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Law & Ethics

Aspects of the International Legal Regime concerning Privatization and Commercialization of Space Activities

Gbenga Oduntan

The business case for the commercialization and privatization of space-related activities is very convincing, and an unprecedented level of investment has already been committed towards the development of satellite technology, space vehicles, spaceports, launch technology, and space defence systems. However, it is unclear whether these developments sit easy with the principles of international space law in particular and international relations in general.

This article will trace the law and practice of space activities as it involves private enterprises, and it will highlight the need for changes to be made to both national and international legislation in order to remove terminological, ideological, and other socio-economic confusion in current legal regimes regulating space law. The central questions about the involvement of private persons in space are (a) can states make profits out of space activities especially where this involves taking finite things from outer space and

selling them here on earth? (b) Can private corporations do so or can they do so only on the behalf of states?

The article will trace the outlines of the increasing scope of commercialization of space activities that are in conformity with international law. It will highlight the sacrosanct nature of the non-appropriation rule for outer space which the article argues is binding upon private persons, as well as states, and prevents territorial control and exploitation of potentially finite resources. We will argue that current international law requires further development and specific reform to accommodate the widespread involvement of private companies in space activities. The article will highlight the continuous application of crucial legal principles such as nationality, registration, flag states' liability, legal ownership, and possession in the emerging future of privatized outer space exploration. The settled interpretation of these concepts in jurisprudence must find newer expression within the context of international commerce as it applies to resources and activities that are placed literally thousands of kilometers away from the earth. In essence, this paper critiques the legality of commercialization and privatization of space activities in relation to three principal areas: (a) the exploitation/appropriation of outer space resources by mining, (b) the territorial appropriation or real property over celestial bodies by private persons, and (c) the space tourism and space experience business. Suggested policy prescriptions and alternative futures will, thus, form part of our conclusion. These include parameters by which national space policies and legislation may allow increasing

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commercialization of the outer space environment as well as exploit certain types of resources while still respecting the central tenets of space law.

A. The Exploitation/ Appropriation of Outer Space Resources by Mining

(A) Applicability of Ownership, Possession, and Market Principles to the Cosmic Higher Grounds

While there is much desire expressed by private entrepreneurs to subject outer space and its resources to the familiar concepts of legal ownership, proprietary rights, and territorial possession, some aspects of these developments stand in sharp contrast with the letter and spirit of space law. Initially, statesmen, international bureaucrats, and enthusiastic scientific advisors were awe-struck by the rapid achievement and high prospects of space travel. This caused them to settle for an inclusive philosophy of common ownership and control over outer space and its resources.¹ Chief among these has been the development of two legal criteria for engagement with outer space, namely, the “province of mankind” formula,² and the “common heritage of mankind” (CHM) principle (which applies to the Moon).³ More recently, however, a small minority of scholars have mounted a strong attack on these principles, and they have argued that both the “province of mankind” formula and the CHM principles are merely statements of general goals and should be seen as mere moral and philosophical obligations. They also argue that treaty provisions designed to facilitate the exploration and use of outer space largely circumscribe the general principle of non-appropriation. According to the proponents of this position, the term “use” in Article 1 of the Outer

Space Treaty denotes the permissibility of—by the very least—limited levels of resource appropriation. In truth, however, there is nothing inherently incompatible between space exploration and aspects of private use or commercialization of outer space. Both treaty law and the practice of international relations in space allow the participation of private endeavour in the environment of outer space as long as it takes place under international law and specifically under the long standing but growing regime of international space law.⁴ Even though the main space law treaties referred to above are somewhat silent upon participation by private corporations, other more recent instruments emanating from the international relations between space faring nations provide an indication of general interest to allow commercialization and participation of private corporations. For example, Article 1 (1) of the Intergovernmental Agreement of 1998 (IGA) implemented for the joint operation of the International Space Station (ISS) recognizes the commercial purpose of outer space activities, stating: “This civil International Space Station will enhance the scientific, technological, and *commercial* use of outer space.”⁵

