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Commercialization of Space Activities— The Laws and Implications

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COMMERCIALIZATION OF SPACE ACTIVITIES—THE LAWS AND IMPLICATIONS

ENG TEONG SEE*

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ABSTRACT

According to an estimate by the Satellite Industry Association, the global space industry grew from \$104 billion in 2004¹ to about \$322.7 billion in 2014.² The figures encompass both satellite and non-satellite aspects of the space industry. The industry grew by another four percent in the years 2014 to 2015 to an estimated global industry revenue of \$335.3 billion.³ With more commercialization of outer space activities, the figures are expected to continue to grow at an exponential rate.

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¹ *Space Industry to Pass \$100 Billion in 2004, Continued Growth Forecast*, DEFENSE-AEROSPACE.COM (Feb. 5, 2004), [http://www.defense-aerospace.com/articles-view/release/3/33063/space-industry-sales-seen-over-\\$100-bn-\(feb-5\).html](http://www.defense-aerospace.com/articles-view/release/3/33063/space-industry-sales-seen-over-$100-bn-(feb-5).html) [<https://perma.cc/HDR9-5T4B>].

² SATELLITE INDUSTRY ASSOCIATION (SIA), 2015 STATE OF THE SATELLITE INDUSTRY REPORT 7 (2015), <http://www.sia.org/wp-content/uploads/2015/06/Mktg15-SSIR-2015-FINAL-Compressed.pdf> [<https://perma.cc/5DMB-4MQ5>].

³ SATELLITE INDUSTRY ASSOCIATION (SIA), 2016 STATE OF THE SATELLITE INDUSTRY REPORT 7 (2016), <http://www.sia.org/wp-content/uploads/2016/06/SSIR16-Pdf-Copy-for-Website-Compressed.pdf> [<https://perma.cc/V2AX-EDWM>].

More and more States and private actors are keen on the lucrative space business, not to mention space resources. With more private participation in space activities driven by economic incentives, there are bound to be issues of competition for and exploitation—if not over-exploitation—of inherently limited natural resources. One question that inevitably arises is whether the current international legal framework on outer space is sufficiently established to cope with the pendulum swing from a landscape once dominated by the States, typified by political dominance and national pride, to one driven by economic interests, as well as to cope with problems arising from competition for space resources.

I. INTRODUCTION

STEPHEN HAWKING ONCE REMARKED: “I believe that the long-term future of the human race must be space⁴ Our only chance of long term survival is not to remain inward looking on planet Earth, but to spread out into space.”⁵ Space adventure began as a State-dominated activity, but the scene has since changed as commercialization of space takes shape.⁶ While Hawking’s statements may not reflect the space activities when they began in 1960, it certainly hints at future space activities.

Space activities are inherently “international in nature because of the physical characteristics of outer space and because the sphere of operations of such activities”⁷—there is no international boundary when satellites are placed in orbit, when satellites take images of the Earth by way of remote-sensing, and when the International Space Station is “parked” in outer space. After all, the exploration and use of outer space, including the

⁴ Michael Logarta, *Humanity’s Future Depends on Empathy, Says Stephen Hawking*, GMA NEWS ONLINE (Feb. 24, 2015, 6:15 PM), <http://www.gmanetwork.com/news/scitech/science/442105/humanity-s-future-depends-on-empathy-says-phen-hawking/story/> [<https://perma.cc/Z5B5-DWKA>].

⁵ Clara Moskowitz, *Stephen Hawking Says Humanity Won’t Survive Without Leaving Earth*, SPACE.COM (Aug. 10, 2010, 6:14 PM), <https://www.space.com/8924-phen-hawking-humanity-won-survive-leaving-earth.html> [<https://perma.cc/4M4L-TG5C>].

⁶ CARL E. BEHRENS, SPACE LAUNCH VEHICLES: GOVERNMENT ACTIVITIES, COMMERCIAL COMPETITION, AND SATELLITE EXPORTS, CRS ISSUE BRIEF FOR CONGRESS (2006); GEORGE V. D’ANGELO, AEROSPACE BUSINESS LAW 6 (1996); C. Brandon Halstead, *Hybrid Hops On (and Over) the Horizon: The Future Has Arrived, and Requires a New Look at Air and Space Law*, 34 ANNALS AIR & SPACE L. 775, 776–77 (2009).

⁷ Ram S. Jakhu, *Legal Issues Relating to the Global Public Interest in Outer Space*, 32 J. SPACE L. 31, 49 (2006).

Moon and other celestial bodies, is the province of all mankind, and outer space is not subject to national appropriation or sovereignty claims.⁸ When private entities carry out their activities on the Earth, they are governed by the laws of the jurisdiction in which they carry out the activities. In outer space, what laws are to govern their activities?

Since the activities are international in nature, international law *prima facie* applies. As it stands now, there are five international space treaties in place, namely, the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and other Celestial Bodies 1967 (Outer Space Treaty); the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space 1968 (Rescue Agreement);⁹ the Convention on International Liability for Damage Caused by Space Objects 1972 (Liability Convention);¹⁰ the Convention on Registration of Objects Launched into Outer Space 1975 (Registration Convention);¹¹ and the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies 1979 (Moon Agreement).¹² The Outer Space Treaty is deemed to be the “Constitution” of outer space as it lays down certain principles that are regarded as rules of customary international law.¹³

The five international space treaties were, however, drafted at a time when space activities were solely within the province of

⁸ Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies art. I–II, Jan. 27, 1967, 18 U.S.T. 2410, 610 U.N.T.S. 205 [hereinafter Outer Space Treaty] (“by claim of sovereignty, by means of use or occupation, or by any other means”).

⁹ Apr. 22, 1968, 19 U.S.T. 7570.

¹⁰ Mar. 29, 1972, 24 U.S.T. 2389.

¹¹ Jan. 14, 1975, 28 U.S.T. 695.

¹² Jan. 27, 1967, 18 U.S.T. 2410.

¹³ Ram S. Jakhu & Yaw Otu M. Nyampong, *International Regulation of Emerging Modes of Space Transportation*, SPACE SAFETY REGULATIONS AND STANDARDS 220 (Joseph N. Pelton & Ram S. Jakhu eds. 2010). The principles include: “(a) that the exploration and use of the outer space must be carried out for the benefit and in the interests of all mankind; (b) outer space and celestial bodies are free for exploration and use by all States on the basis of equality and in accordance with international law; (c) outer space and celestial bodies are not subject to national appropriation by any means; (d) States party to the Treaty are obliged not to place in orbit around the Earth any objects carrying nuclear weapons or any other kind of weapon of mass destruction; and (e) in the exploration and use of outer space, States are to be guided by the principle of cooperation and mutual assistance and must conduct all their space activities with due regard for the corresponding interests of other States.” *Id.*

the States.¹⁴ The treaties were not intended for private commercial activities in space.¹⁵ Speaking on the emerging aerospace transport, authors Jakhu and Nyampong state that “no international space treaty specifically and effectively regulates space safety.”¹⁶ While the statement was specifically made in relation to aerospace transportation, it appears to be true and applies with equal force to commercial space activities in general.¹⁷ The same authors state further that the “current international space treaties are insufficient for current and future space utilization needs.”¹⁸

Whether the international legal framework is sufficient to deal with commercialization of space activities would *prima facie* depend on the nature of the activity concerned and the international law, if any, that applies to it. This article is, therefore, intended to examine a number of space activities and the legal issues and implications that arose or might arise from their commercialization. While it would be beyond the scope of this article to examine every feasible issue, this article will examine certain select issues and the impact of commercialization thereof. Namely it will examine “orbit hoarding,” remote sensing, and space mining before concluding with some remarks on the militarization of outer space.

