

IS A NEW LOOK NECESSARY IN THE AGE OF EXPLORATION AND EXPLOITATION?

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INTRODUCTION

Exploration has been the focus of human endeavors in outer space since the inception of the space age.¹ While exploration is a logical starting point when facing any unknown region, eventually activities must necessarily evolve from a preliminary stage of going into an unknown and looking around (i.e. exploration) to using the region in a logical and productive manner (i.e. exploitation). There is much in outer space that remains unknown and exploration, therefore, still has an important role to play. However, a shift from government-led, exploration-focused space programs to a robust space industry pursuing interrelated exploration and exploitation goals is currently underway, accompanied by an increasing role for the commercial space sector across the full spectrum of outer space activities.² As these fundamental changes to the nature of the space industry are taking place, it is necessary to examine the state of the legal regime that governs space activities.

FROM EXPLORATION TO EXPLOITATION

Space exploration has traditionally been planned by State governments and executed by national space agencies, often following national political agendas, but that traditional structure has slowly been changing. From international partnerships to partnerships between government space agencies and the private sector, there is increasing recognition that the basis of space exploration must evolve in order to advance.³

National space agencies, still very much the leaders in space exploration, are aware of the need for (and the benefits of) international partnerships, and are working towards promoting and increasing the participation of the private sector in a wide array of space activities. The Vision for Space Exploration outlines the future of the U.S. space program, to include developing new means of space transportation in order to return humans to the moon by 2020.⁴ The Constellation Program, consisting of the Orion Crew Vehicle, Aries Launch Vehicle, and Altair Lunar Lander, is the new transportation technology, being developed in accordance with The Vision for Space Exploration, that will replace the Shuttle and provide the basis for transportation to the Moon and beyond.⁵ The objective is to develop technology to enable Moon exploration plans that can later be built upon to take the first steps toward human missions to Mars. Along with broad exploration and technological goals, the Vision for Space Exploration also emphasizes the need to focus on international participation in space exploration and to pursue opportunities for commercial involvement in space transportation and exploration.⁶

International partnerships have already produced successful space exploration projects, such as the International Space Station (ISS), and various national space agencies have acknowledged that the next steps in space exploration cannot be taken by one nation alone; they will require international cooperation. Steps to make increased cooperation a reality are underway in several forums. The Global Exploration Strategy (GES), an open partnership of fourteen space agencies, is based on the premise that "sustainable space exploration is a challenge that no one nation can do on its own."⁷ The various space agencies participating in the GES drafted the

Framework for Coordination (GES Framework), a document which proposes establishing a voluntary, non-binding international forum (the GES Coordination Mechanism) for the sharing of and collaboration on space exploration plans and projects. While the GES Framework does not advocate a specific program (focusing instead on collaboration on individual projects and collective efforts), it does identify the primary targets of exploration as the Moon, Mars, and near-Earth asteroids, beginning with robotic missions and progressing towards a sustained human presence in space.⁸ Furthermore, the GES Framework specifically recognizes the expanding role of various commercial space industries, driven by the demand for new technologies and services.⁹

Additional examples of the trend toward increasing international cooperation in space exploration include projects such as the International Lunar Network (ILN)¹⁰ and the NASA/ESA Comparative Architecture Assessment.¹¹ The ILN is a NASA-led program designed to place six to eight science stations (fixed or mobile) on the surface of the Moon, with the goal of creating a second generation robotic science network.¹² In July 2008 representatives from nine national space agencies considering participating in the project attended a meeting with NASA, cumulating in a statement of intent that served as an “expression of interest by the agencies to study options for participating in a series of international lunar missions.”¹³ The specifics of international participation, to include items such as contributions of technology/infrastructure, scientific coordination, and interoperability standards, are expected to be established by international agreements.¹⁴

The NASA/ESA Comparative Architecture Assessment was released in

July 2008, following a six month study which evaluated “the degree to which NASA and ESA’s lunar exploration architecture concepts could complement, augment, or enhance the exploration plans of one another.”¹⁵ It was noted that, consistent with the GES Framework, NASA is utilizing an open architecture approach, “which will maximize opportunities for international and commercial participation.”¹⁶

National space agencies are not only looking to international partnerships with each other, but to partnerships with private industry. As demonstrated by the GES Framework, space agencies identify both the need for increased commercial involvement and the opportunities that will arise for entrepreneurs as the demand for new space-related technologies and services continues to grow. The integration of commercial partners into national and international space exploration programs has already begun.