Furthermore, a growing number of jurisdictions in the developed world and even in the developing world such as Nigeria make clear provisions for the participation of corporations in outer space that are usually under the regulatory control of their national space authorities.⁶ For example, NASA has categorized areas of commercial opportunity on the ISS and several of its other programs into three main groups: (a) users, (b) operations, and (c) new capability development. It also continues to use its dual position as both a customer and a service provider in order to stimulate new commercial enterprises.⁷ Even command economies like China have expressed their interest in outer

space as a commercial focus, and it is said to have plans for a lunar station to exploit valuable resources to collect sunlight in orbiting stations and beam either direct light or microwave energy down to earth-based collecting points.⁸

There are currently five main areas of possible commercial exploitation of outer space by corporations:

- (a) Exploitation by the provision of services from space to earth-based customers (whether private or government) say by utilization of satellite technology and telecommunication;⁹
- (b) Extraction of potentially finite resources such as mineral resources on asteroids or other planets;
- (c) Extraction of resources of an infinite nature such as the harnessing of solar or other wave energy;
- (d) Commercializing space experience for the use of space tourism or for scientific training purposes;
- (e) Manufacturing, servicing, research and development into space products and applications.

We shall consider some of these areas below. Before this is done, however, it is important to note that private companies already make a hefty profit from space-related activities. In 1964, Intelsat established the first commercial satellite services provider, and in 2014, they declared a total revenue of \$2.472 billion.¹⁰ Additionally, indirect private participants in space activities like Boeing, Lockheed, Orbital, Loral, and Astrium are all involved in the process of satellite manufacturing, and whereas they historically had to deal with expensive, national space launchers such as NASA, since 2009 the prospect of being able to launch directly in space through a private company such as SpaceX is promising.¹¹

At present, one key development of space-related commercial activity is allowing private entrepreneurs to provide goods and services for national space agencies and industries such as NASA and the armed forces. Other areas of commercial penetration include the following: space tourism, space station development, the development of suborbital space vehicles, asteroids mining payload delivery systems, specialty composite structure design, analysis, fabrication, developmental flight tests, the development of small-scale propulsion systems, pumps, launch vehicle components, research, development, and project management.¹²

It is important that these broad developments in the commercialization and privatization of outer space activities should be framed within the existing legal architecture for outer space. The regulation of outer space activities has been enshrined in treaties, conventions, and agreements in the language of statehood:¹³ in its first 40 years, space law has assumed that only states would operate in space. Now, while private entities may succeed onto the sovereign rights usually preserved to the competence of states, in reality they are still bound by the limits that are imposed by the states within which they are registered and by international law. The underlying principle of law is contained in the legal maxim *nemo dat quod non habet* (no one will give more than he has). That is, no private entity will inherit rights of action in, or usage of, outer space more than that originally possessed under international law by the state in which it is registered or operates.

The commercialization and privatization of outer space activities should be framed within the existing legal architecture.

(B) Legality of Exploitation/ Appropriation of Outer Space Resources by Mining Resources

Even though the notion of unbridled extraction of outer space resources for commercial profit continues to be seen as heretical by most legal scholars, this has not prevented the fringes of political commentary and in some cases, the odd mad entrepreneur, from assaulting the settled view that contemporary space law—as it is espoused in the available treaties—does not support a regime of extra-planetary mining.¹⁴ It is also quite unsurprising that these views find wider acceptance in those states that have an advanced technological advantage in space activities.¹⁵

The real issue at hand is not about the right of private entities to explore outer space. Rather, it is whether or not private companies should be able to extract resources from asteroids, planets, or other celestial bodies. Exploitation of resources by the processes of removal or repatriation of commercial quantities is clearly a unique activity upon which international agreement will have to be reached. Both states and private entities are bound by the non-appropriation rule, expressed in the space treaties and customary practice norms. Under the Outer Space Treaty (1967)¹⁶ and the Moon Agreement (1979),¹⁷ outer space, including the moon and its celestial bodies, shall be the province of all of mankind, and not just one singular corporation or state. Treaty law also assures that “there shall be free access to all areas of celestial bodies”.¹⁸ Therefore, *prima facie*, the moon, outer space, and celestial bodies are not subject to national appropriation by claim of sovereignty, by means of occupation or by any other means for that matter.¹⁹ Article 11 (2) Moon Treaty (1979) is particularly instructive, and it provides that neither the surface nor the subsurface of the moon, nor any part thereof or natural resources in place, shall become property of