II. HOARDING OF ORBITAL POSITIONS AND RADIO FREQUENCIES

The use of satellites has become virtually indispensable in our daily lives. Their uses may be found in banking, global positioning systems, meteorological services, satellite broadcasting, satellite communications, rescue services, and many others.¹⁹

¹⁴ FRANCIS LYALL & PAUL B. LARSEN, *SPACE LAW—A TREATISE* 559 (2009).

¹⁵ RICKY J. LEE, *LAW AND REGULATION OF COMMERCIAL MINING OF MINERALS IN OUTER SPACE* 8 (Prof. Ram S. Jakhu ed., 2012).

¹⁶ Jakhu & Nyampong, *supra* note 13, at 222.

¹⁷ Sylvia Ospina, *International Responsibility and State Liability in an Age of Globalisation and Privatisation*, 27 *ANNALS AIR & SPACE L.* 479, 491 (2002) (“The texts of the outer space treaties have not been amended since they were first drafted in a context that is very different from to-day’s socio-economic and political contexts. Whereas before a very limited number of States were involved in space activities, today a growing number of States and corporations have launch capabilities, and incentives to venture into a variety of space activities, including ‘tourism’ or space flights paid for by private parties.”).

¹⁸ Jakhu & Nyampong, *supra* note 13, at 223.

¹⁹ G.A. Res. 1721 (XVI) (Dec. 20, 1961) (underlining the significance of satellite telecommunication by stressing the need to make communication by means

However, to have such applications, one has to launch satellites into space and place them in the relevant orbits.²⁰ The significance of satellites to global telecommunications is witnessed in the UN Resolution 1721(D), which unanimously declares that satellite telecommunication services should be made available on a global and nondiscriminatory basis.²¹ To operate satellite telecommunication, one needs radio frequencies. Both radio frequencies and geostationary earth orbital positions are, however, limited natural resources, as explicitly recognized in the International Telecommunication Union (ITU) Constitution: “Member States shall bear in mind that *radio frequencies and any associated orbits*, including the geostationary-satellite orbit, are *limited natural resources* and that . . . countries . . . may have *equitable access* to both, taking into account *the special needs of the developing countries and the geographical situation of particular countries*.”²²

With more economic development, particularly in the developing countries, there has been more demand for instantaneous, satellite-based communications.²³ This may be seen in such countries as China and India, which have large populations.²⁴ Satellite-based communications have a number of advantages

of satellites “available to the nations of the world as soon as practicable on a global and non-discriminatory basis.”)

²⁰ Jakhu, *Legal Issues*, *supra* note 7, at 72. (“There are several orbits from where a satellite can operate. The geostationary orbit (GEO) is the most preferred and used orbit. The 24-hour ‘visibility’ of a satellite in GEO makes it uniquely advantageous for telecommunications and certain other services. Other orbits, such as Low Earth Orbit (LEO) and Medium Earth Orbit (MEO), have been used for telecommunication satellite constellations, reconnaissance, early warning, science, and other purposes.”)

²¹ G.A. Res. 1721 (XVI) (Dec. 20, 1961).

²² Int’l Telecomm. Union Constitution art. 44.2 [hereinafter ITU Constitution], <http://www.itu.int/en/history/HistoryDigitalCollectionDocLibrary/constitutionsConventions/5.12.61.en.100.pdf> [<https://perma.cc/A95J-VNNU>] (“In using frequency bands for radio services, Member States shall bear in mind that *radio frequencies and any associated orbits*, including the geostationary-satellite orbit, are *limited natural resources* and that they must be used rationally, efficiently and economically, in conformity with the provisions of the Radio Regulations, so that countries or groups of countries may have *equitable access* to those orbits and frequencies, taking into account *the special needs of the developing countries and the geographical situation of particular countries*.”) (emphasis added); *see also* Int’l Telecomm. Union, Radio Reg. pmb. (2012) [hereinafter ITU RR].

²³ Ram S. Jakhu, *Regulatory Process for Communications Satellite Frequency Allocations*, HANDBOOK OF SATELLITE APPLICATIONS, VOLUME 1 271 (Joseph N. Pelton et al. eds. 2013).

²⁴ MICHAEL C. MINEIRO, SPACE TECHNOLOGY EXPORT CONTROL AND INTERNATIONAL CO-OPERATION IN OUTER SPACE 89 (2012).

over land-based infrastructure, particularly in terms of costs and mass coverage. The term “equitable access” is not defined in the ITU Constitution. However, some of the provisions therein suggest that the special needs of developing countries and the geographical location of certain States must be considered when allocating and utilizing orbital positions and radio frequencies. The provisions also suggest that member States may have equitable access only in conformity with the ITU Radio Regulations (ITU RR).²⁵ Due to the difficulties associated with any amendment of the ITU RR, equitable access has been affected in relation to some allotment plans only.²⁶

The ITU allocates and allots radio frequencies on two bases: the first-come-first-served basis and a priori frequency planning basis.²⁷ While the applications to the ITU for radio frequencies and associated orbits are done by the States, with commercialization of space activities and the ensuing need for more orbital positions and radio frequencies, the private sector will naturally lobby their States to make such applications. The urge for more frequencies and orbital positions even push the private entities and their States to register first, regardless of when they will launch the satellites, leading to what is termed a “gold rush” in space.²⁸ The move is significant, as registration comes with seniority and priority.²⁹ There is no obligation on the part of the relevant States to use the frequencies and orbital positions immediately—they have up to seven years to place a satellite into orbit before losing their rights.³⁰ Indeed, States are known to

²⁵ Jakhu, *Legal Issues*, *supra* note 7, at 73.

²⁶ *Id.* (“The limited change ‘can be attributed to the unwillingness of some powerful member States of ITU to accept restrictions on their freedom of action in the use of radio frequencies and orbital positions.’”).

²⁷ *Id.* at 72; Jakhu, *Regulatory Process*, *supra* note 23, at 282–83 (the former is based on Articles 9 and 11 of the ITU RR, while the latter is based on Appendices 30 and 30A (for broadcasting satellite service) and Appendix 30B (for fixed satellite service) of the ITU RR).

²⁸ Peter de Selding, *Signs of a Satellite Internet Gold Rush in Burst of ITU Filings*, SPACE NEWS (Jan. 23, 2015), <http://spacenews.com/signs-of-satellite-internet-gold-rush/> [<https://perma.cc/EP7P-X2XU>]; see also Edmund L. Andrews, *Tiny Tonga Seeks Satellite Empire in Space*, N.Y. TIMES (Aug. 28, 1990), <http://www.nytimes.com/1990/08/28/business/tiny-tonga-seeks-satellite-empire-in-space.html?pagewanted=all> [<https://perma.cc/FKN7-VLTE>]; Dwayne A. Day, *Tough Little Spinner*, THE SPACE REVIEW (Feb. 28, 2011), <http://www.thespacereview.com/article/1787/1> [<https://perma.cc/246Y-ZGMV>] (Tonga, a small island state in the Pacific, actually notified the ITU for 16 orbital slots and ultimately obtained 6).

²⁹ Jakhu, *Legal Issues*, *supra* note 7, at 74 (early registration blocks the placing of other satellites in the same location in the GEO).

³⁰ ITU RR, *supra* note 22, art. 9.1.

even resort to leasing satellites to keep their slots occupied.³¹ Some feared the gold rush in outer space would lead to the prejudice of less-developed countries that had yet to have spacefaring capability.³² While space-faring capability is not required to register, many developing States do not have the financial capability or markets large enough to justify the purchase or use of, let alone sustaining the use of, satellite-based communications at present. The registration of “paper satellites” is real and widespread,³³ and their use goes against the principle of nondiscriminatory exploration and use of outer space.³⁴ It also goes against the equitable use by developing countries;³⁵ it might be too late for those developing States to find a slot in outer space by the time they have the financial capability. Since the gold rush and the issue of paper satellites does not only affect developing countries with no spacefaring capability, but also other countries *with* such capabilities, particularly emerging space nations like China, India, and North Korea, the issue is likely to become more acute as time goes by because there is a possibility of the international community running out of the limited natural resource of orbital slots.

