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INTERNATIONAL STANDARDS IN REGULATING SPACE TRAVEL: CLARIFYING AMBIGUITIES IN THE COMMERCIAL ERA OF OUTER SPACE

ABSTRACT

The era of commercial space travel and the rise of abundant spacefaring nations has led to an increase in space activity, which has outpaced international space laws—laws that were originally imagined for state-sponsored space travel in an arena with only two spacefaring states. International space law began with the creation of the United Nations Committee on the Peaceful Uses of Outer Space in 1959 and the 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, and has continued with conventions from the United Nations and treaties among nations, including the United States and the European Union, which have attempted to address the rise of commercial space travel. However, throughout this evolution in space law, significant ambiguities in terms and regulations have persisted. This Comment calls for a more uniform and clear description of the terms and regulations that govern international space law and leadership from the United Nations in establishing these regulations among the spacefaring nations of the world.

Specifically, this Comment discusses the importance of creating uniform and unambiguous definitions for terms of art within the field of international space law such as “space object,” the delineation of Earth’s air space, and “outer space” itself, as well as the importance of clarifying how a state becomes a launching state among several parties. Part I gives a history of the background of international space law from its inception in 1959 to the current day. Part II looks at the various national and regional attempts to codify and interpret domestic space law and the similarities and differences between these regulatory schemes. Part III analyzes the United Nations’ most recent attempts to clarify the ambiguities in international space law and how those recent attempts fall short of actual clarification. Finally, Part IV presents possible clarifications to the terms and regulations discussed in Parts I, II, and III.

INTRODUCTION

February 11, 2009, 04:55 GMT, approximately 790 kilometers above Siberia. A satellite belonging to Iridium Satellite LLC collided with a decommissioned Russian satellite, rendering Iridium's satellite nonfunctional.¹ The fallout for Iridium, a corporation owned by Motorola that provides services to governments and news agencies in remote locations, was relatively minor because a single failed satellite was insufficient to significantly affect their overall satellite network.² Iridium called the satellite crash a "very low probability event,"³ but as more private corporations plan both manned and unmanned flights into space, the risk of low probability events will rise exponentially. As Major Regina Winchester of the United States Strategic Command noted about the Iridium incident, "[s]pace is getting pretty crowded. The fact that this hasn't happened before—maybe we were getting a little bit lucky."⁴

International law has entered the final frontier—space. Corporations and private companies are occupying areas of space exploration that were once exclusively the arena of states.⁵ While states have historically focused on scientific discovery, the commercial sector seeks more lucrative uses of outer space resources: hosting tourist trips, building space stations, and mining projects on passing asteroids.⁶ As an increasing number of commercial spaceships leave the Earth's atmosphere for pursuits more out of this world, what regulations are in place to ensure the safety of passengers, workers, and the Earth below? The United Nations has left the task to each individual nation to impose, inspect, and maintain their own chosen set of regulations on the commercial spacecraft that is launched within their jurisdiction.⁷ Since 1961,

¹ Becky Iannotta & Tariq Malik, *U.S. Satellite Destroyed in Space Collision*, SPACE.COM (Feb. 11, 2009, 6:00 PM), <http://www.space.com/5542-satellite-destroyed-space-collision.html>.

² Yuri Pushkin & Melissa Gray, *Russian, U.S. Satellites Collide in Space*, CNN, <http://www.cnn.com/2009/TECH/02/12/us.russia.satellite.crash/index.html?iref=topnews> (last updated Feb. 12, 2009).

³ Iannotta & Malik, *supra* note 1.

⁴ Pushkin & Gray, *supra* note 2.

⁵ Markus Hammonds, *Asteroid Mining: Booming 21st Century Gold Rush?*, DISCOVERY NEWS (Feb. 4, 2013, 12:21 PM), <http://news.discovery.com/space/asteroids-meteors-meteorites/could-asteroid-mining-drive-21st-century-space-industry-130204.htm>.

⁶ Leonard David, *Alpha Station: Private Inflatable Space Outpost Envisioned*, SPACE.COM (Jan. 16, 2013, 1:30 PM), <http://www.space.com/19291-inflatable-alpha-station-bigelow-aerospace.html>; Press Release, NASA, NASA Chooses American Companies to Transport U.S. Astronauts to International Space Station (Sept. 16, 2014), <http://www.nasa.gov/press/2014/september/nasa-chooses-american-companies-to-transport-us-astronauts-to-international>; Hammonds, *supra* note 5.

⁷ See generally G.A. Res. 59/115, Application of the Concept of the "Launching State" (Dec. 10, 2004).

the United Nations has maintained a national registry of space objects.⁸ As the number of nations with space exploration capabilities continues to grow and private companies have a wider selection of nations to choose as launching states, the international standards of space regulation must transform as well.

This Comment explores how several experienced spacefaring nations govern their space programs and suggests measures that the international community should take to regulate commercial industries as they begin to expand enterprises into outer space. These regulations are necessary to ensure the continued safety of human beings—not just the ones who are thrust into space, but also the ones remaining behind on Earth. It explores the complications arising from regulating a shared outer space arena amongst the many divided nations of Earth, the concept of “launching states,” and how nations will decide which state’s regulations to apply. This Comment identifies the ambiguities that exist in both international customary space law and the United Nations (U.N.) General Assembly resolutions on space activity, and will suggest clearer definitions based on the intersection of the two.

Part I provides a brief history of international space law, from its codification and inception in 1967, to the current state of ambiguity present in the United Nations as of 2016. Part II examines and compares the various regulations that spacefaring nations have created and enforced independently to fill in the gaps left by the vague regulations created by the United Nations. Part III looks at the most recent attempt by the United Nations to codify and regulate international space law and argues that this attempt falls short of a real and effective change to international space law that the advent of commercial space tourism and a world with many spacefaring nations requires. Part IV explores what possible regulations enforced or promoted on an international level by the United Nations could better clarify ambiguous terms among spacefaring nations. Part V concludes by recognizing the U.N. and the international community’s successes in international space law and reiterates where improvements can be made.

⁸ See Niklas Hedman, Chief of the Committee Services and Research Section of the U.N. Office for Outer Space Affairs, Registration of Space Objects with the United Nations, Address at UN/China/APSCO Workshop on Space Law, Beijing, China (Nov. 17–20, 2014), <http://www.unoosa.org/documents/pdf/spacelaw/activities/2014/pres08E.pdf>.

I. HISTORY AND BACKGROUND OF INTERNATIONAL SPACE LAW

In 1959, the United Nations first identified the need for international cooperation in outer space with the establishment of the United Nations Office for Outer Space Affairs (UNOOSA).⁹ The nations of the world first enacted a concrete agreement on space exploration in 1967 with the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies (TPGASEUOS).¹⁰ This treaty did not address commercial activities in space, likely because only states had the capacity for space travel when the treaty was framed.¹¹ The language of the TPGASEUOS recognizes space exploration as just that—exploration.¹² The treaty discusses space exploration as “for the benefit and in the interests of all countries,” and astronauts are described as “envoys for all mankind.”¹³ The TPGASEUOS did detail one important function of state jurisdiction over objects launched into space—it clarified that states retained their jurisdiction over objects they launch into space from the time of the launch until after reentry into Earth’s atmosphere.¹⁴

After 1967, the United Nations began to make headway in imposing a few regulations upon the international community. The creation of a registry of space objects is one such regulation.¹⁵ In 1974, the United Nations adopted the Convention on Registration of Objects Launched into Outer Space (CROLOS) and began requiring each launching state to register certain information with the U.N. Secretary-General about objects launched into space, including the name of the launching state, a way to identify the space object, the date and territory of the launch, the object’s basic orbital parameters, and the general

⁹ G.A. Res. 1472 (XIV), International Co-operation in the Peaceful Uses of Outer Space, at 5 (Dec. 12, 1959); *Members of the Committee on the Peaceful Uses of Outer Space*, U.N. OFFICE FOR OUTER SPACE AFF., <http://www.unoosa.org/oosa/en/members/index.html> (last visited Jan. 17, 2016).