any state, and the placement of personnel, space vehicles, equipment, facilities, stations and installations on or below the surface of the moon, including structures connected with its surface or subsurface, shall not create a right of ownership. Interestingly, the Moon Treaty does envisage a future of exploitation. Article 11 (5) states:

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.

It is important to note that this international regime is still not in place and a moratorium continues on exploitation of the Moon by anyone. This future regime of exploitation will be based on a total lack of discrimination of any kind and will be in accordance with international law. It is not an outlandish hypothesis to suggest that were it not for these crucial provisions, states’ activity in outer space might have proceeded on such a competitive scale and in such a manner as to degenerate rapidly into belligerency.

This future regime of exploitation will be based on a total lack of discrimination of any kind

In essence, a private company cannot currently appropriate mineral resources from celestial bodies for resale on earth. Any corporation that may therefore be seeking to exploit the minerals that are found on the moon, or any of the other celestial bodies for that matter, will run afoul of space law. The prime area of such commercial interest

by companies at this time is in the mining of asteroids in near-Earth orbit. However, if a corporation embarks upon such activities against the law, in the first instance it will be liable for investigation and possible sanctions by its state of origin. If this is not done or if the actions are condoned by its state of origin, such a corporation will be liable to other states in the international system for any harm done. In this case, punitive actions may be directed at the corporation or/and the state of origin or registration. Principally, the state of origin will have to ensure cessation of the illegal acts for which it may share responsibility and may have to provide remedies including compensation where applicable.²⁰

To sum up, this article shares the view that

The non-appropriation principle represents the fundamental rule of the space law system. Since the beginning of the space era, it has allowed for the safe and orderly development of space activities. . . . this principle should be regarded as a customary rule of international law of a special character, namely “a structural norm” of international law.²¹

B. Legality of Territorial Appropriation or Real Property Rights over Celestial Bodies by Private Persons

In terms of how much territory—if any—can be appropriated by corporations in outer space, again, the basic principle is that private corporations cannot do more than their states of origin under treaty law. A lot will depend on what kind of territory is in question. In terms of orbital territories, such as those that are occupied by satellites in geostationary orbit, it is settled by sheer practice that private corporations can obtain licenses that are granted by states in order to permit them to develop satellites and “occupy” space for extended periods of time.

Indeed, it is in this area that the exploitation of outer space is in most demand. License to launch and operate will in the first instance be received under the laws of the state of origin. This has been the case for instance with the epoch-making launch handled by SpaceX, the first private satellite launch in the United States. After national licenses and permissions have been received, the United Nations will have to be notified and supplied with information about the nature of the launch and other orbital characteristics including the position of the satellite.²² However, in the last decade it has become observable that “there has been a worrying rise in non-registrations over the past few years, perhaps linked to the growth in the number of, especially commercial, entities engaging in space activities.”²³ It is submitted that from the perspective of international law, such non-registered satellites or space objects are illegally occupying mankind’s outer space. Compliance with the legal demands of registration and nationality principles in this area only completes the long line of international jurisprudence over transportation vessels in international spaces such as the law of the sea and law of the air.