To prevent the issue from worsening, the ITU has adopted some measures. One is the a priori measure which is intended to ensure that developing as well as non-spacefaring States will have their due share of frequencies and orbital positions when the need arises in the foreseeable future.³⁶ Another measure is financial due diligence, under which States making applications have to pay filing fees to the ITU for processing their applications.³⁷ The third measure is administrative due diligence that requires the States to provide evidence of seriousness of their

³¹ Peter de Selding, *Eutelsat Leases Chinese Satellite at 11th Hour to Protect Orbital Slot*, SPACE NEWS (May 13, 2011), <http://spacenews.com/eutelsat-leases-chinese-satellite-11th-hour-protect-orbital-slot/> [<https://perma.cc/7563-SK2B>].

³² As seen in the draft resolution submitted by Cameroon, Guinea, Kenya, Libya, Rwanda, and Zambia to the Plenipotentiary Conference (PP-10) of the ITU at Guadalajara, 4–22 October 2010.

³³ *Paper Tigers, The Scramble for Space Spectrum*, INT’L TELECOMM. UNION (July 15, 2003), http://www.itu.int/newsarchive/pp02/media_information/feature_satellite.html [<https://perma.cc/C488-4B54>]; Francis Lyall, *Paralysis by Phantom: Problems of the ITU Filing Procedures*, 39 COLLOQUIUM ON THE LAW OF OUTER SPACE 187 (1996); Jakhu, *Regulatory Process*, *supra* note 23, at 272.

³⁴ Outer Space Treaty, *supra* note 8, art. I.

³⁵ ITU Constitution, *supra* note 22, art. 44.2.

³⁶ ITU RR, *supra* note 22, apps. 30, 30A, 30B (for broadcasting satellite service in Appendices 30 and 30A and for fixed satellite service in Appendix 30B).

³⁷ *Id.* art. 9.2B.1 n. 11.

intention to establish a satellite network.³⁸ The ITU RR also permits the ITU to cancel the frequency assignment if there is a failure to bring it into use within the seven-year period.³⁹ The effectiveness of such measures, however, remains to be seen.⁴⁰ Another possible measure under consideration is shortening the period within which a State is to bring the radio frequency into use. Notwithstanding the ITU's proposal to cancel unused radio frequencies,⁴¹ the ITU RR does not place any time limitation on States' continued occupation of frequencies and orbital slots after they have started using them.⁴² Further, the ITU does not have any effective enforcement power.⁴³ Thus, there remains, in theory, the likelihood of frequencies and slots drying up as commercialization of space activities keeps growing, though it has not materialized yet. The lack of mandatory international dispute resolution mechanisms within the ITU further complicates the situation. Notwithstanding the existence of some diplomatic negotiation procedures⁴⁴ and arbitration procedures,⁴⁵ as one learned author in space law rightly points out, none of the provisions have ever been used.⁴⁶ While noting that member States have largely abided by the ITU regulations for the fear that any

³⁸ By providing, among others, the identity of the satellite network and the spacecraft manufacturer. ITU resolution 49, Annex 2 (1997).

³⁹ ITU RR, *supra* note 22, art. 11.44.

⁴⁰ Jakhu, *Legal Issues*, *supra* note 7, at 75.

⁴¹ ITU RR, *supra* note 22, art. 13.6.b (providing a lengthy process by the Radiocommunication Bureau to cancel any unused assignment of radio frequencies, subject to the decision of the Board); *see also* Int'l Telecomm. Union Radio Communication Bureau, Circular Letter CR/301 (May 1, 2009), https://www.google.com/url?sa=t&rct=j&q=&esrc=S&source=web&cd=1&cad=rja&uact=8&ved=0ahUKEwidpoHhtv3RAhVpxYMKHXs2CtcQFggaMAA&url=https%3A%2F%2Fwww.itu.int%2Fdms_pub%2Fitu-r%2Fmd%2F00%2Fcr%2Fcir%2FR00-CR-CIR-0301!!MSW-E.doc&usg=AFQjCNFF70FZolNn1FjfwBRIEyG9Iw44jw [<https://perma.cc/BVJ4-2MJ7>] (a "threat" by the Radiocommunication Bureau in a Circular Letter CR/301 dated May 1, 2009).

⁴² Jakhu, *Regulatory Process*, *supra* note 23, at 284.

⁴³ *Id.*

⁴⁴ ITU Constitution, *supra* note 22, art. 56 (providing for member states to settle their disputes on questions relating to the interpretation or application of the ITU Constitution, Convention, or Administrative Regulations (including ITU RR) by negotiation, either via diplomatic channels or in accordance with procedures laid down in bilateral or multilateral treaties).

⁴⁵ *Id.* art. 41; *see also* Int'l Telecomm. Union, Compulsory Settlement of Disputes (Optional Protocol Additional to the Int'l Telecomm. Convention, Montreux, 1965), <http://www.itu.int/en/history/HistoryDigitalCollectionDocLibrary/conferences/4.10.43.en.101.pdf> [<https://perma.cc/KBU5-FKQJ>] (applying to member States that are parties to the Protocol).

⁴⁶ Jakhu, *Regulatory Process*, *supra* note 23, at 286.

noncompliance might negatively affect their own individual or collective self-interests, the same author is not very optimistic about the future of such tradition.⁴⁷

III. REMOTE SENSING

The term “remote sensing” refers to “the sensing of the Earth’s surface from space by making use of the properties of electromagnetic waves emitted, reflected or diffracted by the sensed objects.”⁴⁸ Remote sensing may be used “for the purpose of improving natural resources management, land use and the protection of the environment,” among others.⁴⁹ The functions found in Principle I of the 1986 UN Resolution, which contains the Principles Relating to Remote Sensing of the Earth from Outer Space (Remote Sensing Principles 1986), are, however, partial. Remote sensing provides scientific, industrial, civil, military, and individual users with high-resolution images for a number of uses, including defense and intelligence, transportation and infrastructure planning, natural resource assessment, agriculture, disaster relief, and meteorological services.⁵⁰ A significant difference between the known functions of remote sensing and the definition in Principle I is that the latter does not cover reconnaissance or military spying.

The conventional debates over remote sensing center on three rights: the right (of the sensing States) to launch satellites and the right to sense; the right of the sensing States to distribute the data and images; and the right of the sensed States to obtain images.⁵¹ In respect to the first right, the conflict lies between the *sensed* States, which argue that their prior consent was necessary, and the *sensing* States, which rely on the freedom of exploration and use of outer space.⁵² The prior consent argument is premised upon the principle of State sovereignty over its

⁴⁷ *Id.* at 287.

⁴⁸ Principle I of the UN Principles relating to Remote Sensing of the Earth from Outer Space 1986 (Remote Sensing Principles 1986), as adopted in G.A. Res. 41/65, UN Doc A/RES/41/65 (Dec. 3, 1986) [hereinafter Remote Sensing Principles 1986].

⁴⁹ *Id.*

⁵⁰ See generally Atsuyo Ito, *Improvement to the Legal Regime for the Effective Use of Satellite Remote Sensing Data for Disaster Management and Protection of the Environment*, 34 J. SPACE L. 45 (2008) (discussing uses and legal implications of remote sensing).

⁵¹ Ram S. Jakhu, *International Law Governing the Acquisition and Dissemination of Satellite Imagery*, 29:1 J. SPACE L. 65, 73 (2003).