¹⁰ See G.A. Res. 2222 (XXI), Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies (Dec. 19, 1967).

¹¹ Frans G. von der Dunk, *Beyond What? Beyond Earth Orbit? . . .: The Applicability of the Registration Convention to Private Commercial Manned Sub-Orbital Spaceflight*, 43 CAL. W. INT’L L.J. 269, 293 (2013) [hereinafter von der Dunk, *Beyond What?*].

¹² G.A. Res. 2222 (XXI), *supra* note 10.

¹³ *Id.* arts. I, V.

¹⁴ *Id.* art. VIII.

¹⁵ G.A. Res. 3235 (XXIX), Convention on Registration of Objects Launched into Outer Space (Nov. 12, 1974).

function of the space object.¹⁶ However, the information supplied to the U.N. registry was not always uniform.¹⁷

A state may become a launching state, and thus be obligated to report this information to the United Nations, in one of four ways: (1) when a state launches a space object; (2) when a state procures for the launching of a space object; (3) when a state has a space object launched from its territory; or (4) when a state has a space object launched from its facility.¹⁸ When two or more states simultaneously fulfill the requirements to be the launching state for a single space object, the United Nations allows the two states to come to a joint agreement as to which state will be considered the launching state.¹⁹

The decision as to which state is deemed the launching state has several implications for the state itself. The launching state assumes absolute liability for any damage done to property on Earth or to an aircraft within Earth's airspace.²⁰ This absolute liability does not extend to nationals of the launching state seeking claims, nor to foreign nationals who are involved in the launch.²¹ Once in outer space, the launching state is absolutely liable for damage done to other states' space objects.²² In some cases, absolute liability of the launching state can be applied even to states that have not ratified the Convention on International Liability for Damage Caused by Space Objects (CILFDCSO), as some negotiations have found the principle of absolute liability for space activities to be recognized as a principle of customary international law.²³ Interestingly, there is no mention of liability for damage done to celestial bodies in any space treaty or convention created by the United Nations.²⁴

¹⁶ *Id.* art. IV; *see also* Hedman, *supra* note 8 (showing the UNOOSA template).

¹⁷ *See* Hedman, *supra* note 8.

¹⁸ G.A. Res. 3235 (XXIX), *supra* note 15, art. I.

¹⁹ *Id.* art. II.

²⁰ *Id.* art. VII.

²¹ *Id.*

²² *Id.*

²³ *See* G.A. Res. 2777 (XXVI), Convention on International Liability for Damage Caused by Space Objects (Sept. 1972); Paul Dempsey, Liability for Damage Caused by Space Objects Under International and National Law, at 12 (2011) (unpublished comment) (on file with McGill University) [hereinafter Dempsey, Liability for Damage]; *Settlement of Claim Between Canada and the Union of Soviet Socialist Republics for Damage Caused by "Cosmos 954" (Released on April 2, 1981)*, JAPAN AEROSPACE EXPLORATION AGENCY, http://www.jaxa.jp/library/space_law/chapter_3/3-2-2-1_e.html (last visited Jan. 17, 2016).

²⁴ Matthew Feinman, *Mining the Final Frontier: Keeping Earth's Asteroid Mining Ventures from Becoming the Next Gold Rush*, 14 *PITT. J. TECH. L. & POL'Y* 202, 216 (2014); *see also* G.A. Res. 2222 (XXI), *supra* note 10, art. VII.

Beyond the registration of space objects and the jurisdiction and liability of the launching state, the United Nations has been either vague or completely silent as to what further regulations the spacefaring nations of the world should enforce. The United Nations only recommends that states “consider enacting and implementing national laws authorizing and providing for continuing supervision of the activities in outer space of non-governmental entities under their jurisdiction.”²⁵ In fact, the United Nations does not even provide, nor is there an international consensus, for where Earth’s airspace ends and outer space begins.²⁶ There is similar ambiguity regarding the definition of a space object within the international community.²⁷ Under the current U.N. model, states are left almost entirely to their own devices in creating, implementing, and enforcing regulations for objects launched into space.²⁸ Taking up the U.N.’s recommendation, several spacefaring states have enacted their own sets of regulations governing space launches and travel, discussed below.²⁹

II. NATIONAL SPACE REGULATIONS OF SPACEFARING STATES

This Part will discuss and analyze the various national space regulations imposed by states in response to the U.N.’s call for spacefaring nations to regulate their own outer space activity, and what bodies within these states exist to enforce said regulations. Part II.A looks at the regulations currently in force in the United States and how the U.S. government enforces these rights. Part II.B looks at the space regulations of other spacefaring states with newer programs, with a special focus on the development of Chinese space regulations as an emerging power among spacefaring states. Part II.C looks more globally at the U.S.’s efforts, in conjunction with efforts by the European Union (EU), to develop an international consensus among space regulations based on the European Union’s own Code of Conduct for Outer Space.

A. *Space Law of the United States*

The United States requires that any U.S. citizen launching an object into outer space acquire a license or permit, regardless of whether the launch occurs within the territorial United States, unless the United States has an agreement

²⁵ G.A. Res. 59/115, *supra* note 7.

²⁶ Von der Dunk, *Beyond What?*, *supra* note 11, at 280–85.

²⁷ Yan Ling, *Comments on the Chinese Space Regulations*, 7 CHINESE J. INT’L L. 681, 686 (2008).

²⁸ See G.A. Res. 3235 (XXIX), *supra* note 15.

²⁹ See Restrictions on Launches, Operations, and Reentries, 51 U.S.C. § 50904 (2014); Ling, *supra* note 27, at 681–89.

that states otherwise with the foreign government where the launch occurs.³⁰ In the United States, multiple agencies oversee commercial space activities, and all three branches of the U.S. government are involved in the creation of regulations concerning such activities.³¹ The United States gives the Secretary of Transportation power to enforce compliance with these regulations, including the authority to “prevent the launch or reentry [of space objects] if the Secretary decides the launch or reentry would jeopardize public health and safety, safety of property, or national security or national foreign policy interest of the United States.”³² The Secretary of Defense and the Administrator of the National Aeronautics and Space Administration (NASA) each have the power to preempt the launch or reentry of a commercial space flight in times of “imperative national need.”³³ This power, however, is checked considerably; the Secretary of Defense and the Administrator of NASA are required to consult with the Secretary of Transportation, and, seven days after acting, submit a report to Congress justifying the preemption and providing a schedule allowing for the prompt reentry or relaunch of the commercial space object.³⁴

The U.S. Commercial Space Launch Act also contains a provision governing advertisements in space.³⁵ The Secretary of Transportation may not grant a license for a space launch that will be “used for the purposes of obtrusive space advertising.”³⁶ However, it is left to the Secretary of Transportation’s discretion to deny or allow the launch of non-obtrusive commercial space advertisements, or to alternatively be placed on launching facilities.³⁷

The United States also requires before launch, perhaps in response to the CILFDCSO,³⁸ a showing that any commercial launching entity either has liability insurance or has “demonstrated financial responsibility in amounts to compensate for the maximum probable loss from claims” by a third party or

³⁰ 51 U.S.C. § 50904.

³¹ See Henry R. Hertzfeld, Presentation at the United Nations/China/APSCO Workshop on Space Law, Beijing, China: National Space Law: The United States (Nov. 18, 2014), <http://www.unoosa.org/documents/pdf/spacelaw/activities/2014/pres15E.pdf>.