Nevertheless, under the authority of their states of origin, a private corporation may occupy space and exercise some forms of control over reasonable amounts of orbital territory in outer space. With respect to celestial bodies, it is also the case that a reasonable amount of space can be occupied by private corporations as may be necessary for the functioning of space objects and space stations or alternatively for experimentation. For example, The Moon Agreement (1979) has provided that: “Without prejudice to the rights of other States Parties, consideration may be given to the designation of certain areas as international scientific preserves for which special protective

arrangements are to be agreed” (Article 7 (3)). With the granting of such “special protective preserves,” it may be argued that control and preclusion of intrusion is to some extent tolerated in outer space, at least as regarding lunar territories. A private company may set up operations within its own state’s scientific preserve or set up one under the authority of its state of origin. It must be said that it will be more in consonance with the spirit of the Moon Agreement that multiple use and establishment of preserves cannot be exercised by different corporations from the same countries as this will likely establish excessive presence by a few states and may clog up the right of other states to find desirable territory much along the same lines as has occurred in the placement of communication satellites.²⁴

The preferred interpretation is that scientific preserves must first be claimed and maintained by the sovereign state and that further licenses to operate must be given to private companies. This is also in line with the provision in Article 9 (1) of the Moon Agreement (1979) which states, “States Parties may establish manned and unmanned stations on the Moon.” It is probably important to note that “such stations must not exceed the Area which is required for the needs of the station” and that the Secretary General of the UN must always be aware of the location and purpose of such stations. There is a danger, however, that these provisions of the Moon Agreement (1979) may be insufficient to deter states and persons who seek to introduce ownership, possession, and the practice of appropriation of portions of outer space. This is particularly so since all that is required if a state creates preserves and stations is for it to “inform” the UN Secretary General as provided in Article 7 (2) and to “notify and report” as in Article 9 (1).

However, Article 11 (3) appears to remove

all doubts as to the unsuitability of the practice of appropriation on the Moon or of the Moon itself. It states quite clearly that “Neither the surface nor the sub surface of the moon nor any part thereof or natural resources in place, shall become property of any state, international inter-governmental or non-governmental organisation entity or of any natural person.” To remove the possibilities of any constructive appropriation, Article 11 (3) also asserts:

The placement of personnel, space vehicle, equipment, facilities stations and installations on or below the surface of the moon including structures connected to its surface or subsurface shall not create right of ownership over the surface or subsurface of the moon or any areas thereof.

Therefore, it is clear that a private corporation cannot proceed surreptitiously outside of the above rules in order to acquire exclusive territory against the rights of other states on celestial bodies by placing equipment, machinery, or stations there, or through whatever ingenious means that is contrary to international law. There is, of course, the possible argument that Article 11 (3) does not specifically mention corporations and that this may somehow be the basis for corporate ownership. This is a manifestly pedantic argument because the letter and spirit of the provision is clear. Furthermore, much has been said about the fact that the ratification level for the Moon Agreement has been very low and that none of the advanced space-active powers are party to it; however, the fact is that even the Space Treaty (1967)—which has wider signatory and ratification level—does not favor the idea of territorial acquisition over outer space and its celestial bodies. The working of the province of mankind principle does not allow the practice of commercial appropriation of territory on celestial bodies.

At any rate, common agreement will have to exist before international law permits the use of celestial bodies for commercial purposes such as sale, rent, or real property purposes. This is somewhat comparable with the history of the regime governing the Deep seabed. Even the developed states preferred the security that a limited international regime of common ownership would offer their private and public undertakings, compared to the hazards of a “free for all” scenario in the ownership or exploitation of the seabed. Thus, the deep seabed has been recognized since 1970 as the “common heritage of mankind” to be used to the benefit of all states and not only for those states with the capital and technology to exploit them.²⁵

C. Legality of Space Tourism and Space Experience Business

Outside satellite communications and telephony, space tourism is turning out to be the emerging frontier of private-sector activities in outer space.²⁶ The privatization of pleasure trips to the cosmic higher grounds is set to become a defining feature of this century. Ironically enough, it fell upon post-communist Russia to pioneer the advent of space tourism well ahead of the runaway free market space power of the United States. In 2001, Russia launched the first space tourist, American millionaire Dennis Tito, and they allowed him to stay on International Space Station Alpha as a commercial visitor. NASA opposed the move, suggesting that the passenger would be a safety risk. The United States emphasised that Tito’s trip was to be considered a one-time exemption, and he had to sign an agreement that he would not wander through American segments of the station without an escort.²⁷

Since then, space tourism has been largely designed around the idea of private participation in outer space activities. Clearly

liberal capitalistic ideals and the pursuit of profit in return for high-end space-related products is the preferred route of Western businesses. The market case for neo-liberalism in space tourism is obviously sound. There is a beneficial interaction between the moneyed class investor and high net worth individuals willing to part with significant sums in consideration for access to outer space. Virgin Galactic alone has signed up more than 200 prospective space tourists out of a potential pool of 30,000. The Ansari X-Prize continues to spur competition for new flight modes, and hundreds of tickets have been sold at around \$100,000 apiece. Indeed the future of funding for sub-orbital vehicles is destined to emanate from the capitalist class.