⁵² Outer Space Treaty, *supra* note 8, art I.

territory and natural resources thereon.⁵³ The passing of Principle I of the UN Principles Relating to Remote Sensing of the Earth from Outer Space (Remote Sensing Principles 1986) marked a compromise between the sensing and sensed States—the latter gave up their demand for prior consent in exchange for the clear recognition of their rights to have access (on a non-discriminatory basis and at reasonable costs) to the primary and processed data concerning their territory, while the former may exercise remote sensing in reliance upon the freedom of use of outer space.⁵⁴ With hindsight, it is debatable if the sensing States were right to rely on the freedom of exploration and use of outer space as enshrined in Article I of the Outer Space Treaty 1967, for it is trite that the freedom of exploration and use is in respect of *outer space* and it is debatable if the Earth is part of outer space. After all, when one tries to delimit the boundary between the airspace and outer space, one looks at outer space *from the Earth* and not from the Moon or any other celestial bodies. Thus, it is debatable if such freedom implies the right to “reverse-view” the Earth and take images thereof from outer space.

The second right revolves around the debates between two opposing camps: the first was based upon the freedom of action of the sensing State to sense, and thereafter distribute the products of sensing; and the second which emphasized sovereignty over natural resources of the sensed States. The first view was advocated by the United States and some of its Western allies, while the second was advocated by the USSR, France, and developing countries.⁵⁵ The third right centers on the right of the sensed States, because their territories are sensed, to be entitled to the data and images produced—an extension of the principle of State sovereignty. The debates surrounding the rights have

⁵³ G.A. Res. 1803 (XVII), Permanent Security Over Natural Resources (Dec. 14, 1962) (“Permanent sovereignty over natural resources . . . 1. The right of peoples and nations to permanent sovereignty over their natural wealth and resources must be exercised in the interest of their national development and of the well-being of the people of the State concerned.”) Thus, the sensed states argued that their prior consent was required in order to sense and distribute the data and images.

⁵⁴ Jakhu, *Legal Issues*, *supra* note 7, at 76.

⁵⁵ Jakhu, *International Law*, *supra* note 51, at 78; *see also* Convention on the Transfer and Use of Data of Remote Sensing of the Earth from Outer Space, *reprinted in* EDMUND OSMANCYZK, *ENCYCLOPEDIA OF THE UNITED NATIONS AND INTERNATIONAL AGREEMENTS 1714* (Anthony Mango, ed. 2003) (signed by a limited number of mainly the former Communist States).

been widely discussed.⁵⁶ The following discussions would focus on issues arising from the commercialization of remote-sensing activities.

While one of the functions of remote sensing is reconnaissance and while such task lies traditionally with the State, certain States have been able to make use of commercialization of remote sensing for their reconnaissance needs. Satellites in general and remote-sensing satellites in particular have a dual-use nature.⁵⁷ An officially civil and commercial satellite may, unknown to others, be used for military purposes as well. Such dual use is of particular significance to intelligence gathering, as certain States may want to, on the one hand, discover the military activities of their enemies or simply spy on other States, and on the other hand, maintain secrecy of their military reconnaissance satellites. By encouraging commercialization of remote sensing, States may gather data and images and cite the civilian satellites as the source without exposing their military satellites. While commercial entities might be willing to provide national service, they certainly want something in return. Thus, they want protection for the data they gather and images that they produce. In other words, they want intellectual property rights (IPRs) over their works.

Granting IPR protection over remote sensing data and images may run into international legal problems. First, the grant of IPRs is usually limited in territorial scope. In other words, a State can only grant IPRs protection within its territory. Since outer space is not subject to territorial claim, it is questionable whether data gathered in outer space, and the images produced (even though processed and produced on the Earth), can be protected by national IPRs.⁵⁸ Second, granting IPR protection over remote sensing data runs contrary to the principles enshrined in the Remote Sensing Principles 1986. In particular, Principle II thereof states that remote sensing activities “shall be carried out *for the benefit and in the interests of all countries*, irrespective of their degree of economic, social or scientific and technological development, and taking into particular consider-

⁵⁶ Jakhu, *International Law*, *supra* note 51, at 73; Jakhu, *Legal Issues*, *supra* note 7.

⁵⁷ Jakhu, *Legal Issues*, *supra* note 7, at 81.

⁵⁸ Jakhu, *International Law*, *supra* note 51, at 66–67 (“Operating space systems and taking images, which essentially occur in outer space, must be supplemented by ground-based activities for appropriate data processing and interpretation in order to make the satellite imagery practically useful.”).

ation the needs of the developing countries.”⁵⁹ Further, Principle II states that such activities “shall be conducted *in accordance with* international law, including the Charter of the United Nations, the 1967 Outer Space Treaty and the relevant instruments of the International Telecommunication Union.”⁶⁰ None of these instruments expressly permit States to grant IPR protection over remote sensing data and images.

While the term “international law” would certainly cover the Berne Convention on copyrights,⁶¹ as stated above, such rights under said convention remain territorial in nature and would apparently not extend to outer space, where no sovereignty or jurisdiction lie. Protection of remote sensing data and images produced by private entities aside, States may also wish to limit the right of other States or entities to obtain the raw data. The justifications in national legislation would traditionally be premised upon such illusive concepts as national security, foreign policy, or international obligations that are often undefined.⁶² While the restrictions imposed may be perceived as necessary to protect a State’s national interests, it is a double-edged sword—it restricts foreign access to the data, but it may also hamper domestic access to the use of the data and images.⁶³ Such restrictions may even hamper the development of new products and services.⁶⁴ Any unilateral imposition of arbitrary restrictions on the collection and distribution of remote sensing data solely on the ground of national interests is clearly contrary to the Remote Sensing Principles 1986.⁶⁵ Further, due to the dual-use nature of remote sensing satellites, they could become the first targets of anti-satellite (ASAT) weapon strikes not only during

⁵⁹ Remote Sensing Principles 1986, *supra* note 48 (emphasis added).

⁶⁰ *Id.*

⁶¹ Berne Convention, July 24, 1971, 1971 U.S.T. Lexis 263, 25 U.S.T. 1341.

⁶² See Remote Sensing Space Systems Act § 8(6), (7) S.C. 2005, c 45 (Can.) (which gives the relevant Minister the discretion to control distribution of data); Land Remote Sensing Policy Act of 1992, 15 U.S.C.A. § 5601, Pub. L. 102-555 (repealed 2010); 2006 Regulations on Licensing of Private Land RS Space Systems, 15 C.F.R. § 960.12 (West 2006); Jakhu, *Legal Issues, supra* note 7, at 58, 77. The state which ironically has always “ardently advocated the freedom of acquisition and non-discriminatory dissemination of satellite imagery” became the first state to impose extensive legal prohibitions on the collection and distribution. See *id.* at 78–79.

⁶³ A burden would be imposed on remote-sensing operators to obtain authorization in the event they wish to sell the data or images on every case.

⁶⁴ Ram S. Jakhu et al., *Findings of an Independent Review of Canada’s Remote Sensing Space Systems Act of 2005*, 37 ANNALS AIR & SPACE L. 399, 410 (2012).

⁶⁵ Jakhu, *Legal Issues, supra* note 7, at 80.

an actual war but also in anticipation of hostilities.⁶⁶ Notwithstanding the risks associated with remote sensing, there appears to be nothing much that the international community can do, partly due to the limited scope of the Remote Sensing Principles 1986, as well as their non-binding nature.⁶⁷

IV. SPACE MINING

While activities on the Moon have virtually ceased since the Moon Agreement came into being, advancements in science have recently demonstrated that outer space, including the Moon and other celestial bodies, has more natural resources than mankind thought. What is the legality of space mining in international law? Article I of the Outer Space Treaty is not entirely clear on this issue. Speaking on the exploration and use of outer space, including celestial bodies, the Outer Space Treaty appears to be silent on exploitation of resources in outer space. The provision on freedom of scientific investigation reminds the reader of the old space age when space activities were dominated by the States that were more concerned with national prestige and international domination marked by their explorative space activities.⁶⁸

Like many of its provisions, the provision on exploitation and use, as well as scientific investigation, are further elaborated in the Moon Agreement, Articles 6.2 and 11 specifically.⁶⁹ The two Articles are not against private initiatives, investments, or inter-

⁶⁶ *Id.* at 81.