³² 51 U.S.C. § 50904; see also Exec. Order No. 12465, 49 Fed. Reg. 7211 (1984).

³³ 51 U.S.C. § 50904.

³⁴ *Id.*

³⁵ *Id.*

³⁶ *Id.*

³⁷ *Id.*

³⁸ G.A. Res. 2777 (XXVI), *supra* note 23.

the U.S. government.³⁹ The exact amount of insurance or determination as to whether the entity has the proper financial capacity to offset liability is decided through an interagency process, involving the Secretary of Transportation, the Administrator of NASA, the Secretary of the U.S. Air Force, and the “heads of other appropriate executive agencies.”⁴⁰

The National Registry of the United States registers functional objects as well as some secondary objects deriving from launches.⁴¹ Prior to 2008, the United States registered objects broken off from already registered space objects; it no longer does so, nor does it register foreign space objects.⁴² The United States does not use the UNOOSA’s template for registration, but “provides comparable information as recommended in resolution 62/101.”⁴³

As recently as December 2015, the United States implemented a statute that allows for private U.S. citizens to “possess, own, transport, use, and sell” any “space resources” or “asteroid resources” that they recover.⁴⁴ This statute defines both of these terms, noting that the definition of “space resource” encompasses “asteroid resource.” A space resource is defined in the statute as “an abiotic resource in situ in outer space,” and an asteroid resource is simply a space resource recovered from an asteroid.⁴⁵

B. Space Regulations of Other States

The number of states with spacefaring capabilities has grown since the two-nation era of the space race.⁴⁶ In fact, about twenty-six member states engage

³⁹ 51 U.S.C. § 50904.

⁴⁰ *Id.* (noting that the claimed amount should not exceed \$500 million or \$100 million, for third party or government claims, respectively); *see also* Hertzfeld, *supra* note 31 (explaining how the United States uses an interagency approach to governing space affairs and thus avoids delegating this power to a single agency).

⁴¹ Hedman, *supra* note 8.

⁴² *Id.*

⁴³ G.A. Res. 62/101, Recommendations on Enhancing the Practice of States and International Intergovernmental Organizations in Registering Space Objects (Jan. 10, 2008); *see also* Hedman, *supra* note 8.

⁴⁴ *See* Space Resource Commercial Exploration and Utilization, 51 U.S.C. § 51301 (2015).

⁴⁵ *Id.*

⁴⁶ James L. Reed, *The Commercial Space Launch Market and Bilateral Trade Agreement in Space Launch Services*, 13 AM. U. INT’L L. REV. 157, 211 (1999) (noting that Ukraine, China, Japan, Brazil, and India emerged into the international space-launching market).

in and regulate space activities⁴⁷ and licensing issues, both to remedy holes left by international regulations as well as to address nation-specific concerns regarding space activity.⁴⁸

1. *United Kingdom*

The United Kingdom (U.K.) has legislation similar to the United States requiring all U.K. nationals to obtain a license for activities related to launching space objects, whether those objects are launched within the United Kingdom or outside its borders.⁴⁹ The United Kingdom gives its Secretary of State the power to enforce these regulations and to stop any space launching activity in violation of U.K. or international law.⁵⁰ The United Kingdom also requires its Secretary of State to maintain a national registry of space objects.⁵¹ Unlike several other spacefaring powers, the United Kingdom attempts to define a space object within its laws. The U.K.'s definition includes "the component parts of a space object, its launch vehicle and the component parts of that."⁵² This definition, similar to what the United Nations provides in the CROLOS, defines what is included within "space objects" but fails to define a space object itself.⁵³

2. *China*

Space policy in China, one of the rising states in space exploration, is governed by the "White Paper."⁵⁴ This law gives officers of the Commission of Science, Technology and Industry for National Defense the right to be present and inspect relevant activities related to space flight, but does not specifically stipulate the rights these officers have as far as enforcement during inspections.⁵⁵ The Commission also issues licenses to private entities for space

⁴⁷ Paul Stephen Dempsey, Tomlinson Professor and Dir. of the Inst. of Air & Space Law at McGill Univ., Presentation at the United Nations/China/APSCO Workshop on Space Law, Beijing, China: National Legislations Governing Commercial Space Activities (Nov. 17, 2014), <http://www.unoosa.org/documents/pdf/spacelaw/activities/2014/pres06E.pdf> [hereinafter Dempsey, National Legislations Governing Commercial Space Activities].

⁴⁸ See Dempsey, Liability for Damage, *supra* note 23, at 3.

⁴⁹ Outer Space Act 1986, c. 38, §§ 1–2, 8 (UK).

⁵⁰ *Id.* §§ 1–2.

⁵¹ *Id.* § 7.

⁵² *Id.*

⁵³ G.A. Res. 3235 (XXIX), *supra* note 15.

⁵⁴ CHINA NAT'L SPACE ADMIN., CHINA'S SPACE ACTIVITIES (WHITE PAPER) I (Dec. 15, 2003), <http://www.cnsa.gov.cn/n615709/n620681/n771967/69198.html>.

⁵⁵ Ling, *supra* note 27, at 685.

launches and looks at “compliance with national environmental laws and regulations, proof of prevention of pollution and space debris, [as well as requiring] a safety design report . . . and supplementary information concerning the reliability of their Safety Critical Systems” before issuing them.⁵⁶ Beyond this, China’s space law is underdeveloped, with pending legislation⁵⁷ and regulations written by the Chinese National Space Administration (CNSA) expected to pass by 2020.⁵⁸ Regionally, China actively encourages cooperation among Asian spacefaring states as a founding member of the Asia-Pacific Space Cooperation Organization (APSCO)⁵⁹ and by hosting a Workshop on Space Law between the UNOOSA, the China National Space Administration and APSCO.⁶⁰ China records only functional objects in its national registry, though it does register foreign objects that it had a part in launching.⁶¹ China uses the UNOOSA’s registration template.⁶²

3. *Inspection and Enforcement*

Australia appoints an officer with the authority to inspect launch sites within the country, and these officers have more stipulated powers, including the ability to stop launches or destroy space objects to avoid danger to public health, persons, or property.⁶³ For a private entity to obtain a launch license in Australia, the entity must submit both the design and engineering plans of the launch vehicle to be reviewed as well as present “their organizational structure and financial fitness, their program management plan, their technology security plan, and their emergency plan” before any launch can take place.⁶⁴ In South Africa, a similar system is in place where inspectors have the power to inspect and be present at launch sites to ensure that these sites are complying with regulations; the inspectors are also obligated to report any safety risks.⁶⁵ These

⁵⁶ Dempsey, National Legislations Governing Commercial Space Activities, *supra* note 47.

⁵⁷ Xu Yu, Presentation at U.N. Workshop on Space Law: Regulations of Space Activities in China (Nov. 2010), <http://www.unoosa.org/pdf/pres/2010/SLW2010/02-06.pdf>.

⁵⁸ *China Expects to Introduce Space Law Around 2020*, CHINA NAT’L SPACE ADMIN. (Nov. 18, 2014), <http://www.cnsa.gov.cn/n360696/n361228/n361378/656700.html>.

⁵⁹ *China’s Space Activities (White Paper)*, CHINA NAT’L SPACE ADMIN. (Dec. 15, 2003), <http://www.cnsa.gov.cn/n615709/n620681/n771967/69198.html>.

⁶⁰ 2014 United Nation/China/APSCO Workshop on Space Law, ASIA-PACIFIC SPACE COOPERATION ORG., <http://www.apsco.int/NewsOne.asp?ID=357> (last visited Feb. 12, 2016).

⁶¹ Hedman, *supra* note 8.

⁶² *Id.*

⁶³ Ling, *supra* note 27, at 685.

⁶⁴ Dempsey, National Legislations Governing Commercial Space Activities, *supra* note 47.

