main international treaty governing activities in outer space espouse.³⁴ It is glaring to note that none of the languages present in many other international treaties addressing the special status of lesser developed nations, however precatory it may be, is incorporated into the Space Station Treaty. This omission explains the fact that the Space Station Treaty is more akin to a multilateral investment contract than an international treaty.³⁵

The Space Station Treaty requires access to the Station on a reciprocal basis, and by so doing, it conforms to the specific language of the Outer Space Treaty.³⁶ However, the Space Station Treaty would be violating the spirit of the Outer Space Treaty, as expressed in Article I:

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.

This is because the Space Station Treaty only provides access to the ISS on a reciprocal basis, and thus, automatically excludes lesser-developed States, specifically because of their degree of economic or scientific development.

4. Legal Issues Concerning Investment in Outer Space and the ISS

It appears likely that commercial interests and investment in outer space will continue to grow in the coming decades. Investors are increasingly looking to space activities as new frontiers to gain what they believe are near limitless profits. Individuals such as Elon Musk and Richard Branson, along with companies including Planetary Resources and Deep Space Industries, are currently investing in space activities in various forms.³⁷ Like all investors, these private actors are motivated by profit. Yet, investing in outer space is both risky and expensive. Moreover,

³² J Nandasiri, 'Ensuring Equal Access to the Benefits of Space Technology for All Countries' in Chia-Jui Cheng (ed), *The Use of Airspace and Outer Space for All Mankind in The 21st Century* (1995) pp. 209-10.

³³ International Space Station Treaty. (n. 30).

³⁴ U.N. Charter 1945, pmb. (promoting the "advancement of all peoples").

³⁵ See *Martin Marietta v. INTELSAT* [1991]763 F.Supp. 1327 rev'd in part 978 F.2d 140 (4th Cir. 1992) (exemplifying U.S. case law concerning outer space activities which holds that private contracts entered into by parties with equal bargaining power will be enforced); see also *Union of India v. McDonnell Douglas Corporation* (Q.B. December 22, 1992) (discussing a similar line of thought followed by the English High Court ruling that where parties neglect to make an explicit choice of law provision, the Court will select the law to be applied based on inferences in the agreement)

³⁶ Space Station Treaty, art. 9 (discussing usage of the Space Station)

³⁷ B Jonathan, 'Encouraging Private Investment in Space: Does the Current Space Law Regime have to be Changed? (part 1)' <www.thespacereview.com/article/2669/1> accessed on 22 January 2014

given the current status of international law pertaining to outer space, little protection for investors exists. Hence, commercial ventures in outer space face critical obstacles today that serve to discourage further investment.

While the Space Station Treaty attempted to address many of the traditional concerns about investment in outer space, it is not thorough enough to establish legal certainty for investors. A preliminary issue concerns the launch of any vehicle bound for the ISS.³⁸ Before reaching the ISS, a vehicle must pass through the territorial air space of many sovereign nations. At least one scholar has however argued that since no country objected after the first space launch,³⁹ this practice of briefly violating territorial air space became accepted as "instant" customary international law. At least, to date, no State has challenged the legal right of an outer space vehicle to cross through another's territorial air space while traveling into outer space. Interesting questions may however arise in the case of so-called hybrid vehicles capable of operating in both outer space and air. Even assuming that a vehicle launching into outer space is an outer space vehicle and therefore subject to the Liability Convention,⁴⁰ other legal problems such as the apportionment of liability still arise.

The Liability Convention must be read in concert with the Outer Space Treaty, which requires States to bear international responsibility for activities in outer space undertaken by governmental or non-governmental organizations, and which necessarily includes private enterprises acting within their territory.⁴¹ Under this legal system, a State may therefore be held responsible for the acts of a corporation registered in its territory that procures a launch in a different State altogether, irrespective of the host State's knowledge or involvement in the launch.⁴² This sort of legal system does not encourage participation in the exploration, exploitation, and investment in outer space through the space station.

Another critical factor in any outer space investment relates to the handling of intellectual property rights and the transfer of technology. While these issues are not contemplated in the existing outer space treaty regime, they are clearly addressed in the Space Station Treaty.⁴³ In the Space Station Treaty, intellectual property is defined as having the meaning expressed in Article 2 of the Convention Establishing the World Intellectual Property Organization and is similarly supplemented by national laws.⁴⁴ A good example is the domestic law of the United States, or the "Patents in Space Act," which treats items or parts of items made, used, or sold

³⁸Space Station Treaty (n.33) arts. 12, 16, 17 (defining and determining liability for "launch vehicles" headed to and from Earth).

³⁹C Susan, 'Give Me My Space: Implications for Permitting National Appropriation of the Geostationary Orbit', (2001)19 *WIS. INT'L L.J.* 231, 241.