⁶⁷ There are two schools of thought on this point. There are those who believe that the Remote Sensing Principles 1986 are part of the customary international law. See Major Robert A. Ramey, *Armed Conflict on the Final Frontier: The Law of War in Space*, 48 A.F.L. REV. 1, 72 (2000); and those who argue otherwise. Michael Bourbonniere & Louis Haeck, *Canada's Remote Sensing Program and Policies*, in COMMERCIAL OBSERVATION SATELLITES: AT THE LEADING EDGE OF GLOBAL TRANSPARENCY 263, 287 n.4 (John C. Baker et al. eds., 2001).

⁶⁸ See Robin McKie, *Alexei Leonov, the First Man to Walk in Space*, THE GUARDIAN (May 9, 2015), <http://www.theguardian.com/science/2015/may/09/alexei-leonov-first-man-to-walk-in-space-soviet-cosmonaut> [<https://perma.cc/8XYE-SWM3>] (first human space walk by Alexei Leonov); *The First Person on the Moon*, NASA (Jan. 16, 2008), <https://www.nasa.gov/audience/forstudents/k-4/stories/first-person-on-moon.html> [<https://perma.cc/UK4N-QTSQ>] (first human to walk on the Moon); *Lunar Rocks and Soils from Apollo Missions*, NASA, <https://curator.jsc.nasa.gov/lunar/index.cfm> [<https://perma.cc/N4UE-5PD9>] (last visited Jan. 23, 2017) (return of Apollo missions with soil samples taken from the Moon between 1969 and 1972).

⁶⁹ Jakhu, *Legal Issues*, *supra* note 7, at 103–04.

ests.⁷⁰ Despite its attempts to clarify the Outer Space Treaty, the Moon Agreement has attracted very few ratifications, with the United States, Russia, China, and other major spacefaring States not even being signatories to it.⁷¹ The recently rekindled interests in resources on the Moon and other celestial bodies are reflected *inter alia* in the U.S. Space Resource Exploration and Utilization Act of 2015⁷² (the Act) which purports to give ownership and title to resources mined in outer space to private entities with the legal ability to transfer the ownership. The Act is purportedly based on the difference between “national” appropriation (interpreted by the proponents of the Act to mean “the State” itself) and appropriation by private entities (interpreted by the proponents of the Act to mean “non-State”).⁷³

Many arguments, however, militate against the position of the Act. First, “[n]ational appropriation’ must be understood in a broader sense to include all forms of appropriation, including appropriation by the public, private or otherwise.”⁷⁴ “The Outer Space Treaty imposes an international responsibility on States for national activities in space” without differentiating activities by State or non-State actors.⁷⁵ The *travaux préparatoires* of the Treaty supports such an argument. The USSR had initially opposed the United States’s position of opening outer space to private activities but ultimately accepted possible participation of private entities in the exploration and use of outer space upon the condition that such entities must have been authorized by the applicable States, which would continue to supervise them.⁷⁶ Thus, Article VI of the Outer Space Treaty is said to represent a compromise between the two opposing positions, with the result of non-governmental national space activities being assimilated

⁷⁰ *Id.* at 104.

⁷¹ *Status of International Agreements Relating to Activities in Outer Space*, UN OFFICE OF OUTER SPACE AFFAIRS (Jan. 1, 2010) http://www.unoosa.org/pdf/publications/ST_SPACE_11_Rev2_Add3E.pdf [<https://perma.cc/2YJZ-6BZW>] (Australia is apparently the only space-faring country that has ratified the Moon Agreement. France and India have signed it but have refrained from ratifying it).

⁷² 51 U.S.C. §§ 51301–51303 (2015).

⁷³ Stephen Gorove, *Interpreting Article II of the Outer Space Treaty*, 37 *FORDHAM L. REV.* 349, 351 (1969).

⁷⁴ Jakhu, *Legal Issues*, *supra* note 7, at 44.

⁷⁵ *Id.*

⁷⁶ *Id.* at 44–45; Bin Cheng, *Article VI of the 1967 Space Treaty Revisited: ‘International Responsibility,’ ‘National Activities,’ and ‘The Appropriate State,’* 26:1 *J. SPACE L.* 7, 14 (1998) (quoting W. B. Wirin, *Practical Implications of Launching State—Appropriate State Definitions* 37 *PROC. COLLOQ. L. OUTER SPACE* 109, 110 (1994)).

to governmental space activities.⁷⁷ The Belgian and French representatives noted without contradiction that non-appropriation covered both claims of sovereignty and “the creation of titles to property in private law.”⁷⁸ Allowing private entities to appropriate outer space or a part of it would defeat not only Article II,⁷⁹ but also render Article I meaningless.⁸⁰ Lastly, it was apparently supported by President Lyndon B. Johnson’s remarks when presenting the Outer Space Treaty to the Senate for consent for ratification.⁸¹

Without casting any opinion on the legislation, there may be several ways to relook at the history. First, Article II of the Outer Space Treaty refers to “national appropriation by claim of sovereignty, by means of use or occupation, or by any other means.” The words seem to suggest appropriation of *land* because of the words “use or occupation” and “sovereignty.” The difference between land and resources lies in fact that while land would remain there despite use or occupation, resources would be consumed and depleted.⁸² Second, the USSR insisted on national authorization and continued supervision of private space activities without even touching on the issue of “appropriation,” whether of land, resources, or otherwise. Third, the remarks by the Belgian and French representatives appear to refer to “the creation of titles to *property* in private law.”⁸³ It remains unclear if the term “property” refers to titles in land, or things found in or on the land. The term “property” has a specific meaning to common law-trained lawyers, especially English lawyers. It primarily refers to *real* property as opposed to personal property or chattels. It is unclear if the same difference is drawn in civil law. In any event, when it comes to international treaty negotiations, confusions over terminology are inevitable and abound, more so

⁷⁷ Cheng, *supra* note 76, at 14 n.17 (quoting Bin Cheng, *Chapter 9 The Space Treaty*, in BIN CHENG, *STUDIES IN INTERNATIONAL SPACE LAW* 237 (1997)).

⁷⁸ Carl Christol, *Art. 2 of the 1967 Treaty Principles Revisited*, 9 *ANNALS OF AIR & SPACE L.* 217, 236 (1984).

⁷⁹ Jakhu, *Legal Issues*, *supra* note 7, at 45 (providing for comprehensive prohibition of appropriation).

⁸⁰ *Id.*

⁸¹ “Today, outer space is free . . . No nation holds a concession there. It must remain this way . . . [The United States] do[es] not acknowledge that there are landlords of outer space who can . . . bargain with the nations of the Earth on the price of access to this domain.” Treaty on Outer Space: Hearing before the Committee on Foreign Relations, 90th Cong. 105–06 (1967).

⁸² LEE, *LAW AND REGULATION*, *supra* note 15, at 6 (speaking in relation to depletion of natural resources on the Earth).