However, there are some significant fears and questions arising from this development. First and foremost there are doubts as to the applicability of space law rules to corporations in terms of responsibility for accidental damage and losses. Space activities are inherently hazardous, and significant mishaps are not unusual; therefore any uncertainty as to who will be responsible for accidents should necessarily be a source of serious concern in international relations. Ultimately, states are responsible for the actions of their nationals (which includes corporations) in space. Yet where incalculable losses could arise, the tendency will be for corporations to seek to avoid or severely limit their liability for damage. Corporations may seek to hide behind the corporate veil doctrine recognized in many countries, and their states of registry may even seek to deny a genuine connection to their territory as a means of rebuttal of responsibility and compensation claims.²⁸ Moreover there are other significant terminological, ideological, and socio-legal confusions that are beginning to afflict the law and practice of space tourism.

Where does outer space legally begin? Where does airspace end?²⁹ Are low-orbit flights or weightlessness experiences generated by parabolic flights a mis-sold service (under many national laws) given that penetration of outer space may not have occurred? Who is an astronaut? Do space treaties written for astronauts and scientific personnel protect tourists? What types of insurance must private companies obtain especially in relation to the overriding interest of protecting the public from huge losses?³⁰ What happens when one tourist smashes a bottle of rum on the head of another?³¹ Thousands of combinations of criminal and civil jurisdictional nightmares will indeed cascade down from the heavens over the next few years. The general rule is that criminal and civil jurisdiction over flight instruments and stations will follow the flag. All private vehicles, instrumentation, and stations will thus be required to have a flag and be registered with a state. Furthermore states are obliged to register details of launchings and space objects with the UN.³²

The general rule is that criminal and civil jurisdiction over flight instruments and stations will follow the flag.

Conclusion

There are several significant questions relating to the commercialization of outer space and the activities that take place therein which must be meaningfully addressed under new agreements fit for the twenty-first century. There are important tasks for law and policy makers in national systems to bring their legal regimes up to speed on the emerging practices of businesses with respect to outer space. In most cases, this will take the form of legislation that legiti-

mizes outer space activities. The surprising reality is that most states simply do not have a Space Act, not to mention one that is specifically tailored towards the commercialization of space activities.³³ It will be necessary for a pattern of national policy responses to the challenges of privatization, possession, and commercialization of outer space to emerge before changes to the international understandings on these issues can be made. In the interim, commercialization and privatization must be placed within the limits of the existing legal architecture for outer space. A new space treaty may have to be introduced to grant increasing scope for commercial activities in outer space by specifically recognizing the role of the private sector in space activities and regulating key rights and duties that they may exercise. The right to mine infinite resources ought to be gradually phased in especially where these do not fundamentally upset existing international economic trade. Nonetheless, care must be taken not to disturb the common heritage of mankind principle in space law. There appears to be no other arrangement that can encapsulate the hopes and interests of mankind in this most important sphere of existence.