⁴⁰Under the Liability Convention, if a space object causes damage on the surface of the Earth or to aircraft in flight, absolute liability attaches to the launching State. See Space Liability Convention, 1972. Art. 11. The launching State is defined as the "State which launches or procures the launching of a space object... or... a State from whose territory or facility a space object is launched. See *Registration Convention*, Art. I.

⁴¹Outer Space Treaty, art. VI.

⁴²J L Ricky, 'Reconciling International Space Law with the Commercial Realities of the Twenty-First Century' (2000)4 *SING. J. INT'L & COMP. L.*194, 230-31. (Narrating how this example came to life in the OTRAG case, where Germany actively discouraged a German company from assembling rockets and launching them from private facilities in Libya and Congo).

⁴³Space Station Treaty (n.38), art. 21.

⁴⁴*Ibid.*

in outer space in the same manner as if they had been under the jurisdiction of the United States, subject to certain exceptions.⁴⁵

Another legal issue which we consider critical to outer space investment concerns the mechanisms available for the settlement of disputes that will inevitably arise with regard to outer space. The Liability Convention provides that damages caused by space objects in certain locations must be compensated in an amount:

determined in accordance with international law and the principles of justice and equity, in order to provide such reparation in respect of the damage as will restore the person, natural or juridical, State or international organization on whose behalf the claim is presented to the condition which would have existed if the damage had not occurred⁴⁶

If the claim cannot be settled through diplomatic channels, the Liability Convention provides that a Claims Commission can be established at the request of either party.⁴⁷ Unfortunately however, just like other branches of international law, the Claims Commission awards are not enforceable.⁴⁸ Furthermore, an even less satisfactory dispute resolution protocol is included in the Moon Treaty.⁴⁹ The Moon Treaty's provisions failed to elaborate on the sheer minimum of the principles recommended in the United Nations Charter.⁵⁰

The International Law Association has in an attempt to address the lack of appropriate tools for resolving these types of disputes, suggested a Draft Convention on the Settlement of Space Law Disputes.⁵¹ Parties to such disputes may also avail themselves of the International Court of Air and Space Arbitration, established in 1994 by the *Societe Francaise de Droit Aerienet Spatial*. They might resort to the method established by the International Convention for the Settlement of Investment Disputes⁵² as a model, and tailor its terms so they apply in the outer space context.

⁴⁵See *inter alia* Patentability of Inventions and Grant of Patents, (1990) 35 U.S.C. § 105, P.L. 101-580; S Dieter, 'Issues of Intellectual Property in Relation to Research and Invention in Outer Space: European Community Perspective' in Sa'id Mosteshar (ed), *Research And Invention In OuterSpace: Liability And Intellectual Property Rights* (Somerset: Hynes Publishing, 1995) p.80.

⁴⁶Space Liability Convention, (n.40) art. XII.

⁴⁷*Ibid*, arts. XIV-XIX.

⁴⁸The implication being that states which suffered damage under the Liability Convention have no guarantee that they will receive full compensation, nor that, if a decision for compensation is granted by the Claims Commission, enforcement measures are at their disposal.

⁴⁹Moon Treaty (n.17). Art. XIII, (assessing responsibility of dispute resolution to "the State Parties to the treaty" and possibly, International Organisations).

⁵⁰U.N. Charter, (n.33). Art. 33, para. I (providing that "parties to any dispute, the continuance of which is likely to endanger the maintenance of international peace and security, shall, first of all, seek a solution by negotiation, enquiry, mediation, conciliation, arbitration, judicial settlement, resort to regional agencies or arrangements, or other peaceful means of their own choice"); for purpose of comparison, see also Moon Treaty, *Op Cit*, Art. 15, paras 2 & 3.

⁵¹ 'Convention on the Settlement of Space Law Disputes', Int'l L. Assoc., Res. No. 13/2000, <<http://www.ilahq.org/pdf/Space%20Law/RESspace.pdf> > accessed on 29 January 2014.

⁵²Convention on the Settlement of Investment Disputes between States and Nationals of States, March 18, 1965, 17 U.S.T. 1270, 575 U.N.S.T.S. 159.

Lastly, the legal principles espoused by the International Court of Justice regarding liability and responsibility should also be considered by parties to disputes involving outer space investment.⁵³

5. Logistical and Other Space-Related Barriers to Investments

In any industry, legal uncertainty hinders investment. Accordingly, the uncertainty regarding the aforementioned legal issues has been a barrier for many companies otherwise eager to invest in outer space. Besides this legal uncertainty, there are other barriers to outer space investment which are both economic and policy-based.

5.1 Economic Barriers: Outer Space investment is an expensive business. For example, the cost of establishing a new capability, such as a reusable launch vehicle or an on-orbit manufacturing facility, is likely to be in the multi-billion dollar range.⁵⁴ The need to acquire a very high level of start-up capital therefore creates a barrier to entry into the space investment, especially for developing States and small and/or start-up firms.