⁸³ Christol, *supra* note 78 (emphasis added).

when a legal term is translated from one language to another and from one legal tradition to another.⁸⁴ Thus, with all respect, Manfred Lachs's personal conclusion that national appropriation includes sovereign and private rights should, in light of differences in legal traditions and terminology, be taken with a grain of salt.⁸⁵ Fourth, the statement made by President Johnson was apparently an internal statement and can be construed as merely a unilateral declaration of a State which, under international law, may be unilaterally withdrawn. In passing the amended Act in 2015, the United States can be taken as having withdrawn its unilateral declaration.⁸⁶ Thus, if the arguments in support of non-appropriation under Article II fall, it is debatable how the argument under Article I would stand if private interests are focused on resources on a first-come-first-extract basis, regardless of who has any title to the land concerned.⁸⁷ After all, while the proponents of space mining may not have any sovereignty or jurisdiction claim over the lands on the Moon, the opponents do not either.

Another pertinent issue is the interpretation of Article IX of the Outer Space Treaty which provides, *inter alia*, that the State Parties shall have due regard to the corresponding interests of all other State Parties when conducting activities in outer space, presumably including the exploration and use of outer space, including the Moon and other celestial bodies. Further, the fourth sentence thereof provides that if a State Party "has reason

⁸⁴ *E.g.*, in the Cape Town Convention, the term "administrator in insolvency" (a term more familiar to Civil lawyers) as opposed to "trustee in bankruptcy" (a term more commonly found in the Common Law) was adopted. See International Institute on the Unification of Private Law, Convention on International Interests in Mobile Equipment (Cape Town Convention), Art. I(k), S. Treaty Doc. No. 108-10 (Nov. 16, 2001), <http://www.unidroit.org/english/conventions/mobile-equipment/mobile-equipment.pdf> [<https://perma.cc/P2W2-BNCC>].

⁸⁵ See Jakhu, *Legal Issues*, *supra* note 7, at 46. For the different terms used in different language texts, see LEE, *LAW AND REGULATION*, *supra* note 15, at 181.

⁸⁶ Modern politico-economics suggests that States and their nationals are no longer interested in claiming sovereignty to particular lands and instead are more interested in resources. States are happy to give up sovereignty after resources are exhausted or when the occupied land no longer serves any interests, as seen in the case of Portugal giving up Timor Leste. The resources available may no longer justify the costs of maintaining colonial administration, let alone maintaining the claim to sovereignty. Jose Ramos-Horta, *History of Timor-Leste*, <http://ramoshorta.com/about-timor-leste/> [<https://perma.cc/F93W-V5FY>] (last visited Jan. 23, 2017).

⁸⁷ Surely, there would be the issue of disputes over areas mined when space mining materializes and there is no international legal framework to cope with such disputes.

to believe that an activity . . . planned by another State Party in outer space, including the Moon and other celestial bodies, would cause potentially harmful interference with activities in the peaceful exploration and use of outer space, including the Moon and other celestial bodies, *may* request consultation concerning the activity.”⁸⁸ It is curious to note that notwithstanding the planned exploitation of space resources by some of the spacefaring States, no State Parties to the Outer Space Treaty have sought consultation, either the spacefaring States nor the non-spacefaring States. As far as the former is concerned, national interests dictate that there should perhaps not be any international protests, for the States concerned are either eyeing the space resources themselves or are already putting plans in place.⁸⁹

As for the non-spacefaring States, any request for international consultation would probably be to no avail. The *discretion* on the part of a State Party potentially affected by the space activities of another State Party as provided for in the fourth sentence stands perhaps in contrast to the *duty* on the part of the State Party whose space activity planned by it or *its nationals* in outer space, including the Moon and other celestial bodies, would cause potentially harmful interference with activities of other State Parties in the peaceful exploration and use of outer space, to undertake appropriate international consultations before proceeding with any such activity.⁹⁰ While the land on the Moon and other celestial bodies are perpetual,⁹¹ resources thereon may be consumed and vanish thereafter. Thus, the mining activities authorized under the Act would presumably cause potentially harmful interference with the space activities of

⁸⁸ Outer Space Treaty, *supra* note 8 (emphasis added).

⁸⁹ China, for instance, is said to have announced plans to establish a permanent Moon base to mine rare-Earth elements and Helium-3, a non-radioactive isotope that is energy rich. Mary-Ann Russon, *China Wants to Visit Mars by 2020 and Beat NASA to Set Up the First Manned Moon Base*, INT’L BUS. TIMES (Apr. 22, 2016), <http://www.ibtimes.co.uk/china-wants-visit-mars-by-2020-beat-nasaset-first-manned-moon-base-1556304> [https://perma.cc/QVT2-22MT]; Jeremy Beck, *China’s Helium-3 Program: A Global Game Changer*, SPACE SAFETY MAG. (Mar. 16, 2016), <http://www.spacesafetymagazine.com/space-on-earth/everyday-life/china-helium-3-program/> [https://perma.cc/22AF-ME24].

⁹⁰ Outer Space Treaty, *supra* note 8, art. IX (third sentence).

⁹¹ This is much like the lands on the Earth which are presumed in theory to be perpetual, thus, giving rise to freehold titles, barring any interstellar collision. RICHARD T. ELY, CHARACTERISTICS AND CLASSIFICATION OF LAND Vol. 1, 20 (2d ed. 1922) (quoting STEPHEN MARTIN LEAKE, LAW OF PROPERTY LAND (2d ed. London, 1909)).

other State Parties. Where there is competition for resources there is potential breach of peace. In such a situation, it would appear that there would be a reason for the United States to be under a duty to “undertake appropriate international consultations before proceeding with any such activity.” It remains unclear if the United States is prepared to undertake such international consultations which might very well cripple space mining by its nationals *ab initio*. Notwithstanding the lack of exercise of a State’s duty in Article IX, the failure to exercise a State’s discretion to seek consultation may equally bring some legal issues, particularly when States dispute over their rights to mine a certain celestial body or an area thereon.

The Outer Space Treaty aside, do the Moon Agreement provisions represent rules of customary international law? It was unanimously passed by the UN General Assembly *without* a vote.⁹² It is argued that its low amount of signatories may simply represent the total lack of activities on the Moon for the past thirty years, and States’ reluctance to adhere to a treaty which has no practical significance to them, particularly those non-spacefaring States.⁹³ On the other hand, the non-ratification appears to evidence conscious State will, particularly on the part of spacefaring States, *not* to be part of the Moon Agreement. Otherwise they would be bound by the Common Heritage of Mankind provision, their actions in outer space would be restricted, and they could not fully exploit and be entitled to resources recovered in outer space.⁹⁴ Further, the phrase “benefits derived from those resources” is wide and ambiguous.⁹⁵ “Benefits” can very well mean the raw materials mined or recovered, minerals derived from such raw materials, technology used, and the IPRs of the technology used.⁹⁶ It remains unclear if private entities, having invested millions of dollars into the mining mission, would be willing to share the benefits with other entities or States which have contributed nothing, let alone the technology. Further, there is no defined formula for “equitable” sharing, and that is bound to give rise to disputes.⁹⁷ In any event, the

⁹² As duly noted in LEE, LAW AND REGULATION, *supra* note 15, at 112.

⁹³ Jakhu, *Legal Issues*, *supra* note 7, at 104–05.

⁹⁴ *See id.* at 104 (summarizing the U.S. interpretation of the Common Heritage of Mankind provision).

⁹⁵ Moon Agreement, *supra* note 12, art. 11.7.d.

⁹⁶ LEE, LAW AND REGULATION, *supra* note 15, at 157, 262 (drawing the difference between the means and the results).

⁹⁷ *Id.* at 15.

international community has failed to establish the mechanism envisaged in Article 11.7 thereof. Thus, space mining is not met with a corresponding framework of international space law.⁹⁸

What would be the impact if States permit their nationals to conduct mining in outer space? An analogy may perhaps be made with the Western European powers fighting for colonies and resources in Africa, the Americas, and Asia in the 19th and early 20th centuries. While States may not encounter hostilities for the purpose of establishing colonies in outer space, for such would be clearly contrary to Article II of the Outer Space Treaty, there would be nothing to prevent them from facing off against one another for the purpose of obtaining resources.⁹⁹ The Moon Agreement provides a mechanism for equitable sharing of benefits, but how many States are prepared to share such benefits? Indeed, it is arguable that it is the very mechanism of equitable sharing that might have prevented its widespread acceptance. When the fight for resources takes place in outer space, it may serve as the *raison d'état* for spacefaring States to arm themselves in space, thus potentially bringing military conflicts to the space.