Through its Commercial Crew and Cargo Program Office (C3PO), NASA is working toward extending human presence in space by enabling an expanding commercial space industry.¹⁷ The C3PO promotes the development of industry-created, privately owned and operated space transportation systems.¹⁸ NASA will fill the role of lead investor and customer, as well as providing technical assistance to its industry partners.¹⁹ This program has been put into action through the Commercial Orbital Transportation Services (COTS) Demonstration Project, under which NASA is working with the commercial space industry toward the development of crew and cargo space transportation capabilities, both in support of the Constellation program and beyond.²⁰ Under the COTS program, C3PO enters into funded or unfunded Space Act Agreements (SAA) with commercial partners (which are not traditional

government contractors).²¹ In order to encourage private sector innovation and investment, C3PO provides only broad technical goals, rather than specific design requirements, and enables commercial partners to “retain the maximum rights to intellectual and personal property allowed by law.”²² Finally, based on NASA’s commitment to use commercial services to support the ISS once available, C3PO works with an ISS/COTS integration manager to ensure COTS commercial partners’ spacecraft will achieve interoperability with, and certification to visit, the ISS.²³

Another example of the trend toward increasing the involvement of the private sector in space exploration while simultaneously expanding the commercial space industry, is NASA’s Centennial Challenges program (a part of NASA’s Innovative Partnerships Program).²⁴ These partnerships with commercial, academic, and other outside sectors engage “a broad spectrum of entities from these sectors for the purposes of identifying and facilitating opportunities for partnering to develop dual use technologies, which provide technology alternatives for NASA’s Mission Directorates,”²⁵ and are most effective when used to seek innovative contributions from “individuals and companies who would not normally participate in a traditional government procurement process.”²⁶ The Centennial Challenges program, which is managed by outside (private) entities, awards prizes, funded by NASA, for specific accomplishments in the development of space-related technologies.²⁷

Although partnerships with national space agencies are undoubtedly beneficial in promoting the expansion of the commercial space sector, significant development can also be seen in the ‘independent’ commercial space sector. Space tourism is one element of this emerging sector that has

received widespread publicity.²⁸ Space tourism not only includes the actual transportation providers, such as Virgin Galactic (which is “fully and independently funded”),²⁹ but also associated commercial spaceports and other support industries; together they comprise a sector referred to as ‘new space.’³⁰ Other commercial entities are working toward establishing the first commercial space stations, providing launch and cargo transportation services, and taking advantage of opportunities for increased commercial involvement in traditional ‘government’ space activities (e.g. earth observation, weather, positioning, navigation, exploration robotics).³¹ The commercial sector is also using the concept of prizes to promote research and development from within.³²

International partnerships and the increasing involvement of the commercial sector have significantly broadened the base of participants in space exploration. While exploration is still necessary, it is also proven; since the dawn of the space age exploration has been the focus of space activities. There are limits, however, to a program of pure exploration. The key to the further development of space activities may be the ability to move from a program based primarily in exploration to one that incorporates exploitation.

Space exploration conducted exclusively by national space agencies is limited due to the fundamental nature of government programs, such as fiscal/budget concerns and constraints, politics, policy, and the need to be responsive to changes in national (and international) priorities.³³ These limitations are some of the very reasons that national space agencies recognize it is critical to partner with private industry to further exploration goals.³⁴ These agencies also generally do not have a commercial mandate; national government-led space

exploration is not usually done for commercial purposes. If space exploration is to evolve into a program of exploration and exploitation (i.e. looking around, discovering, and *using* outer space and its resources), it will be the commercial space sector, not national space agencies, that lead the way. It is therefore not surprising that one of the GES Framework “themes” is economic expansion, a concept that relies heavily on exploitation, both as a means to support advances in exploration and as a stand-alone purpose for space activities.³⁵ As noted in the GES Framework, “[i]t is hoped that entrepreneurs will create businesses to exploit resources,” which will make space exploration “more sustainable” and decrease demand for and dependence on government resources.³⁶ By partnering with and promoting the development of the commercial space sector, national space agencies are helping to create a solid foundation which can take human space activities to the next level.