Notes

1. The erstwhile Soviet Union (now Russia) stated: "No human activity on the Moon or any other celestial body could be taken as justification for national appropriation." See *Pravda*, November 18, 1959 and United Nations, September 22, 1960 (Official Records), p. 48 para. 58. The United States' position in the words of President Johnson was, "We have rejected the concept of national sovereignty in outer space. No Moon, no planet shall fly a single nation's flag." It has also been stated that "the goals now within reach of the human race are too great to be divided as spoils, too great for the world to waste its efforts in a

- blind race between competitive nations.” Legal Sub-committee, October 20, 1966, A/AC.105/C.2/SR.63.
2. Article 1 of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (also known as the Space Treaty) (1967) states: “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.” 18 UST 2410, 610, U.N.T.S. 205.
 3. Article 11 of the Agreement Governing the Activities of States on the Moon and other Celestial Bodies (1979) 1363 UNTS 3 / 18 ILM 1434 (1979), also known as the Moon Treaty or Moon Agreement, states: “The Moon and its natural resources are the common heritage of mankind, which finds its expression in the provisions of this Agreement, in particular in paragraph 5 of this article.” G.A. Res. 34/68, U.N. GAOR, 34th Sess. Supp. No. 46 at 77, U.N. Doc. A/34/664 (1979).
See also Williams, “Outer Space and Natural Resources,” *op. cit.*, p. 109; R. V. Dekanozov, “The Common Heritage of Mankind in the 1979 Agreement Governing the Activities of States on the Moon and Other Celestial Bodies,” *Proceedings of Twenty Fourth Colloquium on the Law of Outer Space* (1981), 186.
 4. The participation of private satellite technology in space has, for instance, taken place mostly unchallenged since the 1970s as part of an emergent global information infrastructure. Supranational bodies such as the European Union and the International Telecommunications Union have given positive attention and support to this development. Hamid Mowlana, *Global Information and World Communication: New Frontiers in International Relations* (London: Sage, 2005), 14, 81, 109, 170; See also generally James G. Savage, *The Politics of International Telecommunications Regulation* (Boulder, CO: Westview Press, 1989). Note the helpful distinction made by Edythe Weeks in relation to the distinction between commercialization and privatization. Edythe Weeks, *Outer Space Development, International Relations and Space Law: A Method for Elucidating Seeds* (Newcastle upon Tyne: Cambridge Scholar Publishing, 2012), 228.
 5. The ISS is in fact a cooperative program between the United States, Russia, Canada, Japan, and eleven Member States of the European Space Agency (Belgium, Denmark, France, Germany, Italy, the Netherlands, Norway, Spain, Sweden, Switzerland, and the United Kingdom). Intergovernmental Agreement of Jan. 1998, <ftp.hq.nasa.gov/pub/pao/reports/1998/IGA.html> accessed July 12, 2015.
 6. Nigeria in 2012 concluded legal frameworks to licence private space activities in the country including setting up of a register where every space-related object launched by such corporations would be recorded. See Ken Nwogbo, “NASRDA Mulls Law on Space Regulation,” *Nigeria Communications Week*, October 15, 2012, accessed July 21, 2015, <http://nigeriacommunicationsweek.com.ng/taxonomy/term/1024#sthash.f0B9NXN1.dpuf>.
 7. NASA, Business Opportunities: Business Opportunities at NASA, July 28, 2015. <http://www.nasa.gov/about/business/>. Rosanna Sattler, “US Commercial Activities aboard the International Space Station,” *Air & Space Law* XXVII, no. 2 (2003).
 8. John Gittings in Shanghai and Tim Radford “The Moon—a Gigantic Leap for the Chinese who Spy a Business Opportunity in Space: Beijing Takes Giant Leap into Space with Plans for Lunar Station,” May 21, 2002, accessed July 29, 2015, <http://www.theguardian.com/world/2002/may/21/physicalsciences.internationaleducationnews>. Note also Japanese plans in this very area; Graham Templeton, “Japan’s 25-year plan to put a gigawatt solar power farm in space,” April 28, 2014, accessed July 29, 2015, <http://www.extremetech.com/extreme/181389-japans-25-year-plan-to-put-a-gigawatt-solar-power-farm-in-space>.
 9. The satellite communications industry is per-