V. CONCLUSION

Many military conflicts and wars arose as result of competition for resources.¹⁰⁰ Such competition arose, in the past, between the States. In modern time, private entities compete for re-

⁹⁸ Ricky J. Lee, *The Jus ad Bellum in Spatialis: The Exact Content and Practical Implications of the Law on the Use of Force in Outer Space*, 29 J. SPACE L. 93, 93 (2003).

⁹⁹ Modern examples of fights for resources though in name of sovereignty include: the disputes among China, Taiwan, and Southeast Asian States over the Spratly Islands and the war between the United Kingdom and Argentina over the Falkland Islands. It is trite that, in these two instances, petroleum and fishery are among the interests couched in the name of sovereignty. See Michael Bennett, *The People's Republic of China and the Use of International Law in the Spratly Islands Dispute*, 28 STAN. J. INT'L L. 425, 425 (1992); Roberto Laver, *The Falklands/Malvinas: A New Framework for Dealing with the Anglo-Argentine Sovereignty Dispute*, 25 FLETCHER F. WORLD AFF. 147, 148–49 (2001).

¹⁰⁰ Prominent examples include both World War I (WWI) and World War II (WWII). See Martin Kelly, *The Top Causes That Lead to World War I*, ABOUT.COM, <http://americanhistory.about.com/od/worldwari/tp/causes-of-world-war-1.htm> [<https://perma.cc/C35H-KXPD>] (last visited Jan. 24, 2017) (noting that imperialism and desire for raw materials in Africa was a cause of WWI); Jeremy Noakes, *Hitler and 'Lebensraum' in the East*, BBC: HISTORY (Mar. 30, 2011), http://www.bbc.co.uk/history/worldwars/wwtwo/hitler_lebensraum_01.shtml [<https://perma.cc/K7NE-9XC6>] (explaining that the German concept of Lebensraum to acquire land for German people led to invasion of the Soviet Union).

sources for personal gain, and in one way contribute to national economic development. By that, they become the proxies of the States.¹⁰¹ The same may transpose to outer space with the commercialization of space activities. When private entities compete for resources in outer space, the States may intervene in the name of protecting national interests. Notwithstanding the UN Charter (particularly Article 2.4 on refraining from the use of force) and the Declaration on Principles of International Law Concerning Friendly Relations and Co-operation 1970 which repeats the principle of refraining from use of force, spacefaring States may wish to preclude or eliminate competition for space resources,¹⁰² or space-generated revenues, such as competition for space launch services.¹⁰³

Competition for space resources aside, remote sensing is another problem as it may pose national security concerns, as seen in the U.S. Kyl-Bingaman Amendment which *inter alia*, upon the request of Israel, threatens to use ASAT weapons¹⁰⁴ to shoot

¹⁰¹ Such instances are not limited to modern times. Competition for resources and colonies led to the WWI. The failure of the League of Nations led in turn to the WWII, which was due partly to the dissatisfaction of Germany with the post-WWI treaty, and partly the loss of its colonies after the WWI and its inability since then to obtain new colonies overseas. The formation of the European Coal and Steel Community post-WWII might be partly attributed to the need to prevent competition for resources and markets among the Western European powers.

¹⁰² See U.S. Space Resource Exploration and Utilization Act of 2015, *supra* note 72.

¹⁰³ Other countries that offer commercial launch services in competition with US include Europe, China, Russia, Ukraine, India, and Japan. BEHRENS, *supra* note 6, at 9. It, thus, explains why the United States entered into bilateral agreements with Russia, Ukraine, and China as the agreements provided for the “rules of the games” for participating in the launch service market to ensure those three countries did not offer unfair competition as result of state subsidies or non-market economies. Jakhu, *Legal Issues*, *supra* note 7, at 66–69. Quotas for Russia and Ukraine were terminated in 2000. BEHRENS, *supra* note 6, at 14–15. The agreement with China expired in 2001. *Id.* at 10. China, with its Long March launch vehicles, was able to price lower than the Western countries, particularly the United States. China’s explanation was its own low cost. *Id.* at 11. India did not fare better either. The United States, through the threats of sanction, forced Russia to cease transferring space launch technologies to India to prevent India from becoming a competitor in launch services market: Jakhu, *Legal Issues*, *supra* note 7, at 61; BEHRENS, *supra* note 6, at 14.

¹⁰⁴ National Defense Authorization Act for Fiscal Year 1997, § 1064, 110 Stat. 2422 (1996) (enacted). The other types of space weapons include ballistic missiles, space-based lasers (though it is debatable whether such “space-based” weapons would constitute stationing weapons in outer space, contrary to Article IV of the Outer Space Treaty 1967), and conventional kinetic weapons. Robert David Olney, *Death from Above? The Weaponization of Space and the Threat to International Humanitarian Law*, 78 J. AIR L. & COM. 739, 746, 752–53 (2013).

down remote sensing satellites.¹⁰⁵ Other provisions include disallowing the U.S. satellite operators to collect or distribute certain types of satellite imagery of Israel's territory, and not permitting the relevant persons to declassify or otherwise release satellite imagery with respect to Israel of certain precision.¹⁰⁶ Spacefaring States have increased their military use of outer space. In the United States, it began with President Reagan's star wars in 1984.¹⁰⁷ The European Union is also moving toward militarization of space.¹⁰⁸ Japan not so long ago passed a law permitting military space development.¹⁰⁹ India scaled up its

¹⁰⁵ There have been several instances of the use of ASAT weapons, for example, in the United States in 1985. See Peter Grier, *The Flying Tomato Can*, AIR FORCE MAG. (Feb. 2009), <http://www.airforcemag.com/MagazineArchive/Pages/2009/February%202009/0209tomato.aspx> [<https://perma.cc/T55B-ZH7E>]; in China in 2007 (Leonard David, *China's Worrisome Anti-Satellite Test: Worrisome Debris Cloud Circles Earth*, SPACE.COM (Feb. 2, 2007), <http://www.space.com/3415-china-anti-satellite-test-worrisome-debris-cloud-circles-earth.html> [<https://perma.cc/22PY-NDWT>]). An instance occurred again in 2008. See Gregory Kulacki, *The United States, China, and Anti-Satellite Weapons*, ALL THINGS NUCLEAR BLOG (Sept. 7, 2016 9:47 AM), <http://allthingsnuclear.org/gkulacki/the-united-states-china-and-anti-satellite-weapons> [<https://perma.cc/P8QD-H43W>]. They were clear showings of military force in space.

¹⁰⁶ National Defense Authorization Act for Fiscal Year 1997, *supra* note 104, recounted in Jakhu, *International Law*, *supra* note 51, at 80 n.47.

¹⁰⁷ This became Clinton's Ballistic Missile Defense Organization, which was renamed the Missile Defense Agency in 2002. David Edward Gronan, *Power Play: Theater Ballistic Missile Defense, National Ballistic Missile Defense and the ABM Treaty*, 39 VA. J. INT'L L. 799, 816 (1999); Development in Brief, 44 No. 1 Gov't Contractor 4 (Jan. 9, 2002). In its National Space Policy 2010, the United States's so-called principles in space are stated, among others, to be that: "The United States will employ a variety of measures to help assure the use of space for all responsible parties, and, consistent with the inherent right of self-defense, deter others from interference and attack, defend our space systems and contribute to the defense of allied space systems, and, if deterrence fails, defeat efforts to attack them." ROBERT GATES, THE NATIONAL POLICY OF THE U.S. 3 (2011). The National Missile Defense Act of 1999 states, *inter alia*: "It is the policy of the United States to deploy as soon as is technologically possible an effective National Missile Defense system capable of defending the territory of the United States against limited ballistic missile attack (whether accidental, unauthorized, or deliberate) with funding subject to the annual authorization of appropriations and the annual appropriation of funds for National Missile Defense." Pub. L. No. 106-38, 113 Stat. 205 (1999).