⁶⁵ Ling, *supra* note 27, at 685.

inspectors have the power to revoke licenses for failure to comply.⁶⁶ Sweden also designates an authority to inspect the launching of space objects and report findings to the government, and allows for imprisonment for up to one year for violations of its space laws.⁶⁷ Japan and France both impose fines for conducting unauthorized space launch activities.⁶⁸

4. *National Registries*

Japan and Russia register only functional objects in their national registries, and while neither country registers foreign space objects, Russia does mention them in its submissions to the United Nations.⁶⁹ India registers functional objects and upper stages of launch vehicles, while France registers those two as well as payload adapters from launch vehicles.⁷⁰ Nearly every state with spacefaring capabilities registers, at a minimum, functional objects and/or national space objects, and does so using the UNOOSA's template or provides comparable information in compliance with the relevant U.N. convention.⁷¹

5. *Liability of Private Launching Entities*

In terms of liability, some nations have chosen to enact legislation similar to the United States, extending the liability imposed on the state in the CILFDCSO to the private entity launchers.⁷² For example, South Korea requires that private entities who receive launch permits obtain insurance against third party liability, and are required to pay compensation for damage caused by their launch activities.⁷³ Other nations, however, have much weaker legislation or completely lack protection against accidents from launches by private entities resulting in damage to third parties or governments.⁷⁴ The Japan Space Exploration Agency assumes liability for damage to third parties resulting from cosigned launches, but third parties are able to claim reimbursement only if the damage is caused by willful misconduct.⁷⁵

⁶⁶ Dempsey, National Legislations Governing Commercial Space Activities, *supra* note 47.

⁶⁷ *Id.*; Ling, *supra* note 27, at 685.

⁶⁸ Dempsey, National Legislations Governing Commercial Space Activities, *supra* note 47.

⁶⁹ Hedman, *supra* note 8.

⁷⁰ *Id.*

⁷¹ *See id.*

⁷² Dempsey, National Legislations Governing Commercial Space Activities, *supra* note 47.

⁷³ *Id.*; Joon Lee, *Korean Space Law*, UNOOSA (Nov. 17, 2014), <http://www.unoosa.org/documents/pdf/spacelaw/activities/2014/pres13E.pdf>.

⁷⁴ Setsuko Aoki, *National Space Laws of Japan: Today and Tomorrow*, UNOOSA (Nov. 17, 2014), <http://www.unoosa.org/documents/pdf/spacelaw/activities/2014/pres10E.pdf>.

⁷⁵ *Id.*

6. *Environmental Protections in National Space Law*

Some states have addressed environmental concerns in their space legislation, seeking to minimize the damage to Earth's environment from space exploration.⁷⁶ In Austria, private entities must agree to comply with "state of the art" and "internationally recognized guidelines for the mitigations of space debris" before being issued a license to launch within the state.⁷⁷ Argentina also includes environmental concerns in its licensing for space launches requiring "that the operator provide information on environmental precautions taken, including mechanism for placement of the space object in a transfer orbit at the end of its useful life, and identify the anticipated date of its recovery, disintegration or loss of contact" before the issuance of any license.⁷⁸

Most states require that private entities apply for and receive an operation license before each new launch.⁷⁹ Russia, an outlier, gives licenses for space launches that can last three years, provided that the entity continues to operate the launches as specified in the license.⁸⁰

While the extent of the authority varies by state, almost every nation has some entity that enforces space launches, whether that entity is an already existing government agent or a newly appointed officer.⁸¹ For example, Australia, South Africa, the United Kingdom, and the United States all give this appointed entity the power to stop any activity that it finds to not be in compliance with the nations' own regulations, international regulations, or that poses some harm to public safety.⁸² These are all evidence of an emerging international consensus on how to interpret the U.N.'s recommendations that each state consider when enacting and implanting national laws providing for the supervision of activities of non-governmental organizations in outer space.⁸³

⁷⁶ Dempsey, National Legislations Governing Commercial Space Activities, *supra* note 47.

⁷⁷ *Id.*

⁷⁸ *Id.*

⁷⁹ *Id.*

⁸⁰ *Id.*

⁸¹ See Outer Space Act 1986, c. 38, §§ 1–6, 8, 11 (UK); Restrictions on Launches, Operations, and Reentries, 51 U.S.C. § 50904 (2014); Ling, *supra* note 27, at 685.

⁸² *Id.*

⁸³ See G.A. Res. 68/74, Recommendations on National Legislation Relevant to the Peaceful Exploration and Use of Outer Space (Dec. 11, 2013) (recognizing the different approaches taken by states in dealing with various aspects of national space activities).

C. *The European Union's and the United States' Attempt at International Space Law Consensus*

In 2012, the United States expressed its intention to develop, with other spacefaring nations in the international community, an International Code of Conduct for Outer Space (ICCOS).⁸⁴ ICCOS was developed in response to the increased amount of space debris and the increased risk of weaponized space objects as the number of spacefaring nations increased.⁸⁵ ICCOS was to be worked on with and modeled after the E.U. Code of Conduct for Outer Space.⁸⁶ The most current draft of this E.U. Code of Conduct for Outer Space came out in March 2014 and does not do much to clarify the ambiguities that persist in both the international community and U.N. space regulations.⁸⁷

The most recent draft of the ICCOS is guilty of many of the same ambiguities to which the various U.N. conventions on outer space fall victim.⁸⁸ It fails to provide any definition for the term “space object,” however it does make a distinction between space object and space debris, providing an example of what a space object is not.⁸⁹ It does not provide any definition for outer space.⁹⁰ It introduces the term “space environment” without giving any definition as to what it means.⁹¹

A nation that has noticeably not joined the United States and Europe in discussions towards the creation of the ICCOS is China.⁹² China, among others, was concerned that Asian-Pacific nations were not consulted during the

⁸⁴ Brian Wessel, *The Rule of Law in Outer Space: The Effects of Treaties and Nonbinding Agreements on International Space Law*, 35 HASTINGS INT'L & COMP. L. REV. 289, 297 (2012); Press Release, Hillary Rodham Clinton, International Code of Conduct for Outer Space Activities (Jan. 17, 2012), <http://www.state.gov/secretary/20092013clinton/rm/2012/01/180969.htm>.

⁸⁵ *An International Code of Conduct for Outer Space Activities: Strengthening Long-Term Sustainability, Stability, Safety, and Security in Space*, U.S. DEP'T STATE BUREAU PUB. AFF. (Jan. 17, 2012), <http://www.state.gov/r/pa/pl/2012/180998.htm> [hereinafter *An International Code of Conduct for Outer Space Activities*, U.S. DEP'T STATE].

⁸⁶ *Id.*; Wessel, *supra* note 84, at 297.

⁸⁷ Draft International Code of Conduct for Outer Space Activities art. 5.1 (Mar. 31, 2014), http://www.eeas.europa.eu/non-proliferation-and-disarmament/pdf/space_code_conduct_draft_vers_31-march-2014_en.pdf.

⁸⁸ *Id.*

⁸⁹ *Id.* art. 4.3.

⁹⁰ *See generally id.*

⁹¹ *Id.* art. 1.1.

⁹² Michael Listner, *Code of Conduct: Corrections, Updates, and Thoughts Going Forward*, SPACE REV. (June 18, 2012), <http://www.thespacereview.com/article/2101/1> [hereinafter Listner, *Code of Conduct*].

initial drafting of the ICCOS.⁹³ China has pledged to cooperate in all of its space activities.⁹⁴ Russia and China are each party to competing international space cooperation treaties, such as the Treaty on Prevention of the Placement of Weapons in Outer Space and of the Threat or Use of Force against Outer Space Objects (PPWT), which have many of the same objectives as the Western-led ICCOS.⁹⁵ This struggle for power between nations over the future of international space regulation emphasizes the underlying problem created by the lack of well-defined U.N. regulations.