- haps the most active area of commercialization of outer space activities. See Gérardine M. Goh Escolar, "Satellite Communications Regulatory, Legal and Trade Issues" in *Handbook of Satellite Applications*, ed. Joseph N. Pelton, Scott Madry, and Sergio Camacho-Lara (New York: Springer, 2013), 508.
10. Intelsat S.A., "About Us: The Leading Provider of Satellite Services Worldwide," accessed July 30, 2015, <http://www.intelsat.com/about-us/>.
 11. Information and materials about SpaceX are available at <http://www.spacex.com/>, accessed July 23, 2015; The Space Settlement Institute, "Private Space Companies," accessed July 29, 2015, <http://www.space-settlement-institute.org/private-space-companies.html#sthash.de0F0fA9.dpuf>.
 12. Ibid.
 13. (a) The Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water 1963[1], also known as the Nuclear Test Ban Treaty. UNTS Vol. 480 (1963); (b) United Nations General Assembly Resolution 1962 (XVIII)[2] G.A.O.R., 18th Session, Supp. 15, p. 13. (1963); (c) Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space (General Assembly Resolution 1962 of 13 December, (1963)); (d) The Outer Space Treaty (1967). See note 2 above; (e) Agreement on the Return of Objects launched in to Outer Space (1968), also known as the Astronaut Agreement or Rescue Agreement. U.K.T.S. 56 (1969), Cmnd. 3997; (1969) 63 A.J.I.L. 382. In force 1968. Eighty-six parties, including the five permanent members of the Security Council; (f) Convention on International Liability for Damage caused by space Objects (1972), also known as the Liability Convention. U.K.T.S. 16 (1974), Cmnd. 5551; 961 U.N.T.S. 187; 10 I.L.M. 965. In force 1973. Seventy-six parties, including the five permanent members of the Security Council; (g) Convention on Registration of Objects Launched into Outer Space (1975), also known as the Registration Convention. UNTS 187; 14 ILM 43; UKTS 70 (1978);
 - In force 1976. Thirty-nine parties including the five permanent members of the Security Council; (h) The Moon Agreement (1979), see note 2. Other recent instruments of relevance to the study include the Principles Relevant to the Use of Nuclear Power in Outer Space (1992). A/RES/47/68 85th plenary meeting December 14, 1992; Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of all States, Taking into Particular Account the Needs of Developing Countries (1996). A/RES/51/122 83rd plenary meeting December 13, 1996.
 14. Mark Orlove, "Spaced Out: The Third World Looks for a Way in to Outer Space," *Connecticut Journal of International Law* 4 (1988–1989): 597; Yun Zhao, "An International Space Authority: A Governance Model for a Space Commercialization Regime," *Journal of Space Law* 30 (2004): 277; G.F. Kennan, "To Prevent a World Wasteland," *Foreign Affairs* 48 (1969–1970): 401; Aldo Armando Cocca, "Revaluation of the Concept of the Human Condition and the Common Heritage of Mankind: Keys to the Social Benefits of Space Technology," *Acta Astronautica* 19, no. 9 (1989): 779–783.
 15. See for instance, the following: Heidi Keefe, "Making the Final Frontier Feasible: A Critical Look at the Current Body of Outer Space Law," *Santa Clara Computer & High Tech. LJ* 11 (1995): 345; S. Coffey, "Establishing a Legal Framework for Property Rights to Natural Resources in Outer Space," *Case Western Reserve Journal of International Law* 40, no. 1 (2009): 41, 119; Linda Billings, "How Shall We Live in Space? Culture, Law and Ethics in Spacefaring Society," *Space Policy* 22, no. 4 (2006): 249–255.
 16. See note 3 above.
 17. See note 3 above.
 18. Article I Outer Space Treaty (1967); Article 4 and 8 Moon Treaty (1979).
 19. Article 3, Declaration (1963), Article II Outer Space Treaty (1967).
 20. It may be argued that the normal economic and regulatory conditions affecting and shap-