LEGAL FRAMEWORK

The international space law treaties that make up the legal framework for outer space activities were negotiated and came into force at a time when the international arena was dominated by the polarized political ideologies of the Cold War, and exploration was the logical first step for mankind’s entry into outer space.³⁷ The ‘space race’ that shaped the progress of space exploration was largely propelled by Cold War politics and the pioneering space programs of the U.S. and U.S.S.R. were, consequently, dictated and controlled exclusively by the respective governments. Therefore, it is not surprising that the existing body of international space law, while providing a solid framework of broad principles, focuses primarily on the State-led exploration of outer space.

As the parameters of space exploration change, and a shift toward exploitation looms on the horizon, the question arises as to whether the principles embodied in the existing legal regime will continue to provide an adequate framework in light of the fundamental changes that are taking place with respect to space activities. The cornerstone document of international space law, the Outer Space Treaty (OST), mentions exploitation only in the broadest of contexts when it refers, in several instances, to the “exploration and use of outer space.”³⁸ The drafters clearly contemplated something more than exploration, but, in those early days of the space age, chose to deal with it only in general terms.³⁹

One of the international space law treaties that does deal with exploitation on a more specific level is the Moon Treaty.⁴⁰ Negotiated over the better part of a decade, the Moon Treaty was the last of the five major international space law treaties drafted by COPUOS.⁴¹ From its inception the Moon Treaty was mired in controversy and it has not been ratified by any State with independent space-flight capabilities, in part precisely because of its provisions addressing exploitation of natural resources.⁴² Those provisions include a prohibition on property rights in the surface or subsurface of the Moon, or of any in-place resources, and the requirement that an international regime be established to govern the exploitation of natural resources.⁴³ Although establishment of the regime is not called for until “exploitation is about to become feasible,” the Moon Treaty does mandate “purposes” for the regime, which include “[a]n equitable sharing by all States Parties in the benefits derived from” resource exploitation.⁴⁴

The specifics of the enduring debate surrounding the Moon Treaty have been well-chronicled by numerous scholars and

commentators. Regardless of issues and positions, the lasting nature of the debate proves the most important point; there are controversial ambiguities within in the Moon Treaty.⁴⁵ After nearly thirty years of debate, the issues have not been settled and only a handful of States have ratified the Moon Treaty. Despite the changes that have been seen since 1979, with respect to both the international political environment and the nature of space activities, the stalemate between proponents and opponents of the Moon Treaty shows no signs of lifting.

LEGAL CHALLENGES

The legal framework provided by the OST has effectively governed space activities for over forty years. Subsequent treaties have expanded on the OST principles and themselves become part of the public international law framework for space activities.⁴⁶ Notwithstanding the changes that have taken place since those treaties were drafted, the framework remains solid. The shift from exploration to exploitation and the growing importance of the private space sector are not themselves changes that necessarily require reworking the existing framework. The challenge is not about creating an entirely new legal framework for outer space activities, but recognizing when it would (and would not) be beneficial to refine and build upon the existing framework.

As space activities continue to evolve, there undoubtedly will be instances when it is apparent that building on and clarifying the existing legal framework would be beneficial, and possibly necessary. A first consideration should be identifying the proper (and most efficient) forum for the creation of new laws regulating space activities. COPUOS is certainly the proper forum to create broad, public international law principles, but not all space law needs to

be, or should be, created at a multilateral, international level. Because the existing framework does set out broad principles (which serve as the outer boundaries of public international space law), it is relatively easy to craft more specific laws within the confines of those principles. The UNIDROIT, Preliminary Draft Protocol on Matters Specific to Space Assets (Space Assets Draft Protocol),⁴⁷ agreements between international partners participating in a specific project,⁴⁸ national laws regulating space activities in a particular State,⁴⁹ and private contracts relying upon space-related and other national laws are just a few examples of the different arenas in which space law is created. While all of these various treaties and laws function within the framework of the overarching international space law treaties drafted by COPUOS, they also serve to further develop the particulars of space law in ways that are responsive to the realities of space activities.