III. U.N. SOLUTIONS TO THE COMMERCIAL ERA OF SPACE AND THEIR SHORTCOMINGS

Recognizing the similar ways in which the spacefaring states of the world interpreted the treaties and conventions on space law laid out previously, the United Nations attempted to formalize what it perceived as the emergent customary international law of space in 2013 with its Recommendations on National Legislation Relevant to the Peaceful Exploration and Use of Outer Space.⁹⁶ The United Nations recognized and recommended the key ways that spacefaring nations had regulated their space activity.⁹⁷ It recommended the scope of national regulations over space similar to many of the regulations of the various spacefaring states of launch and reentry into Earth's atmosphere.⁹⁸ Similar to the U.K. and U.S. legislation, it recommends that states exercise their jurisdiction over their citizens conducting space activities even outside of their territory.⁹⁹ It recommends creating a national authority with the power to revoke authorization of space activities, as nearly every spacefaring nation has done.¹⁰⁰ It also echoes the language of U.S. regulatory space law in that it lists not only the safety of persons, environment, and property, but also the national security and foreign policy interests of the states as relevant conditions for

⁹³ Michael Listner, *EU Takes the Next Shot in the Battle of the Codes*, SPACE REV. (June 4, 2012), <http://www.thespacereview.com/article/2092/1>.

⁹⁴ Listner, *Code of Conduct*, *supra* note 92; *China's Space Activities (White Paper)*, CHINA NAT'L SPACE ADMIN. (Dec. 15, 2003), <http://www.cnsa.gov.cn/n615709/n620681/n771967/69198.html>.

⁹⁵ Listner, *Code of Conduct*, *supra* note 92; Letter from Valery Loshinin, Permanent Representative of Russia to the Conference on Disarmament, and Wang Qun, Permanent Representative of China, to the Secretary-General of the Conference on Disarmament (Feb. 29, 2008) (on file with author).

⁹⁶ G.A. Res. 68/74, *supra* note 83.

⁹⁷ *Id.*

⁹⁸ *Id.*

⁹⁹ *Id.*; see Outer Space Act 1986, c. 38, §§ 1–2 (UK); Restrictions on Launches, Operations, and Reentries, 51 U.S.C. § 50904 (2014).

¹⁰⁰ G.A. Res. 68/74, *supra* note 83; see Ling, *supra* note 27, at 685.

enforcement by regulatory authorities.¹⁰¹ The U.N.'s attempt to formalize the regulations that the majority of spacefaring nations have already enacted is subject to the same shortcomings as several independent state regulations. For example, the United Nations again fails to give a definition to the term "space object,"¹⁰² and fails to even hint at where outer space begins.¹⁰³ It does not attempt to provide any sort of framework or suggestion for how multiple launching states might decide which state shall register, perhaps believing that it settled the confusion around this question with its 2008 clarification.¹⁰⁴

With the entrance of commercial actors into the space arena, and as multinational corporations have begun launching out of various states, the question of which state has the jurisdiction and responsibilities of the launching state has become even more confusing.¹⁰⁵ The United Nations recognized the possibility of two or more states qualifying as "launching States" in the CROLOS,¹⁰⁶ but this Convention was drafted and signed by nations who believed space travel would be solely for the purpose of exploration and scientific research for the foreseeable future.¹⁰⁷ At the time these treaties were drafted, most nations did not foresee the existence of commercial space activity and the bodies governing space travel, such as the UNOOSA, reflect this shortcoming.¹⁰⁸

As early as the 1990s, multinational space-launching companies had begun to emerge in the international community, comprised of citizens from nations including the United States, Ukraine, Russia, France, and Norway.¹⁰⁹ Many of these multinational corporations launch their satellites overseas, partly because there is a shortage of launch sites in the United States to match the demand for satellites launched into space.¹¹⁰ Thus, situations are created in which multiple

¹⁰¹ G.A. Res. 68/74, *supra* note 83; see 51 U.S.C. § 50904 (noting that the Secretary may prevent the launch or reentry "if the Secretary decides the launch or reentry would jeopardize the public health and safety, safety of property, or national security or foreign policy interest of the United States").

¹⁰² G.A. Res. 68/74, *supra* note 83.

¹⁰³ *Id.*

¹⁰⁴ See *id.*; G.A. Res. 62/101, *supra* note 43, ¶ 3(b)–(d).

¹⁰⁵ See Jonathan C. Thomas, *Spatialis Liberum*, 7 FLA. COASTAL L. REV. 579, 590–91, 598, 628 (2006).

¹⁰⁶ G.A. Res. 3235 (XXIX), *supra* note 15.

¹⁰⁷ See Julie C. Easter, *Spring Break 2023—Sea of Tranquility: The Effect of Space Tourism on Outer Space Law and World Policy in the New Millennium*, 26 SUFFOLK TRANSNAT'L L. REV. 349, 366–67 (2003).

¹⁰⁸ *Id.* at 371–72.

¹⁰⁹ Elizabeth Seebode Waldrop, *Integration of Military and Civilian Space Assets: Legal and National Security Implications*, 55 A.F. L. REV. 157, 165–66 (2004).

¹¹⁰ See Thomas, *supra* note 105, at 590–91.

nations can all claim legitimacy as launching states.¹¹¹ In such a situation, every nation involved has an equally legitimate claim under the CROLOS. Only an agreement negotiated among states themselves can decide which state shall become the launching state.¹¹² The CROLOS does not give power to non-governmental organizations to determine or influence which state shall be considered the launching state.¹¹³ Space law treaties drafted by the United Nations also fail to provide multinational corporations a role in determining which state shall be considered the launching state.¹¹⁴

In 2008, the United Nations attempted to further clarify the CROLOS with its Recommendations on Enhancing the Practice of States and International Intergovernmental Organization in Registering Space Objects.¹¹⁵ The U.N.'s attempt failed to clarify the launching state dilemma in the following ways. First, it still failed to provide any definition for a space object.¹¹⁶ Second, it failed to provide any clarification on the order of prioritization among qualifying launching states, only recommending that launching states should "contact States or international intergovernmental organizations that could qualify as 'launching States' to jointly determine which State or entity should register the space object."¹¹⁷ The decision as to which state is considered the launching state has serious implications, not only for the regulations governing the launch and reentry of the space object, but also for the jurisdiction over the object while in space.¹¹⁸ Further, whichever country is considered the launching state will retain jurisdiction over any mining operation or other commercial site the multinational corporation might establish on an asteroid or other celestial body, making the definition of the launching state even more crucial for the purposes of commercial space ventures.¹¹⁹

¹¹¹ See G.A. Res. 3235 (XXIX), *supra* note 15, art. II; Waldrop, *supra* note 108.

¹¹² See G.A. Res. 3235 (XXIX), *supra* note 15, art. II.

¹¹³ *Id.* (specifying that only launching states have a role in the determination).

¹¹⁴ Easter, *supra* note 107, at 371–73.

¹¹⁵ See G.A. Res. 62/101, *supra* note 43.

¹¹⁶ *Id.*

¹¹⁷ *Id.* ¶ 3(b); see G.A. Res. 3235 (XXIX), *supra* note 15, art. II ("Where there are two or more launching States in respect of any such space object, they shall jointly determine which one of them shall register the object . . .").

¹¹⁸ See G.A. Res. 2222 (XXI), *supra* note 10, art. VIII.

¹¹⁹ Charles Stotler, *The ASTEROIDS Act and Hearing: Some Observations on International Obligations*, SPACE REV. (Sept. 22, 2014), <http://www.thespacereview.com/article/2604/1>; see also G.A. Res. 2222 (XXI), *supra* note 10, art. IX.