The risks associated with space activities also increase the difficulty with regards to space investment. Risks arise from both technical factors and market factors. Technical risks exist because space systems are complex, often requiring new technology, and because space activities occur in a hazardous, challenging, and distant environment where maintenance and repair are expensive and in some cases might prove impossible. Market risks also arise because in many cases the services being offered are new and it is difficult to predict what the customer response will be.⁵⁵ Additionally, financing costs are high and the time frame for achieving a return on investment is fairly long.

5.2 Policy-based Barrier: Government policies can affect space investment and, constitute the greatest barriers especially to private investors. This barriers can occur in either of the two ways: areas where government regulation and oversight are perceived as restrictive or inappropriately competitive⁵⁶ (i.e., the government should do less in order to foster space commerce) and areas where government policies and actions are perceived as insufficiently supportive (i.e., the government should do more in order to foster space commerce).⁵⁷ Despite the increasing commercial focus of space activities, government expenditures and policies will continue to have a major impact on space commerce and private investors' willingness to invest in outer space. The greatest potential impact of government policies will arise from expenditures to reduce the costs of access to space, most likely through the development of reusable launch vehicles. The magnitude of this impact, even if launch costs drop dramatically, is difficult to predict. This uncertainty about potential benefits may inhibit government and industry willingness to commit significant resources to fostering new space markets. Finally, decision-making in both government and industry regarding space commerce will be increasingly shaped by international competition.

⁵³Chorzow Factory Case (F.R.G. v. Po1.), 1928 P.C.I.J. (ser. A) No. 17, at 47 where the Permanent Court held that reparations "must, as far as possible, wipe out all the consequences of the illegal act and re-establish the situation which would, in all probability, have existed if that act had not been committed".

⁵⁴Christensen, C Bryce, Pober & Deborah: 'Barriers to Space Commerce' <www.encyclopedia.com/doc/1G2-3408800023.html>accessed on 22 January 2014.

⁵⁵*Ibid.*

⁵⁶Export/import restrictions, safety and licensing regulations, and launch range use policies are examples of areas that have been criticized as too restrictive.

⁵⁷Christensen, C. Bryce, Pober & Deborah (n.54)

5.3 Besides, both the Outer Space Treaty of 1967 and the Moon Treaty of 1979 forbid nations from claiming any part of the Moon or other celestial body.⁵⁸ This has left outer space void of any legal system that would enable entrepreneurs and companies to plan and execute commercial space activities on the outer space including the moon. It is deducible from the above that lack of Sovereignty in outer space by States also constitutes barrier to outer space investments.

6. Conclusion and Recommendations

If exploitation of and profitable investment in outer space is our goal today, an outer space property legal system that creates both incentives and predictability must be established. Space development is a highly risky endeavor as well as mind-bogglingly expensive coupled with other space-related barriers to investment. Private individuals, companies and even States would not expend efforts in developing a space colony if they were not certain of the project's legality. In view of the current advancement in space-field, valuable projects such as energy collection, mining, and colonization are by no means inevitable. If the law of outer space rejects such uses, or even makes their legality cloudy and uncertain, it is unlikely that the necessary technology to embark on such project would ever be created.

Due to the current confusion regarding space law, something should be done to encourage investment in space by clarifying, amending, or replacing where necessary, the existing legal regime in space. The focus would be to establish a positive legal regime, not just one that may or may not prohibit appropriation in outer space but which would serve to provide investors with clarity regarding what they can and cannot claim. It could also make sure that any actions it allows in space be constantly in accordance with international consensus. This would serve to prevent, as much as possible, conflicts arising between space actors over claims they make. Lastly, a new regime would have to encourage private industry while not losing sight of one of the current priorities in existing space law: preserving equitable sharing in space.

In essence therefore, a wholesale replacement of the Outer Space Treaty with a new legal regime is not advocated in this work as that would be unnecessary. Instead, a solution realizing limited property rights within the existing legal structure provided by the Outer Space Treaty would best serve to encourage future (private) investment while still upholding the necessary prohibition on national claims of sovereignty in outer space. This can be done by establishing a regime of functional property rights within the existing legal structure governing outer space. Under such a regime, the prohibition on sovereign claims in space would remain. This is because conferral of title would not depend upon States sovereign claims over a specific area (as is required under common law), but instead title would be based on functional control over space objects and personnel in that location, thus drawing on the jurisdiction given to States in space under Article VIII of the Outer Space Treaty. Conferral of such rights would almost be identical to property rights on Earth and would undoubtedly encourage space investment.

⁵⁸Article 11, Paragraph 2 states that “The moon is not subject to national appropriation by any claim of sovereignty, by means of use or occupation, or by any other means.”