A second consideration is whether anticipatory lawmaking will help or hurt in a given set of circumstances. Just because a lawmaking body can make rules regulating space activities, does not mean that it should make those rules, especially when the laws it is considering will primarily affect an area or space activity that is still developing.⁵⁰ Law should be practical, rather than an academic exercise, and should evolve with the activity it regulates. In some instances, regulating the theoretical can have a negative effect on innovation and development. The Moon Treaty, for example, introduced a controversial concept (the common heritage of mankind), which it then used as a basis for requiring the eventual establishment of an international regime to govern the exploitation of natural resources.⁵¹ Although the regime was not actually established by the Moon Treaty, certain of its “purposes” were, including the requirement that there be “equitable sharing

by all States Parties” of the benefits of resource exploitation.⁵² The longstanding debate surrounding ill-defined concepts in the Moon Treaty has injected uncertainty into the realm of resource exploitation, uncertainty which could negatively impact development in this sector.⁵³

In conjunction with the above considerations, it is important to account for trends in the space sector as a whole, as well as the legal needs of the various actors involved with space activities when new rules are being contemplated.⁵⁴ Among the trends that need to be taken into account in this transformational period for space activities are the increase in partnerships between the public and private space sectors, the expansion of the commercial space industry, the growing importance of multinational cooperation, and the shift in the focus of space activities from exploration to exploration and exploitation.

The trends, of course, are to a certain extent responsible for defining the legal needs of the space sector. There is a need to minimize ambiguity and settle ongoing debates with respect to existing laws. Legal certainty, to the extent feasible, is critical to the development of the commercial space industry.⁵⁵ Ambiguous laws create additional risk and expense for an industry which necessarily must deal with the risks inherent to space activities. Regardless of whether legal uncertainties are settled through revision to the existing laws or by drafting new laws which clarify areas of existing ambiguity, any progress toward a resolution would be beneficial to the space industry as a whole. If governments and national space agencies are to be successful in promoting the growth of a self-sustaining commercial space industry and encouraging commercial entities to take over areas, such as transportation, that were once the near-exclusive domain of those governments and

agencies, it is essential that industry is supported by laws it can understand and depend upon.⁵⁶

In order for the commercial space sector to be sustainable and successful, it must be profitable.⁵⁷ Therefore, part of supporting the development of the commercial space industry includes creating a legal environment that encourages investment and innovation. From a legal perspective, that includes recognizing when additional rules and regulations would hinder innovation, and when a given activity has reached a level of maturity which would benefit from further rules and regulations. For example, it would be premature to create interoperability standards for technology that is still in the developmental stage and would benefit from the creation of numerous different approaches before selecting one to be the industry standard. However, once a clear standard emerges or a particular technology is proven, implementing standards to promote interoperability may assist with the growth of that sector. Another critical aspect of promoting investment and innovation, is protecting it. UNIDROIT has taken positive steps in this direction with the Space Assets Draft Protocol, which will provide protection for investors. Looking further ahead, the GES also specifically notes several legal issues that will have to be settled in order to provide certainty to, and protect the profits of, the commercial space industry, including the need to reach a common understanding on issue of property rights and technology transfer.⁵⁸

When the focus shifts from exploration to exploitation, profitability becomes an increasingly important consideration; the goal of exploration is generally exploration itself and scientific knowledge, whereas a primary goal of exploitation is profitability. Given their status as government agencies

and their exploration-based mandates, national space agencies are normally not concerned with profitability.⁵⁹ This does not mean that those agencies are not interested in exploitation, but they would likely look at exploitation for its potential to support long-term exploration projects, rather than its revenue-generating potential.⁶⁰ Both forms of exploitation have their place in space activities and it is probable that some very successful commercial applications for resource exploitation will grow out of initial in-situ resource utilization projects that are designed to support exploration programs. However, to the extent that resource exploitation will contribute to a strong, sustainable commercial space sector, it is important to recognize that profitability will be the motivating factor and the goal for those in the commercial sector that pursue developments in resource utilization.

Finally, the move toward international cooperation will involve new dimensions of law if the objective is to make the commercial space sector an integral part of that cooperation. While international cooperation in the form of national space agencies cooperating with each other is nothing new, making that cooperation operate seamlessly on large international projects will become more complicated if, as the trend suggests, an increasing number of the vital roles on those projects are to be filled by the private sector. At the very least there will need to be project-specific agreements that detail the rights and duties of all parties involved in international, public/private space ventures. However, even if projects are dealt with on a case-by-case basis, certain foundational considerations, such as choice of law and jurisdiction, will have to be addressed. Ultimately, as these joint international projects become more of an industry standard, it will be easier to identify areas

where new law is required, where old law needs to be revised, and where existing, but separate, laws would benefit from a consolidated approach.