IV. ATTEMPTS TO CLARIFY AMBIGUOUS TERMS

This Part seeks to clarify several of the terms left undefined by the United Nations and the international spacefaring community. Part IV.A explores possible definitions for the term “space object” based on comparisons between different interstate treaties as well as the definitions for “space object” found in U.N. treaties. Part IV.B addresses perhaps the greatest ambiguity in space law: the lack of a single defined height limit for Earth’s airspace. It explores the ambiguities and attempts to suggest how, despite the manner in which the international community and United Nations have actively avoided this question, a limit could be internationally agreed upon. Part IV.C considers and attempts to answer the question of whether celestial bodies can or should be included in the definition of outer space, and if they are not to be included, where the air space of these celestial bodies should end. Part IV.D discusses a term clearly defined by the United Nations—the “launching state”—and considers how the freedom of selecting launching states could harm the commercial space-launching sector, which clearer launching state selection might improve. Part IV.E examines the problem of incomplete space registries and how solutions to the problems presented in Parts IV.C and D could cure these deficiencies.

A. Defining “Space Object”

The United Nations has not provided any definition for the term “space object,” and no international consensus has been affirmatively reached on what the term means. As mentioned earlier, the United Kingdom defined “space object” in its statute on space exploration as including “the component parts of a space object, its launch vehicle and the component parts of that.”¹²⁰ The term “space object” is not defined within the several multilateral treaties on space exploration to which the United States is a party, although the term “launch vehicle” is defined in several of the treaties as “an object, or any part thereof, intended for launch, launched from Earth, or returning to Earth which carries Payloads, persons, or both,”¹²¹ or “an object, or any part thereof, intended for launch, launched from Earth into air space or outer space, or returning to Earth,

¹²⁰ Outer Space Act 1986, c. 38, § 13 (UK).

¹²¹ Framework Agreement Between the Government of the United States of America and the Government of the Argentine Republic on Cooperation in the Peaceful Uses of Outer Space, U.S.-Arg., at 13, Oct. 25, 2011, T.I.A.S. No. 13-0730 [hereinafter Framework Agreement, U.S.-Arg.].

which carries Payloads or persons, or both.”¹²² Several of these treaties also identify and define the term “transfer vehicle” as “any vehicle that operates in space and transfers a Payload or person or both between two different space objects, between two different places on the same space object, or between a space object and the surface of a celestial body.”¹²³ A relevant aspect of the definitions of transfer vehicle found in these treaties is the absence of any mention of vehicles that transport goods to and from the surface of the same celestial object.¹²⁴ Assuming launch vehicles and transfer vehicles are space objects, the lack of a definition in U.K. statutes, U.S. treaties, and U.N. conventions for vehicles that move within the same celestial body could mean that airborne vehicles confined to moving in the immediate vicinity of but not within single celestial bodies are not space objects at all, and thus are exempt from registering with the U.N. space body registry.¹²⁵

The term “space object” is perhaps best determined by what it is not. One of the few definitions that exist comes from the United Kingdom, not an international body, but it is circular in nature, defining a space object as including “the component parts of a space object.”¹²⁶ The CROLOS also makes clear that a space object includes its launch vehicle and “component parts of a space object.”¹²⁷ While neither the CROLOS nor the United Kingdom provide an explicit definition of a space object within their space law, they do suggest some aspects of what constitutes a space object. For example, defining a space object as having component parts might suggest that it includes some sort of manmade object.¹²⁸ The inclusion of a launch vehicle in the definition of a space object suggests that a space object is launched into

¹²² Framework Agreement Between the National Aeronautics and Space Administration and the Indian Space Research Organisation for Cooperation in the Exploration and Use of Outer Space for Peaceful Purposes, U.S.-India, art. 2(2), Feb. 1, 2008, T.I.A.S. No. 09-201 [hereinafter Framework Agreement, U.S.-India]; Framework Agreement Between the Government of the United States of America and the Government of the French Republic for Cooperative Activities in the Exploration and Use of Outer Space for Peaceful Purposes, U.S.-Fr., art. 9(4), Jan. 23, 2007, T.I.A.S. No. 09-107 (containing a similar definition for “launch vehicle”).

¹²³ Framework Agreement, U.S.-Arg., *supra* note 121, art. 2(7); Framework Agreement, U.S.-India, *supra* note 122, art. 2(6).

¹²⁴ Framework Agreement, U.S.-Arg., *supra* note 121, art. 2(7); Framework Agreement, U.S.-India, *supra* note 122, art. 2(6).

¹²⁵ See Framework Agreement, U.S.-Arg., *supra* note 121, art. 2(7) (including vehicles that depart to and from the same space object in the definition of a transfer vehicle).

¹²⁶ Outer Space Act 1986, c. 38, § 13 (UK).

¹²⁷ G.A. Res. 3235 (XXIX), art. I, Convention on Registration of Objects Launched into Outer Space (Nov. 12, 1974).

¹²⁸ See *id.*; Outer Space Act 1986, c. 38, § 13 (UK).

outer space but does not originate in outer space.¹²⁹ The ICCOSA makes a distinction between space debris and space objects.¹³⁰ NASA defines space debris as “both natural (meteoroid) and artificial (man-made) particles.”¹³¹ The distinction made between space debris and space objects thus suggests that not all man-made objects in space are space objects as defined by international law.¹³²

Any further attempts to define space objects by their relation to space debris is hampered by the fact that “space debris” itself is poorly defined in international space regulations.¹³³ In fact, the lack of a definition for space debris, and the lack of an articulation of how a space object becomes space debris, makes it unclear whether space debris is merely a type of space object or some separate space entity.¹³⁴ As space debris becomes more of a problem for other functioning satellites and rockets in space,¹³⁵ the responsibility of states to monitor and account for their space debris must be enforced. A stronger definition of space debris, ideally set forth by a binding resolution of the U.N. General Assembly, can help with that enforcement by including only man-made debris in the definition of space objects and by creating a more rigidly enforced registration system encouraging nations to monitor their defunct space debris.

The TPGASEUOS provides another aspect of a space object: space objects are objects that remain under the jurisdiction of a launching state.¹³⁶ Compiling and analyzing the information and definitions given in the General Assembly resolutions, national statutes and international treaties, a working definition of space object can be reached. The working definition could read as follows: “A man-made object, launched into outer space, including its launching materials, over which a state retains jurisdiction.” However, this definition is still ambiguous. For example, must a space object be launched into outer space from Earth? Are transfer vehicles built from space materials, which are

¹²⁹ See G.A. Res. 3235 (XXIX), *supra* note 15, art. IV; Outer Space Act 1986, c. 38, § 13 (UK).

¹³⁰ International Code of Conduct for Outer Space Activities, *supra* note 88, art. 5.1.

¹³¹ *Space Debris and Human Spacecraft*, NASA (Sept. 26, 2013), http://www.nasa.gov/mission_pages/station/news/orbital_debris.html#.VFhHmvmUedU.

¹³² See International Code of Conduct for Outer Space Activities, *supra* note 88, arts. 4.2, 5.1.

¹³³ Joseph S. Imburgia, *Space Debris and Its Threat to National Security: A Proposal for a Binding International Agreement to Clean up the Junk*, 44 VAND. J. TRANSNAT'L L. 589, 613 (2011).

¹³⁴ See *id.*

¹³⁵ Karl Tate, *Space Junk Explained: How Orbital Debris Threatens Future of Spaceflight*, SPACE.COM (Oct. 1, 2013, 5:49 PM), <http://www.space.com/23039-space-junk-explained-orbital-debris-infographic.html>.