- ing corporate behavior will also apply to corporations in space. These include public and private regulation, the presence of nongovernmental, and other independent organizations that monitor corporate behavior, institutionalized norms regarding appropriate corporate behavior, associative behavior among corporations themselves, and organized dialogues among corporations and their stakeholders. John L. Campbell, "Why Would Corporations Behave in Socially Responsible Ways? An Institutional Theory of Corporate Social Responsibility," *Academy of Management Review* 32, no. 3 (July 1, 2007): 946. For the position of international law on the responsibility of states for their corporations outside state territory, see further Robert McCorquodale and Penelope Simons, "Responsibility Beyond Borders: State Responsibility for Extraterritorial Violations by Corporations of International Human Rights Law," *Modern Law Review* 70, no. 4 (July 2007): 598–625.
21. Fabio Tronchetti, "The Non-Appropriation Principle as a Structural Norm of International Law: A New Way of Interpreting Article II of the Outer Space Treaty," *Air & Space Law* 33, no. 3 (June 2008): 277.
 22. Parties to the Registration Convention are committed to providing the United Nations with certain information about objects they launch into space.
 23. Yoon Lee, "Registration of Space Objects: ESA Member States' Practice," *Space Policy* 22, no. 1 (February 2006): 42.
 24. Clogging by the commercial interests from a few states is beginning to be a constant worry of the technically aware. See Stuart Clark, "Orbit is Overcrowded, Call in the Junk Busters," *New Scientist* 207, no. 2777 (2010): 46–49; Corinne M Contant, "The Need to Regulate Commercial Telecoms: Issues and Options," *Space Policy* 18, no. 1 (2002): 5–8.
 25. See Declaration of Principles Governing the Sea-Bed and the Ocean Floor, and the Subsoil Thereof, beyond the Limits of National Jurisdiction G.A. Res 2749 (XXV), December 17, 1970. (1970). (1971) 10 I.L.M. 220.
 26. Market studies indicate that there are more than one thousand suborbital passengers per year and this is capable of generating global market figures topping \$1 billion by the end of this decade. See Futron, "Space Tourism Market Study Orbital Space Travel & Destinations with Suborbital Space Travel" (October 2002), 9.
 27. CNN, "Glenn: Tito Flight a 'Misuse' of Space Station," May 6, 2001, <http://www.cnn.com/2001/TECH/space/05/06/glenn.tito/index.html>; see also CNN, "Russia Plans More Space Tourism," April 29, 2001, accessed November 14, 2015, <http://edition.cnn.com/2001/TECH/space/04/29/shuttle.tourists/index.html>.
 28. International legal jurisprudence since the *Nottebohm* insists upon a genuine link between corporate entities and the countries they are incorporated or registered in (as in the case of aircraft and ships). See *Nottebohm* case I.C.J. Reports 1955, p. 4. See further Fawcett, *International Law & the Uses of Outer Space* (Manchester: Manchester University Press, 1968), 27; John Kish, *The Law of International Spaces* (Netherlands: Sijthoff Leiden, 1973), 137.
 29. Gbenga Oduntan, "The Never Ending Dispute: Legal Theories on the Spatial Demarcation Boundary Plane between Airspace and Outer Space," *Hertfordshire Law Journal* 1, no. 2 (2003): 64–83.
 30. Tanja Masson-Zwaan raises the question whether states will follow the US example and make travel conditional on passengers signing informed consent forms. Tanja Masson-Zwaan, "Liability and Insurance for Suborbital Flights," Proc. 5th IAASS Conference "A Safer Space for a Safer World," Versailles, France, October 17–19, 2011 (ESA SP-699, January 2012), 6. Available at https://openaccess.leidenuniv.nl/bitstream/handle/1887/.../s2_3mass.pdf? accessed July 30, 2015.
 31. Oduntan (2012), op.cit., pp. 86, 97.
 32. United Nations, "United Nations Register of Objects Launched into Outer Space," accessed July 21, 2015, <http://www.unoosa.org/oosa/en/spaceobjectregister/index.html>; R Wickramatunga, "Review and Analysis of the Register

- of Space Objects,” *Space Policy* 7, no. 1 (February 1991): 77–81, www.sciencedirect.com/science/article/pii/026596469190049N#.
33. Note may however be taken of the United States jurisdiction where there is a Commercial Space Act of 1998, Title II - P.L. 105-303: An Act to encourage the development of a commercial space industry in the United States, and for other purposes. Oct. 28, 1998 - H.R. 1702].

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