CONCLUSION

Space activities are currently in a transitional period. National space agencies are recognizing the fact that they must partner with, and rely upon, both their international counterparts and the commercial space sector in order for the evolution of space activities to take its next logical step. At the same time, the commercial space sector, experiencing unprecedented growth and support, is adjusting to its prominence in an arena once dominated by government. These changes are expanding the boundaries of traditional space exploration. Industry trends indicate a shift is taking place towards an interdependent space sector, which is relying heavily on partnerships between the government and commercial segments, while pursuing interrelated exploration and exploitation goals.

These fundamental changes in the space industry need to be supported and accompanied by corresponding adjustments in the legal regime governing outer space. Laws that are responsive to the realities of the evolving space industry, supportive of the goals of all industry sectors, and capable of promoting industry growth are both necessary and achievable.

¹ This is not to suggest that there were not political, military, and other driving forces behind space exploration, or that exploration did not lead to productive uses of outer space, but simply that exploration, rather than exploitation, has been the broad goal of space programs.

² See e.g. U.S. Department of Commerce, "Entrepreneurial New Space" *Office of Space*

Commercialization, online: Department of Commerce
 <<http://www.space.commerce.gov/newspace/>> [Dept. of Commerce, “Entrepreneurial New Space”] (discussing developments in the commercial space sector and government interest in promoting of that sector); ESA, “Business” *Human Spaceflight and Exploration*, online: ESA
 <<http://www.esa.int/esaHS/business.html>> (providing an overview of the ESA’s opportunities for and assistance to the commercial sector).

³ See e.g. NASA, “The Framework for Coordination” *The Global Exploration Strategy*, online: NASA
 <www.nasa.gov/pdf/178109main_ges_framework.pdf> [NASA, “Framework for Coordination”] (outlining a strategy for sustainable space development).

⁴ NASA, “The Vision For Space Exploration” (February 2004), online: NASA
 <http://www.nasa.gov/pdf/55583main_vision_space_exploration2.pdf> [NASA, “Vision For Space Exploration”].

⁵ See generally NASA, “Constellation – NASA’s New Spacecraft: Ares and Orion” *Constellation Program*, online: NASA
 <http://www.nasa.gov/mission_pages/constellation/main/> (providing information on various aspects of the Constellation Program).

⁶ NASA, “Vision For Space Exploration,” *supra* note 4.

⁷ NASA, “Framework for Coordination,” *supra* note 3 at 2.

⁸ *Ibid.*

⁹ *Ibid.*

¹⁰ NASA, “NASA Hosts International Meeting For Lunar Science Discussions” *NASA News Release* (29 July 2008), online: NASA
 <http://www.nasa.gov/home/hqnews/2008/jul/HQ_08_190_NASA_hosts_ILN_prt.htm> [NASA, “Lunar Science Discussions”].

¹¹ ESA, “NASA and ESA Complete Comparative Exploration Architecture Study” *ESA Human Spaceflight* (9 July 2008), online: ESA
 <http://www.esa.int/esaHS/SEMBA0THKHF_exploration_2.html> [ESA, “Comparative Architecture Study”].

¹² See generally NASA, “Lunar Science Discussions,” *supra* note 10.

¹³ *Ibid.*

¹⁴ *Ibid.*

¹⁵ ESA, “Comparative Architecture Study,” *supra* note 11.

¹⁶ *Ibid.*

¹⁷ See generally NASA, “C3PO: NASA Commercial Crew & Cargo Program” *Commercial Crew & Cargo*, online: NASA
 <<http://www.nasa.gov/offices/c3po/about/c3po.html>> (providing an overview of the Commercial Crew & Cargo Program).

¹⁸ *Ibid.*

¹⁹ *Ibid.*

²⁰ *Ibid.*

²¹ *Ibid.* Funded Space Act Agreements (SAAs) include financial assistance from NASA, whereas Unfunded SAAs include NASA technical assistance, but no financial assistance. A third category of SAA is the Reimbursable SAA, under which industry compensates NASA for performing work on its behalf.

²² *Ibid.*

²³ *Ibid.*

²⁴ See generally NASA, “Centennial Challenges” *Innovative Partnerships Program (IPP)*, online: NASA
 <<http://centennialchallenges.nasa.gov/>> [NASA, “Centennial Challenges”].

²⁵ NASA, “Partnership Development” *Innovative Partnerships Program (IPP)*, online: NASA
 <http://ipp.nasa.gov/partnership_devel.htm> [NASA, “Partnership Development”] (further noting that “[t]he technologies developed through partnerships are targeted to fill in gaps in Mission Directorate portfolios that are a consequence of diminished budget resources . . . [and act] as a catalyst for leveraging limited NASA resources with outside partner resources to provide a wide range of technologies important to NASA’s missions”).