¹³⁶ G.A. Res. 2222 (XXI), *supra* note 10, art. VIII.

launched from outer space into outer space considered to be space objects? These are all questions that the United Nations should seek to clarify or expand upon in the definition of a space object as the commercial space industry begins to make these considerations a possibility.¹³⁷

B. Clarifying the Boundary between Earth and Outer Space

Perhaps the greatest problem in establishing the boundary between Earth and outer space is the U.N.'s inability to provide a clear definition of outer space, coupled with the international community's overall inability to reach a consensus on the subject. As of the time of this publication, no international body has agreed on a clear definition of where air space ends and where outer space begins.¹³⁸ In the history of the United States, the point at which outer space begins has fluctuated depending on when and by whom it was defined.¹³⁹ The point at which outer space begins as defined by various U.S. officials has varied from fifty miles to ten thousand miles above Earth's surface, with the current height left officially undefined.¹⁴⁰ Other nations, while all claiming the rights over their airspace, have similarly neglected or declined to establish a limit on where this airspace ends.¹⁴¹ In the Bogota Declaration of 1976, Brazil, Colombia, Congo, Ecuador, Indonesia, Kenya, Uganda, and Zaire declared sovereignty of their air space as high as the geostationary orbit over their nations, arguing the geostationary orbit was a natural resource owned by the respective nations.¹⁴² Both international treaties and conventions dealing with airspace over nations as well as those dealing with outer space either do not address or do not reach any sort of consensus on the limit of their airspace when defining the rights and regulations existing within the two zones.¹⁴³ Leaving it to individual states to determine the limits of their own airspace and sovereignty has led to the absence of states seeking to give any exact height so

¹³⁷ See Hammonds, *supra* note 5; Stotler, *supra* note 119.

¹³⁸ Dean N. Reinhardt, *The Vertical Limit of State Sovereignty*, 72 J. AIR L. & COM. 65, 66 (2007).

¹³⁹ See *id.* at 84–88.

¹⁴⁰ See *id.* at 85–88 (noting that nations such as Germany and the United Kingdom currently do not have definitions of the upper limit of airspace).

¹⁴¹ See *id.* at 81–84.

¹⁴² The Bogota Declaration (1976), *reprinted in* 6 J. SPACE L. 193, 193 (1978); see also Susan Cahill, *Give Me My Space: Implications for Permitting National Appropriation of the Geostationary Orbit*, 19 WIS. INT'L L.J. 231, 240 (2001).

¹⁴³ Reinhardt, *supra* note 138, at 66. For international treaties and conventions that do not include a definition, see Convention Relating to the Regulation of Aerial Navigation, Oct. 13, 1919, 11 L.N.T.S. 173; Convention on International Civil Aviation, Dec. 7, 1944, 61 Stat. 1180; G.A. Res. 2222 (XXI), *supra* note 10.

as not to limit their sovereignty any more than necessary.¹⁴⁴ When nations launch objects into space, they must occasionally fly through the sovereign air space of foreign nations in order to reach space stations, including the International Space Station.¹⁴⁵ No nation has ever raised a complaint against another nation for entering its air space when the object was being launched into space.¹⁴⁶ Some have argued that this practice has become customary international law allowing free passage to objects entering space,¹⁴⁷ but this only further complicates the established limits of air space and raises questions as to when objects become space objects.

The lack of U.N. leadership or strongly-worded conventions is more apparent here than anywhere else. The United Nations must seek to establish a uniform limitation on the height of air space over Earth. One proposed height limit that the United Nations should endorse involves the lowest altitude a satellite can remain in orbit without being destroyed by friction with the air.¹⁴⁸ This limit has been criticized because advances in technology will allow objects to orbit Earth more closely, effectively lowering the limit of the air space around Earth.¹⁴⁹ Organizations have suggested solutions to this problem, such as fixing the established air height to the lowest altitude a satellite could maintain on January 27, 1976, the date of the signing of the first outer space treaty.¹⁵⁰ Establishing a fixed point for the boundary of Earth's airspace, especially one based on technology from almost thirty years ago, is not the best regulation to impose on the world. A way for the international community to resolve ambiguity on one of the most contested definitions in space law is to fix the height to account for evolutions in technology. This approach will create a law flexible enough to withstand the constantly changing technologies and allow for the interaction between humanity and outer space.

¹⁴⁴ See Reinhardt, *supra* note 138, at 66.

¹⁴⁵ Lara L. Manzione, *Multinational Investment in the Space Station: An Outer Space Model for International Cooperation?*, 18 AM. U. INT'L L. REV. 507, 519 (2002).

¹⁴⁶ *Id.*

¹⁴⁷ *Id.*

¹⁴⁸ See James, A. Beckman, *Citizens Without a Forum: The Lack of an Appropriate and Consistent Remedy for United States Citizens Injured or Killed as the Result of Activity Above the Territorial Air Space*, 22 B.C. INT'L & COMP. L. REV. 249, 254 (1999).

¹⁴⁹ Beckman, *supra* note 148, at 254.

¹⁵⁰ *Id.*

C. *Celestial Bodies as Distinct from Outer Space*

The next ambiguous term in international space law is “outer space.” As mentioned above, no nation or international treaty has reached a consensus on where the Earth’s airspace ends and outer space begins.¹⁵¹ After establishing the end of the Earth’s airspace and the beginning of outer space, there is still ambiguity as to what exactly constitutes outer space beyond Earth’s boundaries. The language of international treaties and national space regulations always append the phrase “and the moon and other celestial bodies.” This phrasing suggests that the definition of outer space includes anywhere beyond Earth’s boundaries, wherever that might be, or conversely suggests that the term outer space on its own does not include “the moon and other celestial bodies.”¹⁵² The consistent addition of “the moon and other celestial bodies” might only serve as clarification for any state attempting to claim any part of the moon or various celestial bodies that exist outside the Earth, clarifying that the provisions of the TPGASEUOS disallows such actions in these areas. The distinction might also be borne out of an awareness of the future possibility that outer space will no longer be part of a binary Earth and non-Earth definition of outer space, but will be distinguished from certain celestial bodies with heavy commercial or human presence.¹⁵³ As the commercial sector expands onto celestial bodies, the United Nations, as well as spacefaring states, should seek to revisit the very definition and concept of outer space.¹⁵⁴

The concept of a definition of outer space that does not include certain celestial bodies raises a still unanswered question regarding the planets and asteroids above—the problem of determining where the airspace of a commercial site on an asteroid or other celestial body ends and where outer space begins again. Here, it could be useful to use Article IX of the TPGASEUOS, which requires that states take measures to avoid harmful interference with another state’s exploration and use of outer space.¹⁵⁵ In general, the height limit of airspace on Earth extends somewhat beyond what most would consider harmful interference.¹⁵⁶ On a commercial site, such as a mining operation, both the lack of an atmosphere on certain celestial bodies

¹⁵¹ Reinhardt, *supra* note 138, at 66.

¹⁵² See, e.g., Outer Space Act 1986, c. 38, § 7 (UK); G.A. Res. 2222 (XXI), *supra* note 10.

¹⁵³ Feinman, *supra* note 24, at 205–06.

¹⁵⁴ See *id.*

¹⁵⁵ G.A. Res. 2222 (XXI), *supra* note 10, art. IX; see Stotler, *supra* note 119.

¹⁵⁶ See Reinhardt, *supra* note 138, at 87.