¹⁰⁸ FRANK SLIJPER, FROM VENUS TO MARS—THE EU'S STEPS TOWARDS THE MILITARISATION OF SPACE (2008).

¹⁰⁹ Paul Kallender-Umezū, *Japan Passes Law Permitting Military Space Development*, RP DEFENSE (June 23, 2012), <http://rpdefense.over-blog.com/article-japan-passes-law-permitting-military-space-development-107325787.html> [<https://perma.cc/N876-W7R6>].

military use of space.¹¹⁰ Israel—a small country with just 8 million people—has the capability to manufacture and launch its own satellites; it is the military activities in space that drive its space program.¹¹¹ The increased military activities and weaponization in outer space may be interpreted as preemption of any challenge to certain States' monopoly in space and, if necessary, as a means to resolve such challenges.

While Stephen Hawking might be right in saying that mankind must spread out to outer space and the commercialization of space activities has certainly echoed his sentiment, commercialization appears to have many multifaceted implications. The implications were perhaps unforeseen at the time when the five space treaties were drafted and, thus, not catered to. Further, the current international space law regime does not appear to be sufficient to cope with them either.¹¹² The crucial problem with the current international space regime lies perhaps with its emphasis on the *acts* or activities of space actors as opposed to the overall space *governance* framework.¹¹³

Assuming that some kind of international or global space governance is desirable, what form should it take? There were previous calls for the establishment of a World Space Organization.¹¹⁴ In light of increasing commercialization of space activities, one issue that invariably arises is whether there

¹¹⁰ *India to Scale Up Military Use of Space: Army Chief*, INDO-ASIAN NEWS SERV. (June 16, 2008), <http://indiatoday.intoday.in/story/India+to+scale+up+military+use+of+space:+Army+chief/1/9916.html> [<https://perma.cc/27HY-A8CX>].

¹¹¹ Marc Boucher, *Military Space Drives Israel Space Program for Now*, SPACEREF CANADA (Sept. 5, 2012), <http://spaceref.ca/space-exploration-1/space-quarterly/military-space-drives-israel-space-program-for-now.html> [<https://perma.cc/FY-N3-8S92>].

¹¹² Lee, *The Jus ad Bellum in Spatialis*, *supra* note 98, at 93.

¹¹³ By analogy with the legal framework of a State, there is the constitution, and under it laws that regulate both the public and private activities. While the Outer Space Treaty may be touted as the “Constitution of outer space,” it falls far short of that. Further, the international space legal framework does not have any or sufficient laws to cater for private acts and activities. Ramey, *supra* note 67, at 74 (Outer Space Treaty is the “constitution” of outer space).

¹¹⁴ E. Kamenetskaya, *On the Establishment of World Space Organisation: Some Considerations and Remarks*, 32 PROC. ON L. OUTER SPACE 358 (1989); Simon Courteix, *Is It Necessary to Establish a World Space Organisation?*, 36 PROC. ON L. OUTER SPACE 20 (1993); René H. Mankiewicz, *The Regulation of Activities in Extra-Aeronautical Space, and Some Related Problems*, 8.3 MCGILL L.J. 193, 200–04 (1961) (proposing, among others, regulatory powers on rules required for the conduct of peaceful activities in space, jurisdiction over space vehicles, and promotion of joint operations in space, for the new international space authority); Stephen Gorove, *An Old Proposal for the Establishment of a World Space Law Center*, 20 PROC. ON L. OUTER

should be a technical/operation and economic divide as in the context of international civil aviation.¹¹⁵ While the World Trade Organization (WTO) arguably has the jurisdiction to deal with trade in goods and services in commercial space activities, it appears to have focused its time and efforts on liberalization in aviation and telecommunications services only. Surely, the WTO has many more pressing trade issues to deal with, and the space industry concerns primarily a handful of States though the benefits of space technologies affect all of mankind. Whether the international or global space governance should include economic regulation is akin to the debates over whether liberalization in international air transport should be handled by the International Civil Aviation Organization (ICAO) or WTO. It is a serious issue for policy makers. There is at least a case for a combined technical and economic regulatory body.

Compared to the aviation industry, the space industry remains in its incipient stage. Unlike the international air transport industry in the early twentieth century, the space industry is more than just the transportation of people and cargo. There are many more complicated issues in outer space now: satellite communications, space mining, solar energy, and global positioning, just to name a few. The International Convention on Civil Aviation negotiated at Chicago in 1944 and the resulting ICAO have been lamented for lacking economic regulatory power.¹¹⁶

With hindsight, it might be a good idea to have an international space body with both technical and economic regulatory oversight, if one were ever created. The question is, however, not so much what sort of new organization to establish, or what additional jurisdiction and power to give to an existing organization,¹¹⁷ but whether it (either a new or existing organization) will be given extra and sufficient jurisdiction and powers that

SPACE 40 (1977) (which proposes the establishment of a world space law center which study the present and expected scope and field of space law).

¹¹⁵ In the context of international civil aviation, while the General Agreement on Trade in Services of the World Trade Organization (WTO) has deferred liberalization in air transport in light of the bilateral systems, the International Civil Aviation Organization (ICAO) does not possess any power on this matter either. The ICAO's functions and powers are confined to technical or operational matters. BRIAN F. HAVEL, *IN SEARCH OF OPEN SKIES: LAW AND POLICY FOR A NEW ERA IN INTERNATIONAL AVIATION* 123 (1997).

¹¹⁶ Ruwantissa Abeyratne, *Competition in Air Transport—The Need for a Shift in Focus*, 33 *TRANSP. L. J.* 29, 32, 36 (2005).

¹¹⁷ LYALL & LARSEN, *supra* note 14, at 571 (increasing power and authority to the ITU).

are not otherwise available under existing treaties and will thus be able to solve current and future problems, particularly with increasing commercialization of space activities.¹¹⁸ Such problems include more efficient and fairer allocation of orbital slots and radio frequencies for the purpose of satellite telecommunications, expansion of Article 11.5 of Moon Agreement for the purpose of space mining, space debris issues, non-spacefaring States' access to information obtained by remote-sensing, and disputes between commercial entities.¹¹⁹

Surely, the most pertinent issue is whether States are willing to cede more powers to an international organization that might entail more curtailment on their freedom of actions in space.¹²⁰ For instance, would States want such an international organization to have say on militarization of space?¹²¹ With the absence of a legally binding treaty or international space organization, cooperation between States is imperative for the time being.¹²²

¹¹⁸ Carl Q. Christol, *Alternative Models for a Future International Space Organisation*, 24 PROC. ON L. OUTER SPACE 173 (1981); Courteix, *supra* note 114, at 23.

¹¹⁹ LYALL & LARSEN, *supra* note 14, at 573. Current space treaties lack in substance and are focused on disputes between States: Article XIII of the Outer Space Treaty, Articles XIV–XX of the Liability Convention, and Article 15 of the Moon Agreement, for instance.

¹²⁰ Kamenetskaya, *supra* note 114, at 359 (speaking on the United States's reluctance to improve international cooperation in outer space as the then existing forms and methods of multilateral and bilateral cooperation met the political and commercial interests of the United States).

¹²¹ Courteix, *supra* note 114, at 20, 26.

¹²² LYALL & LARSEN, *supra* note 14, at 563.