²⁶ “Griffin: What Makes an Effective Prize?” *Spacepolitics.com* (7 December 2008), online: Spacepolitics.com

<<http://www.spacepolitics.com/2008/12/07/griffin-what-makes-an-effective-prize/>> [Spacepolitics.com, “Effective Prize”] (quoting former NASA Administrator Mike Griffin’s general discussion of prizes following a “ceremony recognizing Armadillo Aerospace for winning the largest prize awarded to date in NASA’s Centennial Challenges”).

²⁷ See generally NASA, “Centennial Challenges,” *supra* note 24.

²⁸ See e.g. Futron Corporation, “Suborbital Space Tourism Demand Revisited” (24 August 2006), online: Futron Corporation

<http://www.futron.com/pdf/resource_center/white_papers/SpaceTourismRevisited.pdf>. The report specifically notes that the space tourism industry has “evolved from a fringe market struggling to be taken seriously to an emerging, competitive market in which a large number of companies are seeking to gain a foothold.” *Ibid.* at 2.

²⁹ Virgin Galactic, “When Can I Go?” *Overview*, online: Virgin Galactic <<http://www.virgingalactic.com/flash.html?language=en>>.

³⁰ See e.g. Dept. of Commerce, “Entrepreneurial New Space,” *supra* note 2; FAA/AST, “2009 U.S. Commercial Space Transportation Developments and Concepts: Vehicles, Technologies, and Spaceports” (January 2009), online: FAA/AST <http://www.faa.gov/about/office_org/headquarters_offices/ast/media/Developments%20and%20Concepts%20January%202009.pdf>.

³¹ *Ibid.*

³² See generally X Prize Foundation, “Ansari X Prize,” online: X Prize Foundation <<http://space.xprize.org/ansari-x-prize>> (describing the \$10 million X Prize awarded to Scaled Composites for the development of SpaceShipOne); Dept. of Commerce, “Entrepreneurial New Space,” *supra* note 2 (generally discussing commercially sponsored prizes).

³³ See e.g. NASA, “Partnership Development,” *supra* note 25.

³⁴ See e.g. NASA, “Partnership Development,” *supra* note 25.; Dept. of Commerce, “Entrepreneurial New Space,” *supra* note 2 (noting that “fostering the growth” of the commercial space sector allows the government to “leverage the power and efficiency of free market enterprise to achieve goals that the government has not been able to reach on its own”).

³⁵ NASA, “Framework for Coordination,” *supra* note 3 at 10-12. Former NASA Administrator Michael Griffin also noted that the government space sector “must recognize a fundamental truth: if our experiment in expanding human presence beyond the Earth is to be sustainable in the long run, it must ultimately yield profitable results, or there must be a profit to be made by supplying those who explore to fulfill other objectives.” Spacepolitics.com, “Effective Prize,” *supra* note 26.

³⁶ NASA, “Framework for Coordination,” *supra* note 3 at 6.

³⁷ See *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies*, 27

January 1967, 610 U.N.T.S. 205, 6 I.L.M. 386 [OST]; *Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space*, 22 April 1968, 672 U.N.T.S. 119, 7 I.L.M. 149 [Rescue Agreement]; *Convention on the International Liability for Damage Caused by Space Objects*, 29 March 1972, 961 U.N.T.S. 187, 10 I.L.M. 965 [Liability Convention]; *Convention on Registration of Objects Launched into Outer Space*, 12 November 1974, 1023 U.N.T.S. 15, 14 I.L.M. 43 [Registration Convention]; *Agreement Governing the Activities of States on the Moon and Other Celestial Bodies*, 18 December 1979, 1363 U.N.T.S. 3, 18 I.L.M. 1434 [Moon Agreement]. Although it entered into force in 1984, only thirteen States are currently party to the Moon Agreement, none of which is a major space power.

³⁸ *OST*, *supra* note 37.

³⁹ See generally Bin Cheng, *Studies in International Space Law* (Oxford: Clarendon Press, 1997) at 375-380 (discussing whether “use” and “exploitation” are two different concepts within the context of international space law).

⁴⁰ Of the five international space law treaties, the Moon Treaty is the only one to use the term “exploitation.”