(like asteroids), as well as the lower height where harmful interference would occur, suggest a much lower and perhaps more easily defined demarcation of where outer space begins and ends past the celestial body.¹⁵⁷

The ambiguity in defining where outer space begins and ends in relation to celestial bodies is compounded by the ambiguity surrounding how outer space is defined.¹⁵⁸ Although it does not define outer space, the TPGASEUOS makes clear that it applies to “Outer Space, including the moon and celestial bodies.”¹⁵⁹ In fact, the term outer space in the TPGASEUOS is almost always followed by the phrase “including the moon and Celestial bodies.”¹⁶⁰ The fact that the TPGASEUOS made explicitly clear multiple times that it was including “the moon and celestial bodies” in the specific article regulation suggests that the definition of outer space alone does not include the moon and celestial bodies unless specifically mentioned. Employing this logic, the definition of outer space might also exclude the space resources introduced by U.S. legislation in 2015, placing any resources that might be mined by a private entity outside the boundary of outer space.¹⁶¹

D. Resolving the Uncertainty in Launching State Selection

The ambiguity present in the selection of a “launching state” is another area where more precise definitions and leadership by the United Nations are needed. Unlike the other ambiguous terms, the definition and requirements of a launching state are clearly laid out by the United Nations in several of its treaties and conventions governing international space law.¹⁶² The ambiguity arises when multiple states qualify as the launching state.¹⁶³ The decision of which state shall be the launching state is left entirely to agreements between the nations, without any other guidelines or factors to be considered.¹⁶⁴ The problems presented by this ambiguity are especially present in the different

¹⁵⁷ See Stotler, *supra* note 119.

¹⁵⁸ See Reinhardt, *supra* note 138, at 86.

¹⁵⁹ G.A. Res. 2222 (XXI), *supra* note 10, art. I.

¹⁶⁰ *Id.*

¹⁶¹ Space Resource Commercial Exploration and Utilization, 51 U.S.C. § 51301 (2015).

¹⁶² G.A. Res. 3235 (XXIX), *supra* note 15; G.A. Res. 2777 (XXVI), *supra* note 23, art. I.

¹⁶³ See G.A. Res. 3235 (XXIX), *supra* note 15, art. II.

¹⁶⁴ *Id.* But see Frans G. von der Dunk, *Conference on Security and Risk Management in a New Space Era: Military, Commercial, and Tourism Dimensions: Passing the Buck to Rogers: International Liability Issues in Private Spaceflight*, 86 NEB. L. REV. 400, 411 (2007) (discussing the possibility of a private launch operator launching a space object from the high seas without any state qualifying as a launch state) [hereinafter von der Dunk, *Conference on Security and Risk Management*].

ways that states register objects in their national registries and in the information they provide to the United Nations for its registry of space objects.

This ambiguity could be solved in several ways. The United Nations may revisit the concept of a launching state entirely by recognizing the significant impact that the rise of private commercial launching agents have had on the launching state paradigm, especially as it applies to the CILFDCSO.¹⁶⁵ Alternatively, the United Nations could develop a hierarchy of launching states where certain launching state qualifications have precedence over others. The spacefaring states of the world could make clear in their treaties and agreements with each other exactly how a launching state will be designated, as some agreements currently do.¹⁶⁶

E. The Uncertain Registration of Space Objects

Closely related to the problem of ambiguity over the launching state is the ambiguity present in the U.N.'s rules regarding registration of space objects, both with the U.N.'s registries and with the national registries.¹⁶⁷ As mentioned earlier, states differ significantly in what objects and information they provide in their national registries to the United Nations.¹⁶⁸ A clarification of two previously discussed ambiguous terms, space objects and the launching state, would serve to rectify the current confusion and discord present among different states' national registries.¹⁶⁹ A clearer definition of space objects, specifically a definition including non-functional objects in space, and a more precise selection process for launching states, will allow for the national registries reported to the United Nations to more effectively combat and avoid the dangers that space debris presents to space craft orbiting the earth in outer space—dangers that may cause a repeat of the 2009 satellite collision.¹⁷⁰

¹⁶⁵ Von der Dunk, *Conference on Security and Risk Management*, *supra* note 164, at 410–11; *see also* G.A. Res. 2777 (XXVI), *supra* note 23, art. II.

¹⁶⁶ *See* James L. Reed, *The Commercial Space Launch Market and Bilateral Trade Agreements in Space Launch Services*, 13 AM. U. INT'L L. REV. 157, 162 (1997) (discussing the launch agreement between the United States and China).

¹⁶⁷ *See* G.A. Res. 3235 (XXIX), *supra* note 15.

¹⁶⁸ *See* Hedman, *supra* note 8 (comparing the registration practices of six different states).

¹⁶⁹ *See id.*

¹⁷⁰ Pushkin & Gray, *supra* note 2.

CONCLUSION

The United Nations and the international community have succeeded in clarifying international space regulations, and they should continue to uphold and encourage other spacefaring nations to follow customary international law. The existence of regulatory authorities among the spacefaring nations should continue to be fostered by the international community and the United Nations.¹⁷¹ The countries that do not specify the powers of their space regulation authorities should be encouraged to enact legislation to provide their authorities with broader enforcement powers.¹⁷²

The international community and the U.N.'s previous attempts to establish as international customary law the jurisdiction over its citizens, even in areas outside the territory of the nation, should be continued because they serve as a model for space regulation.¹⁷³ Further, the states that currently exercise these types of space jurisdictions should promote it among the other spacefaring nations. This type of jurisdiction ensures the enforcement of regulations in areas where jurisdiction arising from the CROLOS might fall short.¹⁷⁴

The exploration of outer space has changed significantly since the United Nations passed the TPGASEUOS two years before man would first set foot on the moon.¹⁷⁵ The evolution of space technologies as well as the emergence and growth of commercial ventures into outer space have revealed ambiguities and created shortcomings in the international regulations of outer space that must be addressed to safely continue the expansion of mankind beyond the confines of Earth. The foundation set by the U.N. space treaties and the similarities found in the regulations of the individual spacefaring nations, should serve as a model upon which to base new regulations. But where these regulations confine the evolution of space law through outdated modes of thinking about space exploration or ambiguous definitions of terms of art, the international community, led by the United Nations, must seek to clarify international space regulations to foster the movement of man to the stars.

The United Nations has shown an ability to foster this evolution with its more recent treaties, in which it codified and clarified the growing body of

¹⁷¹ See G.A. Res. 68/74, *supra* note 83.

¹⁷² Ling, *supra* note 27, at 681–89.

¹⁷³ See G.A. Res. 68/74, *supra* note 83; Restrictions on Launches, Operations, and Reentries, 51 U.S.C. § 50904 (2014); Outer Space Act 1986, c. 38, §§ 1–2, 8 (UK).

¹⁷⁴ Von der Dunk, *Conference on Security and Risk Management*, *supra* note 164, at 411 (2007).

¹⁷⁵ G.A. Res. 2222 (XXI), *supra* note 10.

customary international law among the spacefaring states.¹⁷⁶ The international community is also beginning to recognize and create solutions to the need for more uniform international space regulations.¹⁷⁷ Continued U.N. action that not only recognizes the direction of evolving international space regulations, but also serves as a leader in shaping this area of international law is critical. Clarifying the ambiguity as to where outer space lies, what a space object is, and how a launching state should be chosen are all questions the international community must answer as space exploration and commercial ventures beyond the Earth continue to expand. The international spacefaring community has grown since the first satellite escaped Earth's orbit and entered outer space.¹⁷⁸ Outer space has become more crowded, and it appears that it will only continue to do so in the future.¹⁷⁹ The international community has been very fortunate, even lucky, that the number of international space incidents have remained as low as they have,¹⁸⁰ but the time for the international community to rely on luck has ended. The time for true international consensus and cooperation, led by definitive words from the United Nations, has come.

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¹⁷⁶ G.A. Res. 68/74, *supra* note 83.

¹⁷⁷ See Press Release, Hillary Rodham Clinton, *supra* note 84; Draft International Code of Conduct for Outer Space Activities, *supra* note 87.

¹⁷⁸ Hammonds, *supra* note 5.

¹⁷⁹ See *id.*; Pushkin & Gray, *supra* note 2.

¹⁸⁰ Pushkin & Gray, *supra* note 2.

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