⁴¹ *Moon Treaty*, *supra* note 37.

⁴² See e.g. Cheng, *supra* note 39 at 374, 665.

⁴³ *Moon Treaty*, *supra* note 37 at art. 11. Article 11(5) further states that the international regime “shall be implemented in accordance with Article 18,” which requires that the question of the review of the treaty be included on the UN General Assembly agenda ten years after entry into force. That review has not been accomplished, though the treaty has been in force since 11 July 1984.

⁴⁴ *Ibid.* at art. 11(7).

⁴⁵ See e.g. Ian Brownlie, *Principles of Public International Law*, 6th ed. (Oxford: University Press, 2003) at 258 (pointing out that the Moon Treaty “provisions concerning the appropriation of resources of the moon have certain obscurities”).

⁴⁶ Due to its extremely limited acceptance by the international community, the Moon Treaty is not generally considered to have introduced any new concepts that have become part of the widely recognized general principles of space law. See e.g. Cheng, *supra* note 39 at 665 (noting that “[w]hether the [Moon Treaty] will ever gain sufficient support from the main space powers to turn its basic principles into rules of general international law is still an open question”).

⁴⁷ UNIDROIT, *Preliminary Draft Protocol on Matters Specific to Space Assets*, UNIDROIT 2004 Study LXXIJJ - Doc. 13 rev., (as revised December 2003), online: UNIDROIT <<http://www.unidroit.org/english/publications/proceedings/2004/study/72j/s-72j-13rev-e.pdf>> [*Space Assets Draft Protocol*].

⁴⁸ See e.g. NASA, *Memorandum of Understanding Between the National Aeronautics and Space Administration of the United States of America and the Canadian Space Agency Concerning Cooperation on the Civil International Space Station*, 20 January 1998, online: NASA <http://www.nasa.gov/mission_pages/station/structure/elements/nasa_csa.html>.

⁴⁹ See generally UNOOSA, “National Space Law Database” *Space Law*, online: UNOOSA <<http://www.unoosa.org/oosa/en/SpaceLaw/national/index.html>> (providing links to the text of the domestic space law of various States).

⁵⁰ See e.g. Cheng, *supra* note 39 at 665.

⁵¹ *Moon Treaty*, *supra* note 37 at art. 11.

⁵² *Ibid.* at art. 11(7).

⁵³ See e.g. Cheng, *supra* note 39 at 357, 665 (commenting that the Moon Treaty was “hastily and hence poorly put together” and noting that it “has done little for commercial exploitation” and “has cast a long shadow over any enterprise on celestial bodies by postulating the future existence of an unknown international regime yet to be established”); I.H.Ph. Diederiks-Verschoor & V. Kopal, *An Introduction to Space Law*, 3rd ed. (The Netherlands: Kluwer, 2008) at 144 (commenting that “[i]t is beyond any doubt that there exists at the moment a great confusion in terminology relating to space activities, and it is imperative that steps be taken as soon as possible in order to arrive at a more standardized use of terms and expressions”).

⁵⁴ See e.g. Diederiks-Verschoor & Kopal, *supra* note 53 at 144 (noting that “[i]t is desirable imperative to update the existing body of treaties and agreements in conformity with the latest technological and political developments, as they are rapidly becoming inadequate in their present form”).

⁵⁵ See e.g. NASA, “Framework for Coordination,” *supra* note 3 at 11 (noting that “[f]or business to be confident about investing, it needs the certainty of a long-term commitment to space exploration, the opportunity to introduce its ideas into government thinking, and the rule of law”).

⁵⁶ See e.g. *Ibid.*; Diederiks-Verschoor & Kopal, *supra* note 53 at 144.

⁵⁷ See e.g. NASA, “Framework for Coordination,” *supra* note 3; Spacepolitics.com, “Effective Prize,” *supra* note 26 (noting the link between profitability and sustainability necessary for successful commercial space ventures).

⁵⁸ NASA, “Framework for Coordination,” *supra* note 3 at 11.

⁵⁹ Cf. Spacepolitics.com, “Effective Prize,” *supra* note 26 (quoting former NASA Administrator Michael Griffin on the importance of NASA’s commercial partners, and the commercial space industry in general, achieving and maintaining profitability)

⁶⁰ See generally NASA, “Partnership Development,” *supra* note 25 (discussing the need for private industry to fill the gap in technology development created by budgetary constraints in order to accomplish NASA missions).